DRAFT
GENERAL MANAGEMENT PLAN
ENVIRONMENTAL IMPACT STATEMENT

GRAND CANYON
NATIONAL PARK • ARIZONA

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DRAFT
GENERAL MANAGEMENT PLAN
and
ENVIRONMENTAL IMPACT STATEMENT

GRAND CANYON
NATIONAL PARK
Coconino and Mohave Counties, Arizona

March 1995

This general management plan provides management objectives and visions for the entire park, with alternative plans for the park's developed areas (South Rim, North Rim, Tuweep, and the corridor trails). The proposed action, the no-action alternative, and three other alternatives are presented in this document, and their environmental consequences are analyzed. The proposed action (alternative 2) would emphasize regional cooperation for information distribution, regional resource preservation, and a quality visitor experience. A major shift away from the use of private automobiles would occur. Alternative modes of transportation would be emphasized throughout the region, with staging areas linked to regional private transit services in outlying communities and a public transit system within the park. A bike/pedestrian trail system would be developed within the park. Private vehicles would be removed from all high use areas in the park, creating pedestrian-only areas. The number of private vehicles allowed into the park at any one time would be limited in certain areas. The adaptive reuse of historic structures and other structures would be maximized. The construction of new facilities within the park would be almost entirely within disturbed areas. The visitor experience would be defined by the unique qualities of each individual area, and the number of visitors allowed into some areas of the park would be determined by a carrying capacity analysis. With respect to environmental consequences, the proposed action would stabilize park growth, enhance natural and cultural resource preservation, significantly improve the visitor experience, create better living and working conditions for park employees, and benefit local economies. Visitors could be inconvenienced by having to use alternative modes of transportation to visit certain park areas. The other alternatives include continuing existing conditions (the no-action alternative), a minimum requirements alternative (alternative 1), reduced development within the park (alternative 3), and increased development within the park (alternative 4).

The public review period for this document will end 60 days after the publication of a notice of availability in the *Federal Register*. All comments must be received by that time and should be addressed to

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United States Department of the Interior • National Park Service
in cooperation with the
United States Department of Agriculture • Forest Service

Grand Canyon National Park today encompasses approximately 1,216,000 acres of public land on the southern end of the Colorado Plateau. It is a globally significant natural resource containing scenic vistas known throughout the world. In recognition of its significant values, Grand Canyon National Park was designated as a world heritage site on October 26, 1979.

A 277-mile stretch of the Colorado River runs through the park, and thousands of miles of tributary side-canyons are included within its boundaries. The exposed geologic strata — layer upon layer from the bedrock Vishnu schist to the capping Coconino limestone — rise over a mile above the river, representing one of the most complete records of geological history that can be seen anywhere in the world.

The park contains several major ecosystems from the Sonoran Desert of the lower canyon to the coniferous forests of the North Rim. Many species of plants and animals make up these diverse ecosystems, with the park providing sanctuary. While many wild creatures live out their entire lives within the protected park area, migratory species also benefit from the temporary sanctuary that the park affords.

Over four million recreational visits are recorded in the park each year, primarily on the South Rim. Recreational pursuits include river running, fishing, hiking, photography, nature study, and sightseeing. But a vacation to the Grand Canyon can become more than a recreational or scenic venture. The canyon's grandeur and the awesome physical forces that are continuing to shape it can transform the experience of a perceptive visitor from a casual sightseeing trip to one that helps form or influence personal views of nature and individual responsibilities to conserve it.

A person's first view of the Grand Canyon often evokes awe and an overwhelming sense of wonder. As one attempts to comprehend the grandeur and scenery rolling off to the far horizons, the tremendous size and depth of the canyon begin to make a second impression, intensifying the awe and deepening the wonder. This place is truly special. From a scenic perspective alone it is unique on the planet, but there are many more attributes of the Grand Canyon that cannot be experienced or clearly understood from an overlook on the rim.

Almost the entire park is wild in character, and it is this pristine natural setting that imparts another dimension to the experience of visiting the canyon. Thousands of acres of untrammeled country allow a person to hike for days in solitude and, from time to time, to experience natural quiet. But visitors do not have to immerse themselves in wilderness to appreciate what it means to them and to the human spirit. Whether one is rafting down the river, hiking along the Tonto Trail, or enjoying panoramic views from the rim — it is during the quiet times, as the long shadows of evening fill the side canyons and the cool air descends in soft breezes from the rim, that one can look inward as much as outward and experience again that same awe and wonder, and understand that the essential wildness of the Grand Canyon is a precious gift that we must cherish and protect.

WORLD HERITAGE SITE

GRAND CANYON NATIONAL PARK • ARIZONA

NO-ACTION ALTERNATIVE — EXISTING CONDITIONS / ONGOING PROGRAMS

SUMMARY OF ACTIONS

Unlimited day visitation would continue in all park developed areas, with nearly every visitor facility in developed areas of the South Rim continuing to be overcapacity during peak use periods. No major facilities would be built, and no major park functions would be relocated. Any required facility changes would be done in or adjacent to existing disturbed areas. The number of overnight accommodations, campsites, and all other visitor services would remain the same in each developed area. Minor adjustments in management would be made to help reduce resource damage and to provide a safer visitor experience.

Planning would be focused inside the park, primarily to solve existing problems. Issues related to planning and land management practices in areas immediately outside the park would be handled individually as the need arose, without an overall area vision or cooperative regional planning effort to guide the direction. Limited cooperative planning to distribute regional information to visitors would occur.

SUMMARY OF IMPACTS

Uncontrolled growth would continue within the park, with only limited improvements to visitor services. Damage to natural and cultural resources would continue to worsen, and the visitor experience would become degraded. Communication with visitors to help them plan their trip so they could have a quality experience in the park would continue to be minimal, resulting in negative experiences for park visitors.

Extensive quantities of substandard housing would remain, along with an ever-increasing shortage of park housing, forcing more and more employees to find housing in adjacent areas, perhaps long distances from the workplace. The lack of operational space would become severe, reducing employee effectiveness. Over the long term the economy of the area could be damaged due to the worsening image of Grand Canyon National Park and the poor visitor experience.

ALTERNATIVE 1 — MINIMUM REQUIREMENTS

SUMMARY OF ACTIONS

Unlimited day visitation would continue in all developed areas of the park until visitor congestion, resource damage, and public safety warranted restricting access during peak visitation. This would be accomplished by implementing reservation systems based on the capacity of existing parking and eating facilities on the South and North Rims. Regional information programs would explain the park's reservation systems to visitors. Overnight accommodations would not be affected. Visitor use at Tuweep and on the corridor trails would not be limited under this alternative.

Existing land use patterns would be retained — no major facilities would be built, no major park functions would be relocated, and most park facilities would remain where they are now. A few minor facilities would be added. Any required facility changes would be done in or adjacent to existing disturbed areas.

Planning would be focused inside the park, primarily to solve existing problems. Issues related to planning and land management practices in adjacent areas outside the park would be handled individually as the need arose, without an overall area vision or integrated regional planning effort to guide the direction.

SUMMARY OF IMPACTS

Park resource damage and a worsening visitor experience at Grand Canyon would be alleviated by limiting the number of people visiting developed areas on the North and South Rims at any one time. Tuweep would continue to experience uncontrolled use, possibly leading to deteriorated natural resources and a degraded visitor experience over the long term. Some impacted areas would be rehabilitated, helping to restore resources within the park. The visitor experience would improve compared to the no-action alternative because fewer people would be competing to use facilities. However, visitors would continue to be frustrated by not being able to easily find places they want to see. Information, orientation, and education about park themes would remain ineffective because of inadequate and poorly located facilities. Visitors would not be well distributed throughout the park, reducing the number of people who could enjoy the park at any one time, and more and more visitors would be turned away.

An increasing number of employees would not be able to live in the park, and many would have to find their own housing, often over an hour from the park. Housing in some developed areas would be improved, and the need for additional housing would be reduced by limiting visitation.

Some improvements would occur outside the park due to NPS assistance to outside entities for regional visitor information. However, many park problems would fall to regional entities, for example, visitors parking outside the park and using private transit services to enter the park, disappointed visitors being turned away at the gate, and housing for park employees.

ALTERNATIVE 2 — PROPOSED ACTION

SUMMARY OF ACTIONS

The regional context of Grand Canyon National Park would be emphasized, and proposals for resource preservation and visitor use would take into account environmental effects on the park as well as the region. Planning outside the park would be done cooperatively, with an emphasis on disseminating information, preserving regional and park resources, and providing a quality visitor experience.

The National Park Service would work jointly with adjacent entities to provide for many park needs outside park boundaries. The most appropriate locations for facilities would be considered in a regional context, taking into consideration principles of sustainable design and the need to preserve resources while providing for a quality visitor experience. Alternative modes of transportation (public transit, hiking, and biking) would be emphasized within the park.

To minimize impacts on natural and cultural resources, existing structures would be adaptively reused, and required new facilities would be built in previously disturbed areas wherever possible. Some disturbed areas would be revegetated. Park facilities would be retrofitted, planned, designed, and operated to reflect their environmental setting and to maintain the integrity and biological diversity of ecological systems and processes.

The visitor experience within and adjacent to the park would be defined by the unique qualities of each area. To ensure a quality experience, the number of visitors admitted to certain areas would be limited during peak visitation periods based on the desired visitor experience and the need to protect resources. The process for determining use limitations would be the same throughout the developed areas of the park; however, visitor levels in specific areas would vary considerably, and use would be limited sooner in some areas than in others. As a result, day visitation on the South Rim and the corridor trails would not need to be limited during the life of this plan; day visitation on the North Rim would be limited by the year 2005 or 2010, depending on the effectiveness of management actions; and day use at Tuweep could be limited during peak times. In areas where permits became necessary, visitors would be able to obtain permits ahead of time and would have their permits checked at park entrances.

A monitoring system would be established to measure resource impacts, facility use, visitor satisfaction, and levels of visitor attendance in each park developed area. The permit system would be adjusted as needed.

To preserve resources and to ensure a quality visitor experience, most of the park's developed areas would be accessible only by public transit, hiking, or biking. Private vehicles (tour buses, cars, and RVs) would only be allowed in specific areas. The public transit, bikeway, and pedestrian system would be significantly expanded.

Interpretive programs would focus on the significant resources of Grand Canyon, as well as regional conservation and preservation issues. Overnight accommodations would be expanded on the South and North Rims primarily by adaptively reusing existing structures.

Summary of Impacts

A stable situation for the future would be provided for all the developed areas of the park, significantly improving natural and cultural resources, providing a high-quality visitor experience, and ensuring quality living and operating conditions for park employees. Most development would occur in disturbed areas, historic structures would be adaptively reused, resource damage would be minimized, park operations and living communities would function well, and regional economies would be enhanced. By establishing visitor use capacities, the park would be able to ensure high-quality visitor experiences. Planning would be done regionally to encourage sustainable planning, design, and implementation in a regional context.

Alternative 3 — Reduced Development within the Park

Summary of Actions

Alternative 3 would emphasize the preservation of park resources by placing all new facilities and relocating many existing functions outside the park. Cooperative regional planning would ensure that NPS functions occurring outside park boundaries demonstrated environmentally sensitive planning and design. The National Park Service would expand its regional information services, as described for alternative 2.

On the South Rim all day visitor vehicles would be removed, and a major public transit system would be provided. No new lands within the park would be disturbed, and historic uses of existing structures would be retained wherever possible. Overnight accommodations would be reduced on the South Rim but increased on the North Rim by adaptively reusing historic structures.

Planning for the park would be done in a regional context to minimize negative impacts resulting from park uses being placed in areas outside the park. Communications would be expanded, as described for alternative 2. Wherever possible, facilities placed outside the park would be clustered in disturbed areas and linked to existing systems. Alternative modes of transportation would be emphasized regionally as well as in major high use areas of the park, the same as alternative 2.

Summary of Impacts

There would be an emphasis on preserving natural and cultural resources within the park, and many park disturbed areas would be rehabilitated. The visitor experience within the park would be highly controlled on the South Rim, and strict limitations of the number of visitors on the North Rim and at Tuweep would force many visitors to plan far in advance to experience those areas.

Many more acres would be disturbed outside the park than any other alternative as a result of park-related facility development; services, housing, and operational facilities within the park would be limited. Many visitors would be inconvenienced since no private vehicles could be driven through the park.

Alternative 4 — Increased Development within the Park

Summary of Actions

Alternative 4 proposes actions to improve visitor convenience by placing major park visitor services inside the park wherever reasonable and by distributing visitors throughout the developed areas of the park. No day use limitations would be established unless the visitor experience was being significantly degraded.

The type of vehicular use allowed in some areas would be restricted, and high use areas would be accessible only by transit vehicles or hiking or biking (the same as alternative 2); other developed areas would be accessible by private vehicles. Overnight accommodations would be increased in all developed areas on the North and South Rims by constructing some new facilities and adaptively reusing existing structures. New facilities would be placed either in or adjacent to disturbed areas.

Planning outside the park would emphasize regional information, as described for alternative 2. Cooperative planning with outside entities would focus on disseminating information, providing trip planning assistance, and distributing visitor use.

Summary of Impacts

Allowing all visitors to enter the park and developing facilities to accommodate their needs would result in continuing resource damage. This alternative would produce more resource damage inside the park than any alternative and would set a precedent for continued resource damage in the future. The greatest resource damage would be caused by widening roads and developing additional parking. Visitor convenience would be significantly enhanced. Park operations and development would continue to expand to meet visitor demand. After 2010 the visions and management objectives for the developed areas might not be attainable due to the increases in facilities and visitors.

Impacts to regional resources would increase over the long term as a result of growth inside and outside the park to meet visitor needs. Due to ever-increasing needs for park construction, new employee housing, and larger visitor facilities, the regional economy would continue to increase.

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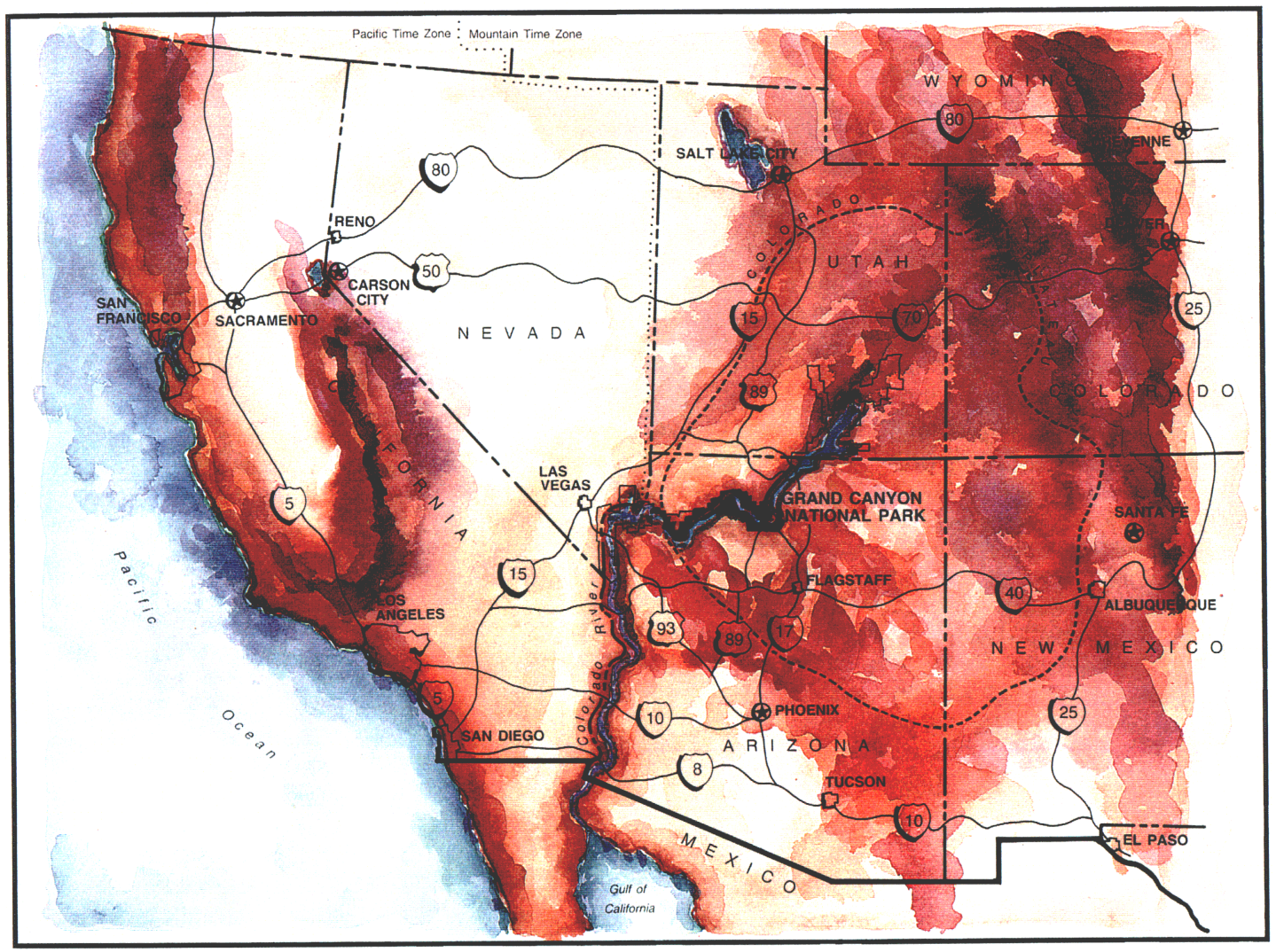
PURPOSE OF AND NEED FOR ACTION



WESTERN REGIONAL CONTEXT
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20101/DSC/1•95

This *Draft General Management Plan / Environmental Impact Statement* for Grand Canyon National Park presents and analyzes alternatives to guide the management of resources, visitor use, and general development over a 10- to 15-year period. The primary purpose of the plan is to provide a foundation from which to protect park resources from harmful activities, while providing for meaningful visitor experiences. A secondary purpose is to encourage compatible activities on adjacent lands so as to minimize adverse effects on the park.

The need for the plan is to address park issues in the context of the legislation that established Grand Canyon National Park and the organic act for the National Park Service. These issues are described in detail in the second part of this section.

The direction for future park management is based on the laws establishing the park, the purpose of the park, and its significant resources, as described below. These elements in turn are the foundation for park visions and management objectives. Collectively, these pieces provide the context and philosophical direction for the alternatives considered in this document.

While the approved general management plan will provide overall direction for park management, specific action plans will provide the details for implementation. Where appropriate, the park's existing management plans, and those being revised, are adopted by this general management plan as adequate on a parkwide level (these plans are described beginning on page 8). The need for parkwide management plans that are not yet written (such as a cave management plan) will be identified in the appropriate sections of this plan.

Within this framework, the focus of this document is on the developed areas of the park — the South Rim (Hermits Rest, Grand Canyon Village, and Desert View), the North Rim (Bright Angel Point and Walhalla Plateau), Tuweep, and the corridor trails. Four alternatives that describe development concepts for these areas are being considered.

Park Purpose

The purpose of Grand Canyon National Park is based on the legislation establishing the park and the legislation governing the National Park Service.

As a place of national and global importance, Grand Canyon National Park is to be managed

- to preserve and protect its natural and cultural resources and ecological processes, as well as its scenic, aesthetic, and scientific values
- to provide opportunities for visitors to experience and understand the environmental interrelationships, resources, and values of the Grand Canyon without impairing the resources

Grand Canyon's Legislative History

President Theodore Roosevelt, by presidential proclamation, reserved land in the Grand Canyon of Arizona as the Grand Canyon National Monument on January 11, 1908. President Roosevelt stated in the proclamation that the Grand Canyon of Arizona "is an object of unusual scientific interest, being the greatest eroded canyon in the United States, and it appears that the public interest would be promoted by reserving it as a National Monument" (Proclamation No. 794).

On February 26, 1919, Congress dedicated and set apart Grand Canyon National Park "as a public park for the benefit and enjoyment of the people" (Grand Canyon National Park Establishment Act, 40 Stat 1175). Over the years the park has been enlarged and its boundaries revised, most recently on January 3, 1975, when Congress recognized "that the entire Grand Canyon, from the mouth of the Paria River to the Grand Wash Cliffs, including tributary side canyons and surrounding plateaus, is a natural feature of national and international significance" (the Grand Canyon National Park Enlargement Act, Public Law 93-620). In this act, Congress also recognized the need for "further protection and interpretation of the Grand Canyon in accordance with its true significance."

These legislative statements effectively provide the foundation upon which park management is based. Management seeks to protect the natural and cultural resources of the park while providing for "the benefit and enjoyment of the people" through resource-based interpretation programs and appropriate public and concession facilities.

PARK SIGNIFICANCE

The significance statements focus on why the Grand Canyon is unique.

WORLD HERITAGE SITE

As a world heritage site, the Grand Canyon is recognized as a place of universal value, containing superlative natural and cultural features that should be preserved as part of the heritage of all people. The Grand Canyon is unusual in meeting both natural and cultural resource criteria for designation as a world heritage site.

NATURAL RESOURCES / NATURAL ECOSYSTEM PROCESSES

The great biological diversity of the park includes examples of five of the seven life zones and three of the four deserts in North America (the Great Basin, Sonoran, and Mojave).

The park serves as an ecological refuge, with relatively undisturbed remnants of dwindling ecosystems (such as boreal forest and desert riparian communities), and numerous rare, endemic, or specially protected (threatened/endangered) plant and animal species.

As stated in the establishing legislation, the Grand Canyon is the "greatest eroded canyon in the United States." It is considered one of the finest examples in the world of arid-land erosion.

The Grand Canyon is neither the world's longest nor deepest canyon, but its volume is immense, averaging 4,000 feet deep for its entire length of 277 miles, 6,000 feet deep at its deepest point, and 15 miles wide at its widest.

The geologic record of the Grand Canyon is particularly well-exposed and includes a rich and diverse fossil record. The canyon also contains a great diversity of geological features and rock types.

Numerous caves in the park contain extensive and significant geological, paleontological, archeological, and biological resources.

NATURAL RESOURCES / RESEARCH

Six research natural areas have been designated in the park (8,845 acres total) to provide opportunities for nondestructive research in areas relatively uninfluenced by humans.

A national natural landmark occurs partially within the park, which encourages recognition and protection of the ponderosa pine habitat of the Kaibab squirrel — a classic example of the process of variation through geographic isolation.

The park is known for world-class research in a number of fields (e.g., geology, geomorphology, paleontology, ecology, air quality, aircraft effects, and noise).

The park serves as a natural gene pool, because of its biological diversity and unique conditions.

CULTURAL RESOURCES

Six American Indian groups, represented by eight tribal governments, have close and sacred cultural ties to the Grand Canyon, with some considering the canyon their original homeland and place of origin.

Over 4,500 years of human occupation have resulted in an extensive archeological record.

The park contains a large number of historic and prehistoric properties and districts that are nationally and internationally significant. Many are eligible for or listed on the National Register of Historic Places; many are also designated as national historic landmarks.

The Grand Canyon contains nationally significant examples of rustic architecture.

The park has hundreds of miles of established prehistoric and historic routes and trails.

SCENIC QUALITIES AND VALUES

The Grand Canyon has internationally recognized scenic vistas, qualities, and values. With ever-changing and colorful scenery of enormous proportions, it is widely considered one of the world's most beautiful natural areas.

The great variety of scenery includes forests, deserts, canyons, plains, plateaus, volcanic features, and streams and waterfalls.

The Grand Canyon is an excellent place for night sky viewing.

The Grand Canyon's class 1 air quality is extremely important to its scenic quality (i.e., visibility, colors, details).

NATURAL QUIET AND SOLITUDE

The Grand Canyon is recognized as a place with unusual and noticeable natural quiet, and direct access to numerous opportunities for solitude.

SPIRITUAL/INSPIRATIONAL QUALITIES

All of the natural, cultural, and scenic qualities of the Grand Canyon, coupled with the canyon's vast size, give rise to inspirational/spiritual values and a sense of timelessness.

RECREATIONAL OPPORTUNITIES

A wide diversity of resource-based recreational opportunities and support services help visitors experience, enjoy, and appreciate the park.

The vast majority of the park provides opportunities for wilderness experiences. Hundreds of miles of trails and routes provide access to park resources and diverse recreational opportunities and experiences. The Bright Angel Trail, Kaibab Trail, and River Trail are designated national recreation trails as part of the national trails system. The Arizona Trail also passes through the park.

The Colorado River, as it flows through the park, provides opportunities for one of the world's premier river experiences, including one of the world's longest stretches of navigable white water.

POTENTIAL DESIGNATIONS

Over 1 million acres in the park meet the criteria for wilderness designation as part of the national wilderness preservation system. If combined with over 400,000 additional acres of proposed or designated wilderness contiguous to the park boundary, this area could become one of the largest, primarily desert wilderness areas in the United States.

The Colorado River and most of its tributaries in the park meet the criteria for wild river designation as part of the national wild and scenic rivers system.

PARK VISION STATEMENTS

The vision statements for the Grand Canyon convey the essence of the park's qualities. The statements are built on the park's purpose and significance. The visions affirm what must be preserved, as well as what types of experiences visitors should be able to expect. The visions also provide the basis for management objectives.

Even though the National Park Service, the U.S. Forest Service (USFS), and the Bureau of Land Management (BLM) have different congressional mandates, they all share a unified vision when addressing the management of visitor use and the preservation of natural resources on lands adjacent to Grand Canyon.

The vision statements have been developed as a result of oral and written comments that have been made throughout the public scoping process. Numerous meetings were held with the public to identify planning issues and concerns and to develop alternative strategies to resolve them. Consultations with American Indians were also significant.

SOUTH RIM

The South Rim presents opportunities for visitors that are different from those available in other park areas. Of utmost importance is direct access to the rim, where panoramas of the canyon provide the park's aesthetic, inspirational, and emotional appeal — some of the main reasons people visit the park. The South Rim should remain the focus for most park visitors, with diverse opportunities to view the canyon. It should also provide access to areas that allow people to have solitary experiences.

The South Rim should accommodate large numbers of visitors, but dense crowds and related conflicts and resource impacts should be minimized. Visitors should be able to experience solitude in natural settings as well as social exchange in developed areas. For access to such areas, the West Rim and East Rim Drives should be meandering, rural roads that lead to overlooks where visitors can get away from the more urbanized areas of the Grand Canyon Village.

The South Rim should provide parkwide orientation and introduce visitors to all the park's educational themes. This area's historical and archeological resources are so extensive, and the American Indian cultural heritage so rich, that interpretation of these aspects of the park should be a strong component of South Rim programs. In addition, historic resources should be appropriately used and their integrity maintained.

The South Rim should be a model of excellence in planning and management. Alternative means of transportation — walking, biking, or using convenient public transit — should be encouraged. To minimize new disturbance, necessary services and facilities should be provided in existing disturbed areas wherever possible, or outside the park. Any new development should be cost-effective, water-conserving, and

GRAND CANYON NATIONAL PARK IN THE FUTURE

Grand Canyon National Park is a place of tremendous beauty, peace, and scenic grandeur, as well as a place of vast natural and cultural interest. The canyon is one of the world's most spectacular products of the combined natural forces of uplift and erosion, and as a world heritage site, it has been identified as a place of universal value to all people. In order to protect this magnificent place, the park should be managed to ensure the preservation of its ecological processes and historical and archeological resources. Proposed wilderness areas both in and adjacent to the park should be managed as wilderness, and appropriate adaptive reuse of historic resources should be encouraged while the historical integrity of the cultural landscape is preserved.

Visitor use should be carefully managed in ways that ensure diverse opportunities are provided — from solitary wilderness experiences where one feels far from development, to social experiences where a variety of visitor services and conveniences are offered. The unique qualities of each area of the park and its immediate surroundings should be preserved and enhanced to heighten the distinctly different visitor opportunities. All interpretive/educational themes should be represented in the most appropriate locations and manner to educate visitors who have diverse interests and backgrounds.

Any development should be a model of excellence in planning and management, and it should reflect the preservation of park resources and values. New development should be compatible with the historic setting and architecture, as well as being energy efficient, including the use of alternative energy sources and transportation methods.

The park should work cooperatively with surrounding entities to encourage planning and management actions outside the park's boundaries that are compatible with those inside the park. Planning should be done regionally so concepts developed in the park can also be linked to adjacent surrounding areas. The defined visitor experience for particular park areas should also be carried over onto adjacent lands. Information concerning the entire region should be provided and should explain visitor use management strategies, resource sensitivity, and interpretation, as well as help respond to general visitors needs.

energy-efficient, thus reflecting sustainable design concepts.

The park should work cooperatively with the community of Tusayan, Kaibab National Forest, and all other affected entities near the park to encourage compatible, aesthetic, and well-planned development and recreational opportunities and to provide high-quality visitor information and services.

North Rim

The serene and beautiful natural environment, the sweeping canyon views, and a relaxed, uncrowded feeling are the prime qualities of the North Rim. To ensure that these qualities are preserved, the North Rim's natural, scenic, and cultural resources should be preserved. The North Rim and the adjacent national forest lands should maintain a low-key and uncrowded atmosphere that offers visitors oppor

tunities to be intimately involved with the environment.

Any visitor support and administrative facilities and services should be sited to maintain desired visitor experiences and to preserve the largely undisturbed setting. Park roads should be maintained as meandering, scenic drives planned for visitors to view the park environment at a slow pace.

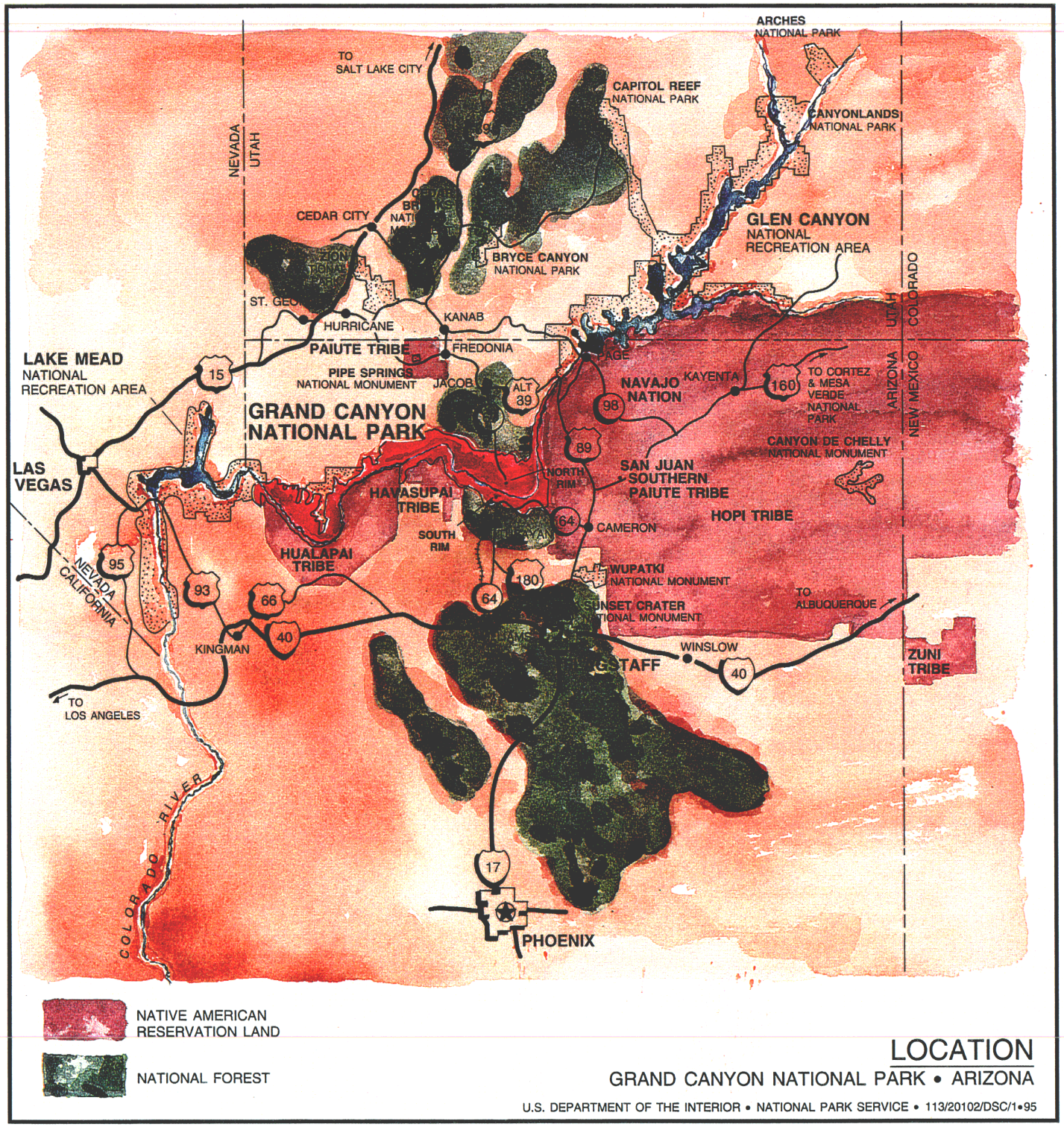
Visitors should be able to experience natural sights and sounds with little or no intrusion from other people in many areas of the North Rim. Day hiking opportunities should be provided, and trails should be maintained through forested and developed areas.

The National Park Service should work cooperatively with Kaibab National Forest to ensure that plans for the management and use of adjacent lands consider the preservation of park resources and provide the same low key, uncrowded visitor experience as is envisioned in the park.

At the same time cooperative work should be done so that the Forest Service supplements and diversifies the visitor experiences provided in the area, especially recreational uses that may be inappropriate in the park but that would be acceptable on national forest lands. This cooperative effort must recognize the different congressional mandates and missions of the Park Service and the Forest Service.

Tuweep

Tuweep is unique within the Grand Canyon because it is remote yet still accessible by car. It has spectacular views of Lava Falls, and its highly sensitive



LOCATION
GRAND CANYON NATIONAL PARK • ARIZONA

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natural resources require protection. Even though Tuweep is accessible by car, this area should continue to provide uncrowded, primitive experiences that are dominated by nature and solitude. Visitor facilities should remain minimal, and the ranger station should retain its historic character and reflect sustainable design principles.

The park should work cooperatively with the state of Arizona, Mohave County, the Bureau of Land Management, Lake Mead National Recreation Area, and other regional entities to ensure that lands outside the park remain uncrowded, that roads and facilities are primitive, and that mining, grazing, and other land uses do not adversely affect Tuweep.

Corridor Trails

The corridor trails are the main transportation routes for most visitors into the inner canyon. Rustic facilities have historically been provided along the trails to meet visitor needs. For over a hundred years mules have carried visitors into the canyon, hauled supplies, and helped with trail maintenance.

The traditional character of the trails should be maintained, and mule use should be allowed to continue. However, crowding, visitor use conflicts, and resource impacts should be minimized. Services, such as drinking water and toilets, should continue to be provided at critical locations for visitor safety and reduced environmental impacts.

Phantom Ranch should continue as a small rustic historic ranch where visitors can come and experience the inner canyon.

Undeveloped Areas

Over 90% of the park is proposed for wilderness. These areas offer visitors opportunities for solitude and primitive recreation. The management of these areas should preserve the wilderness values and character. Nonwilderness undeveloped areas should continue to serve primarily as primitive thresholds to wilderness.

Management Objectives

The management objectives for Grand Canyon, which are based on the park visions, set the direction for future park management. The objectives describe desired conditions to be achieved, while the alternatives present various ways to reach them.

International Significance

- Manage the park to preserve its integrity as a world heritage site with natural and cultural resources of national and international significance.

Natural and Cultural Resources

- Preserve, protect, and interpret the park's natural and scenic resources and values, and its ecological processes.
- Preserve, manage, and interpret park cultural resources (archeological, ethnographic, architectural, and historic resources, trails and cultural landscapes) for the benefit of present and future generations.
- Preserve, protect, and improve air quality and related values such as visibility.
- Manage visitor use, development, and support services to protect the park's resources and values.
- Preserve and protect the genetic integrity and species composition within the park, consistent with natural ecosystem processes.
- To the maximum extent possible, restore altered ecosystems to their natural conditions. In managing naturalized ecosystems, ensure the preservation of native components through the active management of nonnative components and processes.
- Manage ecosystems to preserve critical processes and linkages that ensure the preservation of rare, endemic, and specially protected (threatened/endangered) plant and animal species.
- Protect the natural quiet and solitude of the park, and mitigate or eliminate the effects of activities causing excessive or unnecessary noise in, over, or adjacent to the park.
- Preserve natural spring and stream flows and water quality. Withdraw only the minimum water necessary to meet park purposes. To the maximum extent feasible, strive to meet increases in water demand by conserving and reusing water.
- Provide opportunities for scientific study and research focused on Grand Canyon, consistent with resource protection and park purposes.
- Inventory, monitor, and maintain data on park natural and cultural resources and values, and utilize this information in the most effective ways possible to facilitate park management decisions to better preserve the park.
- Clearly delineate and maintain the park boundary to protect park resources and values.
- Identify and evaluate all cultural properties within the park for inclusion on the National Register of Historic Places.
- Collect ethnographic data and develop an ethnohistory for the Havasupai, Hopi, Hualapai, Navajo, Southern Paiute, and Zuni in association with the Grand Canyon, as appropriate, to preserve, protect, and interpret park resources and values important to diverse American Indian cultures, including sacred, significant, and traditional use areas.

Wilderness and Wild River Management

- Manage areas meeting the criteria for wilderness designation as wilderness. Actively pursue the designation of these lands as part of the national wilderness preservation system.
- Manage the Colorado River and its tributaries that meet the criteria for wild designation under the federal Wild and Scenic Rivers Act as a wild river. Actively pursue designation of these waters as part of the national wild and scenic rivers system.

Visitor Experience

- Provide a diverse range of quality visitor experiences, as appropriate, based on the resources and values of Grand Canyon, compatible with the protection of those resources and values.
- Consistent with park purposes and the characteristics of each landscape unit, preserve and protect the maximum opportunities in every landscape unit of the park for visitors to experience the solitude, natural conditions, primitiveness, remoteness, and inspirational value of Grand Canyon.
- Provide equal access to programs, activities, experiences and recreational opportunities for individuals with disabilities, as appropriate and consistent with the levels of development and inherent levels of access in areas within the park.
- Provide a wide range of interpretive opportunities and information services to best assist, inform, educate, and challenge visitors.
- Educate and influence the public through positive action to preserve and protect the world they live in, including but not limited to the park.
- Provide a safe, efficient, and environmentally sensitive transportation system for visitors, employees, and residents, consistent with management zoning and resource considerations. Emphasize nonmotorized modes of transportation wherever feasible.
- Provide access that is appropriate and consistent with the character and nature of each landscape unit and the desired visitor experience.
- Develop visitor use management strategies to enhance the visitor experience while minimizing crowding, conflicts, and resource impacts.
- Provide visitor and employee facilities and services, as necessary and appropriate, in or adjacent to areas dedicated to those uses or in appropriate disturbed areas.
- Ensure that development and facilities within the park are necessary for park purposes.

Facility Design

- Consistent with the park's purpose, strive to make Grand Canyon a model of excellence in sustainable design and management through such means as energy efficiency, conservation, compatibility with historic setting and architecture, recycling, accessibility, and the use of alternative energy sources.
- Encourage appropriate use and adaptive reuse of historic structures, while preserving historic integrity.
- Design high-quality facilities that exemplify visual consistency and appropriateness.

Regional Issues

- Understand, assess, and consider the effects of park decisions outside the park as well as inside.
- Work cooperatively to assist local American Indians in plan-

ning, developing, and managing lands adjoining the park in a mutually compatible manner.

- Work cooperatively with appropriate entities to encourage compatible, aesthetic and planned development and recreational opportunities outside park boundaries, and to provide information, orientation, and services to visitors.
- Carry the NPS concern for the environment beyond the boundaries of the park, including the protection of park resources and values from external influences.

South Rim Management Objectives

The South Rim is considered to be bounded on the west by the Havasupai Reservation and the Great Thumb west of Pasture Wash, on the east by Cape Solitude and Cedar Mountain east of Desert View, on the north by the canyon rim, and on the south by the park boundary. The following objectives for the South Rim are in addition to the overall park objectives.

Visitor Experience
- Identify and develop an appropriate range of visitor experiences, opportunities, and access that will accommodate a variety of visitor expectations, abilities, and commitment levels.
- Recognize that views of the canyon, access to views and trails, and interpretation and information are the most important parts of the visitor experience on the South Rim.
- Maintain the South Rim from Hermits Rest to Desert View as the focus for the majority of visitor use in the park, including major visitor facilities and accommodations.

Cultural Resources
- Utilize the extensive cultural resources of the South Rim as a strong component of the interpretive program, including the interpretation of American Indian cultures.

Development
- Develop and promote the use of foot trails, bicycle paths, and public transportation to provide convenient and efficient movement of visitors, employees, and residents within Grand Canyon Village and between major points of interest.
- Maintain and enhance the meandering, rural character of West Rim and East Rim Drives, including the feeling that one is removed from the developments of Grand Canyon Village and Desert View. Maintain the existing large undisturbed areas along West Rim Drive.

North Rim Management Objectives

The North Rim is considered to include all lands north of the canyon rim within the park boundary, including Tuweep, except undeveloped park lands west of Tuweep. Bright Angel Peninsula is considered to encompass the entire peninsula south and west of the North Kaibab trailhead, including the majority of North Rim developments. The following objectives for the North Rim are in addition to the overall park objectives.

Visitor Experience
- Maintain a slow pace, low-key atmosphere and historic setting on the North Rim, including Bright Angel Peninsula, allowing visitors to have an intimate involvement with the environment. Preserve the uncrowded atmosphere of limited or no development in all areas. Ensure that park roads are maintained as meandering, scenic roads that are designed for viewing the park environment at a slow speed.
- Ensure that visitors, even on Bright Angel Peninsula, are within a short distance of areas where the sights and sounds of other people create little or no intrusion on their experience.
- Provide a primitive winter experience consistent with historic winter recreation opportunities.
- Maintain Tuweep as an uncrowded, primitive, and remote experience that is dominated by nature and solitude.

Access
- Emphasize the natural environment and slow pace of the visitor experience in providing access to all parts of the North Rim, and be consistent with the characteristics of the particular destination inside the park.
- Provide opportunities for day hikes on maintained trails through the forest environment away from developed areas.

Development
- Limit all visitor, administrative, and support facilities and services, including overnight accommodations, to maintain the integrity of the desired visitor experience and historic setting.
- Maintain large undisturbed areas on the Bright Angel peninsula.

Corridor Trails Management Objectives

Corridor trails include the Bright Angel Trail, North and South Kaibab Trails, River Trail, Old Bright Angel Trail, and the Tonto Trail between the Bright Angel and South Kaibab Trails. The following objectives for the corridor trails are in addition to the overall park objectives.

Visitor Experience
- Where livestock and visitors share the same trails and areas, minimize conflicts and resource impacts, and enhance safety.
- Provide a high level of NPS management presence to enhance the visitor experience and safety, and to protect park resources and values.
- Provide a quality backcountry experience consistent with historic uses of the cross-canyon corridor.

Development
- Provide facilities only at currently developed areas within the cross-canyon corridor.
- Provide only basic services and facilities that support resource preservation and visitor safety, and that preserve an experience dominated by the natural environment and historic setting, design, and uses.
- Minimize the intrusion of the sights and sounds of facilities and developments on the visitor experience (for example, lights or generators should not be seen or heard within campgrounds). Maintain and enhance the historic setting.

Maintenance
- Maintain the Bright Angel, North Kaibab, South Kaibab, and River Trails to accommodate high levels of backcountry visitor use.
- Minimize the impacts of trail maintenance activities, such as borrow pits, on the environment away from the immediate trail.

Undeveloped Area Management Objectives

Undeveloped areas are considered to be all areas within the park boundaries not within the areas described for the South Rim, North Rim, or corridor trails. They include most of the inner canyon, Lower Gorge, Colorado River, Marble Canyon, Sanup Plateau, and Pasture Wash. The following objectives are in addition to the overall park objectives.

- Manage and monitor visitor use and park resources in the park's undeveloped areas to preserve and protect natural and cultural resources and ecosystem processes, and to preserve and maintain a wilderness experience or, where an area is not suitable for wilderness, a primitive experience.
- Establish indicators and standards for desired visitor experiences and resource conditions, monitor the condition of those indicators on a regular basis, and take action to meet the standards if they are not being met.
- Provide a variety of primitive recreational opportunities consistent with wilderness and NPS policies on accessibility. In deciding which opportunities would be provided in the undeveloped areas of the park, consider recreational opportunities available outside the park, as well as opportunities available in developed areas of the park.
- Conduct administrative activities, including research, search-and-rescue, emergencies, and fire management, in a manner that is consistent with NPS policies regarding wilderness management and use of the minimum tool in wilderness areas.
- Maintain roads designated open to public or administrative motor vehicle use in undeveloped areas in an unpaved condition without major improvements. Only consider improvements that reduce resource impacts in keeping the road minimally open for vehicle use. Rehabilitate and revegetate all roads not designated for vehicle use, or convert them to trails as appropriate.
- Consistent with the above goals, reduce conflicts among undeveloped area users, including river, hiker, stock, motorized and non-motorized users.

CONTEXT FOR THE PLAN

Issues and Concerns

The most pressing issues in the park today that are not being dealt with in any approved park-wide plan are those that result from the annual crush of five million visitors and their private cars. The roads and facilities in the developed parts of the park were never designed to handle this volume of use. The result has been the gradual degradation of the visitor experience and unacceptable impacts on the park's natural and cultural resources.

South Rim

■ Region

The South Rim lacks a coordinated regional transportation system, and most visitors rely on private vehicles for access to the park; a few visitors arrive by tour bus. High visitor use, particularly in summer, causes traffic congestion outside the park.

There is no information or orientation for visitors before they enter the park. Visitors often arrive at the South Rim without reservations for accommodations, not realizing that facilities are usually full year-round

Most park visitors on the South Rim pass through the community of Tusayan, which has a number of motels, restaurants, and tourist developments that cater to park visitors. There is no overall plan to guide future development in the Tusayan area. The potential expansion of Grand Canyon Airport in Tusayan would also increase visitation to the park.

There are demands for more water outside the park, with the possibility of new wells or requests for more park water.

■ Visitor Experience

The South Rim is too crowded during summer. The road system is heavily congested and confusing; confusing traffic routing and signs further confound visitors. Parking for automobiles and buses is inadequate.

The shuttle system is crowded, and there are too few buses. Routes are inadequate, and the operating season is too short.

The small visitor center is hard for visitors to find. Orientation is inadequate, and outdated exhibits are in overcrowded spaces.

Interpretive facilities, such as the Yavapai observation station and Tusayan museum, are overwhelmed by visitors in the peak season, resulting in inefficient operations. The park's interpretive emphasis is on Euro-American cultures, with little interpretation of American Indian cultures and their relationship to the canyon. Information and interpretation are inadequate for international visitors.

Food services are inadequate, with long waits at all sit-down restaurants.

Biking is dangerous because no lanes, paths, or trails have been designated.

■ Cultural and Natural Resources

There is potential for archeological resources to be damaged by development.

Historic structures in Grand Canyon Village are poorly used.

Air quality is poor due to auto and bus emissions, and wood smoke.

Vegetation at the most popular overlooks is being trampled by unrestricted use.

Natural quiet is affected by aircraft overflights.

■ Utilities

Water for the South Rim is provided by the transcanyon waterline, which needs costly repairs. There is an issue about selling park water to entities outside the park.

Phone service is inadequate, which limits the effectiveness of visitor communications and regional coordination.

There are too few restrooms. Visitors must use chemical toilets in the village and at some museums, and these facilities are maintenance intensive.

North Rim

■ Region

Visitor information and regional orientation before visitors reach the park is inadequate.

There are no coordinated means to work with outside entities to address development needs and environmental concerns.

■ Visitor Experience

Many visitors favor the current low-key experience, but there is concern that this experience could be lost with more visitation.

Aircraft noise intrudes on the experience in several areas.

Traffic flow is poor, and signs are confusing in particular areas.

There is not enough parking on Bright Angel Point.

Orientation and information services are inadequate.

Food services are overcrowded and lack diversity.

Access to Cape Royal is by way of a steep, narrow, windy road.

There is a question about opening Bright Angel Point to additional types of winter use.

■ Cultural and Natural Resources

Archeological sites are being vandalized, especially in the backcountry.

Fuel loads in wooded areas should be more efficiently reduced.

■ Utilities

There are too few restrooms in the lodge area; restrooms are lacking in other areas.

The capacity of septic, sewage, and water systems may not be able to accommodate future growth.

Tuweep

■ Region

Information for visitors before they get to Tuweep is inadequate.

Closer communication between the Bureau of Land Management and the park is needed to provide visitors with information, more appropriately distribute use, and ensure resource preservation

■ Visitor Experience

Future visitor increases could degrade the present visitor experience at Tuweep.

Parking occurs directly at the overlook, with potential for harmful effects on the resource. Designated parking is inadequate.

The narrow dirt roads receive limited maintenance.

Campsites are overcrowded, and the campground is overused by groups. The campsites near the Toroweap overlook have no privacy.

■ Cultural and Natural Resources

Natural quiet is affected by aircraft overflights.

■ Utilities

Water is limited. Chemical toilets, with high maintenance requirements, are used.

Corridor Trails

■ Visitor Experience

Visitor information is lacking, so visitors are not always prepared for safe hiking trips. Trails are often overcrowded.

Mule use on all South Rim trails causes conflicts with hikers.

■ Cultural and Natural Resources

Intensive trail maintenance is needed due to mule use, and borrow pits in the inner canyon are used for maintenance purposes.

Excess water from the transcanyon waterline is released to Garden Creek, with resulting impacts on the natural habitat.

■ Utilities

Water-conserving toilet facilities are lacking.

Some trailheads lack restrooms, drinking water, or phones.

Other Issues

Issues related to the undeveloped areas of Grand Canyon — including the Lower Gorge, the Colorado River, Marble Canyon, all inner canyon areas not considered in the corridor trails, sections of the South Rim, and most of the North Rim (including the Sanup and Kanab plateaus) — will be addressed through implementation plans and studies now underway. The issues include aircraft overflights, natural quiet, regional air quality, and water use.

Influence of Other Plans and Projects on This Plan

Plans and studies used to develop this document are listed in the "Selected References" section. The plans listed below directly influenced the development of alternatives and their environmental analysis. In addition, several plans will need to be prepared once a general management plan has been approved; these NPS plans are also identified.

National Park Service

Master Plan. The 1976 final *Master Plan* is the current guiding document for the park. It establishes the management philosophy and identifies strategies for addressing issues and achieving management objectives. Existing development, as described under the no-action alternative, is based on the direction established in the 1976 *Master Plan.*

This plan was based on the park boundaries as defined by the Grand Canyon National Park Enlargement Act of 1975.

Wilderness. A wilderness proposal was prepared in 1980 at the request of Congress; it was updated in 1993 and awaits further action. Wilderness designation was proposed for 1,109,257 acres, with an additional 29,820 acres of potential wilderness, pending resolution of park boundary and motorized riverboat issues.

NPS *Management Policies* (1988) require that wilderness study areas be managed the same as designated wilderness and that no actions be taken that would diminish wilderness suitability until the legislative process for wilderness designation has been completed.

Therefore this *Draft General Management Plan / Environmental Impact Statement* treats all proposed wilderness areas as wilderness and anticipates the final resolution of wilderness issues and the preparation of a wilderness management plan as future actions. All actions proposed in this document, and all future implementation plans based on it (such as the *Backcountry Management Plan,* the *Colorado River Management Plan,* and the *Fire Management Plan)* will be consistent with NPS wilderness policy requirements.

Resource Management Plan. The park's *Resource Management Plan*(updated in 1994) guides the management of all park resources. It has provided guidance throughout the planning process.

Backcountry Management Plan. The park's 1988 *Backcountry Management Plan* will be updated to be consistent with the direction provided in the management objectives and other sections of this document. A wilderness experience will be provided in all wilderness areas. Ways to manage use on the corridor trails and at Tuweep will generally be addressed in the revised plan according to the direction provided in this general management plan.

Colorado River Management Plan. The park's 1989 *Colorado River Management Plan* will be updated to be consistent with the direction provided in the management objectives and other sections of this document. A wilderness river experience will be provided on the river, and the nonconforming uses of motorboats and generators will be among the subjects addressed in the updated plan. The plan will be consistent with NPS input into the Glen Canyon environmental studies and the environmental impact statement for the operation of Glen Canyon Dam.

Fire Management Plan. The park's 1992 *Fire Management Plan* will be updated to be consistent with the direction provided in the management objectives and other sections of this document. It will also specifically address the restoration of the natural fire regime in wilderness areas, using practices consistent with the wilderness management plan.

Other Plans. The park's 1985 *Statement for Management,* the 1989 *Land Protection Plan,* the 1994 *Architectural Character Guidelines,* and the 1994 *Statement for Interpretation* were also consulted in developing the alternatives considered in this document.

Selection of Impact Topics

Based on an analysis of significant resources and the potential for beneficial or adverse effects on them, impact topics were selected. The selection was also based on concerns expressed during scoping and public involvement activities and on statutory, regulatory, and NPS policy requirements. All impacts are addressed regionally and for the park.

Site-specific planning and environmental compliance will be carried out for specific development and recovery areas after the final general management plan has been approved. More detailed impact analyses will be conducted before any subsequent action plans are approved. The following impact topics were identified.

- *Natural resources* — threatened and endangered species, geologic resources, soils, vegetation, wildlife, water resources, air quality, solitude and natural quiet, and visual quality
- *Cultural resources* — archeology, traditional cultural properties, ethnographic resources, historic structures, and cultural landscapes
- *Visitor experience* — visitation, regional information, orientation and interpretation, visitor convenience and services
- *Transportation-related concerns* — access and circulation, parking, transit, bike and pedestrian trails
- *Socioeconomic environment* — regional effects of visitation and visitor expenditures, plus impacts of housing, community services, and concessions on jobs and earnings;
- *Area Operations* — NPS and concession employees housing needs, facility and space needs for community services and management support (including operational relationships and conflicts with visitors), and utilities (potable water, wastewater, power, and phones)

Bureau of Land Management

Arizona Strip District, Resource Management Plan and Final Environmental Impact Statement. This 1990 plan by the Bureau of Land Management provides management direction for the Arizona Strip and was important in developing the management direction for the Tuweep area. The management objectives and proposed management actions for lands adjacent to Tuweep are similar and compatible with the park's management objectives and visions.

U.S. Forest Service

Kaibab National Forest Plan. This 1987 plan, which is now being revised, defines the mission, goals, objectives, and management direction for most of the national forest lands directly adjacent to developed areas on the South and North Rims. The management goals and objectives for recreation and visitor use management in Kaibab National Forest are compatible with the visions for Grand Canyon National Park established during this general management planning process. The USFS goals and objectives were carefully considered when developing the alternatives considered in this document.

Kaibab National Forest Land Exchange Environmental Impact Analysis. The U.S. Forest Service has recently started analyzing the environmental impacts associated with the exchange of a large contiguous parcel of land (±640 acres) adjacent to development in Tusayan for ±1,200 acres of inholdings scattered throughout the Tusayan Ranger District of Kaibab National Forest.

The purpose of the proposed land exchange is to manage and influence the development of land located within the Tusayan Ranger District to ensure that the appropriate level of visitor and community services are provided and that resource values of the national park and national forest are protected. The exchange could help minimize potentially adverse impacts that could otherwise result from piecemeal, uncoordinated development of private and federal lands.

If completed, the land exchange would consolidate lands adjacent to an existing urban area and allow for housing and related community services to be developed for Forest Service and Park Service employees. Visitor accommodations, commercial enterprises, and park-related interpretive facilities could also be provided.

As a cooperating agency, the National Park Service is working closely with the Forest Service for two primary reasons: (1) to help ensure that the land exchange would not adversely affect the national park, and (2) to see if needed park housing, community services, and possible gateway information, staging/parking, and public transit facilities could be a part of the development.

Tusayan Planning Committee

Tusayan Area Plan. In 1993 Coconino County formed the Tusayan Planning Committee to create a plan for the Tusayan area. The plan would guide future land use decisions in Tusayan. A park representative from the general management planning team is on the committee and provides input to ensure that decisions made in the plan are positive for park resources and visitors, and that any actions will create an improved gateway to the Grand Canyon's South Rim.

Regional Transportation Committee

In 1993 a regional transportation committee was formed to provide a process for making regional transportation decisions. The committee's purpose is to help analyze transportation options outside the park in conjunction with the park's general management planning process.

The committee, which is coordinated by the Northern Arizona Council of Governments, includes numerous public and private entities. A steering committee helps direct the whole committee. A member of the Grand Canyon general management planning team is on the overall committee and the steering committee.

Through this committee, a regional transportation study is being conducted, focusing on regional intermodal transportation solutions to help solve traffic congestion within the park. The study is concentrating on establishing staging areas in existing communities and developing efficient alternative transportation modes to the South Rim.

Overview of Alternatives

Four alternatives are being considered, in addition to a no-action alternative, which provides a baseline for analyzing impacts.

• *Alternative 1: Minimum Requirements* — This alternative would continue the present course of action until resource damage, visitor safety, and a meaningful visitor experience could no longer be ensured because of too many visitors and motorized vehicles. At that time a reservation system would be established to limit the number of visitors or vehicles entering the park at any one time, primarily during peak hours.

Park planning would have an inward focus, with little cooperative planning done outside park boundaries. However, regional information would be expanded to ensure that visitors understood the reservation system and could make reservations before reaching the park. Planning within the park would focus on existing problems and would occur when situations became severe.

• *Alternative 2: Proposed Action* — This alternative would emphasize planning in a regional context. Cooperative planning with outside entities would focus on distributing information about visiting the park, preserving regional resources, encouraging compatible development, and providing a quality visitor experience.

To protect resources within the park the most appropriate locations for park facilities would be considered in a local and regional context, taking into consideration regional environmental as well as economic sustainability and the need for resource preservation as well as providing a quality visitor experience.

Alternative modes of transportation would be encouraged throughout the region and required in certain portions of the park. The adaptive reuse of the park's historic structures would be maximized. The construction of new facilities, or the expansion of existing facilities, would occur primarily in disturbed areas; undisturbed lands (both inside and adjacent to the park) would be avoided wherever feasible.

The visitor experience would be defined by the unique qualities of each individual area, including areas outside the park. Therefore, the number of visitors admitted to some areas of the park during peak visitation periods would be limited.

• *Alternative 3: Reduced Development within the Park* — This alternative would emphasize the preservation of park resources by placing as many facilities as reasonable outside park boundaries. Cooperative planning would be undertaken to minimize the impacts of disturbance outside park boundaries.

Within the park historic structures would be adaptively reused, and existing historic uses would be continued. To minimize resource damage, visitors would have to use alternative modes of transportation in most areas of the park, and the number of visitors admitted to certain areas of the park would be carefully controlled.

• *Alternative 4: Increased Development within the Park* — This alternative would focus on enhancing the visitor experience by providing convenient facilities as near the park as feasible and working cooperatively with outside entities to provide park and regional information and trip planning assistance, as well as to help distribute visitors throughout the region.

Wherever reasonable, major park visitor services would be placed inside the park. Visitor distribution would be maximized to reduce the need for limiting the number of people allowed in the park at one time. Resources would be protected by placing needed facilities in or near disturbed areas, or in nearby areas outside the park.

The alternative actions are summarized in table 1 at the end of this section. Environmental consequences are summarized in table 2.

Actions Common to All Alternatives

Certain planning assumptions and proposals are common to all alternatives. These relate to actions both inside and outside the park, and they are described below.

Visitor Experience

An action common to all alternatives in this plan is the preservation of the wilderness threshold visitor experience along the rim of the canyon. In every alternative, actions are proposed that would ensure an enjoyable experiences as visitors arrive at the rim. The anticipation and sense of arrival for first-time visitors as well as returning visitors are key elements in the visitor experience, and they need to be maintained regardless of what alternative is ultimately chosen for implementation.

The visitor experience at the Grand Canyon can be described as basically unfolding in two phases. The first phase is the arrival sequence and canyon viewing, and all visitors participate in this experience. Most visitors spend their entire time in the park getting oriented to the facilities and services and viewing the canyon from various rim overlooks. The second phase is exploring the canyon below the rim. Even though thousands of people every year hike or ride the corridor trails into the depths of the canyon, and thousands more float the river, the majority of visitors do not have the time or inclination to do this, and for them taking in the spectacular vistas from the rim constitutes their park experience.

Whether a visitor's interest is focused on scenery or nature study or human history, the visitor experience is made up of activities that happen above or below the rim. All alternatives consider actions that would (1) protect and ensure the individual visitor's opportunity to experience that awe-inspiring first look into the Grand Canyon from along the rim, and (2) maintain the opportunity for threshold wilderness experiences along the many miles of corridor trails.

The intent of the general management plan for the Grand Canyon, then, is just as much about preserving nature and wildness in the Grand Canyon as about protecting the visitor's experience of wonder and awe when first gazing into the depths of the canyon. In one sense the visitor experience at the Grand Canyon depends on the park staying wild below the overlooks and staying quiet and uncrowded behind them.

Management Zones

The NPS *Management Policies* (1988) require that general management plans

> prescribe a system of management zoning for park lands and waters to designate where various strategies for management and use will best fulfill management objectives and achieve the purpose of the park. The delineation of management zones will be based on an evaluation of the congressionally established purposes of the park; the nature of the park's natural and cultural resources; all past, existing, and anticipated uses; and park management objectives. This prescriptive zoning will consider the capability of lands to support identified uses and will be used as a framework for specific planning and management decisions on use and development of the park. (NPS 1988d 2:7).

■ Natural Zone

As defined in the NPS *Management Policies,* the natural zone includes lands and waters that will be managed to conserve natural resources and ecological processes and to provide for their use and enjoyment by the public in ways that do not adversely affect these resources and processes. Development in the natural zone will be limited to dispersed recreational and essential management facilities that have no adverse effect on scenic quality and natural processes and that are essential for management, use, and appreciation of natural resources (NPS 1988d 2:7).

The 1980 and 1993 wilderness proposals, the established Havasupai use land, and undeveloped areas on the South Rim are all within the natural zone. (The Management Zones map illustrates the part of the park that is within the natural zone.)

■ Development Zone

The development zone, as defined in the *Management Policies,* includes lands that will be managed to provide and maintain facilities serving park managers and visitors. It will include areas where park development or intensive use may substantially alter the natural environment or the setting for culturally significant resources. Impacts associated with such development will be mitigated to the greatest extent possible. The development zone will encompass the facilities themselves and all associated lands directly modified as a result of their continuing management and use. Development zones will be restricted to the smallest area necessary to accommodate required development and use (NPS 1988d 2:8).

Eight distinct developed areas are included in this zone: Hermits Rest, Grand Canyon Village, Tusayan museum, Desert View, and their connecting drives on the South Rim; Tuweep and Bright Angel Point on the North Rim; Phantom Ranch; and Lees Ferry

■ Cultural Zone

This zone includes lands that will be managed for the preservation, protection, and interpretation of cultural resources and their settings and to provide for their use and enjoyment by the public. Cultural resources that are key to the purposes of the park will be included in this zone (NPS 1988d 2:7).

All designated historical districts being dealt with in the plan are located within the above-listed developed areas. Compared to the geographic extent of the other zones, these districts are small. A separate illustration at an appropriate scale has been provided in the "Affected Environment" section.

Boundary Considerations

As explained in the NPS *Management Policies,* Congress has specifically directed the National Park Service to consider, as part of the planning process, what modifications of external boundaries might be necessary to carry out park purposes (NPS 1988d 2:8). The National Park Service is directed to conduct studies of potential boundary adjustments. These studies may result in recommendations to revise boundaries

- to include significant resources or opportunities for public enjoyment related to the purposes of the park
- to address operational and management issues such as access and boundary identification by topographic or other natural features or roads
- to protect park resources critical to fulfilling the park's purposes

Recommendations to expand park boundaries will be preceded by determinations that

- the added lands will be feasible to administer considering size, configuration, ownership, costs, and other factors
- other alternatives for management and resource protection are not adequate (NPS 1988 2:8)

The scoping process for this plan identified a concern along the northwest boundary of the park regarding the long-term protection of park interests relative to the airstrip at Tuweep. This concern would be addressed in cooperation with affected landowners, and subsequently a determination would be made as to whether a boundary study for this area should be conducted to determine the desirability and feasibility of adjusting the park boundary.

Sustainable Development

Sustainable development attempts to minimize human impacts on the earth, recognizing that development practices often deplete natural support systems, or may lead to the destruction of critical cultural resources. Central to the concept of sustainable development is the idea that all decisions — from initial concept, through design, construction, and operations — must be evaluated in light of the principles of natural and cultural conservation.

The Park Service would promote environmentally sensitive planning and design and would demonstrate technologies and practices that reduce environmental impacts and produce environmental benefits in energy conservation, solid waste management, transportation, water conservation and reclamation, wastewater treatment, and community organization.

Access for Visitors with Disabilities

All nonhistoric buildings would be made fully accessible for persons with disabilities. Every effort would be made to ensure that providing accessibility to historic buildings would be balanced with maintaining the historic integrity of each structure. All visitor services would be adapted for those visitors with special needs.

All parking lots would conform to federal accessibility standards. Handicap parking with adjoining access aisles would be located next to accessible routes.

All trails above the rim would be made as accessible as physical conditions allow, given the fact that the terrain at Grand Canyon is rugged and steep. Actual trail conditions would range from wide paved trails with level grades to narrow unpaved trails with steep grades. Wherever possible, slopes would not exceed 5% and cross slopes would not exceed 2%. A trail rating system based on ease of accessibility would be developed. Trails would be rated so that visitors with disabilities would know what to expect.

Accessible transit vehicles would be made available in transit only areas, and visitors with disabilities would be allowed private vehicle access.

Interpretive Prospectus

An interpretive prospectus for Grand Canyon National Park is being developed in concert with the general management plan. When approved, this prospectus would be the first step toward comprehensive interpretive planning for facilities proposed in this plan. The interpretive prospectus would also establish a foundation for future exhibit planning and design, audiovisual production, and publications because it is based on the same set of interpretive themes that have been developed for this general management plan, as stated below.

■ Archeology

The ways human beings adapted to a harsh environment, how they utilized the canyon's natural resources, and what environmental and cultural conditions allowed them either to live at the canyon or forced them to move elsewhere offer important analogies for modern people and their interrelationship with the natural environment.

■ Ethnography

Many American Indians attribute a profound religious and cultural significance to the canyon. It is their sacred and ancestral homeland, a place that remains extremely spiritual to them.

■ History

The exploration, exploitation, and protection of the Grand Canyon region affected the eventual development of the area.

American Indians lived and continue to live in and around Grand Canyon, and they have played and continue to play a significant role in the history of the canyon.

■ Geology

Grand Canyon is one of the most spectacular erosional features on the face of the earth. Water, including the Colorado River, and other natural forces are responsible for sculpting the arid landforms visible below the rim. Each of the many rock layers exposed in the canyon responds differently to erosion, giving the canyon its characteristic diversity of shape and color.

The formation of the Grand Canyon and its multiple rock layers was the product of many forces, including uplift and subsidence of the land, erosion, volcanism, and the movement of land masses over large portions of the earth. Understanding the exact timing and sequence of events that carved the canyon still challenges scientists.

The geologic record exposed in the walls of Grand Canyon — many thousands of feet of sedimentary, igneous, and metamorphic rock — provides an unparalleled view of the geologic history of North America.

■ Natural Resources

The elevational diversity at Grand Canyon has resulted in significant climatic variations and biological diversity that are reflected in life zones ranging from the arid lower Sonoran Desert to those typical of forested regions far to the north in Canada.

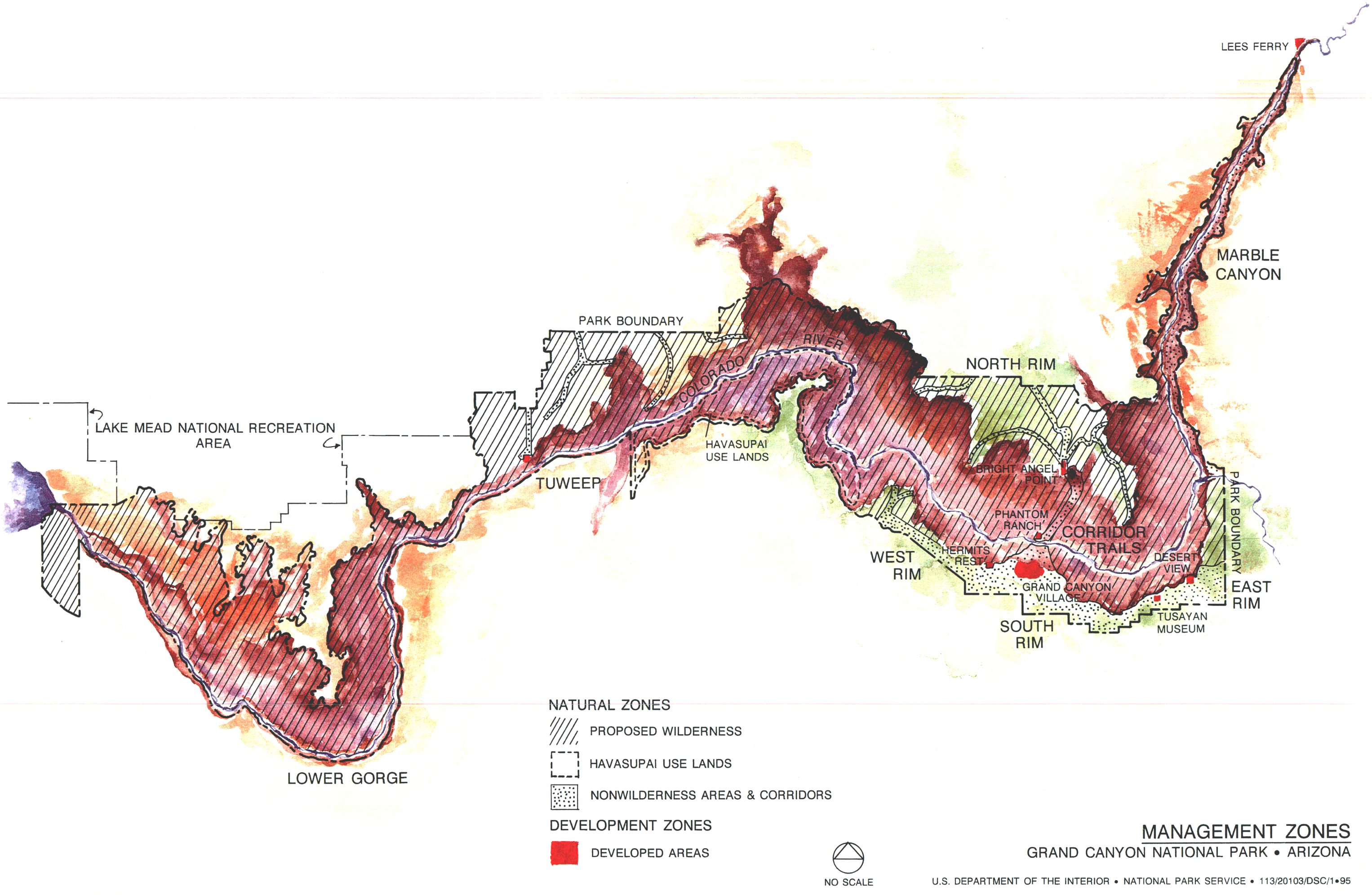
■ Park Management

Decisions made about the operation of the park must preserve park resources while providing for the enjoyment of visitors.

Outside activities and influences often threaten the natural and cultural resources and values of the park. The park also affects people and lands outside the park boundaries. The National Park Service works cooperatively with outside interests to identify threats and solutions.

■ Inspiration and Experience

The Grand Canyon has an aesthetic and emotional appeal that has inspired people to contemplate the significance of nature in the human experience (with examples from the works of artists, writers, and musicians).



NATURAL ZONES

- PROPOSED WILDERNESS
- HAVASUPAI USE LANDS
- NONWILDERNESS AREAS & CORRIDORS

DEVELOPMENT ZONES

- DEVELOPED AREAS

NO SCALE

MANAGEMENT ZONES

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20103/DSC/1•95

The Grand Canyon offers opportunities for solitude, contemplation, and a personal experience of the remarkable resources that make up the canyon and its environments. The whole is diminished if any of these pieces is lost.

Proposed Wilderness

Over 90% of the park would be managed as wilderness, in accordance with the park's 1993 wilderness proposal. Areas currently excluded from proposed wilderness include (1) several dirt roads throughout the park, (2) on the South Rim the area from Hermits Rest to Desert View, (3) on the North Rim Bright Angel Point, 300′ on either side of paved roads and 150′ on either side of unpaved roads, and the Tuweep developed areas, and (4) the corridor trails.

Carrying Capacity

All alternatives establish a numerical limit to how many visitors can be accommodated at park facilities. This capacity figure is based on the size of existing overlooks and rim trails (primary visitor destinations) and can easily be modified to account for new information gathered from monitoring or changing conditions. Capacity figures are also based on the visions to be attained or maintained at different developed areas. For example, since the vision for the North Rim calls for substantially less crowding than on the South Rim, the densities (visitors per unit area) figured into the North Rim capacity are lower than they are for the South Rim, although the methodology used for each was the same.

Since overnight capacities are already established by the number of rooms and campsites, the carrying capacity referred to in this document is a day carrying capacity.

The day carrying capacities were derived through the following process:

- o generating a detailed inventory and measuring all visitor facilities in the rim developed areas of the park
- o conducting a thorough analysis of visitor use at each area
- o surveying visitor preferences directly related to crowding at overlooks and rim trails
- o photographing visitor use patterns, counting visitors at overlooks, and surveying visitor opinion concurrently at various times of day, at various overlooks
- o categorizing the desired visitor density for each overlook and rim trail
- o establishing a capacity for each overlook and rim trail, based on the above information
- o determining the potential redistribution of visitors between overlooks, based on the proposals in the alternatives
- o correlating the overlook and rim trail capacities with the secondary attractions like restaurants and gift shops
- o determining the overall carrying capacity for that area

Natural Resource Management

Air quality and visibility in the park would be improved by cooperatively reducing in-park and external emission sources. The intent is to improve the visitor experience at overlooks during the day and to add to the enjoyment of the night sky.

Flow monitoring of inner-canyon springs and creeks would be initiated in some new areas and continued in other areas. Unless an alternative water source for the South Rim is provided, the transcanyon waterline would be replaced from Phantom Ranch to Cottonwood.

Research and monitoring would be conducted to better understand and manage the park's water resources and hydrogeology. Measures would be taken to ensure that well drilling or other outside water uses do not adversely affect park water resources.

Natural water quality and flows would be perpetuated throughout the park, except for the Colorado River where flows would be managed to maintain the natural values of the river corridor. Water withdrawals needed for the administrative use of the park would be limited to current levels and would be conducted in a way that would minimize impacts to park resources. This may include investigation of the feasibility of alternative water sources to Roaring Springs, and/or modifying the transcanyon pipeline so that all water not needed for park administrative purposes is returned to the flow of Roaring Springs, and no longer discharged at Indian Garden.

The National Park Service would use water rights where appropriate to protect park resources and administrative uses necessary to meet the purposes of the park. To do so, the park would participate in state adjudications of water rights, seek negotiated settlements to protect park water rights, and if necessary, seek injunctive relief when park water resources or rights are being adversely affected.

A cave management plan would be developed to address issues such as a permit system; specific standards, indicators, and monitoring programs, and a method to address problems when standards are not met; active or passive management by the National Park Service or cooperative management by another entity, such as the Cave Research Foundation; and use limits or restrictions, if necessary, including party size limits.

The following additional studies and surveys would be required for the management of natural resources.

- Conduct a parkwide relict area survey for unaltered natural vegetation and biotic communities.
- Prepare a parkwide soil map and classification system to the series level or to the soil type.
- Study fire effects of exclusion, wildfire, and prescribed fire on park wildlife and the representative vegetation communities.
- Inventory, monitor, and study the biology of federally listed and sensitive species of plants and wildlife.
- Study the impact of water diversion or groundwater withdrawal on seeps, springs, and hanging gardens.
- Study fire scars on presettlement trees to determine the natural fire regime for plant communities.
- Study the status and trends of nonnative species within the park.
- Inventory and assess park wildlife species.
- Study the impacts that nonnative species have on native wildlife and develop mitigation measures.
- Assess impacts of urbanization on wildlife.
- Conduct feasibility studies on reintroducing extirpated wildlife.
- Study the impact of water diversion or groundwater withdrawal on stream channels.
- Conduct a wetlands delineation survey.
- Quantify various springs and streams from a standpoint of future water right adjudications.
- Conduct an instream flow study for Garden Creek.
- Identify adverse erosion areas at archeological sites, campgrounds, and along trails.
- Identify areas where water resources are excessively impacted by management actives and/or visitor use.

Cultural Resource Management

All significant cultural resources (archeological, historic, and ethnographic) would be preserved and protected.

On the South Rim a new museum collection storage and research facility, with appropriate environmental controls, security, and fire protection, is proposed for construction near the NPS maintenance area.

Cultural landscape studies would be conducted to evaluate the significance of historic landscapes in the park and determine their character-defining features. Physical changes to significant historic landscapes would be undertaken in accordance with NPS *Management Policies* and historic preservation standards, and significant character-defining features would be retained.

Cultural resource program needs for park management include the following:

- Conduct a comprehensive archeological inventory of the entire South Rim developed area and immediate adjacent areas.
- Conduct an archeological inventory of the inner canyon developed areas and trails.
- Computerize cultural resource databases.
- Document, evaluate, and prepare nomination forms to the National Register of Historic Places for all CCC improvements in the park.
- Prepare an ethnographic overview and assessment, including a traditional use study.
- Develop a parkwide archeological research design.
- Perform data recovery at archeological sites in designated campgrounds.
- Conduct a cultural resource inventory of the park's backcountry.
- Conduct a cultural landscape study.
- Prepare an administrative history of the park.

Cooperation outside Park Boundaries

The National Park Service would consult and cooperate with its neighbors with regard to activities occurring outside park boundaries that may affect park management practices.

■ South of the Park

The Park Service would continue to support Kaibab National

Forest in implementing the forest plan and expanding recreational opportunities in the Tusayan Ranger District when those activities are compatible with this plan.

The Park Service, as a cooperating agency on the Tusayan land exchange, would continue to support Kaibab National Forest in the USFS efforts to consolidate inholdings in the Tusayan Ranger District and to provide lands for coordinated community development, compatible with park purposes, in the Tusayan area. If the exchange was not completed, or if the selected lands were in an inappropriate location for park support facilities, then the Park Service would continue to work with the Forest Service to place some park support facilities on forest lands.

It is assumed that the Grand Canyon Railway would operate a shuttle service from the Tusayan area to the Maswik transportation center. This service would carry no more than 20% of the daily visitation into the park.

In all alternatives it was considered important to improve the arrival sequence of visitors to the Grand Canyon. Visitors who have driven hours to get to the park should be allowed a period of transition before viewing the great natural spectacle of the Grand Canyon.

The transition can help prepare visitors for what they are about to see, help them absorb the experience, and give them time to contemplate its meaning in their lives. A large component of this transition is simply time. It can take place in a 5-minute walk from the parking lot to the rim or in a 2-1/2-hour train ride from Williams. Seeing the Grand Canyon out the windshield of a car at Mather Point, however, does not provide any transition period. The alternatives considered in this document seek to change that experience.

■ North of the Park

It is assumed that the Forest Service would continue to manage and develop Kaibab National Forest lands as directed in its management plan. The Kaibab Plateau visitor center at Jacob Lake has been recently opened, more nonmotorized trails and camping opportunities are being considered, and additional restaurant and lodging facilities would be provided, as included in the *Land Management Plan.* The Arizona Highway 67 Scenic Byway corridor would continue to be intensively managed for high-quality scenic resources.

The Federal Highway Administration would reconstruct Arizona 67 from Jacob Lake to the park boundary by 1999.

South Rim

■ Access/Transportation

South Rim roads would be resurfaced, minor parking lot redesigns and improvements would be undertaken, and trails would be added in conjunction with road improvements.

The Arizona Trail would be completed as an unpaved trail from Grand Canyon Village to U.S. Forest Service lands to the southeast. It would be used for hiking, biking, and horseback riding, consistent with the park's *Backcountry Management Plan.*

■ Orientation/Interpretation

The Kolb Studio would be converted into a museum/interpretive/office facility; and a restroom would be provided in the garage.

New wayside exhibits, as proposed in the wayside exhibit plan, would be provided along the rim, and an outdoor exhibit would be provided at the Yavapai observation station.

■ Employee Housing

Approximately 85 new housing units for employees would be constructed in the Grand Canyon Village area. Substandard housing units would be rehabilitated, replaced, or removed.

■ Utilities

The wastewater treatment system at Desert View would be upgraded.

North Rim

■ Access/Transportation

An unpaved section of the Arizona Trail would be completed to connect Kaibab National Forest to the North Kaibab Trail. The trail would be used for hiking, biking, and horseback riding, consistent with the park's *Backcountry Management Plan.*

■ Orientation/Information

A small information station, with restrooms, would be provided on Bright Angel Point. The approved wayside exhibit plan would be implemented throughout the developed area of the North Rim.

■ Visitor Services

Food service, with a limited menu, would be provided for visitors at the historic inn, along with a camper store.

At Grand Canyon Lodge minor building use changes would be implemented. All visitor vehicle parking would be removed from in front of the lodge. A drop-off area would be provided in the parking lot.

■ Management Support

A fire/safety building would be constructed in the NPS management support area.

■ Employee Housing and Services

Substandard housing would be rehabilitated, replaced, or removed.

■ Utilities

The wastewater treatment system would be expanded.

Tuweep

Outbuildings at the ranger station would be rehabilitated, along with the septic and water catchment systems.

Corridor Trails

The corridor trail system would be designated as part of the Arizona Trail, but restrictions on bicycle, livestock, and overnight hiking use would continue, consistent with the park's *Backcountry Management Plan.*

SUMMARY OF THE NO-ACTION ALTERNATIVE

Unlimited day visitation would continue in all park developed areas, with nearly every visitor facility in developed areas of the South Rim continuing to be overcapacity during peak use periods. No major facilities would be built, and no major park functions would be relocated. Any required facility changes would be done in or adjacent to existing disturbed areas. The number of overnight accommodations, campsites, and all other visitor services would remain the same in each developed area. Minor adjustments in management would be made to help reduce resource damage and to provide a safer visitor experience.

Planning would be focused inside the park, primarily to solve existing problems. Issues related to planning and land management practices in areas immediately outside the park would be handled individually as the need arose, without an overall area vision or cooperative regional planning effort to guide the direction. Limited cooperative planning to distribute regional information to visitors would occur.

PARKWIDE MANAGEMENT ACTIONS

NATURAL RESOURCES

■ Air Quality and Noise

Pollution and noise emission standards for commercial vehicles would be enforced only in reaction to complaints. An important criterion for selecting new NPS vehicles would be minimized harmful emissions and noise. Trains would continue to use bells and whistles for safety and to signal passengers, with no set limitations.

The recommendations of aircraft overflight studies would be implemented to reduce noise and increase safety over the canyon.

■ Vegetation, Wildlife, and Ecosystems

Vegetation, wildlife, and ecosystems would be managed primarily to address immediate problems; longer term planning and management actions would depend on funding levels. Periodic surveys would identify and remove hazardous trees, and disturbed visitor areas would be revegetated and rehabilitated on a case-by-case basis as funds became available. Native and self-sustaining plant materials would be used in landscaping, when possible. Nonnative species would remain, with no management program for removal or replacement.

Threatened and endangered species would be protected on a case-by-case basis, with limited research and recovery programs. Ecosystem and species research would be done on a limited basis, with little coordination of the work done by outside researchers. Efforts to get better control of collected specimens by researchers and to enter information into the park's museum collection database would continue to be minimal.

Borrow pits inside and outside the park would continue to be used for trail maintenance, and new pits would be developed as needed.

■ Water Resources

The discharge of water from the transcanyon pipeline at Indian Garden would continue; however, the volume would be somewhat diminished as demand on the South Rim increased.

The overall capacity of the water supply system would not be expanded during the life of this plan. Increased need for potable water would be met through conservation, improved efficiency in the system, and greater use of recycled wastewater. Some changes in water and wastewater systems would be needed to support other elements of this plan.

■ Scenic Resources

The current mix of historic and nonhistoric structures and landscapes would be retained. Only a limited effort would be made to restore the character of the historic scene and the cultural landscape.

Limited maintenance would be conducted at overlooks to correct impacts from overuse and disturbance. Vista clearing would be done on a case-by-case basis, with no parkwide program to set guidelines.

New light sources would be shielded to reduce light pollution at night.

CULTURAL RESOURCES

Present cultural resource management programs would continue, including (1) nonsystematic data collection and inventorying of archeological sites, traditional American Indian cultural properties, and historic structures to meet specific project needs, (2) intermittent updating of the list of classified structures, and (3) limited ethnographic studies, mostly initiated by outside interests.

The Park Service would provide limited protection and stabilization of archeological sites and ruins. Resources would be monitored, with remedial actions focused primarily in high use visitor areas.

Historic sites would be preserved as funding allowed. Identified sacred sites would be preserved, and a few traditional cultural properties, currently identified on the National Register of Historic Places as archeological resources, would be protected.

Cultural resources would be evaluated under criteria for the national register on a project specific basis.

Consultation with American Indian tribes for ethnographic resource planning would be done intermittently on a project-by-project basis.

The active cataloging of park research collections and library collections would continue. Improper storage conditions for the natural and cultural history museum collections would continue until the new storage and research facility was completed. Data stored in the museum collection would not be available for research until the museum collection database was complete.

SOUTH RIM

Summary of South Rim Actions

Unlimited day visitation would continue to be allowed, with extensive roadside parking to alleviate parking shortages and to get visitors as close as possible to visitor services and resource areas. No new visitor facilities would be provided, although limited management changes would be taken to better distribute visitors throughout the South Rim.

Existing land use patterns and facilities would be retained. Approved housing would be constructed at Grand Canyon Village to replace substandard housing and to provide housing for new employees. No new permanent housing or management support facilities would be provided at Desert View.

VISITOR EXPERIENCE

■ Access/Transportation

Regional Access: Private bus and train service to Grand Canyon would continue. Currently, one to two trains per day (eight cars each) are authorized to operate from Williams and provide access for up to 1,440 people. Some exceptions are made so the trains can have up to 12 cars.

A proposed railroad spur from Tusayan could provide a maximum of eight train trips per day with four cars each trip (total of 3,000 passengers). This system would be reevaluated after several years to determine if changes were required to address impacts to the region and the park.

Private shuttle and tour bus companies would continue to transport visitors to the canyon. In addition, private shuttles would be encouraged for employees living outside the park, and regional shuttle service from Flagstaff, Williams, and Valle would be encouraged. Due to the severe lack of parking within the park, private companies would likely develop parking and shuttle services outside park boundaries.

Within the life of this plan the U.S. Forest Service (USFS) Road 302/307 would probably remain a narrow gravel road with unrestricted use.

Roads, Parking, and Transit: Only minor road improvements, such as resurfacing, would be provided on the South Rim.

Public transit would be retained as a minor and limited means of travel on the West Rim and in the village from May through September; no shuttle service would be available from October to May. On the West Rim the shuttle would run from the interchange in the village to Hermits Rest, with stops at each overlook; during the rest of the year the West Rim would be open to all sizes of private vehicles. No public transit would be available along the East Rim or to Desert

View. The transit system would continue to share roadways with private vehicles (except on the West Rim during the shuttle season). A few transit vehicles would be added as funding allowed and used wherever the need was greatest.

Concession tour buses would be allowed throughout the park and would continue to provide tours along the West Rim, through the village, and along the East Rim to Desert View, Lees Ferry, and other locations outside the park.

Employees would continue to provide their own access to work, use the same park roads as visitors, and park in any public parking lots.

• *Grand Canyon Village* — No additional roads would be built in the village. Routine resurfacing and minor upgrading would be done for safety and efficiency. The existing entry station, which currently has long back up lines during peak times, would be retained, and visitors would have no means to obtain entry passes before arriving at the park.

All existing parking would be retained (±2,410 spaces). Day and overnight guests would continue to use the same parking spaces, even around lodging units. Makeshift parking areas, such as at the Bright Angel trailhead, would remain. Extensive roadside parking would continue in areas where visitor safety was not being affected.

Day tour buses would have access to all of the village and East Rim roads and would also continue to stop primarily at the Yavapai observation station and Bright Angel Lodge.

The Maswik transportation center would continue to be used as an overflow parking facility. It would also serve as the in-park staging area for the railroad spur when that system became operational.

• *Desert View* — No changes would be made to Arizona Highway 64 (East Rim Drive), with traffic continuing to drive close to the rim in the area of Desert View. The existing parking lot would remain (140 spaces), and extensive roadside overflow parking would continue to be allowed. The undersized entry station would remain the same. Tour buses would continue to park in the existing parking lot.

Trails:

• *Outside the Park* — The National Park Service would work with other agencies to extend the Arizona Trail, linking the South and North Rims to Flagstaff and areas farther south, as well as to the north.

Hundreds of miles of unmaintained trails and roads for hiking, horseback riding, and biking in the Tusayan Ranger District of Kaibab National Forest would remain easily accessible to South Rim visitors. The Grandview Lookout/Hull Cabin area would continue to have groomed trails for cross-country skiing, and outfitters for biking and horseback riding would continue to operate just outside the park, with their own sections of maintained trails. Horseback rides to the rim edge would continue to be available. The U.S. Forest Service would continue to expand its trail system and encourage nonmotorized use.

• *Inside the Park* — No new paved bike paths would be provided south from the park or on the South Rim. The only off-road trail designated for bikers would be the Arizona Trail. Bike use would continue on existing roads and would not be encouraged in the park.

The current pedestrian trail system would remain, with changes only where required because of minor roadway improvements.

No mule rides would be provided along the South Rim. Staging corrals for mule rides into the canyon, along with mule barns and other related operations, would remain the same.

■ Orientation and Interpretation

Gateway Information: Limited gateway information would be provided by the Park Service. There would be little coordination by the Park Service of information provided by the private sector or other entities about visiting the park.

Grand Canyon Village / Desert View: Visitor centers at Grand Canyon Village and Desert View would be retained. The village visitor center would provide trip-planning information, accommodation information, exhibits, orientation film, restrooms, and natural history association sales. Minor changes would be made to improve space utilization. The Maswik transportation center would have staffed information booths about train trips, NPS programs, and concession services, as well as outdoor information panels.

Interpretive exhibits and cooperating association sales would continue to be offered at the Tusayan museum and the Yavapai observation station.

Portions of the rehabilitated Kolb Studio would be partially used as a visitor interpretive facility, with the remainder used as offices and conference rooms.

The National Park Service would continue to offer special summer programs and off-season programs at the Shrine of the Ages, which would continue to be shared with churches. The visitor center amphitheater would be retained.

The Desert View contact station, consisting of an information desk, a small office, and limited book sales, would remain in a converted restroom facility.

The Orphan Mine would continue to be fenced off, signed as dangerous, and interpreted from the Powell Memorial.

■ Visitor Services

Outside the Park: Park-related visitor services — for example, lodging, camping, restaurants, shops, restrooms, special programs — would continue to be provided by the private sector, with expansion in the town of Tusayan and in areas farther away. The U.S. Forest Service is studying whether to provide additional campground facilities at the 10X Campground and in the vicinity of Desert View.

South Rim: All present visitor service facilities would be retained without expansion, except that chemical toilets would be added in high use areas. No additional services would be provided except for portable services such as food carts.

At Hermits Rest the snack bar and gift shop would remain the same. The toilets would be upgraded.

• *Grand Canyon Village* — All present lodging facilities — including El Tovar, Bright Angel, Yavapai, Maswik, Kachina, and Thunderbird Lodges — would be retained. These facilities provide approximately 70 economy rooms, 290 mid-range rooms, 475 upscale rooms, and 85 deluxe/suite accommodations, for a total of about 920 rooms on the South Rim.

The approximately 80-space RV park near the business center would be retained, along with two bathhouses and full hook-up service. The 326-space Mather campground would also be retained. The camper services facility (shower/laundry/restrooms) would remain at its current location.

All existing food service facilities would be retained, including El Tovar, the Bright Angel, and the Arizona Steakhouse restaurants (±485 seats); the Maswik and Yavapai cafeterias (±605 seats); the rim ice cream shop; and the business center deli (40 seats). Various approaches would be used to better distribute visitors in the village, such as early dinner incentives, box lunches, food carts, outdoor barbecues, and improved advertising for the cafeterias and the business center deli, as well as restaurants in Tusayan.

All gift shops in the village (including Lookout Studio, Bright Angel, Maswik and Yavapai lodges, Verkamp's, and those at El Tovar), business center functions (grocery/deli/supply store, post office, bank, and Yavapai gift shop), and the gas station and public garage would remain.

• *Desert View* — Existing facilities at Desert View — the 50-site campground, the gift shop and 40-seat snack bar, the Watchtower gift shop, and the general store — would remain.

AREA OPERATIONS

■ Outside the Park

Housing: A few jobs (for example, special resource research, and fund raising for the cooperating association) would remain in Flagstaff, where employees would continue to find their own housing.

Community Services: The present limited community services for employees and their families would continue; these services could be expanded if the land exchange in the town of Tusayan was completed. In that case sites for churches, schools, clinics, recreation centers, and meeting space would be designated in Tusayan.

■ Grand Canyon Village

Housing: All existing housing within the park would be retained, and only the worst substandard housing units would be removed. The Pinyon Park and trailer village areas would remain as substandard housing areas.

Approximately 285 additional housing units, which have already been approved, would be built by the year 2010 for NPS and cooperator employees to replace the worst substandard units and to reduce multiple bunking. This housing would be built at

densities averaging six dwelling units per acre. The units would be built in areas between Pinyon Park and the NPS maintenance facility. Under this alternative an additional 148 housing units would be needed to replace all substandard units and to provide sufficient housing to meet the needs of new employees; these units would not be built in the park.

Community Services: Existing community service space (schools, churches, meeting rooms) would remain inadequate. Trailers would be temporarily permitted in disturbed areas to meet severe community service needs.

Management Support: Management support facilities for the Park Service and cooperators would continue to be inadequate. Grand Canyon National Park Lodges' primary operations would remain centered in the powerhouse area and in buildings along the rim, and all mule facilities would remain the same. If absolutely necessary, additional office space for these functions could be provided in temporary trailers placed in disturbed areas.

Utilities: The village water supply tanks and distribution system would remain the same, as would the sewage treatment facility. Distribution lines would be extended minimally. Additional temporary toilets would be provided in high use areas.

■ Desert View

Housing: No additional housing units would be built at Desert View, and substandard units would remain. Under this alternative a total of 30 housing units would be needed to replace substandard housing and to meet housing needs, but would not be built.

Community Services: The existing laundry and outdoor picnic area for residents would remain the same.

Management Support: Temporary trailer units would still be used for ranger operations, and NPS and concessioner maintenance operations would be housed in the present overcrowded facilities. Temporary office trailers would be added in existing disturbed areas to provide additional space when needed.

Utilities: Only minor improvements for water would be made, such as upgrading pressure pumps. Proposed improvements to the existing lagoons would be undertaken, and low-flow fixtures would be added to the facilities.

North Rim

Summary of North Rim Actions

The North Rim, like the South Rim, is facing overcapacity problems at parking and restaurant facilities on Bright Angel Point. No new facilities would be built under this alternative to correct existing problems. Visitor information provided by the U.S. Forest Service at the Kaibab Plateau visitor center would help distribute visitor use to somewhat alleviate this situation. No substandard housing units would be replaced or rehabilitated.

Visitor Experience

■ Access/Transportation

Regional Access: Private tour bus companies would continue to transport visitors to the North Rim, with use projected to increase.

The National Park Service would support the Arizona Department of Transportation's decision to keep Arizona Highway 67 from Jacob Lake to the park closed during the winter months.

Roads, Parking, and Transit: When open, unlimited vehicular access would be allowed. All existing parking lots would remain. Extensive roadside parking would be allowed except in extremely dangerous areas. No roads or parking areas on the Walhalla Plateau would be changed, and all sizes of vehicles would be allowed to use these roads.

No public transit would be provided for visitors. Concession tour buses and private tour buses of all sizes would continue to have access throughout the North Rim developed area. Tour bus parking would continue to be designated at the amphitheater parking lot at the campground.

A concession employees' shuttle would continue to be provided, while NPS employees would have to provide their own daily transportation. All employees would continue to be allowed to drive on any visitor roads and park in any parking lot.

Trails:

- *Outside the Park:* Visitors would continue to have access to the Arizona Trail from north of Jacob Lake, through the park, and to the south. In addition, hundreds of miles of maintained and unmaintained roads and trails would continue to be available for hiking, horseback riding, and biking in the USFS North Kaibab Ranger District. The existing 25 designated trails (totaling nearly 200 miles) outside the park would be expanded.

- *Inside the Park.* No off-road bike trails would be built. Bikes would continue to share park roads with motorized vehicles. The only off-road trail for bikers would be the Arizona Trail.

The current pedestrian trail system, which is routed through forested areas and offers limited views of the canyon, would be retained. Visitors could continue to use existing wilderness roads (now for pedestrian trail use only); however, these trails would not be advertised.

■ Orientation and Interpretation

Gateway Information: The Park Service would provide funding to the U.S. Forest Service to assist in running the Kaibab Plateau visitor center at Jacob Lake.

Orientation Centers: A currently proposed contact station near Grand Canyon Lodge would provide services such as trip planning assistance, interpretive program schedules, concession tours, natural history association sales, and restrooms.

Interpretive Facilities: No museums exist on the North Rim, and none would be proposed. The current auditorium would remain at Grand Canyon Lodge, as well as the campground amphitheater.

Personal service interpretive programs would continue to be provided at small informal amphitheaters provided throughout the North Rim developed area and would help distribute visitors.

■ Visitor Services

Outside the Park: Visitors would rely on services available in the towns of Kanab and Fredonia and areas farther away. The U.S. Forest Service is studying proposals to expand lodging at the Kaibab Lodge and Jacob Lake Inn and to increase designated camping in several areas.

North Rim: Grand Canyon Lodge would continue to provide approximately 200 guest rooms. The campground (84 sites), as well as the restrooms and a shower/laundry facility, would be retained, with camping allowed for all sizes of vehicles.

The capacities of existing food service facilities would remain (232 seats at the Grand Canyon Lodge restaurant, buffeteria, and bar, and 32 seats at the fast-food area and camper store at the historic inn). Some uses would be rearranged at the lodge, but the amount of food service would not change.

The gift shop and camper store would remain, along with the gas station, the limited auto repair service, and restroom facilities. The frame cabins beside the camper store would remain boarded up and unused. Portable toilets would be added as needed in high use areas. In some areas on the Walhalla Plateau toilets would be converted to more environmentally sensitive models.

Winter Use: The U.S. Forest Service would continue to provide designated areas for motorized and nonmotorized winter use, with access to canyon views outside the park. The Kaibab Lodge would also continue to support winter activities, such as cross-country skiing and snowshoeing.

The park would remain closed to motorized use during the winter. One group campsite at Bright Angel Point would continue to be left open, with chemical toilets available. No concession facilities would be available.

Area Operations

■ Outside the Park

No housing, community services, management support, and utilities would be provided outside the park.

■ Inside the Park

Housing: Approximately 40 new units would be built under this alternative, allowing concession workers to change from a six-day workweek to a five-day one. Approximately 90 additional units would be needed to replace substandard units and to meet housing needs for this alternative, but these units would not be built. Additional seasonal travel trailers would be allowed to help relieve overcrowded housing conditions.

Community Services: No additional community services would be provided.

Management Support: No additional management support facilities would be provided except for a new fire protection building. Temporary office trailers would be added in existing disturbed areas where shortages were severe.

Utilities: No water service expansion would be needed, and the proposed sewage treatment upgrades would provide adequate capacity to meet demand. All existing restroom facilities would remain. Utility distribution lines could be extended minimally. Chemical toilets would be replaced with environmentally sensitive toilets, and additional toilets would be added in high visitor use areas such as the Widforss trailhead.

TUWEEP

Summary of Tuweep Actions

No actions would be taken to improve access, parking, or camping opportunities.

VISITOR EXPERIENCE

■ Access/Transportation

The National Park Service would have limited communication with Mohave County about the maintenance of Tuweep access roads. These roads could be upgraded by others in the future. Additional mining would be discouraged.

In the park primitive dirt roads would receive limited maintenance, along with existing parking areas at the Toroweap overlook and Vulcans Throne. Extensive overflow parking would be allowed along the roads.

The existing trail system would remain, including Tuckup, Saddle Horse Canyon, and the Lava Falls trail.

■ Orientation and Interpretation

Gateway Information: No information about Tuweep would be available on the present access routes except the one sign along Mohave County Road 5. No additional effort would be made to attract visitors.

Tuweep: The information sign at the ranger station would be retained, and Tuweep information sheets would continue to be provided.

■ Visitor Services

The Bureau of Land Management would continue to allow primitive camping outside the Tuweep area.

In the park camping would continue at the 11 existing campsites and would be controlled under backcountry camping policies. A maximum of six people would be allowed at individual sites, and 11 people at the group site, with a maximum of two vehicles per site. Since campsites would be available on a first-come, first-served basis, campers unable to get a park site would be asked to use BLM campsites, or they could be issued a park backcountry camping pass, if passes were available.

AREA OPERATIONS

The substandard seasonal ranger trailer would be replaced with a seasonal trailer at the same location. The existing office would not be changed.

The landfill in proposed wilderness would be closed and cleaned up. The septic and water catchment systems would be enlarged.

CORRIDOR TRAILS

Summary of Corridor Trail Actions

Hiker use would not be limited. Mule use would remain at existing levels on South Rim trails and could potentially increase on the North Kaibab Trail. Present overnight lodging and camping accommodations at Phantom Ranch, Indian Garden, and Cottonwood would continue.

VISITOR EXPERIENCE

■ Access and Use

South Rim: A maximum of 40 visitor mule trips above Indian Garden (60 passes) would continue to be allowed on the Bright Angel Trail and 20 on the South Kaibab (20 passes). Additional pack mules would be allowed to take equipment and supplies into the canyon.

North Rim: Approximately 70 visitor mule trips above the Tunnel (140 passes) would be allowed on the North Kaibab Trail, with potential increases not to exceed contractual limitations. Mule and horse use would remain unlimited on the Ken Patrick and Uncle Jim Trails. The old Bright Angel Trail would not be upgraded.

■ Interpretation

Special interpretive programs would continue on the South Kaibab Trail.

■ Visitor Services

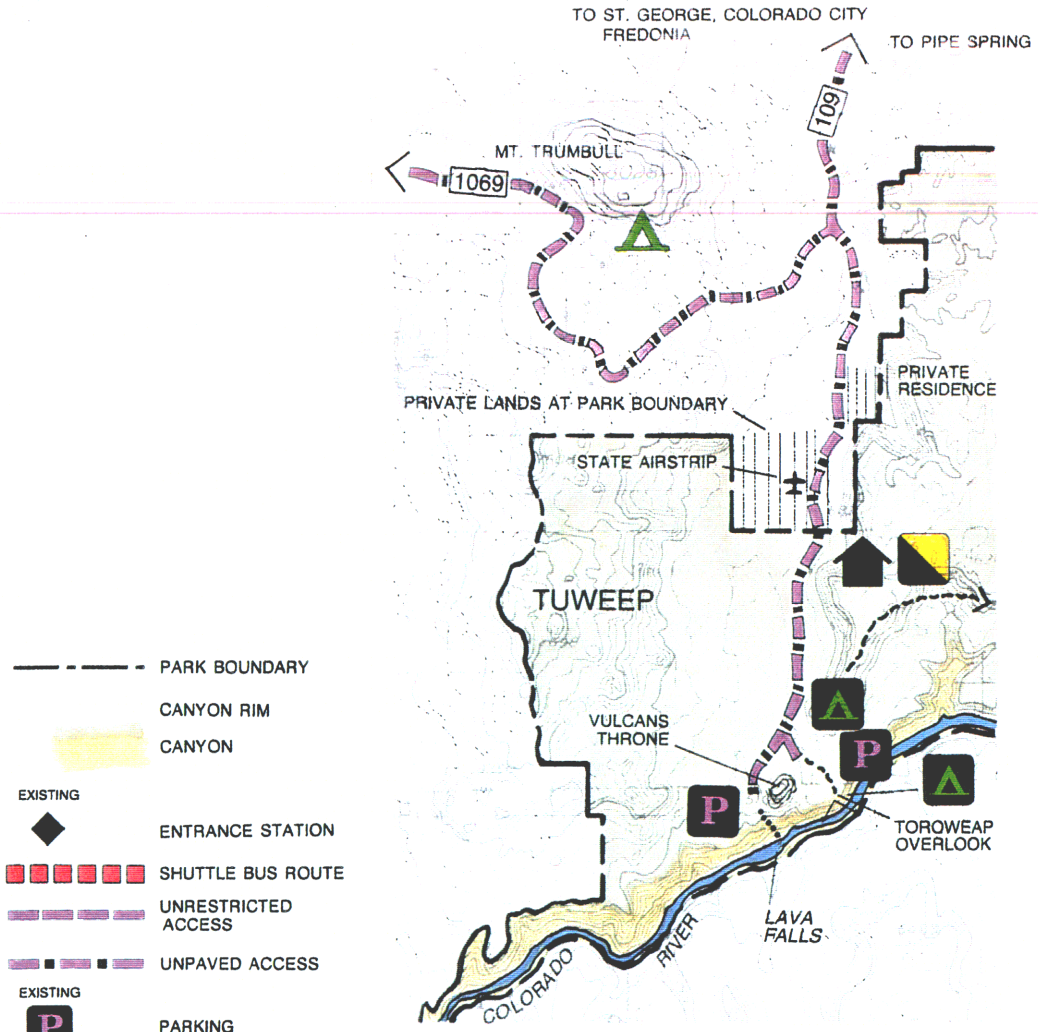
All existing visitor service facilities would be retained, without additions or new facilities. Phantom Ranch would have approximately 92 beds and the Bright Angel campground 31 campsites (a maximum of 90 campers). Indian Garden would continue to have about 15 campsites (a maximum of 50 people), and Cottonwood campground, 12 sites (a maximum of 30 people).

AREA OPERATIONS

Housing, management support facilities, and water and sewer systems would remain the same.

Composting toilets would be added in areas along the trail where needed. Toilet or restroom facilities would continue to be provided at all major trailheads.

The transcanyon waterline might be reconstructed.



PARK BOUNDARY
CANYON RIM
CANYON

EXISTING
ENTRANCE STATION
SHUTTLE BUS ROUTE
UNRESTRICTED ACCESS
UNPAVED ACCESS

EXISTING
PARKING
RAILROAD

EXISTING
TRAILHEAD
RIM TRAIL
MAJOR CORRIDOR TRAIL
MINOR CORRIDOR TRAIL
ARIZONA TRAIL
BIKE AND/OR PEDESTRIAN TRAIL

EXISTING
CONCESSIONER MULE BARN
CONCESSIONER MULE STAGING
MULE TRAIL

EXISTING PROPOSED
MINOR TRANSIT STATION / SHELTER
MAJOR ORIENTATION CENTER
CONTACT STATION
GATEWAY INFORMATION CENTER
INFORMATION

EXISTING PROPOSED
LODGING
CORRIDOR TRAIL FACILITY

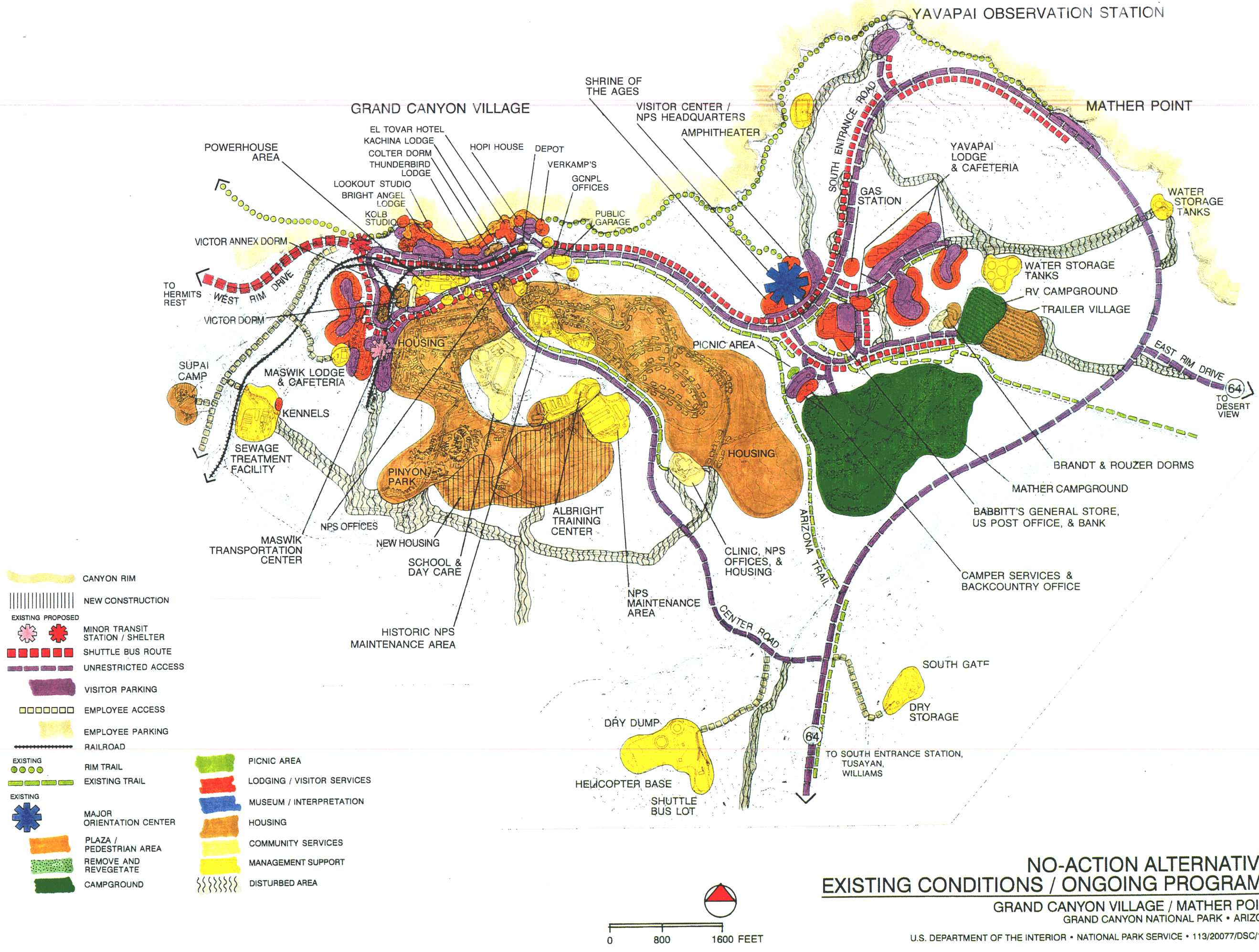
EXISTING PROPOSED
CAMPGROUND
PRIMITIVE / DISPERSED CAMPING
VISITOR SERVICES
MUSEUM / INTERPRETATION

EXISTING PROPOSED
HOUSING
MANAGEMENT SUPPORT
SCENIC HIGHWAY

NO-ACTION ALTERNATIVE
EXISTING CONDITIONS / ONGOING PROGRAMS

PARK DEVELOPED AREAS
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20072/DSC/1•95



NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS

GRAND CANYON VILLAGE / MATHER POINT

GRAND CANYON NATIONAL PARK • ARIZONA

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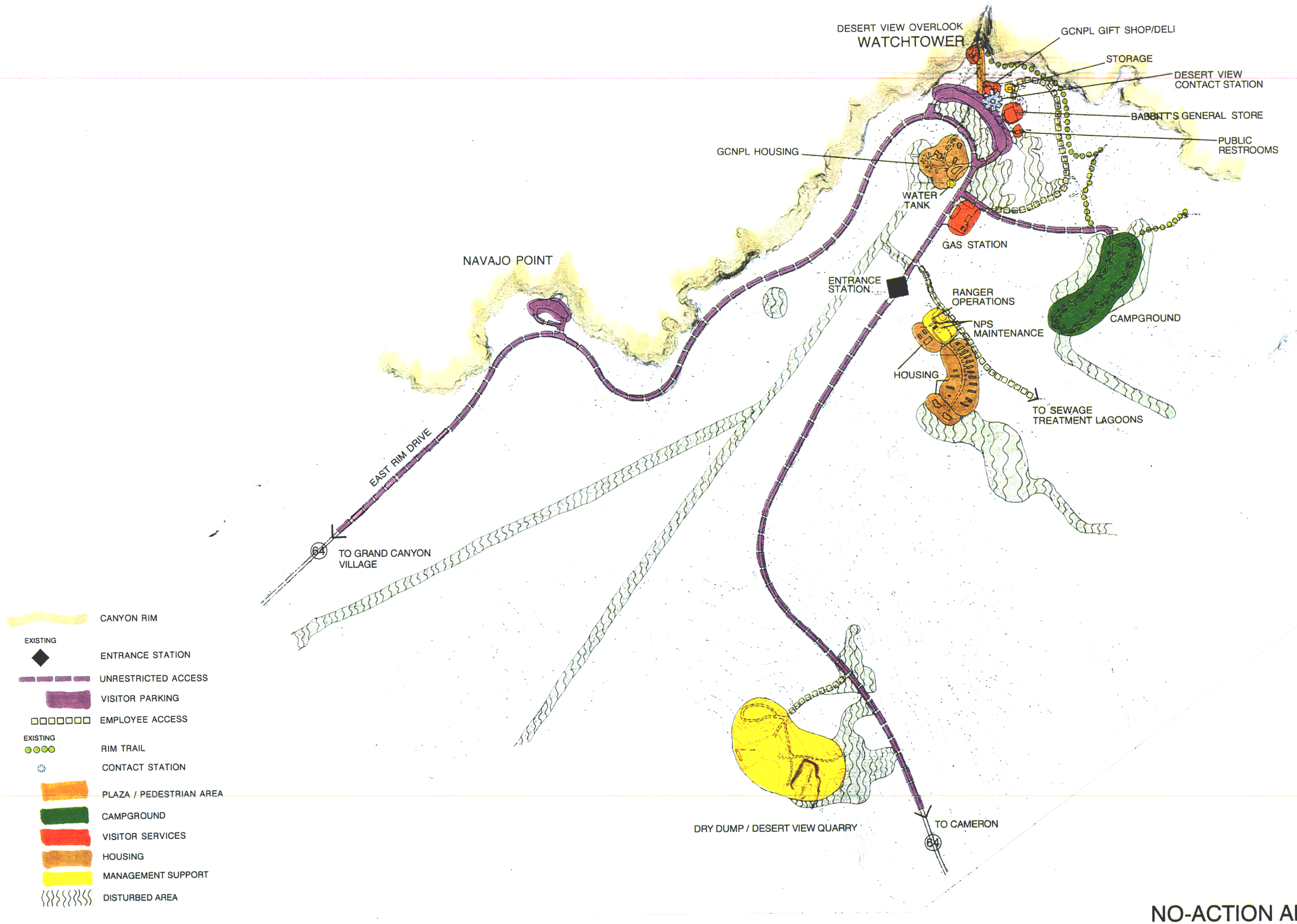
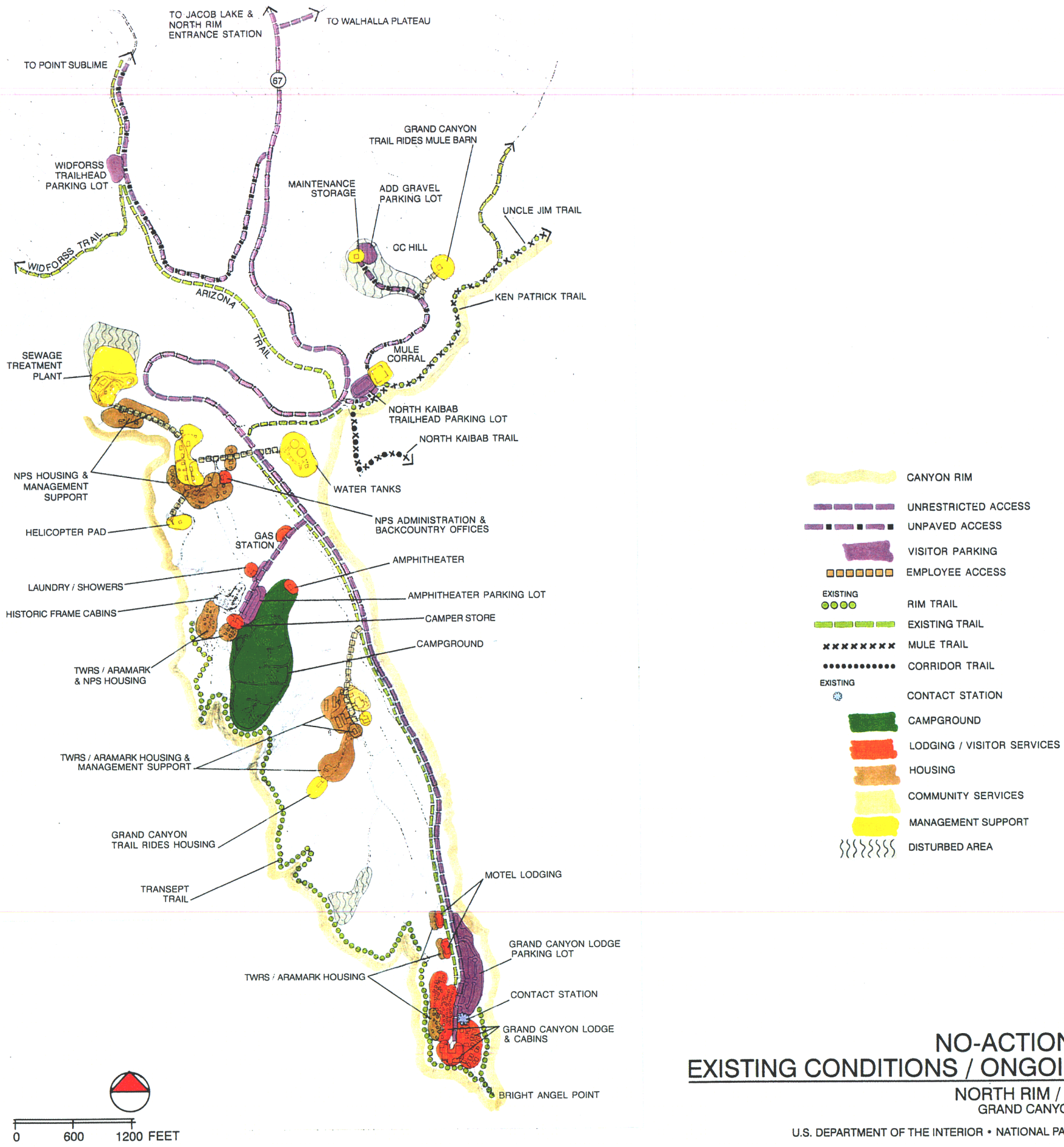


NO-ACTION ALTERNATIVE:
EXISTING CONDITIONS / ONGOING PROGRAMS

DESERT VIEW
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20082/DSC/1•95



NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS

NORTH RIM / BRIGHT ANGEL POINT

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20087/DSC/1•95

SUMMARY OF ALTERNATIVE 1

Unlimited day visitation would continue in all developed areas of the park until visitor congestion, resource damage, and public safety warranted restricting access during peak visitation. This would be accomplished by implementing reservation systems based on the capacity of existing parking and eating facilities on the South and North Rims. Regional information programs would explain the park's reservation systems to visitors. Overnight accommodations would not be affected. Visitor use at Tuweep and on the corridor trails would not be limited under this alternative.

Existing land use patterns would be retained — no major facilities would be built, no major park functions would be relocated, and most park facilities would remain where they are now. A few minor facilities would be added. Any required facility changes would be done in or adjacent to existing disturbed areas.

Planning would be focused inside the park, primarily to solve existing problems. Issues related to planning and land management practices in adjacent areas outside the park would be handled individually as the need arose, without an overall area vision or integrated regional planning effort to guide the direction.

PARKWIDE MANAGEMENT ACTIONS

NATURAL RESOURCES

■ Air Quality and Noise

Natural resource management actions would be the same as the no-action alternative. For air quality and noise, pollution and noise emission standards for commercial vehicles would be enforced in response to complaints. NPS vehicles would gradually be replaced with low-polluting models that also met noise standards. The recommendations of aircraft overflight studies would be implemented.

■ Vegetation / Wildlife / Ecosystems

Vegetation, wildlife, and ecosystems would be managed to address immediate problems; longer term planning and management would depend on funding levels. Nonnative species would remain, with no program for removal. Threatened or endangered species would be protected on a case-by-case basis.

■ Water Resources

The National Park Service would seek to reduce impacts associated with water use in the park and to prevent or minimize impacts on park water sources from groundwater development outside the park. No additional water storage would be provided. Potable water needs would be met through conservation and more efficient use.

■ Scenic Resources

As described under the no-action alternative, the current mix of historic and nonhistoric structures and landscapes would be retained. At overlooks impacts related to overuse and disturbance would be corrected. New light sources would be shielded to reduce light pollution at night.

CULTURAL RESOURCES

As described for the no-action alternative, present cultural resource management programs would continue, including (1) data collection and inventorying of archeological sites, traditional American Indian cultural properties, and historic structures to meet specific project needs, (2) intermittent updating of the list of classified structures, and (3) ethnographic studies needed for specific projects. Cultural resources would be evaluated under national register criteria on a project specific basis. The cataloging of park research, library, and museum collections and the deaccessioning of museum collection items would continue on a limited basis. Improper storage conditions for the natural and cultural history museum collections would continue until the new museum collection storage and research facility was completed. Data stored in the museum collection would not be available for research until the museum collection database was complete.

Archeological sites would receive limited protection and stabilization; remedial actions would be taken primarily in high use visitor areas. Historic sites would be preserved as funding allowed. Identified sacred sites and a few traditional cultural properties would be protected.

SOUTH RIM

Summary of South Rim Actions

Visitor use on the South Rim would be limited to prevent facility congestion and resource damage and to provide public safety. To ensure safety and offer an adequate visitor experience, roadside parking would be restricted, and the number of private vehicles would be limited in certain areas. Once restrictions were deemed necessary, visitors would be required to obtain reservations before entering.

No major facilities would be built, and no major land use changes would be made. Approved housing would be built, and some substandard housing would be removed. However, housing would still be inadequate, and some employees would need to find housing outside the park.

VISITOR EXPERIENCE

■ Visitor Use Capacities

The first step to address the overcapacity of most facilities in developed areas on the South Rim (including parking lots, roads, restrooms/toilets, restaurants, gift shops, visitor centers, museums, and shuttle services) would be to more evenly distribute visitors in the park. When facilities such as parking areas and restaurants were operating at capacity, a day reservation system would be established for the South Rim, and day visitors would be required to have reservations. Overnight capacities for lodges and campgrounds on the South Rim would not change.

Based on projected visitor increases and the capacities of existing facilities, a reservation system might be needed in 1995; however, it is unlikely that it could be established this year. The approximate number of visitors and vehicles that could enter the South Rim at any one time is given below, and once the established limit was reached, visitors would be asked to go to another area of the park or to make reservations for another time or day.

A subsequent detailed study would determine the most appropriate type of reservation system, how to distribute visitors most effectively, and the exact numbers of vehicles allowed entry. A monitoring system would also be established so that the reservation system could be changed to reflect any variations in visitor use patterns over time. During periods when facilities were not over capacity, such as during the off-season, visitor use would not be restricted.

Two visitor use capacities would be set for the South Rim — one for the number of private vehicles (cars, RVs, tour buses) allowed in the park at any one time, which would be based on the total number of parking spaces, and the other for the number of visitors arriving by other means who could still be accommodated at park facilities. (Parking capacities for various types of vehicles are lower during certain times of the day than the capacity for food service.) The numbers of restrooms and the capacities of visitor centers and gift shops were also considered in the analysis, but were not felt to be as critical as parking and food services. Measures could be taken to remedy some deficiencies (for example, chemical toilets could supplement restrooms, and outdoor interpretive programs could supplement interpretation at the visitor center).

The emphasis of the reservation system would be on the number of vehicles, not people, entering the park.

Parking Capacity: The maximum number of private vehicles (cars, RVs, tour buses) that could park on the South Rim at any one time is 3,320, including all lots in Grand Canyon Village, along East Rim Drive, and at Desert View; however, the limiting number for parking was assumed to be the number of parking spaces in the village (2,686). Based on an average of 3.1 people per vehicle and 31 people per bus, 9,805 visitors in private vehicles could be present at any one time, excluding shuttle buses and trains. Under this scenario Desert View, the South Kaibab trailhead, Grandview, and

all the rim lots in the village would be at maximum capacity most of the day. Once these lots were filled, visitors would be directed to parking spaces off the rim. To ensure that the entire South Rim did not exceed capacity, calculations for parking lots in the village would be based on a 76% capacity.

At Desert View all facilities are currently over capacity (parking lots, snack bar, gift shops, visitor center, and restrooms). A total of 225 parking spaces would be provided in existing disturbed areas currently used for parking. Once these parking spaces were full, the entire Desert View area would be at capacity, and no additional vehicles would be allowed to enter.

Food Service Capacities: For lunchtime food service — the next most critical component for determining visitor capacities — Grand Canyon Village has the capacity to handle approximately 12,765 visitors, an increase of approximately 4,550 onsite visitors over the current peak summer day (1992) of 8,250 onsite visitors. (Visitor use patterns for food service change considerably throughout the day, and during lunch the additional capacity for food service exceeds the vehicle parking capacity.) With these limitations, approximately 550 visitors above the private vehicle limit would be allowed to enter the park every hour until about 3 P.M.

However, during the evening hours more visitors wish to eat at a sit-down restaurant along the rim, and the demand for more formal dining facilities in the park is significantly higher than during lunch. To accommodate 2010 evening demand, many more visitors would be asked to eat in facilities off the rim or from food carts, and long waits (90 minutes) would be incurred at restaurants on the rim. Assuming that off-rim facilities were fully utilized, 8,525 visitors could be accommodated after 3 P.M., with visitors able to arrive by various means of transportation. No visitors would need to be turned away unless visitation patterns changed significantly as a result of the reservation system. The evening total of 8,525 visitors represents an increase of 2,580 over the current peak summer evening (1992) of 5,707.

■ Access/Transportation

Regional Access: The Park Service would work with the Arizona, Nevada, and Utah state highway departments to have signs placed along all major roads leading to the park. The signs would repeatedly state that a reservation system was in place, that all visitors must have reservations before entering the park, and that visitors without advance reservations might not be allowed to enter the park or might have to wait.

As described for the no-action alternative, private bus and train service to Grand Canyon would continue and could be expanded.

Private shuttles would be encouraged for employees living outside the park, and regional shuttle service from Flagstaff, Williams, and Valle would be encouraged. However, once the South Rim's vehicular carrying capacity was reached, shuttles coming into the park would be required to drop off passengers and to park outside. The park would encourage expanded private shuttle service from Tusayan to transport visitors who were allowed entrance to the park but had to leave their vehicles outside park boundaries.

The Park Service would work with private and governmental entities to ensure that private or public off-street parking was provided outside park boundaries. Approximately 940 parking spaces would be needed for visitors taking the railroad spur, private shuttles, or waiting for their entry time. The Park Service would also work with appropriate entities to ensure that roadside and illegal parking did not occur in Tusayan as a result of the reservation system.

USFS Road 302/307 would remain a gravel and dirt road, which is not accessible during several months of the year.

Roads, Parking, and Transit: Roads on the South Rim would continue to be used as they are now. Only minor road improvements such as resurfacing would be provided.

As mentioned above, a visitor reservation system would limit the number of private vehicles allowed to enter the park during peak periods. No on-road parking would be allowed in the park. A total of approximately 2,686 spaces would be available for parking throughout the South Rim, including gravel areas at Southgate and Desert View. Parking attendants in the village would help maximize the use of existing lots.

As described for the no-action alternative, public transit would provide access on the West Rim, in the village, and to the South Kaibab trailhead from May through September; no public transit would be available along the East Rim or to Desert View.

Concession tour buses would continue to provide tours along the West Rim, through the village, and along the East Rim to Desert View, Lees Ferry, and other locations outside the park.

No employee shuttle service would be provided, with employees being able to use all park roads and to park in any public parking lots.

• *Grand Canyon Village* — As described for the no-action alternative, routine road resurfacing and minor upgrading would be done for safety and efficiency; no additional roads would be built. All existing parking would be retained (2,686 spaces), with parking for oversized vehicles at Southgate.

The seasonal village shuttle system would be expanded to the Southgate parking area. Day tour buses would have access to all roads in the village and on the East Rim and would continue to stop at the Yavapai observation station and Bright Angel Lodge and other areas desired.

The Maswik transportation center would continue to provide overflow parking and would also serve as the in-park staging area for the proposed railroad spur.

• *Desert View:* Arizona 64 would continue to run close to the rim in the area of Desert View, and the existing parking lot would remain (140 spaces). A total of 85 spaces would be added in existing disturbed areas. A small gravel parking lot (±55 spaces) would be added at the quarry to be used as a waiting area for visitors with reservations to enter the park. The entry station would remain the same. No public transit service would be available to Desert View.

• *Off-Season Roads, Parking, and Transit* — No public transit would be available from October to May. While the West Rim Drive would be open to private vehicles, their maximum length would be limited to 22 feet for safety and resource protection (concession buses would be exempt from this standard).

Trails:

• *Outside the Park* — As described for the no-action alternative, the Arizona Trail would be extended to link the North and South Rims.

• *Inside the Park* — Trails for biking, hiking, and mule rides would be the same as the no-action alternative. No bikeway trails would be provided, and the existing pedestrian trail system would be retained.

■ Orientation and Interpretation

Gateway Information Center: Under this alternative a gateway information center would be established in the town of Tusayan to provide reservations and other information to visitors. The Park Service would work with entities in Tusayan to find appropriate space for this function.

South Rim: Interpretive staff would continue to offer general information and trip planning assistance to visitors, plus special programs in areas where visitors were waiting for long periods and where lines tended to form.

Orientation and interpretation on the South Rim would be the same as the no-action alternative. Information and programs would be offered at visitor centers at Grand Canyon Village and Desert View, the Maswik transportation center, the rehabilitated Kolb Studio, the Tusayan museum, the Yavapai observation station, the Shrine of the Ages, and the visitor center amphitheater.

The Orphan Mine would be interpreted from the Powell Memorial.

■ Visitor Services

Outside the Park: As described for the no-action alternative, the private sector would continue to provide park-related visitor services outside the park, with expansion probable in the town of Tusayan and in areas an hour or more away from the park. The U.S. Forest Service would continue to assess the potential for expanding the existing campground and developing new ones.

South Rim: Existing visitor services would continue to be offered. Except for providing more chemical toilets in high use areas, as described for the no-action alternative, no visitor services would be expanded.

All present lodging facilities (providing a total of ±920 rooms) would be retained in the village, as well as the 80-space RV park near the business center and the 326-space Mather campground. Food service facilities in the village would continue to provide a total of 1,130 seats at restaurants, cafeterias, and the deli.

Strategies to increase food service capacity would include distributing use throughout the day (such as offering early dinner

incentives and better advertising of off-rim facilities like the business center cafeterias and deli, as well as restaurants in Tusayan) and by providing additional food service (box lunches, food carts, and outdoor barbecues).

The Hermits Rest the snack bar and gift shop, all gift shops in the village, the present functions at the business center (the grocery/deli/supply store, post office, bank, and Yavapai gift shop and cafeteria), and the gas station and public garage would remain.

Desert View: The Desert View campground (50 sites) would remain, as would the snack bar (40 seats) and the Watchtower and the Grand Canyon National Park Lodges' trading post gift shops.

Area Operations

■ Outside the Park

Housing: By the year 2010 approximately 85 housing units would be needed outside the park to accommodate NPS employees who could not obtain housing in Grand Canyon Village. Employees would have to find their own housing accommodations. A few park-related jobs (for example, special resource research, fund raising for the cooperating association) would remain in Flagstaff.

Community Services: Depending on the completion of the Tusayan land exchange, sites for churches, supplemental schools and clinics, recreation halls, and meeting space could be provided outside the park.

Even if the land exchange failed, space must be found outside the park for increased recreational needs and churches.

■ Grand Canyon Village

Housing: All existing housing within the park would be retained except for substandard housing at the YACC camp, Pinyon Park, and the trailer village, which would be removed. The Pinyon Park and trailer village areas would be revegetated once housing was torn down, and the site of the YACC camp would be used for new housing. Employee-owned trailers would be allowed to remain in some areas, under strict guidelines.

Approximately 285 additional housing units would be built by 2010 for NPS and cooperator employees. These units would replace the 113 substandard units. This housing would be built between Pinyon Park and the NPS maintenance facility, at densities averaging six dwelling units per acre. No other park housing would be provided.

Community Services: As described for the no-action alternative, existing community services (schools, churches, meeting rooms) would remain the same. No new facilities would be built, and no existing structures would be converted to community services. Temporary trailers could be placed in disturbed areas to address severe community service needs.

Management Support: NPS operations would remain dispersed throughout the village in various overcrowded and temporary facilities. Grand Canyon National Park Lodges' primary operations would continue to be centered in the powerhouse area and in buildings along the rim, and all mule facilities would remain the same. No new facilities would be built. Temporary trailers could be added in existing parking lots or other disturbed areas to meet severe space needs.

Utilities: No utility system changes for water supply, sewage treatment, or electricity would be made.

■ Desert View

Housing: At Desert View, approximately 30 housing units would be built in existing disturbed areas to replace about 10 substandard housing units and to provide for additional housing needs under this alternative.

Community Services: As described for the no-action alternative, the existing laundry and outdoor picnic area would remain the same for community services.

Management Support: NPS and concessioner maintenance operations would be housed in the present overcrowded facilities. Temporary trailers in disturbed areas would be used to provide additional needed space. Temporary trailer units would still be used for ranger operations.

Utilities: Beyond the search to reduce water use impacts in the park, only minor improvements for water would be made, such as upgrading pressure pumps. The existing lagoons would be improved, and low-flow fixtures would be added to the facilities.

North Rim

Summary of North Rim Actions

A day use reservation system for the North Rim would need to be implemented by approximately 2004, with the maximum number of vehicles being based on the parking lot capacities on Bright Angel Point. Once these areas were filled, the main food services would also be overcapacity. Overnight accommodations would remain the same as the no-action alternative.

Substandard housing would be replaced, and additional housing would be provided to meet existing needs on the North Rim.

Visitor Experience

■ Access/Transportation

Regional Access: As described for the no-action alternative, private tour bus companies would bring visitors to the North Rim, with use projected to increase until a reservation system was initiated. The National Park Service would work with the Arizona Department of Transportation to keep Arizona 67 from Jacob Lake to the park closed during the winter.

Roads, Parking, and Transit: Unlimited vehicular access would be allowed up to the parking capacity on Bright Angel Point. Assuming that 80% of the visitors entering the North Rim went to Bright Angel Point and 20% went to Walhalla Plateau, then approximately 495 vehicles or 1,780 visitors could be present at any one time on the North Rim. This level of use is nearly identical to the use that occurred on peak days in 1992 and 1993. Due to safety hazards and resource damage, no roadside parking would be allowed.

A new gravel lot would be developed on CC Hill to provide overflow parking for North Kaibab Trail users (20 car spaces and 10 oversized vehicle spaces). The existing CC Hill access road would be graded and some sections paved, but not realigned.

No roads or parking areas on the Walhalla Plateau would be changed, other than minor improvements, such as resurfacing.

Like the no-action alternative, no public transit would be provided for visitors. Concession and private tour buses of all sizes would be allowed. However, after dropping visitors off at the Grand Canyon Lodge, tour bus drivers would park at the amphitheater lot adjacent to the campground.

The concession employee shuttle would continue. NPS employees would continue to provide their own transportation and could drive on any visitor use roads and park in any parking lot.

Trails:

- *Outside the Park* — Trails outside the park would be the same as the no-action alternative. Hikers and bikers would continue to have access to the Arizona Trail and to hundreds of miles of roads and trails in the USFS North Kaibab Ranger District, where horseback riding would also be allowed.

- *Inside the Park* — As described for the no-action alternative, no special provisions would be made for biking; the only off-road trail for bikers would be the Arizona Trail. Existing pedestrian trails would be retained, and visitors could continue to use existing wilderness roads for hiking, but these trails would not be advertised.

■ Orientation and Interpretation

Gateway Information: An NPS staff person would be assigned to the USFS Jacob Lake visitor center to help provide park visitor information and distribute visitor use throughout park and forest lands.

Orientation Centers: A proposed contact station near Grand Canyon Lodge would provide services on Bright Angel Point, as described for the no-action alternative.

Interpretive Facilities: Existing facilities and programs would remain (Grand Canyon Lodge recreation room/auditorium and campground amphitheater); no additional facilities would be provided.

■ Visitor Services

Outside the Park: The towns of Kanab and Fredonia, as well as areas farther away, would continue to provide visitor services outside the park. The U.S. Forest Service is also studying whether to expand lodging at the Kaibab Lodge and Jacob Lake and to increase designated camping in several areas. Under this alternative additional parking could be needed at Kaibab Lodge to accommodate visitors waiting to enter the park.

North Rim: Overnight accommodations would be the same as the no-action alternative: approximately 200 guest rooms would be available at Grand Canyon Lodge and 80 individual sites and 4 group sites at the campground, along with restrooms and a shower/laundry facility.

Current food service facilities would remain (a total of ±265 seats at the lodge and the camper store). The gift shop and camper store would remain, along with the gas station and the limited auto repair service. The frame cabins beside the historic inn would remain boarded up and unused.

Besides retaining existing comfort stations, toilets would be added as needed in high use areas, and water conserving toilets would replace existing facilities in some areas on Walhalla Plateau (the same as the no-action alternative).

Winter Use: The North Rim would remain closed to motorized use during the winter, like the no-action alternative. One group campsite would continue to be left open, with chemical toilets available. The U.S. Forest Service would continue to provide designated motorized and nonmotorized winter use areas outside the park, and the Kaibab Lodge would continue to support winter sports such as cross-country skiing and snowshoeing.

Area Operations

■ Outside the Park

The Park Service would work with the Forest Service to provide housing at Jacob Lake for the NPS employee working in that area. If space was not available, the NPS employee would need to find housing in Fredonia, Kanab, or elsewhere.

■ North Rim

Housing: Approximately 120 new units would be constructed for NPS and concessioner employees in order to eliminate double bunking, substandard housing, and a six-day workweek. Approximately 20 substandard employee housing units would be replaced, and additional concessioner housing would allow employees to work five-day instead of six-day weeks.

Community Services: As described for the no-action alternative, existing community services would be retained, and no additional services would be added.

Management Support: Temporary office trailers could be added in existing disturbed areas where shortages were severe.

Utilities: No major utility changes would be made; utility lines would be minimally extended. As described for the no-action alternative, chemical toilets would be replaced with water-conserving models, and additional toilets would be added in high visitor use areas.

Tuweep

Summary of Tuweep Actions

Unlimited day visitation would continue. No additional visitor services would be provided, and existing facilities would remain in their current locations. Seasonal ranger housing would be provided.

Visitor Experience

■ Access/Transportation

Even though the National Park Service would prefer that the present dirt access roads to Tuweep remain, future activities outside the park, such as mining, could result in road improvements.

As described for the no-action alternative, existing dirt roads in the park would be maintained, along with parking areas at the Toroweap overlook and Vulcans Throne. Overflow parking would be allowed along the roadside.

Existing trails would remain (including Tuckup, Saddle Horse Canyon, and access to the Lava Falls trail).

■ Orientation/Interpretation

Gateway Information: Limited information about Tuweep would be available on the present access routes. This area would not be advertised, and knowledge about it would primarily be by word of mouth. The only sign for Tuweep would be along Mohave County Road 5.

Tuweep: The information sign at the ranger station would be retained, and Tuweep information sheets would continue to be provided.

■ Visitor Services

The Bureau of Land Management would continue to offer camping outside the Tuweep area.

Camping within the park would be the same as the no-action alternative. The 11 campsites would be retained, with a maximum of six people at each individual site and 11 people at the group site. A maximum of two vehicles per site would be allowed. Campers who did not get a park site would be asked to camp on BLM lands, or they could be issued a park backcountry camping pass, if passes were available.

Area Operations

As described for the no-action alternative, the substandard seasonal ranger trailer would be replaced, the existing ranger office would remain, and visitor toilets would be converted to water-conserving models.

Corridor Trails

Summary of Corridor Trail Actions

Present trail use patterns on the major trails providing access into the canyon would continue. Hiker use would continue to be unlimited, and mule use would remain at existing levels on the principal North and South Rim trails. Overnight accommodations at Phantom Ranch, Indian Garden, and Cottonwood campground would remain.

Visitor Experience

■ Access and Use

South Rim: A maximum of 40 visitor mule trips (60 passes) would be allowed on the Bright Angel Trail and 20 on the South Kaibab (20 passes). Additional pack mules would be allowed to take equipment and supplies into the canyon.

North Rim: Approximately 70 visitor mule trips (140 passes) would be allowed on the North Kaibab Trail (the same as the no-action alternative). Mule and horse use would not be limited on the Ken Patrick and Uncle Jim Trails.

■ Interpretation

Special interpretive programs would still be scheduled on the South Kaibab Trail.

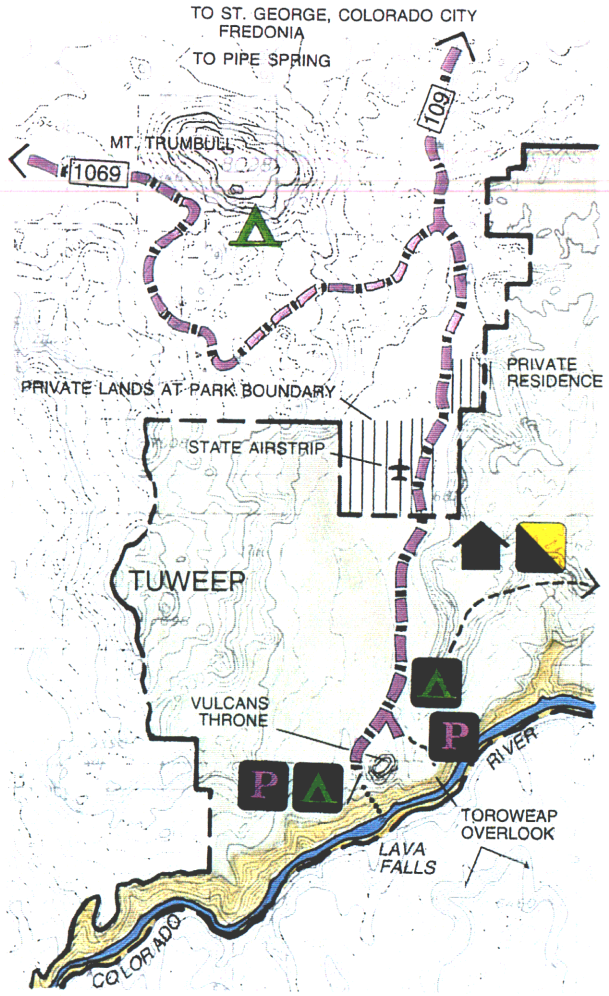
■ Visitor Services

All existing visitor service facilities would remain. Indian Garden would provide 15 campsites, and Cottonwood campground 10 sites. Water-conserving toilets would be added in strategic areas along the trails. Toilet or restroom facilities would be provided at all major trailheads.

Area Operations

Housing, management support facilities, and utilities would remain the same as the no-action alternative.

All toilets would be converted to water-conserving models to reduce the need for water or sewage treatment.



PARK BOUNDARY
CANYON RIM
CANYON

EXISTING
ENTRANCE STATION
LIMITED DAY USE
LIMITED NUMBER OF MOTORIZED VEHICLES

EXISTING
MINOR TRANSIT STATION / SHELTER
SHUTTLE BUS ROUTE
UNRESTRICTED ACCESS
RESTRICTED ACCESS
UNPAVED ACCESS

EXISTING PROPOSED
PARKING
RAILROAD

EXISTING
TRAILHEAD
RIM TRAIL
MAJOR CORRIDOR TRAIL
MINOR CORRIDOR TRAIL
ARIZONA TRAIL
BIKE AND/OR PEDESTRIAN TRAIL

EXISTING
CONCESSIONER MULE BARN
CONCESSIONER MULE STAGING
MULE TRAIL

EXISTING PROPOSED
MAJOR ORIENTATION CENTER
CONTACT STATION
GATEWAY INFORMATION CENTER
INFORMATION

EXISTING PROPOSED
LODGING
CORRIDOR TRAIL FACILITY

EXISTING PROPOSED
CAMPGROUND
PRIMITIVE / DISPERSED CAMPING
VISITOR SERVICES
MUSEUM / INTERPRETATION

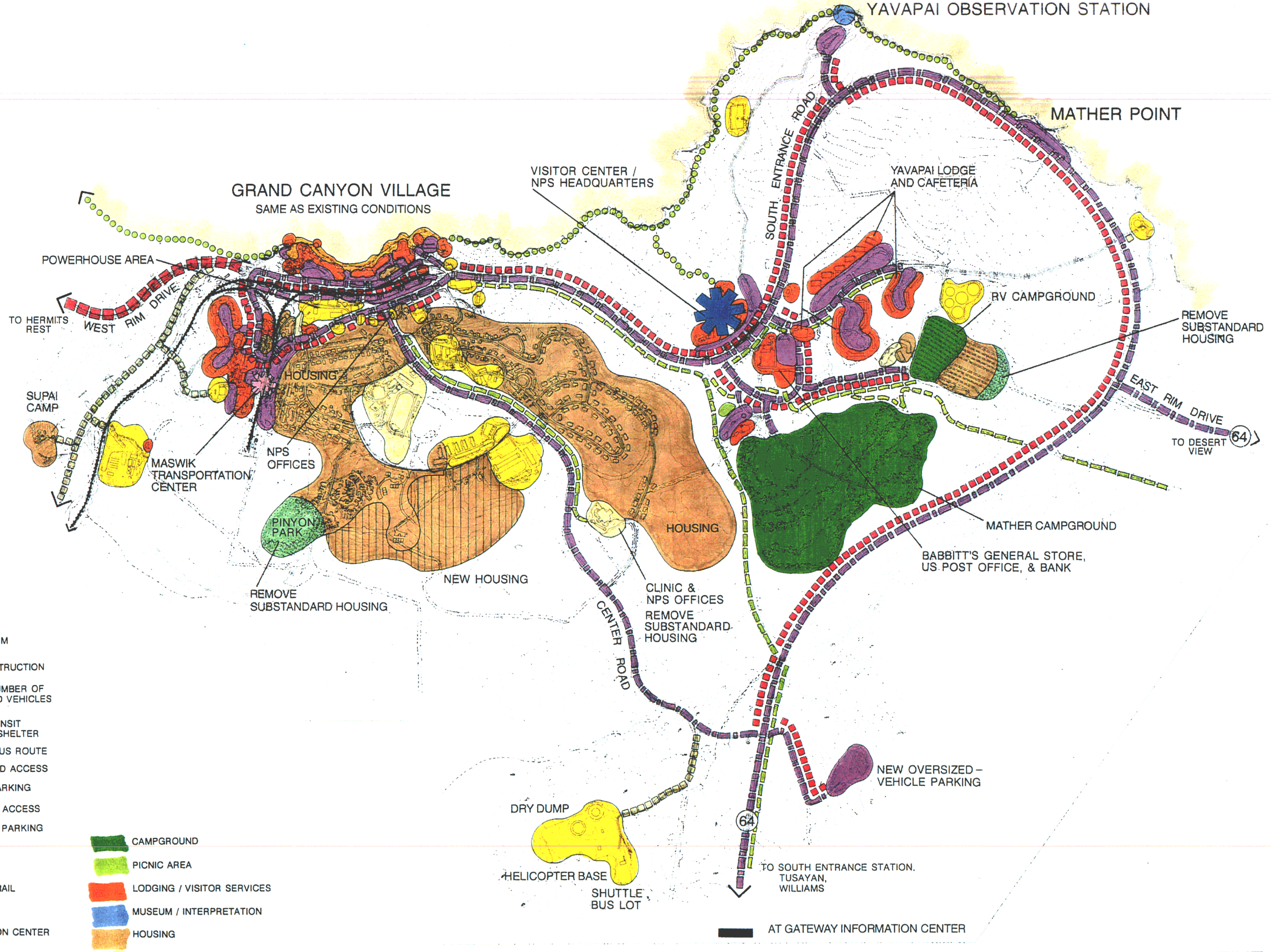
EXISTING PROPOSED
HOUSING
MANAGEMENT SUPPORT
SCENIC HIGHWAY

ALTERNATIVE 1: MINIMUM REQUIREMENTS

PARK DEVELOPED AREAS

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20073/DSC/1•95

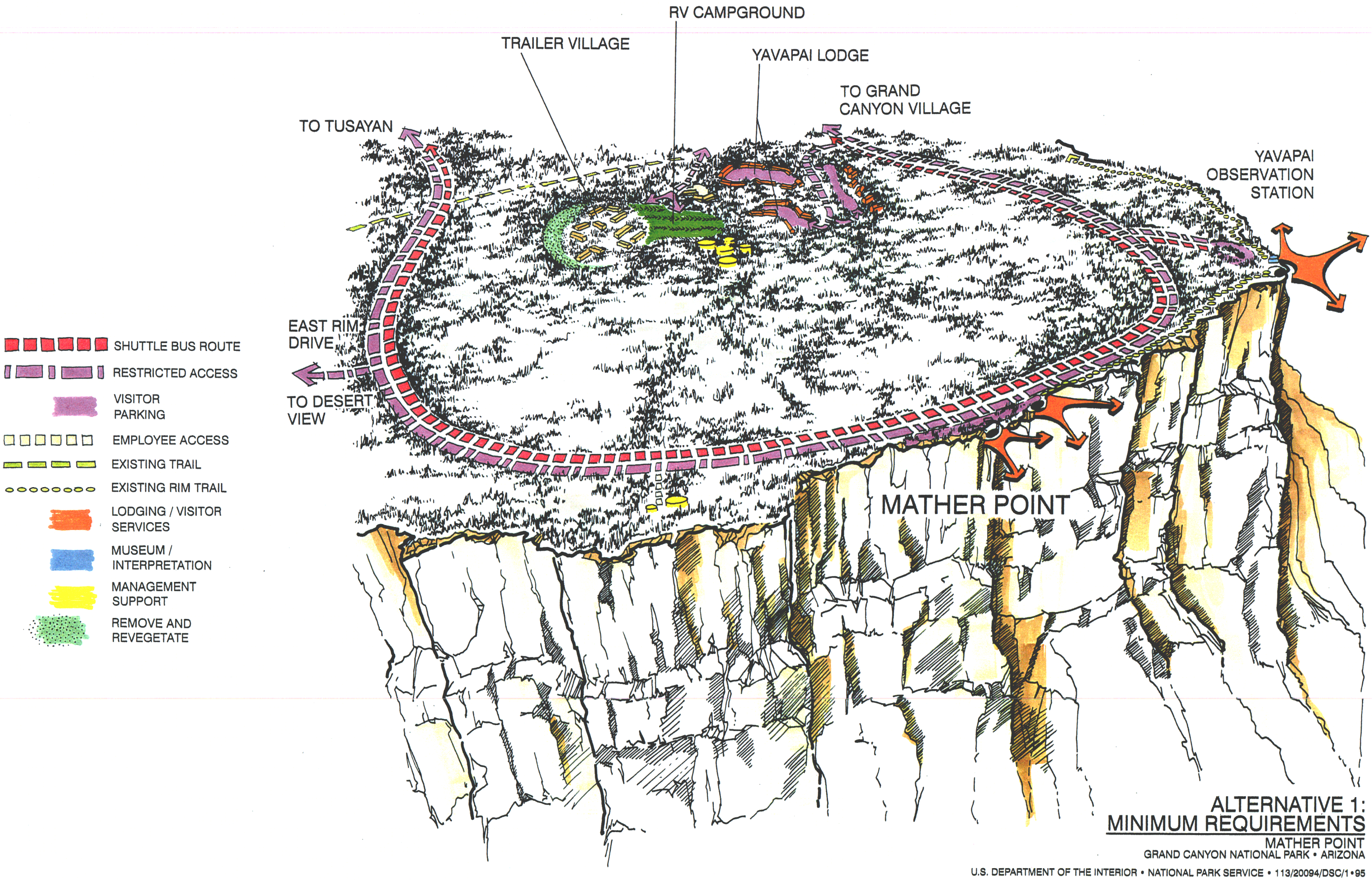


ALTERNATIVE 1: MINIMUM REQUIREMENTS

GRAND CANYON VILLAGE / MATHER POINT

GRAND CANYON NATIONAL PARK • ARIZONA

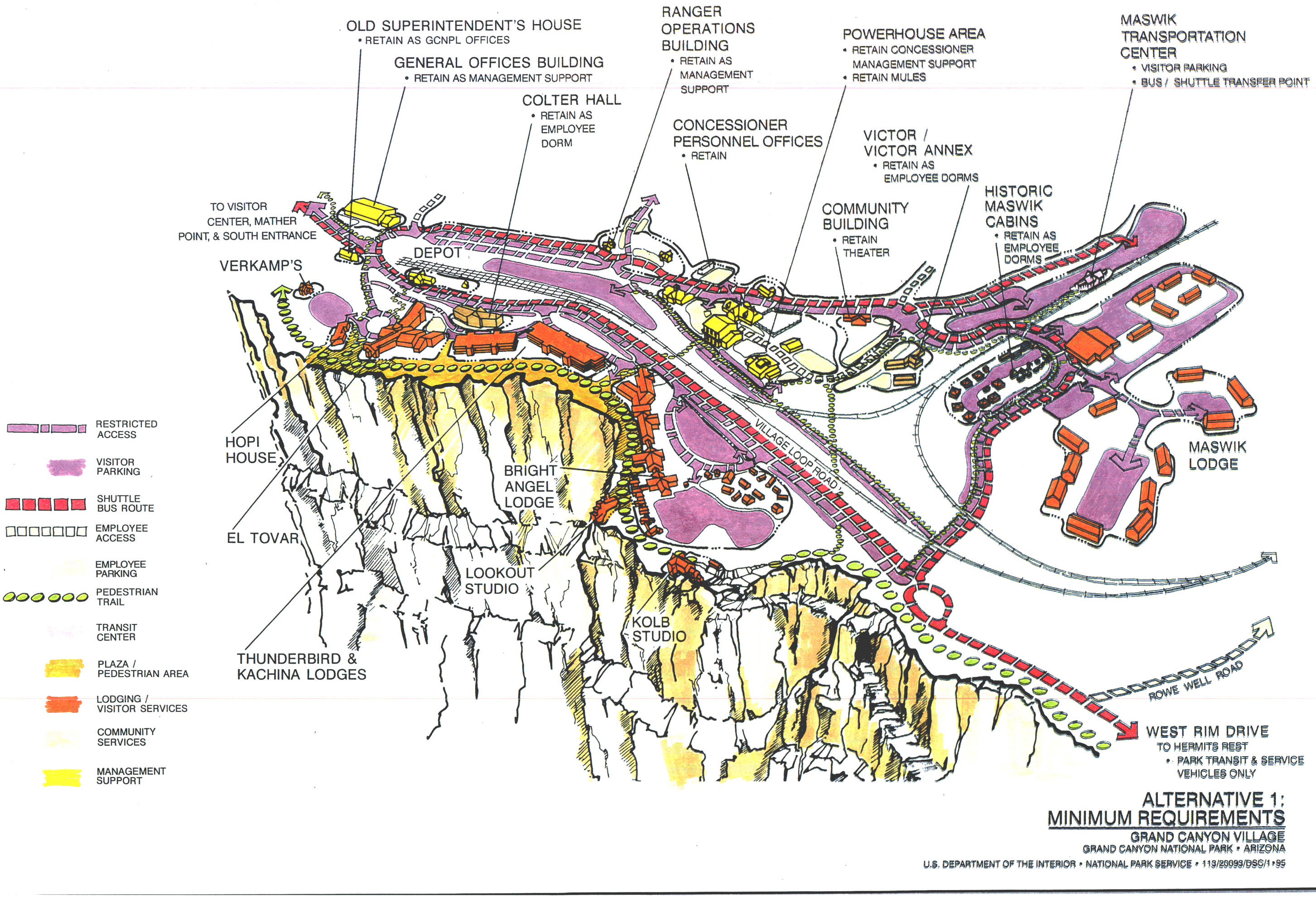
U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20078/DSC/1•95



ALTERNATIVE 1: MINIMUM REQUIREMENTS

MATHER POINT
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20094/DSC/1•95

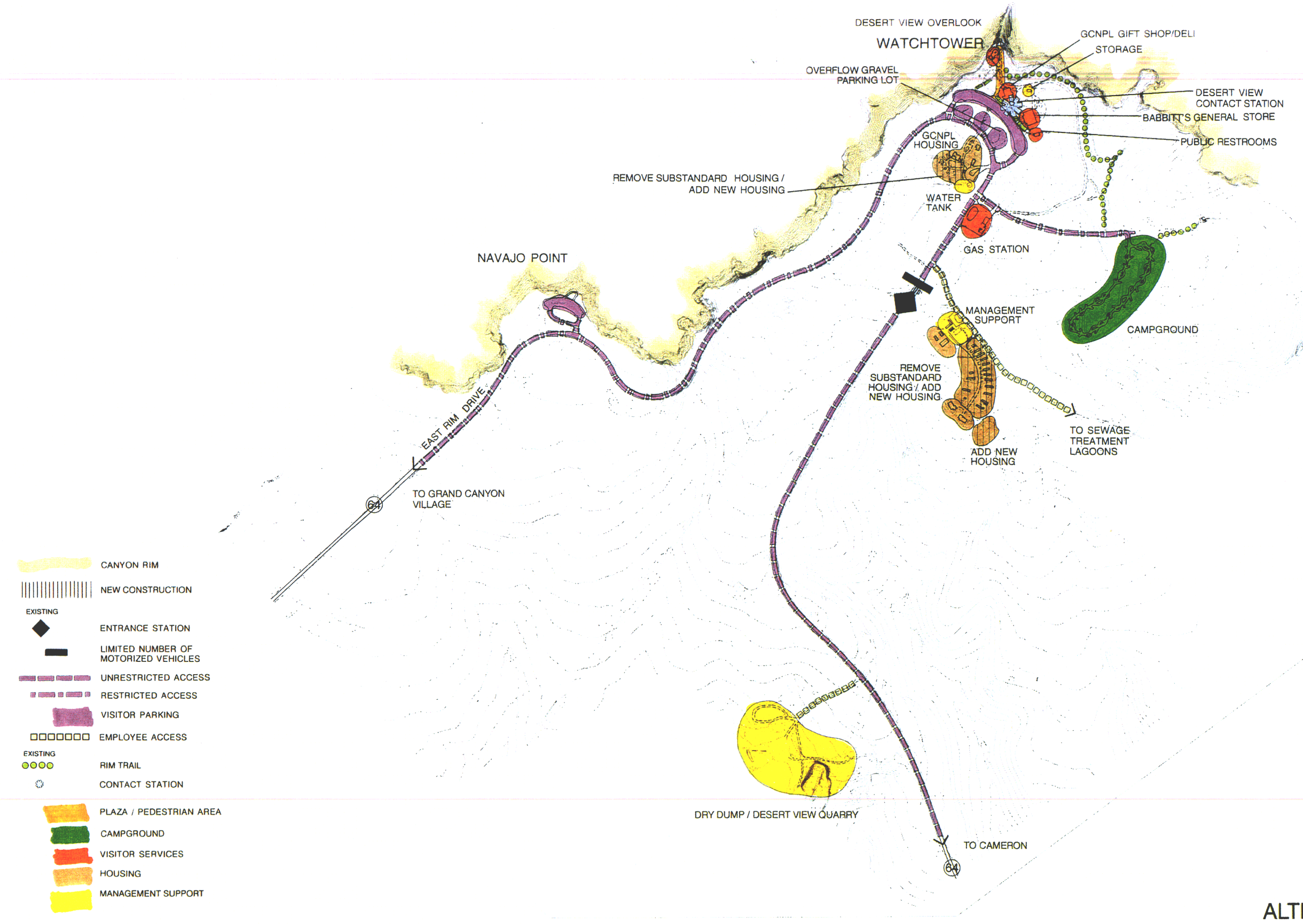


ALTERNATIVE 1: MINIMUM REQUIREMENTS

GRAND CANYON VILLAGE

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20093/DSC/1•95

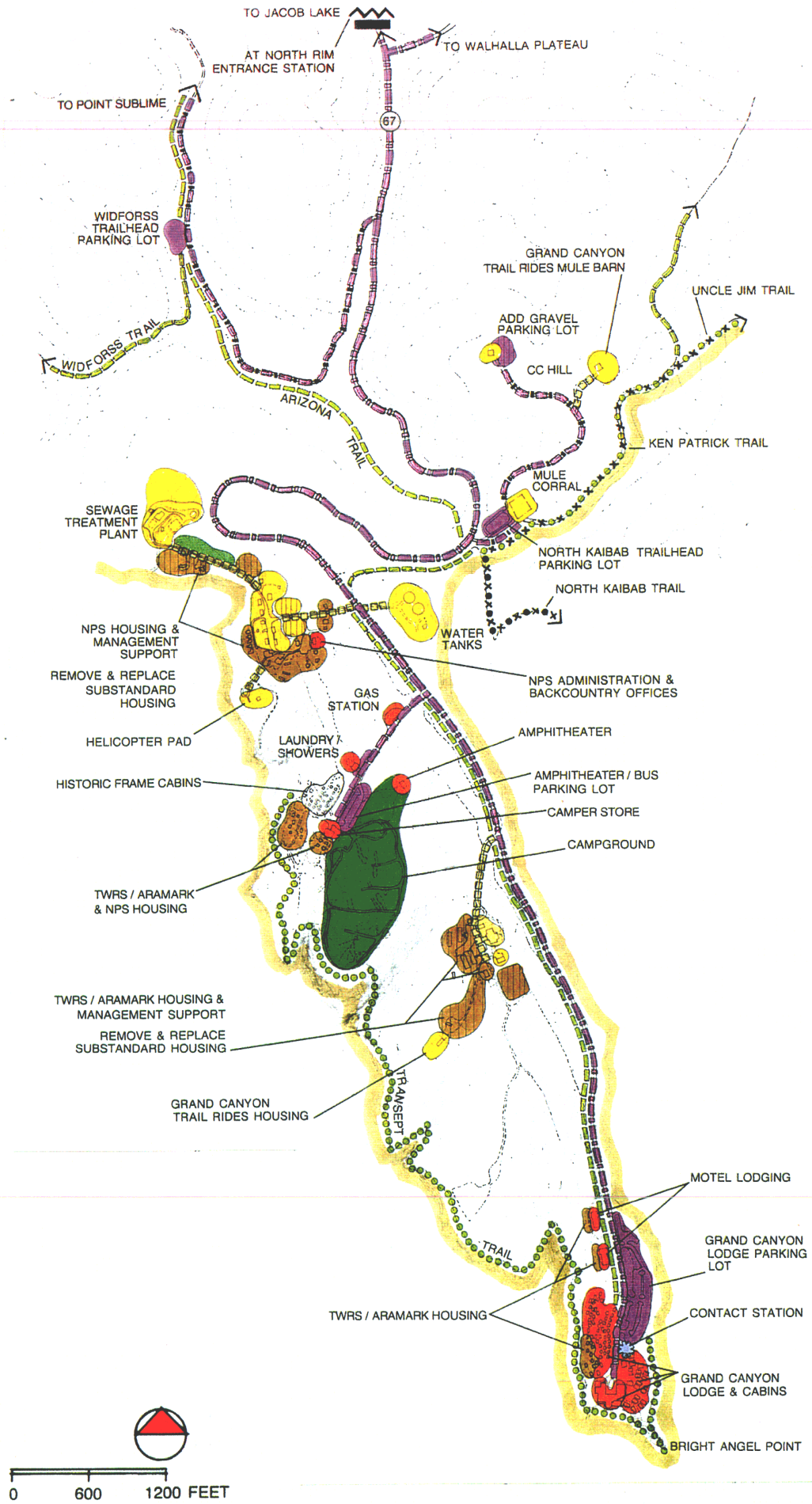


ALTERNATIVE 1: MINIMUM REQUIREMENTS

DESERT VIEW

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20083/DSC/1•95



CANYON RIM
NEW CONSTRUCTION
LIMITED DAY USE
LIMITED NUMBER OF MOTORIZED VEHICLES
RESTRICTED ACCESS
UNPAVED ACCESS
VISITOR PARKING
EMPLOYEE ACCESS
EXISTING
RIM TRAIL
EXISTING TRAIL
MULE TRAIL
CORRIDOR TRAIL
EXISTING
CONTACT STATION
REMOVE AND REVEGETATE
CAMPGROUND
LODGING / VISITOR SERVICES
HOUSING
COMMUNITY SERVICES
MANAGEMENT SUPPORT

ALTERNATIVE 1: MINIMUM REQUIREMENTS

NORTH RIM / BRIGHT ANGEL POINT

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20088/DSC/1•95

Summary of the Proposed Action

The regional context of Grand Canyon National Park would be emphasized, and proposals for resource preservation and visitor use would take into account environmental effects on the park as well as the region. Planning outside the park would be done cooperatively, with an emphasis on disseminating information, preserving regional and park resources, and providing a quality visitor experience.

The National Park Service would work jointly with adjacent entities to provide for many park needs outside park boundaries. The most appropriate locations for facilities would be considered in a regional context, taking into consideration principles of sustainable design and the need to preserve resources while providing for a quality visitor experience. Alternative modes of transportation (public transit, hiking, and biking) would be emphasized within the park.

To minimize impacts on natural and cultural resources, existing structures would be adaptively reused, and required new facilities would be built in previously disturbed areas wherever possible. Some disturbed areas would be revegetated. Park facilities would be retrofitted, planned, designed, and operated to reflect their environmental setting and to maintain the integrity and biological diversity of ecological systems and processes.

The visitor experience within and adjacent to the park would be defined by the unique qualities of each area. To ensure a quality experience, the number of visitors admitted to certain areas would be limited during peak visitation periods based on the desired visitor experience and the need to protect resources. The process for determining use limitations would be the same throughout the developed areas of the park; however, visitor levels in specific areas would vary considerably, and use would be limited sooner in some areas than in others. As a result, day visitation on the South Rim and the corridor trails would not need to be limited during the life of this plan; day visitation on the North Rim would be limited by the year 2005 or 2010, depending on the effectiveness of management actions; and day use at Tuweep could be limited during peak times. In areas where permits became necessary, visitors would be able to obtain permits ahead of time and would have their permits checked at park entrances.

A monitoring system would be established to measure resource impacts, facility use, visitor satisfaction, and levels of visitor attendance in each park developed area. The permit system would be adjusted as needed.

To preserve resources and to ensure a quality visitor experience, most of the park's developed areas would be accessible only by public transit, hiking, or biking. Private vehicles (tour buses, cars, and RVs) would only be allowed in specific areas. The public transit, bikeway, and pedestrian system would be significantly expanded.

Interpretive programs would focus on the significant resources of Grand Canyon, as well as regional conservation and preservation issues. Overnight accommodations would be expanded on the South and North Rims primarily by adaptively reusing structures.

Parkwide Management Actions

Natural Resources

■ Air Quality and Noise

All commercial vehicles entering Grand Canyon would have to display a valid emissions sticker on their windshields. Tour buses not having a valid emissions sticker would not be allowed in the park.

All NPS and concession buses would be required to meet locally established air and noise emission standards in order to set a national example for using quiet and minimally polluting buses. By the year 2010 all NPS and concession buses on the South Rim would be converted to natural gas, battery electric, or an energy source with emissions at least equal to or better than the emission characteristics of natural gas or electric vehicles. Some vehicles may require dual power capabilities (for example, electric vehicles with diesel or natural gas backup power). The bus system for the North Rim would be required to meet the same air and noise emission standards as for the South Rim as soon as feasible. All bus operators would be required to turn bus engines off when parked or when loading or unloading passengers (the same as the no-action alternative).

Safe bikeway systems would be provided to encourage the use of alternative modes of transportation.

The Park Service would encourage the use of clean fuels in Tusayan and throughout the South and North Rims for vehicles and heating systems.

An employee shuttle service would be created for people working on the South and North Rims, which employees would be encouraged to use. This service would extend into the Tusayan area. The Park Service would also encourage regional employee shuttle service to the park. Walking and biking trails would also be expanded.

All trains would be required to meet the federally mandated train air emission standards and to minimize the use of train whistles and bells, as safety allowed.

No new wood-burning stoves or fireplaces would be allowed in the park, and all replacements would have to meet EPA standards. Historic uses such as El Tovar fireplace would be exempt from these standards. Campfires would still be allowed in the campground.

The Park Service would discourage changes at the Grand Canyon Airport in Tusayan that would result in increased noise pollution in the park. Any needed expansion of airport facilities would be encouraged to be located farther from the park.

■ Vegetation / Wildlife / Ecosystems

The Park Service would develop and implement an ecosystem approach to managing threatened and endangered species, and it would institute an active research and recovery program. An active research program for all ecosystems and species would be developed, based on a baseline inventory and long-term monitoring program. All specimens collected and retained from park lands would have to be cataloged.

A vegetation management plan would be developed and implemented. The plan would focus on removing or preventing hazardous tree situations, rehabilitating and revegetating disturbed areas, removing nonnative species, reestablishing native landscaping, promoting healthy native landscaping through appropriate plant care techniques, and using low-impact techniques to manage overlooks and vistas. Native and self-sustaining plant materials from the park's gene pool would be used wherever feasible.

Landscaping around historic structures would maintain the character of the cultural landscape and would use naturally occurring plants. Vegetation loss would be a primary consideration in evaluating development proposals, and little loss would be tolerated. If projects result in vegetation loss, the revegetation of other disturbed areas could be required, acre for acre.

The need to use borrow pits for trail maintenance would be minimized; trail maintenance materials would be brought from outside the park whenever possible.

The natural role of fire within the park ecosystems would be restored within the constraints specified in the park's *Fire Management Plan.*

■ Water Resources

Water resource management actions would be the same as alternative 1, including reducing the use of water in the park, protecting park waters, protecting groundwater resources from development, instituting water quality and flow monitoring, understanding the park's hydrography, protecting park water rights and the water supply capacity, water sales to Tusayan, and flood hazard area management.

For facilities proposed in the Tusayan area (housing, a gateway information center, etc.), water would be provided from the park system unless other sources were developed that had less impacts on park resources.

Minimum flow requirements in Bright Angel Creek for aquatic wildlife and recreational activities during droughts would be established. Water withdrawals might have to be curtailed to meet these requirements. Water consumption (measured as gallons/visitor pumped to the rim would be reduced from 43 in 1994 to 20 in 2010 if the Roaring Springs source was retained.

■ Scenic Resources

Components of the human environment that adversely affect scenic resources (for example, powerlines, lights, airport beacons, trash bins) would be identified, and the Park Service would work with the necessary entities to minimize or reduce such visual intrusions. The character of historic districts would be enhanced by removing

many nonhistoric structures and locating needed new facilities in areas that did not detract from the historic character. Overlooks would be actively maintained for resource protection and scenic quality.

New light sources would be shielded to reduce light pollution at night (the same as alternative 1).

Cultural Resources

A comprehensive inventory and data management system would be established for archeological resources, historic structures, cultural landscapes, museum objects, and ethnographic resources. As part of this system, the following would be undertaken:

- a regionally based archeological research plan
- a park archeological assessment and research design document
- a comprehensive historic resource program (including historic resource studies, a park administrative history, historic structure reports, and cultural landscape reports)
- a parkwide ethnographic overview and assessment
- specific ethnographic studies for each tribe associated with the park
- studies to identify ethnographic resources for resource management and protection purposes, for nomination to the national register, and for interpretive use
- scope of collections statement

The Park Service would develop an integrated database for archeological, historic, and ethnographic resources, including cultural landscapes and museum objects. This database would be incorporated into the NPS archeological resources inventory, the historic property preservation database, and the ethnographic resources inventory. Updates on the documents and the database would be done regularly. Research by an interdisciplinary team would support planning and compliance actions.

A comprehensive program to preserve and maintain archeological, historical, and ethnographic resources would be implemented. The primary purposes of these studies would be to identify, document, and protect these resources. This program would also meet the requirements of the Archeological Resources Protection Act, the National Historic Preservation Act, the American Indian Freedom of Religion Act, and the Native American Graves Protection and Repatriation Act. In addition, an active stewardship program would be organized and encouraged to manage cultural resources, including the adaptive reuse of historic structures.

A memorandum of agreement would be executed with each associated American Indian tribe to detail consultation procedures for actions that might affect ethnographic resources and to ensure their protection. The confidentiality of all ethnographic information collected in the studies would be ensured when so requested.

A proactive ruins stabilization program would be developed, and sacred sites identified by the tribes would be protected. Sacred sites would also be protected through ongoing consultation and communication with the tribes.

A program would be initiated to complete the survey, inventory, documentation, and evaluation of cultural resources in the park under national register criteria.

The active program for collections management and a high-quality program for cataloging park collections would take place in the new museum collection storage and research facility. In addition, the park would actively seek to improve the quality of its museum collections by both acquiring needed materials and deaccessioning inappropriate materials.

South Rim

Summary of South Rim Actions

The vision for the South Rim is to allow visitors direct access to canyon panoramas and to offer a range of visitor experiences, from more social experiences in Grand Canyon Village to solitary experiences elsewhere along the rim.

To achieve this vision, the number of private vehicles parking on the South Rim at any one time would be limited. During peak seasons private vehicles would be removed from the village, the West Rim, and East Rim overlooks. These areas would become pedestrian spaces where visitors could enjoy the views, learn about the park's interpretive themes, use visitor services, and find secluded spots.

A public transit system, along with bike and pedestrian paths, would provide access along the South Rim.

A gateway center in Tusayan and two orientation/information stations in the park — one at Mather Point near the village, and the other at Desert View — would tell visitors about the park.

Overnight lodging would be increased by about 25% by adaptively reusing existing structures, and the total number of campsites would be increased by about 18%.

Substandard housing units would be replaced with higher density housing in disturbed areas. Additional housing would be developed in cooperation with the U.S. Forest Service outside the park in or near Tusayan.

Visitor Experience

■ Visitor Use Patterns

To provide a quality visitor experience and minimize land disturbance, day visitation limits would be established but are not expected to be reached by the year 2010 because of improved visitor distribution, the number of existing canyon overlooks, and the high capacity of many overlooks. The initial capacity would be 22,640 visitors at any one time (see the box on the next page for a description of how the carrying capacity was set).

A monitoring system would be implemented to ensure that visitor use patterns, levels of visitor satisfaction, and the extent of resource damage were clearly understood, documented, and addressed.

Overnight accommodations would be increased by adaptively reusing historic structures. Day attendance limitations are anticipated by the year 2015 if growth patterns continue as projected in this document and if proposed use patterns are implemented.

Grand Canyon Village: Major changes would be made in visitor and employee use patterns in the village in order to minimize land disturbance and to accommodate large numbers of visitors without related conflicts and resource impacts.

Private vehicles would be removed from the rim and other high use areas, including the historic village. To ensure visitors had convenient access to all park areas, public transit, bike, and pedestrian systems would be significantly expanded. Wherever possible, disturbed lands would be used for land use changes and development.

To enhance the village's historic character, parking areas and nonhistoric structures would be removed from the core area, private vehicles would be prohibited, and historic structures would be adaptively reused for visitor facilities and services.

To help visitors plan their visits and to give them an understanding of all the park's interpretive themes, a new orientation center would be provided near Mather Point, within walking distance of the rim. Parking for this facility would be accommodated nearby.

Desert View: Major changes would be made in visitor and employee use patterns at Desert View in order to minimize land disturbance and to accommodate large numbers of visitors without related conflicts and resource impacts. East Rim Drive would be moved back from the rim so the Watchtower area could be used by visitors without intrusions from vehicles. Private vehicle parking and tour bus parking would be moved back from the rim to the existing concessioner housing area. Approximately 450 parking spaces would be provided. Some visitor service buildings, including a new orientation center, would be built in disturbed areas within walking distance of the rim.

■ Access/Transportation

Regional Access: The Park Service would encourage alternatives to private automobile travel to Grand Canyon. These alternatives would complement

the transportation and orientation proposals in this alternative. Current examples include the Grand Canyon Railway from Williams, Nava-Hopi Tours from Flagstaff, and various shuttles from Tusayan and the Grand Canyon Airport in Tusayan. Additional alternatives in the future, besides the shuttle from the gateway information center in Tusayan, could include a canyon area shuttle service from a staging area in Valle, or proposals stemming from a regional transportation plan currently being developed under the auspices of the Arizona Department of Transportation.

A major parking facility and staging area for up to 2,600 vehicles (depending on the success of other transportation alternatives) would be provided in cooperation with the U.S. Forest Service at the gateway information center in Tusayan (surface parking or a garage). A transit center would provide transit information and service on a regular basis.

USFS 302/307 would remain a gravel road. USFS 328/Rowe Well Road would be upgraded to a gravel road.

Roads, Parking, and Transit:

• *Overview* — Transit service, biking and hiking would be the primary means for park visitors and residents to travel year-round along the South Rim. A convenient, attractive, and energy-efficient transit system would serve the developed areas from Hermits Rest to Yaki Point and from Desert View to the Tusayan museum. Each bus would have a bike rack. Automobiles would be restricted from Hermits Rest to Desert View year-round by 2010. This main village would only be accessible by transit, hiking, or biking.

Back from the rim at Mather Point, a well-screened parking lot for 1,225 private vehicles (including RVs) and 60 tour buses would be constructed to serve the Mather Point orientation/transit center. Visitors would be required to walk a short distance (up to 1,000 feet) from the parking lot, past the orientation/transit center, to get to the rim, or they could board transit or tour buses at this location to all South Rim destinations. Walking trails and bike paths (and rentals) would also be available. The parking lot was sized to allow a limited number of visitors to drive to within walking distance of the rim all year long, while still making an eight- or nine-month shuttle season from Tusayan viable. Visitors who could not park at Mather Point because the lot was full would be required to visit the park by alternative means.

Through-traffic on East Rim Drive would not be restricted. However, developed overlooks and the Tusayan museum would only be available for transit and tour bus vehicles during the peak use season. Automobiles would have access to picnic areas and roadside pulloffs — rock walls along the roadsides east and west of these pulloffs would discourage overflow parking. During the off-season, until visitation levels dictated year-round restrictions, automobiles would have access to all East Rim overlooks and the Tusayan museum.

At Desert View parking for about 450 private vehicles (including RVs) and 15 tour buses would be constructed in the existing concessioner housing area. This parking would be adjacent to the Desert View orientation/transit center and would be a short walk (up to 1,000 feet) from the rim. Shuttle service from Desert View to the Tusayan museum would be available, and tours would take visitors from Desert View to destinations along East Rim Drive and to the Mather Point orientation/transit center. Walking trails and bike paths (and rentals) would also be available here. The proposed parking lot at Desert View would be sized to accommodate projected demand to the year 2010.

West Rim Drive would be converted to year-round public transit/concession tour service only. The Maricopa Point overlook and parking area would be removed due to the proximity of a rare plant population, and the Hopi Point overlook would be redesigned for bike/pedestrian use only.

• *Grand Canyon Village* — The Mather Point orientation/transit center would be the central transit center for the South Rim. This would be the primary point for visitors to make direct transit connections to the village and West Rim Drive, the Yaki Point trailhead, or the gateway information center in Tusayan. This center would include a transit pick-up/drop-off area, covered shelter and seating, information and display panels, and restrooms. Transit routes along the South Rim, with different bus sizes and schedules, would provide convenient visitor access to South Rim areas.

The South Rim entrance road from Mather Point to the village loop drive would be restricted to public transit vehicles only. Overnight private tour buses dropping passengers off at lodges along the rim could use the portion of road between Mather Point and the village loop drive only to drop off and pick up guests staying in lodging on the rim. If this additional use caused problems, then overnight tour buses would be directed to park at the Maswik transportation center, and shuttle service would be provided to rim lodging.

Day tour buses could drive directly to the Mather Point orientation center, where they could park. The parking area at the Maswik transportation center would provide both day and overnight bus parking.

Private automobiles and RVs would have to park at the Mather Point staging area. The area would be heavily landscaped and would provide a total of about 1,225 private vehicle parking spaces and 60 bus spaces. Long-term parking for hikers would be designated, and an on-call shuttle or taxi pick-up service would be available for hiker access to and from major trailheads.

All overnight visitors would be given identification for their cars. These vehicles would have access to the same roads and parking lots as day users; however, overnight visitors would be allowed to park their vehicles at lodging away from the rim or at their campsites. Visitors staying on the rim would have to park at the Maswik transportation center and lodge area, with shuttle service to the rim. The Maswik transportation center would also serve as the in-park staging area for the railroad spur when that system became operational.

The business center parking lot would be reduced to about 100 spaces. The area would be landscaped and redesigned so portions of the existing lot could be used as a pedestrian plaza, with eating areas and an outdoor interpretive program area. Mail delivery by the U.S. Postal Service would be encouraged to reduce resident traffic.

A few new road sections would be constructed so private vehicles would not have to use public transit routes from Mather Point to the village. The new road sections, which would be built on disturbed lands wherever possible, include

- a 0.4-mile access road to link the RV campground and the existing south entrance road
- a 1.4-mile road to connect the Maswik transportation center and Maswik Lodge to Center Road
- a 0.25-mile section of road back from the rim to provide access to the Mather orientation/transit center (the existing road section closer to the rim would be converted to a bike path)
- a 0.4-mile link connecting community residences to the business center

• *Desert View* — A bypass would be constructed on Arizona 64 around Desert View to eliminate traffic traveling through the developed area. The present road into Desert View would be changed to a spur road on the east and a bike trail on the west. Portions of the spur road would be realigned to improve safety and so that it functions effectively in conjunction with the proposed bypass.

A new entrance station for Desert View, with at least two entry lanes, would be developed east of Desert View. The existing entrance station would be removed and the area revegetated.

The Desert View orientation/transit center would be the transportation hub of the East Rim. Visitors would be able to park their cars and board transit or tour buses to all South Rim destinations. Alternatively,

Setting the South Rim Carrying Capacity

On the South Rim the overlooks and rim trails were determined to be the primary visitor destinations. Their carrying capacity was derived through the following process:

- generating a detailed inventory and analysis of current visitation for every developed visitor use area on the South Rim
- surveying visitor preferences
- photographing visitor use patterns along with the visitation analysis and surveys at prime and average use times
- determining the size of each primary and secondary overlook (paved and adjacent disturbed areas)
- categorizing the desired density of visitors at every overlook
- establishing the appropriate number of visitors for each overlook, based on the above information
- determining the potential redistribution of visitors, based on the proposed plan
- correlating the overlook and rim trail carrying capacity with the secondary attractions (for example, restaurants and lodging)
- determining the overall South Rim carrying capacity

visitors would be able to rent bicycles and use the bike paths or walk on the pedestrian trails along the rim in both directions from Desert View. The transit center would include transit pick-up/drop-off areas, a covered seating and waiting area, and information panels. Restrooms would be provided in the orientation center nearby. Buses would be fitted with bike racks.

The parking lot would accommodate 450 private vehicles (including RVs) and 15 buses, and it would be constructed in the existing concessioner housing area. Access to the lot would be from the south to keep traffic noise as far from the rim as possible.

• *Off-Season Roads, Parking, and Transit* — Public transit service would be adjusted during off-seasons in terms of schedules, numbers of buses, routes, and bus types to meet different South Rim use patterns. However, by the year 2010 visitor use is projected to increase to such levels that the entire area from Yaki Point to Hermits Rest, including major portions of Grand Canyon Village, would only be accessible by transit or hiking/biking year-round. Many parking lots within these areas would then be removed and revegetated, although public transit access roads and parking spaces for service vehicles would be retained.

During the off-season visitors in private cars would initially be allowed access to overlooks along East Rim Drive that were accessible only by bus during the high use season. As visitor use increased, however, bus access to these overlooks would be gradually extended until year-round service was offered by 2010; at the same time private vehicle parking lots would be redesigned for bus use only, and portions of each lot would be revegetated. At that time private vehicles would only have access to pulloffs along the rim and picnic areas.

• *Employee Roads, Parking, and Transit* — An efficient employee shuttle system would be developed for NPS and concession employees residing both in the park and in Tusayan. Employees would be encouraged to use alternate transportation modes.

The parking area at the existing visitor center/NPS headquarters would be designated for employees and NPS vehicles only (this plan proposes that the building be used as the NPS central administration building). This centralized parking facility would provide employee parking in the village. No new parking would be developed for employees. Employees would be directed to use roads back from the rim and to stay off public transit routes except for special work-related situations.

Trails:

• *Outside the Park* — Same as that described for the no-action alternative.

• *South Rim and Desert View* — Bikes would still be permitted on all roads. An off-road bike trail system would be provided to link Hermits Rest and Desert View. The trail would be used by both bikers and pedestrians except in very heavy use areas, such as between the business center and the village, where separate trails would be provided. The trail system would generally be north of the road on the East and West Rims so as to avoid road-crossing conflicts, and disturbed areas would be used whenever possible to limit resource impacts. Bike trails would also be provided in the park's residential area to link the community to all major use areas and the primary bike system. A bikeway plan would be done to determine more exact routes, paved and unpaved sections, bike/pedestrian overlooks and other design details. Bike rentals and safe racks would be placed in all major use areas.

Road sections at Mather Point, Desert View, the Hopi overlook, and the village loop bypass, which would no longer be used for motorized vehicles, would all be converted to bike paths. A few overlooks along the East Rim would be added for bike and pedestrian access only.

The pedestrian rim trail system would be substantially expanded. However, archeological sites would be avoided, and tree removal and other vegetation disturbance would be minimized. The trail extensions or improvements would include:

- an improved trail from Yaki Point to Verkamp's
- a loop trail from the Grandview overlook eastward to the Coconino Rim (incorporating the Grandview road)
- a trail from Desert View to the Tusayan museum along the rim, plus trails in conjunction with the proposed outdoor exhibits in the Tusayan museum area
- a trail (along an old road alignment) from Desert View to Cape Solitude
- a trail from the Tusayan orientation/transit center to the Mather orientation/transit center

■ Orientation and Interpretation

Regional Information: The National Park Service would actively work with area partners to ensure the following:

- Visitors have appropriate information to plan their trip before reaching the park. Partners could include the Flagstaff Chamber of Commerce at the Flagstaff visitor center, Kaibab National Forest and the city of Williams at the Williams visitor center, the Navajo Tribe and the Cameron Chapter at Cameron, the city of Kanab at the information center in Kanab, and other future information sources that would be identified in the future.
- The community of Tusayan is given every opportunity to fulfill the vision it has set for itself in their area plan. Partners could include Coconino County, Kaibab National Forest, and a wide variety of interested groups and individuals throughout the region.
- The community of Cameron is given the opportunity to plan its future in a way that provides economic development compatible with park purposes. Partners would include the Navajo Tribe, at a minimum.
- Actions taken by other land managers in the region would be compatible with park purposes; adverse impacts to other land managers from park actions would be minimized. Partners would include all land management organizations and tribes in the region.
- Regional planning would be done to coordinate efforts in visitor use management, sustainable and compatible development, and resource management. Partners would include all in the region.

Farther away from the park than the immediate region, information would be provided to potential visitors before they left their homes through various media, including mailings, video, telecommunications, and Internet. This information would help visitors understand the need to plan their trips well ahead and would help them formulate realistic expectations.

As visitors came closer to the park, more detailed information would be provided, and the means of providing the information would become more interactive. As an example, airports that serve Grand Canyon visitors would have interactive computer installations; visitor centers within 90 minutes of the park would have an informed person that visitors could speak with. Each of these visitor centers would probably require a different level of support from the Park Service, including facility funding, staffing, training, and frequent information updates. When reservations were required for day visits, as is proposed for the North Rim in a few years, visitors would be able to get these reservations at visitor centers in gateway communities as well as many other off-site locations.

The Park Service would encourage the state of Arizona to include Grand Canyon information at interstate rest stops and welcome centers.

Tusayan Gateway Information Center: A gateway information center would be provided north of Tusayan. The gateway information center would be a mandatory stop for all park visitors. A site north of town is preferred in order to reduce the length of the transit route and to enhance the sense of arrival. However, the ultimate location would be decided during the review process now being conducted by the U.S. Forest Service for the land exchange. The center would provide regional trip-planning information, as well as restrooms, telephones, an outside information kiosk, day parking, and transit service to the park. Other possible functions include

- lodging/campground check-in for the national park, the national forest, and possibly Tusayan, along with information on regional accommodations and a phone bank for making lodging reservations
- sales of park entry passes, NPS backcountry information, and a direct phone link to the backcountry office
- limited local area theme exhibits and book sales
- offices related to the operation of the building
- USFS administrative offices and services
- bike rentals

The facility would be jointly funded and operated by the Forest Service and the Park Service, and other entities could also be involved.

South Rim Overview: Two orientation centers would be developed — the primary center would be near Mather Point, with a smaller center at Desert View.

Both centers would be set back from the rim, but would have direct and easy pedestrian access to the rim.

These centers would help visitors to understand and appreciate Grand Canyon's major interpretive themes and to plan their visits. As described for alternative 1, the Maswik transportation center would continue as a minor orientation center.

Interpretive exhibits focused on particular themes would be provided in the existing powerhouse area in Grand Canyon Village, the Yavapai observation station, and the Tusayan museum.

The interpretation of traditional and contemporary relationships of American Indians and their use of the Grand Canyon and its resources would be conducted in appropriate places throughout the park. This interpretation would include, but not be limited to, cultural demonstrations by American Indians. The program would include formal partnerships modeled after those that currently exist between the National Park Service and American Indian groups.

Hermits Rest, Lookout Studio, and the Desert View Watchtower (all national landmarks designed by Mary Jane Colter) would be converted back to their original uses, and the gift shops would be significantly reduced in size. Limited exhibits related to the history of the individual structures and their surroundings could be provided.

At Orphan Mine hazardous materials would be removed and the area revegetated. The mine would be interpreted through wayside exhibits, personal service programs, and possibly as part of one of the educational exhibits in the powerhouse area. The headframe from the mine would be removed after consultation with the state historic preservation officer and careful documentation, and any opening easily accessible to visitors would be sealed.

Book sales by the park's cooperating association would be provided in all the orientation centers and at major interpretive facilities. Sale items at the interpretive facilities would be directly related to the themes presented at that site, with the primary sales facilities at the Kolb Studio and the Mather Point orientation/transit center.

Grand Canyon Village:

• *Mather Point* — The Mather Point orientation/transit center would be the main point for visitors on the South Rim to learn what there is to do at the Grand Canyon. The center would be set back approximately 400–600 feet from the rim at Mather Point. Several pedestrian paths would provide easy access to the point.

The facility would be planned so visitors could be oriented quickly, choose the options they desire, and spend their time experiencing the park. Answers to the most frequently asked questions would be readily available to visitors so they would not have to wait in lines for basic information; this would allow more time for visitors to get answers about specific situations.

Facilities at the orientation center would include:

- an outdoor plaza, with seating and landscaping; restrooms; a 24-hour information kiosk for accommodation information, and a phone
- a parkwide information desk, exhibits to introduce visitors to all educational themes represented in the park, and cooperating association book sales (no gift shops)
- a backcountry permitting station and safety video area, and offices directly related to services at this center
- lodging information phones (registration would be at the gateway information center or at the lodge front desks); concession tours registration (mule rides and tour buses); and bike rental

• *Grand Canyon Village* — Interpretive facilities would be concentrated in the powerhouse area of the historic village. This entire area would become a pedestrian area and would be directly linked to the facilities on the rim across the railroad tracks. These interpretive facilities would be housed in historic structures that would be rehabilitated. Food service would also be provided. With the space available, the following interpretive functions could be accommodated (specific interpretive uses would be decided during subsequent design work):

- an education center in the powerhouse, where a wide range of themes and hands-on exhibits would be offered
- a children's museum and/or artist-in-the park facility in the horse barn
- an American Indian cultural center in the mule barn
- film/theater space on the bottom floor of the community building, with the Grand Canyon Field Institute and other interpretive classrooms upstairs (pending solutions to accessibility problems)
- visitor services in the remaining buildings

Kolb Studio would be converted to interpretive space, as described under alternative 1. The Fred Harvey exhibit in Bright Angel Lodge would be updated, and the space would be redesigned to provide a comfortable lounge area to relieve the existing overcrowded lounge. An amphitheater, waysides or brochures, and personal service programs would also be provided in the historic village area.

• *Business Center* — The existing visitor center amphitheater would be relocated either to the business center or in a nearby area central to lodging and camping facilities.

• *Yavapai/Tusayan:* Interpretive exhibits at the Yavapai observation station and the Tusayan museum would be simplified to focus on only selected themes, and related outdoor exhibits would be expanded. The Yavapai observation station would primarily be used for viewing the canyon, with a few exhibits on geology, physiography, and related topics. The Tusayan museum exhibits would focus on prehistory. Only a small area of each building would be used for theme-related sales by the cooperating association.

Desert View: The visitor experience at Desert View would be improved by moving most visitor services farther back from the rim, by keeping the rim open for viewing, picnicking, and enjoying the Watchtower, and by restoring the tower to its original use, with limited interpretive exhibits. Exhibits would relate to American Indian culture and the cooperative effort between Mary Jane Colter and the Hopi Indians to build the tower and paint the inside.

For visitor orientation, a small, simple building would be constructed on the east side of the existing parking area, which would minimize any visual obstructions of the Watchtower and would keep the rim as the primary focus for visitors. This facility would provide

- general trip-planning and transit information, small-scale exhibits emphasizing American Indian themes and also introducing all other Grand Canyon themes, and cooperating association book sales
- phones for lodging reservations and backcountry use
- restrooms, and a 24-hour information kiosk and phones

■ Visitor Services

Outside the Park: Visitor services related to the Grand Canyon (primarily lodging, camping, restaurants, and gift shops) would continue to be available in areas an hour or more away from the park and in Tusayan.

South Rim: Visitor services on the South Rim would be concentrated in the historic village, the adjacent powerhouse area, and the business center. Functions now occurring in these areas not directly related to visitor services (for example, maintenance, storage, and employee housing) would be relocated to areas where the visitor experience would not be affected. Instead of building new facilities, historic structures would be adaptively reused for visitor service functions.

The number and scale of gift shops on the rim would be reduced, and sales items would be changed to reflect the type of items that were historically sold there or that were related to themes interpreted in the park. The powerhouse area would become a major visitor use area, with a mix of interpretive and visitor service facilities. Some lodging would be relocated from the village to the Yavapai Lodge area off the rim. Existing business center uses would be retained.

Hermits Rest, Lookout Studio, and the Desert View Watchtower (all designed by Mary Jane Colter) would be converted back to their original uses and characteristics. Hermits Rest would once again be a rest area with a small gift shop and limited food service in spaces that were historically used that way. Lookout Studio would focus on art, primarily regional area paintings, photography, posters, post cards, and other art-related items, and a seating and rest area would be provided. The Desert View Watchtower would be returned to its historic characteristics as an area for people to rest, talk, view the canyon, and have a beverage and snack; only the original backroom space would be used for gift sales.

Numerous restrooms would be added along the South Rim, particularly at all major parking/staging areas and orientation centers, all food service and interpretive facilities in the village, the Bright Angel trailhead (at the Kolb Studio garage), the South Kaibab trailhead, Yaki Point, and the Tusayan museum. Restrooms in Bright Angel Lodge would be

expanded into the hair salon space. Current facilities at El Tovar, the Arizona Steakhouse, and the depot would remain.

In high use areas where water is not available, water-conserving toilets would be added. These toilets would replace facilities at Hermits Rest and could be added near the Hopi, Grandview, and Lipan overlooks.

• *Village Lodging and Camping* — Approximately 240 rooms would be added, for a total of about 1,160 rooms. Visitor lodging would continue at El Tovar and Bright Angel. To help restore the historic character of the village, the Kachina and Thunderbird Lodges would be removed from the rim (±100 rooms), and approximately 100 replacement rooms would be provided at Yavapai West, where the 160 existing one-story units would be replaced by approximately 260 new units. The Victor, Victor annex, and Colter employee dormitories would be converted to lower priced visitor lodging (±155 rooms total). These facilities would be designed like many European lodges, with a central lounge and shared restroom facilities.

The Rouzer and Brandt dormitories in the business center area would also be converted to lodging accommodations for special groups, such as Grand Canyon Field Institute students, artist-in-the park guests, Elder Hostel visitors, and scout troops. When not rented by recognized groups, the space would be available to the public as lower priced lodging.

The Maswik historic cabins (±30), now used by employees, would be converted to visitor lodging. The Maswik plywood cabins (±10) would be removed and that area revegetated.

Mather campground (326 spaces) would be retained, like alternative 1. Camper services (laundry, showers, restrooms) would be renovated and enlarged. The RV campground would be redesigned to provide about 110 spaces (currently about 80).

• *Village Food Service, Shopping, and Other Facilities* — Food service capacity would be increased. The restaurant at El Tovar, the Arizona Steakhouse, and the Yavapai cafeteria would remain the same as alternative 1. The Bright Angel restaurant would be expanded into the current gift and ice cream shop, and the gift and ice cream shop would be relocated to the powerhouse area. A small sales area would be retained for essential items (such as toiletries) needed by overnight guests. The Maswik cafeteria would be converted to table service during the evenings. The Verkamp's, El Tovar, and Yavapai Lodge gift shops would remain.

The area currently occupied by the Kachina and Thunderbird Lodges would be converted into outdoor seating, dining, and program space once these buildings were removed. The landscape design would keep with the rim's cultural landscape.

Outdoor seating and gathering space would also be provided in the powerhouse area and would be designed to keep with the character of the cultural landscape. Visitor services that could be provided in this area include the following:

- a restaurant in the historic laundry building (fast-food/take-out service for breakfast and lunch, table service for dinner)
- a gift shop in the Grand Canyon National Park Lodges maintenance building
- bike rental in the blacksmith shop
- ATM and post office in the magistrate's office
- a corner store, with groceries, supplies, and a deli to replace the recently burned Babbitt's store

The business center would continue to have the same services as alternative 1. In addition, landscaped outdoor picnic areas would be provided, along with interpretive program space.

Desert View: Visitor services at Desert View would be moved back from the rim to provide more space for visitors to enjoy the views and rest and relax. The Watchtower, which would primarily be a rest and interpretive area, would offer very limited food and drink service and a small gift shop. The restroom facility would be removed and replaced as part of the Desert View orientation center.

The Grand Canyon National Park Lodge's trading post would be moved southeast of Babbitt's store, either to the existing parking lot or to adjacent disturbed areas. The existing contact station would be used for park operations or for visitor services. The 50-site campground would be increased to 100 sites in the area where campground utilities already exist.

A small house south of Arizona Highway 64 would be adaptively reused as a bike rental shop. The gas station would remain the same as alternative 1.

AREA OPERATIONS

All South Rim jobs that do not require a frequent or direct relationship to park resources, facilities, or visitors would be moved to Flagstaff or Williams, where housing and office space are more readily available. At a minimum, this would mean 3% of the current South Rim workforce. Relocation goals would be 20% of the current summer NPS South Rim staff and 5% of the current summer GCNPL staff.

Replacement units for substandard housing and additional required housing would be provided either in heavily disturbed areas in Grand Canyon Village and Desert View (where utilities already exist) or adjacent to Tusayan outside the park.

The locations of most management support operations for both the Park Service and its cooperators would change, and in nearly every case additional space would be provided. When determining specific locations for management support functions, the following would be considered: health and safety needs, visitor experience, the square footage of buildings and disturbed lands, what functions need to be near each other for efficient operations, and future needs. Management support functions remaining in the park would be accommodated by adaptively reusing existing structures and using previously disturbed lands for new structures.

■ Outside the Park

Housing: Positions that would be moved out of the park would no longer need employer-provided housing. Up to 300 housing units that are needed near the park but that cannot be accommodated inside the park within the designated disturbed areas would be provided adjacent to Tusayan. There would be a range of housing types and densities.

Community Services: A major center for community services would be gradually created in the town of Tusayan, with facilities being provided over time as the needs were identified. Areas for community services would be provided either as part of the land exchange, as part of a federal housing area on forest land if the land exchange did not occur, or within the current town of Tusayan. Community facilities needed could include:

- additional school facilities (no expansion within the park), churches, a medical facility
- recreation center, meeting rooms, day-care facility, a theater
- a neighborhood and community park, with ballfields, playground, picnic/seating areas, and other typical neighborhood and community park amenities
- laundry, bank and/or ATM station, oversized vehicle storage, auto repair center, and grocery/supplies

Utilities: The National Park Service would work cooperatively with the U.S. Forest Service, the landowner involved in the land exchange, and other entities from the town of Tusayan to provide adequate water specifically for the gateway information center and a federal housing area. The gateway information center and the federal housing area would tie into existing or proposed utilities for wastewater treatment, and the Park Service would expand utilities if necessary.

■ Grand Canyon Village

Housing: Up to 500 housing units would be provided within the park in disturbed areas to replace some 115 substandard housing units, to reduce overcrowding, and to meet additional NPS and concessioner housing needs. Housing would include all dorms needed for park operations by the year 2010 and high-density housing (with an overall density of 15 dwelling units per acre). Housing would be built on existing disturbed lands in two parcels — Pinyon Park and the former YACC camp area; no undisturbed lands would be used for housing. Housing development now occurring between Pinyon Park and the former YACC camp area would be stopped, with just a few short roads and/or units added to bring the development to a reasonable conclusion.

Community Services: Grand Canyon Village would continue to provide community services for the in-park community (including the existing school, day care, grocery store, and clinic). The expansion of these facilities would occur outside the park, and any addition of services within the park would be accommodated by first considering the adaptive reuse of historic structures. All services except Babbitt's store are planned with very limited parking. Residents would be

encouraged to use the employee or visitor shuttle or other alternative modes. The historic NPS maintenance facility would be converted to recreational space for residents.

The post office, bank, and Babbitt's store would remain in the business center for use by visitors and residents. To provide better mail service, centralized mailboxes would be provided throughout the community.

NPS Management Support Functions: Except for the Albright Training Center, all NPS operation spaces would change at least slightly. The existing visitor center/headquarters building would be used entirely as the park's administrative headquarters. The building would undergo major remodeling, and an addition could be built if the atrium could not be effectively used for office space.

The backcountry office and some interpretive offices would be moved to the Mather Point orientation/transit center, and the existing backcountry building and a portion of the parking area would be removed and the area revegetated. Expanded office space for the concessioner would be provided in the existing public garage at the general office building. A new fire and safety building for the Park Service and Grand Canyon National Park Lodges would be built in the disturbed area at the existing NPS maintenance facility.

NPS maintenance operations, warehouses, and Denver Service Center offices would be moved to new structures at the existing dry dump site. This site would also be used for all transportation operations and for the Park Service and Grand Canyon National Park Lodges. The Southgate disturbed area would be used for maintenance material storage, for NPS mules and horses, and for the storage of employee boats, RVs, and other items. The sewage lagoons would be redesigned and significantly reduced in size, and the helicopter base would be moved to this area. In addition, an existing landing pad would be reused at the clinic where parking is now. The boat shop would be moved to Lees Ferry.

Other Management Support Functions: Most management support functions would be moved so that the powerhouse area could be used for interpretation and visitor services and so that future space would be adequate for concessioner operations. A few existing buildings and spaces would remain for concessioners; the following buildings would be used for concessioner operations, although uses could change:

- NPS maintenance complex for GCNPL maintenance
- NPS warehouse for GCNPL commissary, purchasing, retail storage
- general offices (public garage end included) for GCNPL personnel, uniform center, housing director, food and beverage director
- old schoolhouse for training director and training room
- new barn, corral, and blacksmith's shop on the west edge of the village for the mule operation
- the dry storage area for transportation dispatch, maintenance, and parking
- old superintendent's house remains GCNPL administrative offices
- personnel building to be removed

Utilities: For the purposes of this general management plan, it is assumed that Roaring Springs would remain the water source for the North and South Rims. However, other sources could be investigated in lieu of replacing the transcanyon waterline.

Aggressive water conservation measures would be employed, including the use of low-flow fixtures in new and existing facilities, expanded use of reclaimed water, and perhaps some precipitation harvesting. If these measures were not employed, an additional 5 million gallons in storage capacity and longer hours of water pumping would be required. The wastewater treatment facility would remain the same, with connecting lines to the Mather Point orientation/transit center and to the proposed transportation center at the NPS maintenance area. The overflow lagoons at the South Rim treatment plant would be redesigned and reduced significantly in size since they are only needed for emergencies rather than daily use.

■ Desert View

Housing: Approximately 70 housing units would be built to replace about 10 substandard units and to meet additional housing needs under this alternative. This housing would be developed in a disturbed area southeast of Arizona Highway 64; any housing that did not fit within this heavily disturbed area would be tightly clustered in areas where utility extensions already exist. All housing would be removed from the Grand Canyon National Park Lodges area just south of the existing parking lot, and this area would be converted to parking and a transit facility.

Community Services: A new employee laundry and lounge would be built as part of the consolidated housing area. In addition, a small outdoor recreation space would be provided for picnicking and games.

Management Support Functions: Existing management support facilities would be retained except for the construction of a new maintenance building for Grand Canyon National Park Lodges and a new NPS ranger operations and maintenance facility. These facilities would be located in disturbed areas currently occupied by substandard management support facilities or housing.

Utilities: The Desert View water system and sewage treatment facility would be the same as alternative 1.

■ Other Areas and Cooperators

All housing except the historic residence at Hermits Rest would be removed, and housing would either be provided in the village or adjacent to Tusayan outside the park. Existing housing at the South Kaibab trailhead would be rehabilitated.

The Babbitt's store offices would remain at the business center, and the existing NPS and Grand Canyon National Park Lodges mule barns would remain at the South Kaibab trailhead.

NORTH RIM

Summary of North Rim Actions

The vision for the North Rim is to provide a low-key, uncrowded atmosphere that offers visitors opportunities to be intimately involved with the environment.

To achieve this vision, a day visitor reservation system would be implemented, visitor use would be better distributed on Bright Angel Point, and a greater percentage of people would be encouraged to visit Walhalla Plateau. Private vehicle access on Bright Angel Point would be restricted, and transit service, as well as bike and pedestrian pathways, would be expanded on the point and Walhalla Plateau.

Visitors would get information about visiting the North Rim outside the park at the U.S. Forest Service's Kaibab Plateau visitor center at Jacob Lake and at an orientation center on Bright Angel Point at CC Hill. Lodging opportunities would be increased by about 25% by adaptively reusing existing structures, while a few campsites could be removed as part of a redesign of the campground.

VISITOR EXPERIENCE

■ Visitor Use Patterns

Day visitor numbers would be limited on the North Rim either by the year 2005 or 2010, depending on how well visitors could be distributed throughout the developed area. These shifts in use patterns are expected to occur because of the following factors:

(1) More visitors would visit the Walhalla Plateau because (a) some visitors would prefer to drive their own vehicles, which would be allowed on the plateau, rather than using public transit, or hiking or biking, which would be required on Bright Angel Point; (b) visitors would be encouraged to visit the Walhalla Plateau and would be prepared before arriving at the park for that more limited service experience; and (c) a convenient bus service would be made available to visitors to the plateau.

(2) Visitors who go to Bright Angel Point would be likely to stay longer at that location because of having to park their vehicles and use transit, or hike or bike; this could reduce the amount of time spent visiting Walhalla Plateau.

(3) A portion of visitors could decide to leave the park once they had viewed the canyon from the proposed North Rim orientation center on Bright Angel Point.

According to the "Grand Canyon North Rim Visitor Utilization Study" (Operations Research Consulting Associates 1993), a maximum of about 1,700 visitors at any one time can now be accommodated within the North Rim developed area. Based on an average four-hour stay, about 430 visitors per hour can enter the park (a peak hourly rate of ±130 vehicles, multiplied by 3.3 visitors per vehicle). With a nominal shift in visitor use patterns, which could be accomplished by suggestions to visitors to slightly alter use patterns, approximately 28% more visitors than today could be

accommodated (amounting to about 550 visitors per hour, or ±170 private vehicles, RVs, and tour buses). With an aggressive shift in visitor use, which could be accomplished by stronger encouragement and incentives to visitors, 38% more visitation could be accommodated (about 590 visitors per hour, or ±180 private vehicles). As on the South Rim, a monitoring system would be implemented to record resource damage and visitor use patterns so that the attendance limitations could be adjusted to reflect appropriate use once the plan was implemented.

■ Access/Transportation

Regional Access: The Park Service would work with regional entities to encourage visitors to use vehicles less than 22′ long when they visited the North Rim because of restrictions on vehicle sizes in this part of the park. The Park Service would continue to support the Arizona Department of Transportation in maintaining Arizona Highway 67 between Jacob Lake and the park as a small-scale, two-lane road that is closed and unplowed in the winter. The Park Service would also continue to support the U.S. Forest Service in their work to manage that highway corridor for high-quality scenic resources.

Roads, Parking, and Transit: A convenient, attractive, and energy-efficient transit system, which would be accessible to visitors with special needs, would be provided on Walhalla Plateau and Bright Angel Point. Visitors would be encouraged to use the transit system on the Walhalla Plateau, and they would be required to use it, or hike or bike, on Bright Angel Point. Transit vehicles would be only about 22′ in length and equipped to carry bikes.

A small North Rim orientation center, staging area, and transit center would be developed on CC Hill. The access road would be realigned to reduce grades, and parking would be provided for approximately 400 vehicles (375 cars, 16 RVs, and 4 buses, requiring ±4 acres). In conjunction with this action, the parking lot at the North Kaibab trailhead would be removed and the area revegetated. The transit center would have a shelter, waiting area, information panels, and restrooms; from here visitors would have access to Bright Angel Point and all overlooks on Walhalla Plateau.

Day visitors on Bright Angel Point would have to use the transit system or hike or bike to their destinations. Overnight guests would receive a pass to drive to their lodging or campsite and park, and then use the transit system.

The size of vehicles on the entire Walhalla Plateau, from the Bright Angel Point/Walhalla Road intersection, would be limited to a maximum length of 22′ and width of 8′. Parking lots on the plateau would be sized for the carrying capacity established for each overlook. No parking lots would be reduced in size until after use patterns on the plateau became established (based on the changes in the plan) and had been monitored. Parking pull-offs for just a few cars would be established at new trailheads.

Except for a few company vehicle spaces, employee parking would not be provided at Grand Canyon Lodge. The concession employee shuttle would be retained, and an efficient NPS employee shuttle would be created (possibly a joint system for both NPS and concession employees).

Trails:

• *Outside the Park* — Visitors would continue to have access to the Arizona Trail and all trails in Kaibab National Forest, as described for the no-action alternative.

• *Inside the Park* — Bike riders could continue to share the existing road system with motorized vehicles and would be allowed on the Point Sublime road (the same as the no-action alternative). A bike trail (separated from the road wherever possible and constructed outside the proposed wilderness boundary) would be developed to link CC Hill, Bright Angel Point, and all overlooks on Walhalla Plateau. Disturbance to archeological sites, traditional American Indian cultural properties, and natural resources would be minimized and mitigated.

Approximately 10 miles of rim hiking trails would be constructed on the Walhalla Plateau to link Point Imperial and Vista Encantadora. Visitors could continue to use existing roadbeds within the proposed wilderness area as hiking trails (the same as alternative 1).

A rim trail would be developed around Bright Angel Point to connect CC Hill, Grand Canyon Lodge, and the Transept Trail.

A few short sections of mule trails would be constructed to connect the mule staging area to the North Kaibab trailhead and the Uncle Jim Trail. This trail would be separate from the Ken Patrick Trail. Mule use would be allowed on new trail sections, the Uncle Jim, and the North Kaibab trails (see "Corridor Trails" for North Kaibab Trail use).

■ Orientation and Interpretation

Gateway Information: In cooperation with the U.S. Forest Service, the services available at the Kaibab Plateau visitor center at Jacob Lake would be expanded. Either the existing structure could be enlarged, or a new facility could be built nearby. In addition to more parking, restrooms, and a 24-hour information kiosk, the center would accommodate the following functions:

- information/trip planning, national park day-use and backcountry permits, small-scale exhibits on the regional environment, book sales
- lodging and camping check-in for all USFS and NPS facilities, as well as direct phone connections for lodging/camping confirmations and reservations

Orientation Center: The small orientation center on CC Hill would blend into the landscape and would be within easy access of canyon views. The center would provide

- an information desk, interpretive program information panels, limited book sales
- a backcountry permitting station and office, basic hiker safety equipment sales (i.e., water bottles)
- mule ride/tour bus registration desk
- outdoor seating, picnic areas, restrooms, drinking water, vending machines

A contact station currently proposed at Grand Canyon Lodge would remain and would provide information and announcements of interpretive programs, as well as restrooms (the same as alternative 1).

Interpretive Facilities: The auditorium space in Grand Canyon Lodge, the amphitheater at the campground, and an extensive personal service program would be retained, as described for alternative 1.

To enhance the visitor experience and draw people to Walhalla Plateau, outdoor exhibits focusing on American Indian cultures, geology, and other natural resources could be added at Point Imperial.

■ Visitor Services

Outside the Park: Visitor services outside the park would continue to be available in Kanab and Fredonia, as well as areas farther from the park. USFS proposals to expand lodging at Kaibab Lodge and Jacob Lake and to increase designated camping in several areas would be evaluated as part of that agency's planning process. Under this alternative additional parking might be needed at Kaibab Lodge to accommodate visitors waiting to get in the park.

North Rim:

• *Lodging and Camping:* The existing visitor cabins and motel units (±200) at the Grand Canyon Lodge would remain. To provide additional lodging, approximately 20 historic frame cabins at the lodge and inn would be converted from employee housing to visitor lodging units. This would increase the total number of visitor cabins to approximately 220.

Four to six of the historic frame cabins would be adaptively used; the rest would be rased and the area revegetated.

The campground would be redesigned and revegetated to protect resources and to provide additional privacy. The number of group sites and the locations of individual sites would be studied, which could result in fewer campsites. The maximum length for vehicles in the campground would be 22′. The existing laundry and shower building would be replaced by a larger facility in the campground. The campground's historic features, such as the screening walls for the trash receptacles, would be preserved.

• *Food Service, Shopping, and Other Facilities* — As described for alternative 1, minor changes would be undertaken at Grand Canyon Lodge to improve visitor services, and the inn's camper store and fast-food restaurant would remain. The existing gas station would be adaptively reused for a bike rental shop, and a mobile repair unit would be provided for minor vehicle breakdowns.

Picnic sites would be added near the North Kaibab trailhead and the Grand Canyon Lodge area, and they would be redesigned at overlooks on Walhalla Plateau.

Restrooms would be added at the CC Hill orientation center, while other restrooms on Bright Angel Point would remain the same. Water-conserving toilets would be provided on the

Walhalla Plateau, as described for alternative 1.

Winter Use: Outside the park the U.S. Forest Service and the National Park Service would work together to provide a system of winter huts to allow access to visitors on skis or snowshoes.

Within the park the North Rim would be closed to motorized winter use, and concession facilities would be closed (the same as alternative 1). One group campsite, with portable toilets, would continue to be available. As part of the winter hut system, three portable huts would be located near prime overlooks or in areas accessible to moderately fit skiers (Point Imperial, the Lindbergh Hill area, and CC Hill). The huts would be moved into parking lots once motorized use ended for the season. Portable toilets and firewood would be available. The maximum group size at any one hut would follow the same maximum standards as for backcountry group campsites.

Area Operations

■ Outside the Park

The National Park Service would work with the U.S. Forest Service to provide housing for NPS employees working at Jacob Lake at the nearby USFS housing site. Until that housing could be provided employees would have to find housing in Fredonia or Kanab.

■ North Rim

Housing: Approximately 215 housing units would be constructed in existing disturbed areas to replace substandard units and units converted to visitor lodging, to relieve overcrowding and allow for a five-day rather than a six-day workweek for concessioner employees, and to meet housing needs under this alternative. The average density would be 15 dwelling units per acre or higher, and the units would be designed to blend with the character and environment of the North Rim. No single-family units would be built, and only a few lower density units would be provided.

Community Services: Current community services would be retained, and existing structures would continue to be used.

NPS Management Support Functions: All existing NPS management support space would remain, except for the following changes. A new maintenance building would be constructed in disturbed areas and would be designed to blend with the area's historic and natural character. A new backcountry office and minor interpretive office space would be included at the North Rim orientation center and at Jacob Lake. The helipad would be moved to the clearing just north of the sewage treatment plant.

Concessioner Management Support Functions: Management support facilities for the concessioner would remain the same, except for the construction of a new joint transit maintenance facility at Lindbergh Hill, including parking spaces for transit and concession buses, a paved access road, a shuttle maintenance building and offices, covered bus storage, and utilities. The mule staging area would be relocated from the North Kaibab trailhead to near the new orientation center, in a location that would provide easy access to the North Kaibab trailhead; the mule concession barn would remain the same.

Utilities: Water-conserving toilets would be placed at all the major overlooks on the Walhalla Plateau and at Widforss trailhead, as described for alternative 1. The North Rim water supply and storage system would have adequate capacity to handle increased needs for potable water and supply. A new line would have to be built to the CC Hill orientation center, and a storage facility would be added at Lindbergh Hill for water hauled into or collected in this area. The wastewater treatment plant would remain the same as alternative 1, with a sewerline extension to CC Hill.

Tuweep

Summary of Tuweep Actions

To ensure uncrowded, primitive experiences, day use limits would be established at Tuweep at a maximum of 30 vehicles or 85 visitors. This would include visitors at the Toroweap overlook, the campground, the Vulcans Throne area, and local trails. The Park Service would attempt to achieve these limits through roadside signs and other information sources first. If these means failed, a reservation system could be required.

The Park Service would work cooperatively with federal, state, and local agencies having jurisdiction over adjacent lands to ensure a visitor experience compatible with that offered in the park.

If the Bureau of Land Management could not acquire the state-owned airstrip near the park boundary and adjacent private lands, the Park Service would seek to acquire them. The Park Service would work with the Bureau of Land Management to encourage them to trade for all other private lands near the entry to Tuweep.

Visitor Experience

■ Access, Roads, and Trails

The Park Service would work with Mohave County to ensure that access roads to Tuweep remained unpaved and did not change in character to help preserve the area's secluded and natural character. The Park Service would also work with the Bureau of Land Management to ensure the natural visual quality along access roads was retained.

Existing roads inside the park would remain dirt and have the same limited maintenance as in the no-action alternative. Vehicle sizes would be limited to a maximum of 22′ in length. To reduce congestion and natural resource impacts at the rim, the parking lot at the Toroweap overlook would be removed and the area revegetated. A new 25-space area would be provided on rock surfaces near the entry to the Saddle Horse Canyon trail. A small roadside pulloff would be designated at the Tuckup trailhead.

Existing trails would be maintained (the same as alternative 1). The existing road from the proposed parking area would be converted to a pedestrian trail, although visitors with disabilities and service vehicles would still be allowed to drive to the rim. A new loop trail would be built from the west side of the new parking lot to connect the Saddle Horse Canyon trail and Toroweap overlook.

■ Interpretation

Gateway Information: Park managers would work with the Bureau of Land Management, Mohave County, Pipe Spring National Monument, and other entities to provide information about Tuweep to visitors and to monitor resource preservation throughout the entire area.

Information signs about Tuweep would be placed along all three major county access roads to alert people about Tuweep's limitations for accommodating day and overnight use, as well as to provide safety information.

Grand Canyon National Park would work with Pipe Spring National Monument to provide information about Tuweep. Staff at the monument could also make reservations for campsites and issue day use permits during peak seasons if a reservation system became necessary; no facility additions are anticipated, other than a small exhibit and information panel on Tuweep.

Use permits could also be distributed in Fredonia, Kanab, or St. George by other federal agencies.

Tuweep: An information/interpretive kiosk could be provided at a small roadside pulloff just inside the park boundary. Waysides could also be provided at the parking lot for Toroweap overlook.

■ Visitor Services

The Bureau of Land Management would continue to provide camping opportunities outside the park.

During high use seasons (spring and fall) a camping reservation system could be established for the Tuweep campground. The two campsites at Toroweap overlook would be removed, and two replacement sites would be provided at the existing campground. One campsite would be designated as a group site. A maximum of six people would be allowed at the individual campsites and 11 people at the group site (the same as alternative 1); however, there would be a limit of one private vehicle at each individual campsite and two vehicles at the group campsite. No commercial uses would be allowed at Tuweep.

AREA OPERATIONS

■ Housing

To replace the substandard seasonal housing, either a private residence outside the park would be rented or a new unit built in the park. Office space could be expanded slightly to provide adequate space for the seasonal ranger.

■ Utilities

A septic system would be developed at the seasonal ranger unit (if needed). All public toilets would be converted to water-conserving models. A toilet would be placed at the new parking lot for the Toroweap overlook.

CORRIDOR TRAILS

Summary of Corridor Trail Actions

The vision for the corridor trails is to maintain the traditional character of the trails and to minimize crowding, visitor use conflicts, and resource impacts.

To accomplish this, the proposed action would continue unlimited hiker use on all trails, but resource impacts and user conflicts due to mule use would be reduced. Present overnight lodging and camping opportunities would remain largely unchanged, pending additional planning at Phantom Ranch.

VISITOR EXPERIENCE

■ Access and Trails

Sections of the main trails would be hardened with a natural material that blended well with the environment, that was permeable, that provided good traction, and that would significantly reduce the need to use borrow material. Existing borrow areas would be rehabilitated. Concessioners would be made much more responsible for corridor trail maintenance. Programs and exhibits at all corridor trailheads with mule and hiker use would help educate visitors about stock trails and hiker etiquette. Private stock use opportunities would continue to be available; the park's revised backcountry management plan would address specifics about such use.

South Rim: The Hermit and Grandview trails would be suggested as alternatives to the corridor trails for visitors with experience hiking in the Grand Canyon. However, neither trail use nor maintenance would be increased to levels that would alter their status as threshold trails. Current mule use on the Bright Angel and South Kaibab trails would remain the same as in alternative 1 except no additional pack strings would be allowed for carrying visitor packs into or out of the canyon.

North Rim: The mule ride concessioner, in conjunction with the Park Service, would begin immediately to reduce resource impacts and user conflicts now occurring on the North Kaibab Trail. This would be accomplished by hardening the trail from the rim to the tunnel (using cobbling or similar material), and by educating all visitors about mules on trails.

A monitoring system for resource damage and the visitor experience on the trail would be established; trail use could increase as a result of use at the nearby CC Hill orientation center, and the monitoring system would continue until new use patterns were established. If resource damage and visitor use conflicts were not adequately mitigated with these measures, then the number of mules allowed on the trail would be reduced to a level comparable to that on the Bright Angel Trail.

The Old Bright Angel Trail would be upgraded for user safety and so more visitors would use the trail. A signed trail connection would be established from Six Rock Meadow to the trailhead.

■ Interpretation

At Indian Garden visitor programs would be provided, and a small amphitheater would be added near the picnic area. A small building (the former ranger station), which is used for storage, would be converted to a visitor contact station.

The roving interpreter program would be expanded, especially on the South Rim corridor trails.

■ Visitor Services

The capacity of overnight accommodations at Phantom Ranch and the Bright Angel campground would not be increased but could be decreased pending the completion of a development concept plan for the area.

The campgrounds at Indian Garden and Cottonwood would remain the same size.

AREA OPERATIONS

■ Housing

The ongoing development concept plan for Phantom Ranch would address needed facilities. At Indian Garden housing would remain the same, except one house now used for storage would be converted back to housing for an interpreter.

■ Management Support

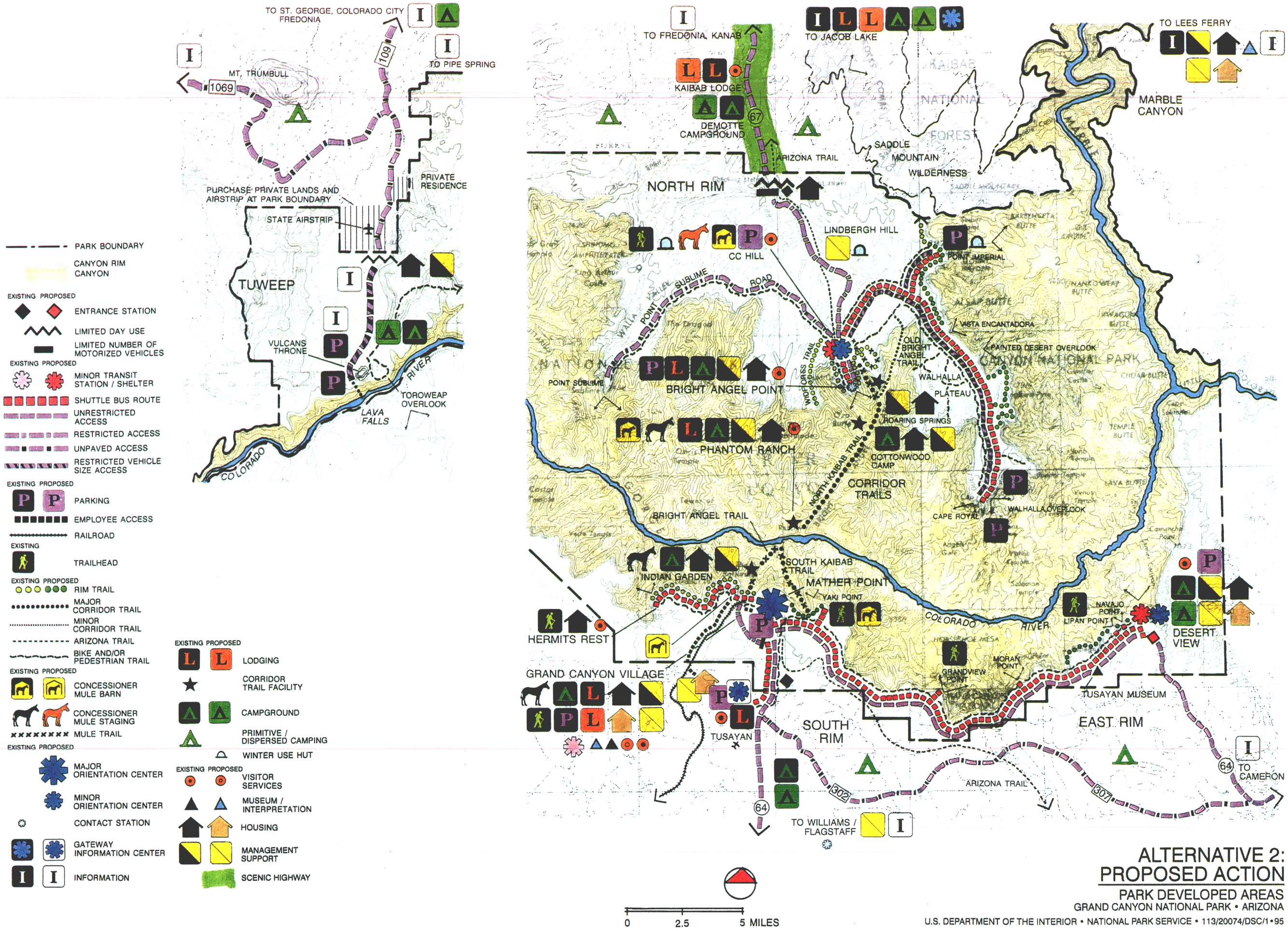
Management support facilities would not be changed.

■ Utilities

The water systems along the corridor trails would not be changed except as outlined in "Actions Common to All Alternatives." Existing toilets along the trails would be replaced with water-conserving models, and toilets would be added, if needed (the same as alternative 1).

■ Other Areas

At Lees Ferry an orientation center with facilities for the river trip safety talks and an exhibit area for the historic boat collection would be constructed.



PARK BOUNDARY
CANYON RIM
CANYON

EXISTING PROPOSED
ENTRANCE STATION
LIMITED DAY USE
LIMITED NUMBER OF MOTORIZED VEHICLES

EXISTING PROPOSED
MINOR TRANSIT STATION / SHELTER
SHUTTLE BUS ROUTE
UNRESTRICTED ACCESS
RESTRICTED ACCESS
UNPAVED ACCESS
RESTRICTED VEHICLE SIZE ACCESS

EXISTING PROPOSED
PARKING
EMPLOYEE ACCESS
RAILROAD

EXISTING
TRAILHEAD

EXISTING PROPOSED
RIM TRAIL
MAJOR CORRIDOR TRAIL
MINOR CORRIDOR TRAIL
ARIZONA TRAIL
BIKE AND/OR PEDESTRIAN TRAIL

EXISTING PROPOSED
CONCESSIONER MULE BARN
CONCESSIONER MULE STAGING
MULE TRAIL

EXISTING PROPOSED
MAJOR ORIENTATION CENTER
MINOR ORIENTATION CENTER
CONTACT STATION
GATEWAY INFORMATION CENTER
INFORMATION

EXISTING PROPOSED
LODGING
CORRIDOR TRAIL FACILITY
CAMPGROUND
PRIMITIVE / DISPERSED CAMPING
WINTER USE HUT

EXISTING PROPOSED
VISITOR SERVICES
MUSEUM / INTERPRETATION
HOUSING
MANAGEMENT SUPPORT
SCENIC HIGHWAY

ALTERNATIVE 2: PROPOSED ACTION

PARK DEVELOPED AREAS

GRAND CANYON NATIONAL PARK • ARIZONA

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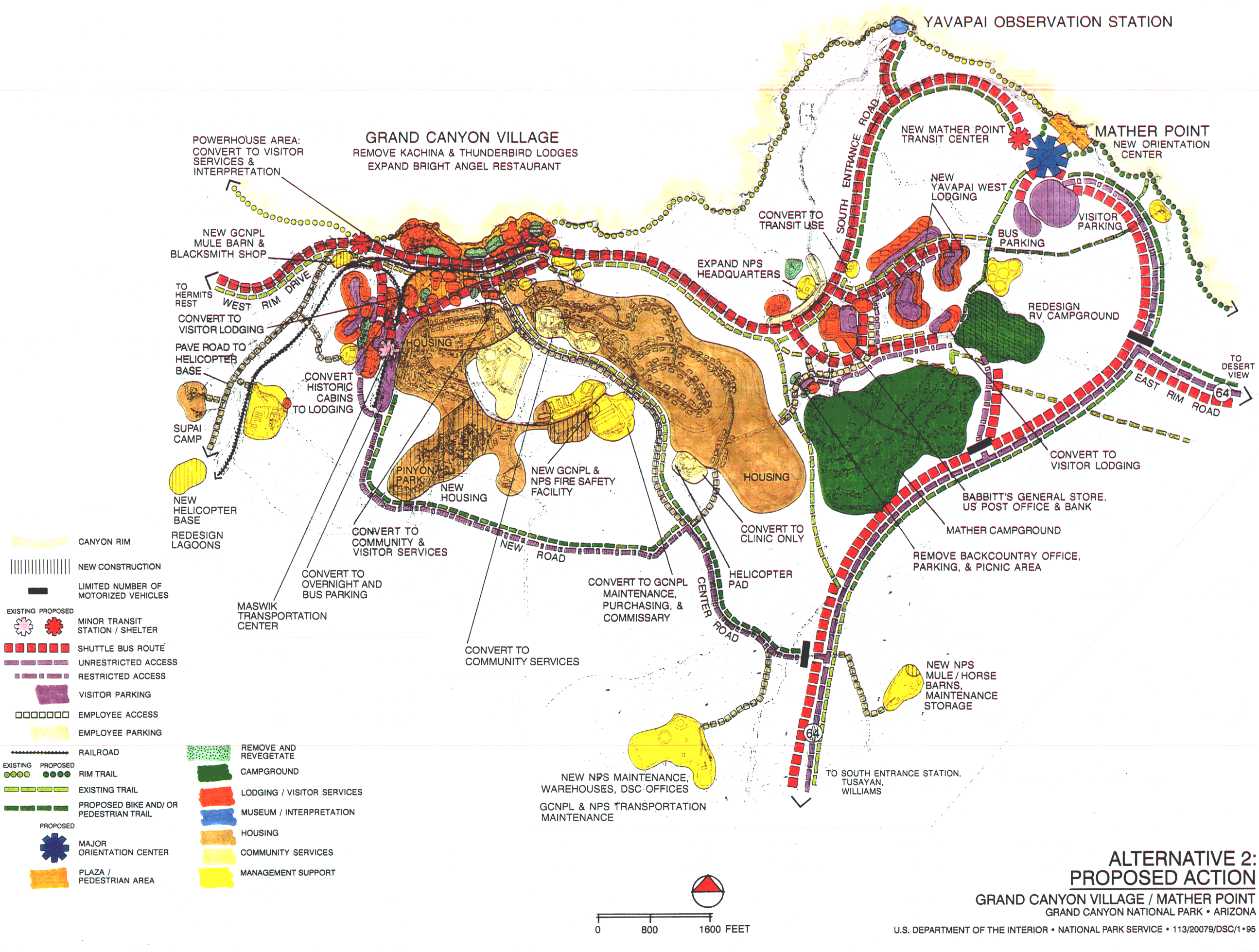

ALTERNATIVE 2: PROPOSED ACTION

GRAND CANYON VILLAGE / MATHER POINT

GRAND CANYON NATIONAL PARK • ARIZONA

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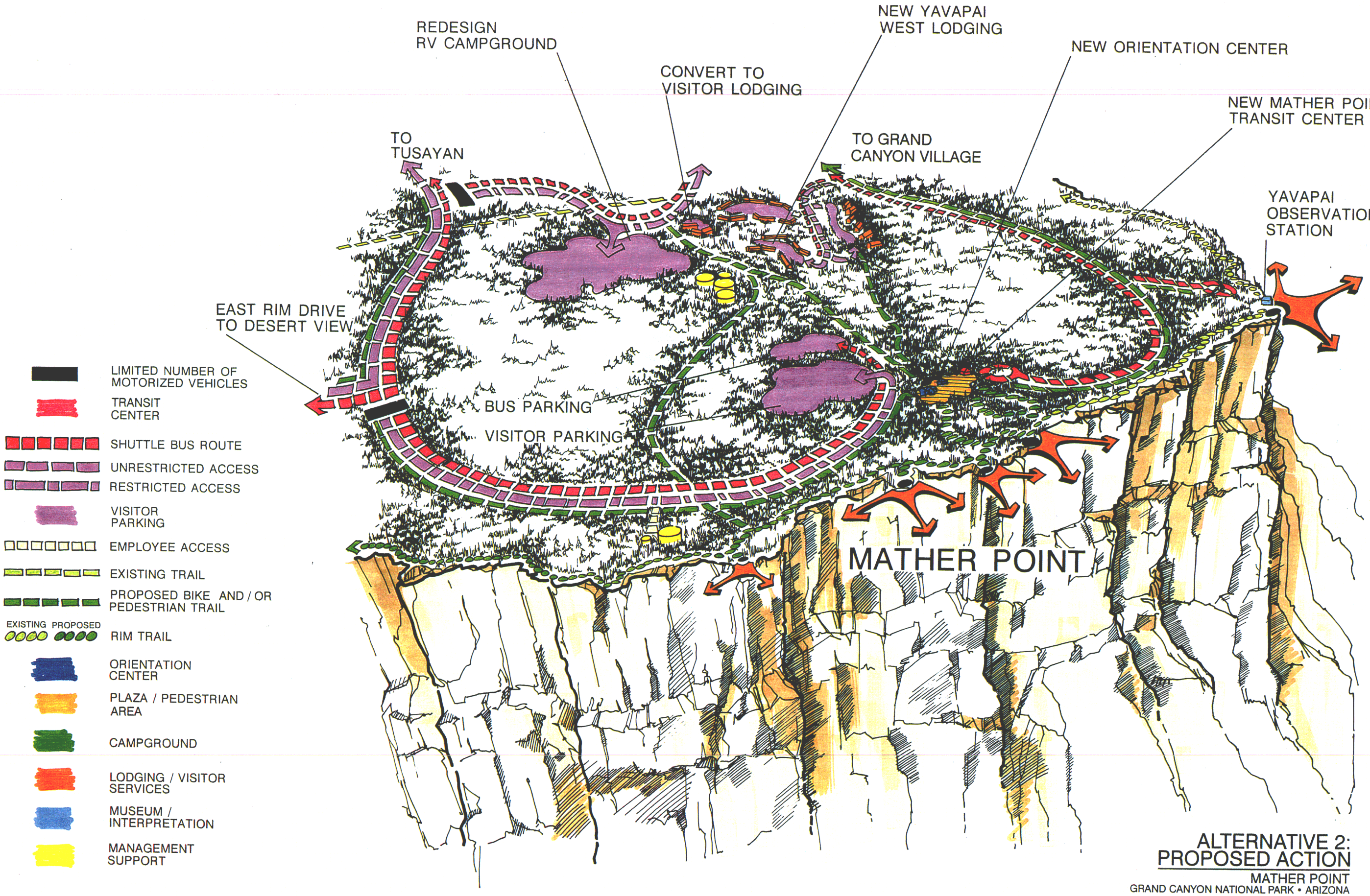

ALTERNATIVE 2: PROPOSED ACTION

MATHER POINT
GRAND CANYON NATIONAL PARK • ARIZONA

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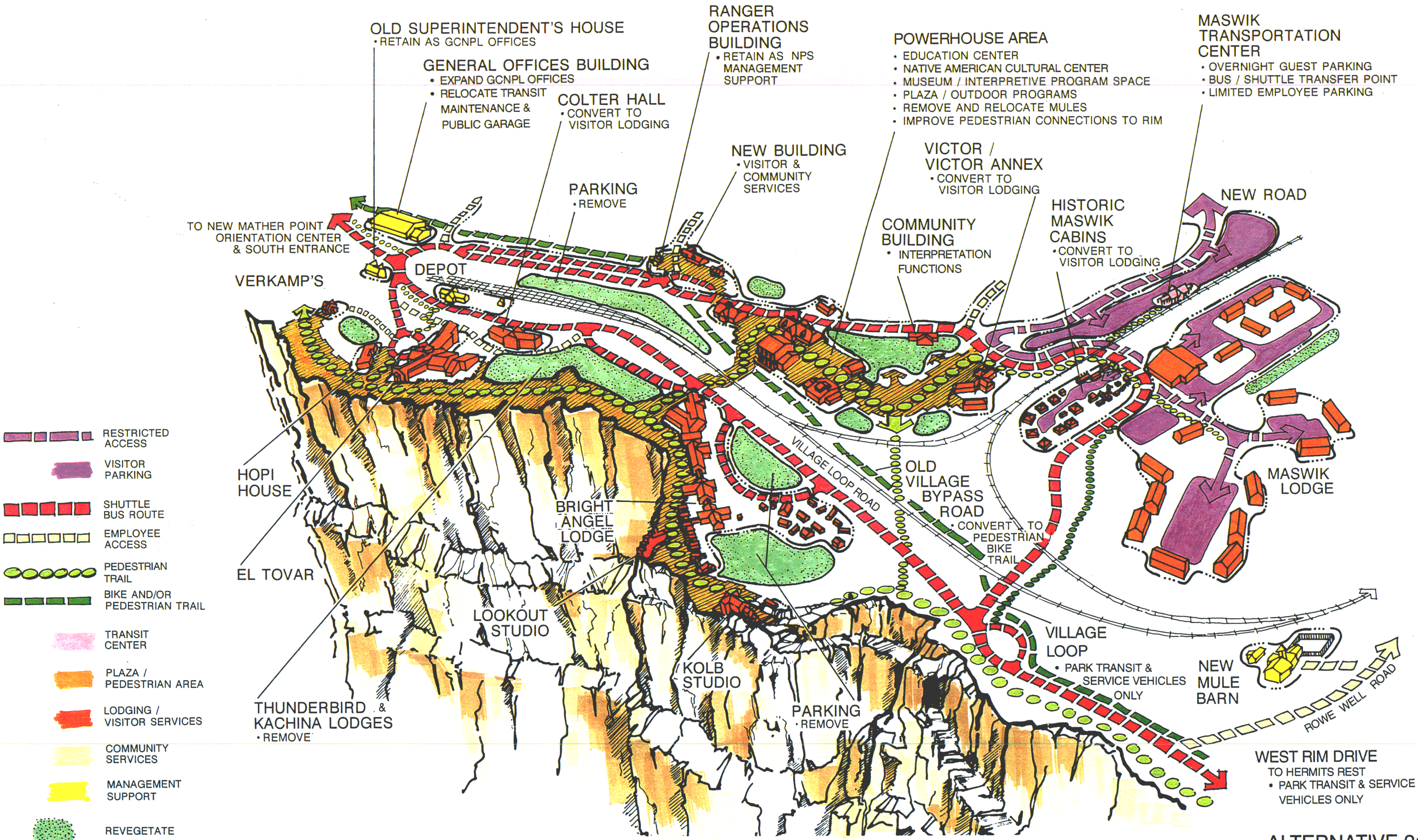

ALTERNATIVE 2: PROPOSED ACTION

GRAND CANYON VILLAGE

GRAND CANYON NATIONAL PARK • ARIZONA

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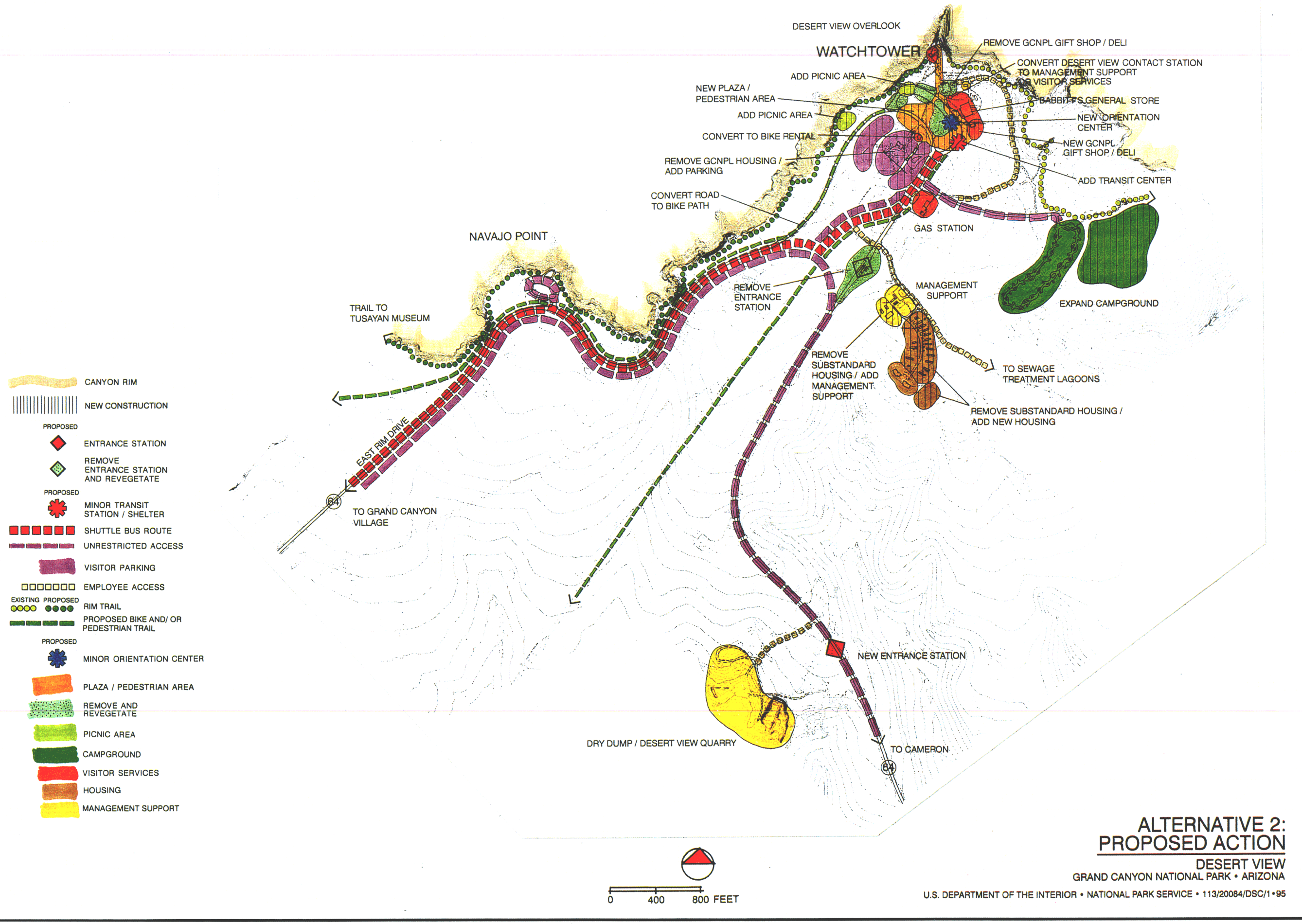

ALTERNATIVE 2: PROPOSED ACTION

DESERT VIEW

GRAND CANYON NATIONAL PARK • ARIZONA

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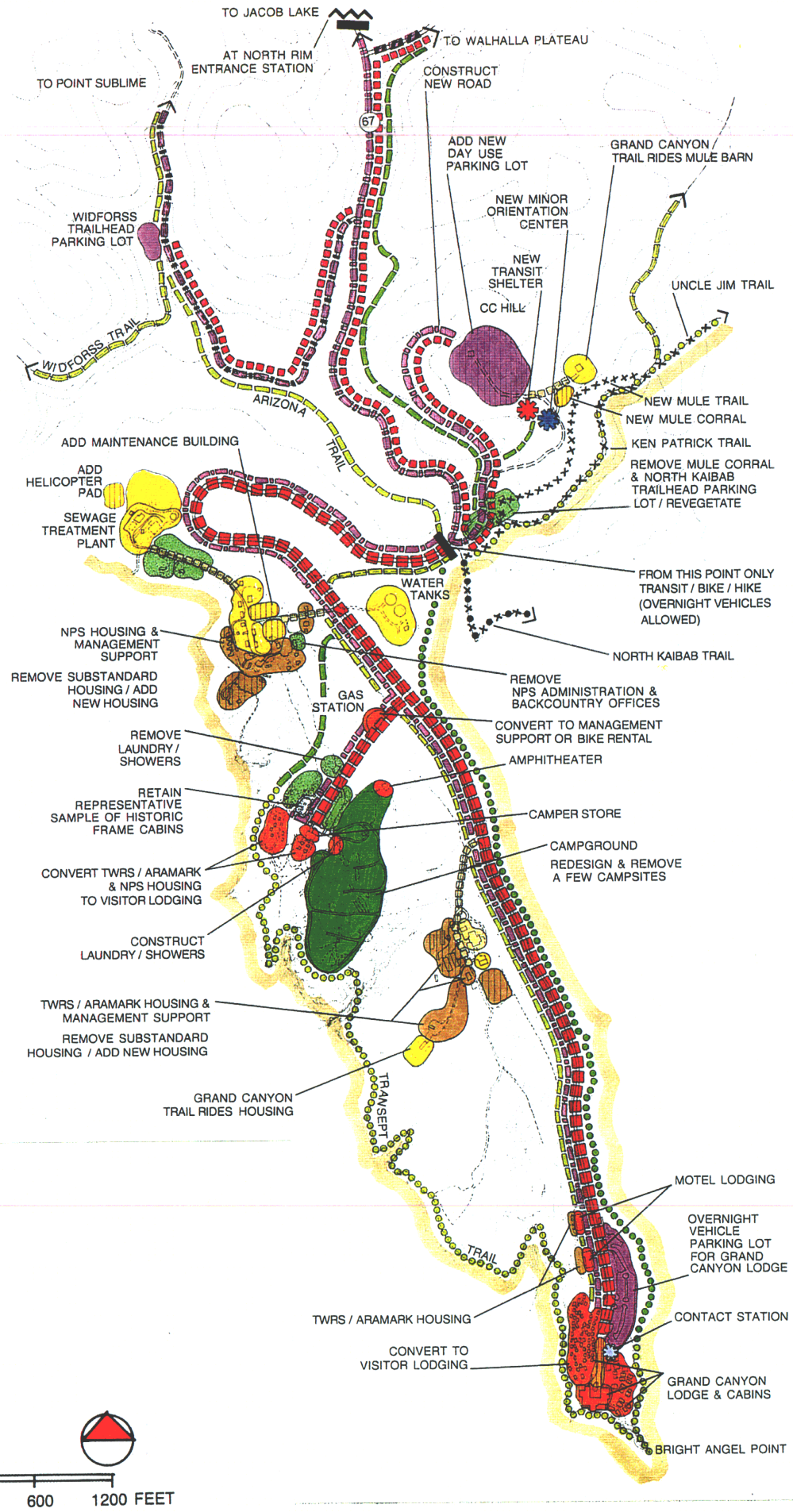


CANYON RIM
NEW CONSTRUCTION
LIMITED DAY USE
LIMITED NUMBER OF MOTORIZED VEHICLES
PROPOSED
MINOR TRANSIT STATION / SHELTER
SHUTTLE BUS ROUTE
RESTRICTED ACCESS
UNPAVED ACCESS
RESTRICTED VEHICLE SIZE ACCESS
VISITOR PARKING
EMPLOYEE ACCESS
EXISTING PROPOSED
RIM TRAIL
EXISTING TRAIL
PROPOSED BIKE AND/ OR PEDESTRIAN TRAIL
MULE TRAIL
CORRIDOR TRAIL
PROPOSED
MINOR ORIENTATION CENTER
EXISTING
CONTACT STATION
PLAZA / PEDESTRIAN AREA
REMOVE AND REVEGETATE
CAMPGROUND
LODGING / VISITOR SERVICES
HOUSING
COMMUNITY SERVICES
MANAGEMENT SUPPORT

ALTERNATIVE 2: PROPOSED ACTION

NORTH RIM / BRIGHT ANGEL POINT

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20089/DSC/1•95

Summary of Alternative 3

Alternative 3 would emphasize the preservation of park resources by placing all new facilities and relocating many existing functions outside the park. Cooperative regional planning would ensure that NPS functions occurring outside park boundaries demonstrated environmentally sensitive planning and design. The National Park Service would expand its regional information services, as described for alternative 2.

On the South Rim all day visitor vehicles would be removed, and a major public transit system would be provided. No new lands within the park would be disturbed, and historic uses of existing structures would be retained wherever possible. Overnight accommodations would be reduced on the South Rim but increased on the North Rim by adaptively reusing historic structures.

Planning for the park would be done in a regional context to minimize negative impacts resulting from park uses being placed in areas outside the park. Communications would be expanded, as described for alternative 2. Wherever possible, facilities placed outside the park would be clustered in disturbed areas and linked to existing systems. Alternative modes of transportation would be emphasized regionally as well as in major high use areas of the park, the same as alternative 2.

Parkwide Management Actions

Natural Resources

■ Air Quality and Noise

Actions related to vehicle emission standards (concession, NPS, private tour buses), type of concession and NPS buses, an employee shuttle system, train emissions, stoves and fireplaces, regional pollution, airport expansion, and fire management would be the same as alternative 2.

■ Vegetation, Wildlife, and Ecosystems

An ecosystem approach to managing threatened or endangered species, research programs, and vegetation management planning would be undertaken (the same as alternative 2). The use of borrow pits for trail maintenance would be minimized.

■ Water Resources

Actions would be the same as alternative 2. These include monitoring of springs, water rights protection, providing park water outside the park, water conservation measures, extending waterlines, and expanding treatment and storage facilities.

■ Scenic Resources

Actions related to critical visual components, the character of historic districts, and vista clearing would be the same as alternative 2.

Cultural Resources

All management actions for cultural resources would be the same as alternative 2. A comprehensive inventory and data management system would be developed for archeology, history, and ethnography, and a resource data base would be developed and maintained. Preservation, maintenance, and stewardship programs would be developed for cultural resources. Tribal memorandums of agreement would be negotiated to protect ethnographic resources.

A proactive ruins stabilization program would be developed, as well as a program to protect American Indian sacred sites. A program would be initiated to complete the survey, inventory, documentation, and evaluation of cultural resources under criteria for the National Register of Historic Places.

A collection management and cataloging program would be undertaken as described for alternative 1, while the park would actively seek to improve the quality of its museum collections by acquiring needed materials and deaccessioning inappropriate items (the same as alternative 2).

South Rim

Summary of South Rim Actions

Under this alternative the vision for the South Rim — to provide visitors direct access to the rim, and to allow for social as well as solitary experiences — would be achieved by removing day visitor vehicle use, providing an expanded public transit system, adaptively reusing historic structures, and expanding visitor services in developed areas. To ensure the long-term preservation of the park's natural and cultural resources, all new facilities and many existing functions would be provided outside the park.

Visitors would be oriented to the park at two centers developed outside the park, one center in or near the town of Tusayan, and one outside the entrance to Desert View. In Grand Canyon Village additional interpretive opportunities and visitor services would be provided by adaptively reusing historic structures. At Desert View the visitor experience would focus on canyon viewing opportunities.

Existing substandard structures and nonhistoric buildings in historic districts would be removed and those areas revegetated. Lodging would be reduced by about 10% total) and campsites by about 20%.

No new housing would be provided in Grand Canyon Village, although some replacement housing units would be constructed in heavily disturbed areas at Desert View.

Visitor Experience

■ Access/Transportation

Regional Access: The Park Service would work with regional transportation entities to encourage expanded regional transit, the same as alternative 2. However, because no private day vehicles (tour buses, cars, RVs) would be allowed in the park under this alternative, low-cost public or subsidized transit service would be provided from the two gateway centers outside the park.

The south center would have parking for approximately 3,500 private vehicles (34.5 acres), and approximately twenty-five 100-passenger buses would provide service to the Mather Point orientation center and Grand Canyon Village. The east center would have parking for about 880 vehicles (8.6 acres), and public transit service would provide access to Desert View and Mather Point.

Bus headways would be very short, and buses would run on daily extended schedules to provide efficient and convenient service. Private bus and railroad spur service would also be provided from the south center.

USFS 302/307 would remain a gravel road the same as alternative 1.

Roads, Parking, and Transit:

• *Overview* — The South Rim transit system would be greatly expanded and improved since visitors would be required to rely on it for access. Visitors could also hike and bike to destinations along the rim. Along the South Rim approximately 90 public buses would operate during the peak season, and small transit transfer facilities would be built at key locations. The only visitors allowed to drive into the park would be overnight visitors, who would be required to park in designated locations and use the transit system or hike or bike.

No new roads or visitor parking lots would be built, and no existing parking lots would be expanded. Many existing lots would be reduced in scale or completely removed and revegetated.

On the West Rim public and concession transit service would operate year-round from the village/West Rim intersection, along the existing route. Existing parking at the Maricopa Point overlook would be removed and revegetated, and parking at Hopi Point would be converted to pedestrian space (the same as alternative 2).

East Rim Drive would also be restricted to transit service only, or hiking or biking. Access would be provided to all existing overlooks, the Tusayan museum, and Desert View.

• *Grand Canyon Village* — The public shuttle system from the south center in Tusayan would take visitors to Mather Point and then continue on into the village. Mather Point would serve as a small transfer center, with public transit connections to the village, the Yaki Point area, East Rim, and Desert View. The transit facility would provide covered and uncovered waiting space and transit information. It would be

constructed in a portion of the existing parking lot or in an adjacent disturbed area.

The south entrance road from the business center to the village, as well as the north, west, and east sections of the village loop road, would be restricted to public transit and concession bus traffic only.

Overnight visitors not staying on the rim would be allowed to drive to their lodging, park, and leave their vehicles while using public transit or hiking or biking to other South Rim destinations. Visitors staying at the Yavapai Lodge and the Mather campground would be allowed to drive along the south entrance road and a section of the business center road. Visitors staying in Maswik Lodge would be given access to the south entrance road, Center Road, and the small section of the village loop drive that links the Maswik transportation center and lodge. Visitors staying on the rim would drive to the Maswik transportation center and be given valet service to the their rim lodging. The Maswik transportation center would also serve as the in-park staging area for the railroad spur when that system became operational (the same as the no-action alternative).

Rowe Well Road would be upgraded to a gravel road (the same as alternative 2).

• *Desert View* — All day visitors would park at the east center staging/parking area and enter the park by means of transit or hiking or biking. A small transit shelter/waiting area would be provided in the existing Desert View parking lot. All unnecessary paving at the Desert View lot would be removed and that area revegetated.

Only overnight campers staying at Desert View would be able to drive to their campsite in the park. They would not have motorized access to any other areas of the South Rim.

Existing roads would be used for all services.

• *Off-Season Roads, Parking, and Transit* — Transit service would be provided year-round to meet visitor needs; however, schedules, numbers of operating buses, routes, and bus types would be adjusted during off-seasons to serve different use patterns on the South Rim.

The area between Mather Point and Hermits Rest (including much of the historic village) would be transit-only year-round. The East Rim and Desert View would be open to private vehicles during seasons when carrying capacities at these areas were not being exceeded; however, by the year 2010 all South Rim developed areas would be accessible only by year-round transit, as well as hiking and biking.

Many parking lots throughout the South Rim would be downscaled or phased out by 2010, including all the lots on the West Rim, the historic village rim area, the East Rim, and Desert View (the same as alternative 2).

• *Employee Roads, Parking, and Transit* — An efficient employee shuttle system would be developed, as described for alternative 2. Employees who did drive would be required to use roads back from the rim and would not be allowed to use the transit-only sections of the South Entrance and village loop roads except in special work-related situations.

Employee parking would be available at the existing NPS headquarters building, the former visitor center (the same as alternative 2).

Trails:

• *Outside the Park* — Visitor access to the Arizona Trail and roads and trails in Kaibab National Forest would continue, as described for the no-action alternative.

• *South Rim and Desert View* — On-road bike lanes would be designated on all road shoulders leading to major visitor destination areas and along major park residential roads. A narrow bikeway would connect Hermits Rest to Desert View and to all the overlooks and interpretive facilities. Some road sections, such as along portions of West Rim Drive, would be widened for safety reasons.

The pedestrian trail system on the rim would not be expanded except in areas where social trailing was damaging resources.

■ Orientation and Interpretation

Gateway Information and Orientation Centers: Two gateway information and orientation/transit centers would be developed just outside park boundaries — one on the north side of Tusayan, adjacent to town facilities and development, and the other near Desert View, just south of the park's east entrance. They are referred to as the south center and the east center. The facility in Tusayan could have additional cooperators, such as representatives of the community of Tusayan and Grand Canyon Railways (the same as alternative 2).

The centers would provide functions similar to those described under alternative 2 — trip-planning information, introduction to the park's primary interpretive themes, park backcountry check-in, telephones, day parking, transit information and service to the park, book sales, bike rental, and lodging and campground information and check-in for both the park and forest, and possibly Tusayan. In addition, the centers would provide the following functions:

- park backcountry safety video/instructions and offices
- national park concessioner mule/tour bus registration, and offices
- limited food services and basic hiking/camping supplies

Unlike alternative 2, the centers would not sell park day entry passes or reservations for private vehicles because none would be allowed in the park.

The east center would be much smaller than the south center, and the themes would emphasize American Indians and the local area, such as the Hopi and Navajo lands, upper basin ecology, and the Coconino Rim.

South Rim: All primary park orientation would occur outside the park at the south and east information and orientation/transit centers. Interpretive facilities in the park would be concentrated in the powerhouse area of the village and would adaptively reuse historic structures that are now being used for other purposes (see the Grand Canyon Village and Desert View sections for more detail).

The Orphan Mine would be restored (including the headframe) and interpreted. The hazardous materials would be removed and the area made safe for visitors.

As described for alternative 2, book sales by the park's cooperating association would be provided at all major orientation and interpretive facilities. Sales items would be related to park themes and would take up a minimal amount of space.

Grand Canyon Village: The existing Maswik information center would remain the same as in the no-action alternative; this would be the major information center in the park under this alternative. Most interpretive facilities would be concentrated in the powerhouse area, which would become a pedestrian-only area with a strong link to the rim (the same as alternative 2). The industrial type cultural landscape would be recognized and interpreted.

Historic uses that are occurring in their original locations (for example, dormitories, mule barn, blacksmith shop) would be maintained. Buildings where historic uses no longer exist or where the structures are not adequate for current uses (for example, the powerhouse, historic laundry, horse barn, GCNPL maintenance building, magistrate building, community building) would be adaptively used for other purposes. Interpretive functions would be accommodated in the powerhouse area, as described for alternative 2. The powerhouse would be converted into an education center, and either the horse barn, the community building, or the laundry would be used as an American Indian cultural center, a children's museum, and interpretive classrooms.

The historic community building, the Kolb Studio, the Fred Harvey exhibit in the Bright Angel Lodge, and the interpretive exhibits in Lookout Studio would be the same as alternative 2.

New and expanded interpretive exhibits would be added at Mather Point since this would be the first overlook for the majority of visitors.

The themes interpreted at the Yavapai observation station and the Tusayan museum would be more focused under this alternative, and book sales by the cooperating association would be reduced, as described for alternative 2. Neither area would have expanded outdoor exhibits. The historic structures on the rim designed by Mary Jane Colter would be converted back to their historic character and would have limited exhibits (the same as alternative 2).

Desert View: The existing Desert View contact station would present information not provided at the east information and orientation/transit center. The Watchtower would be rehabilitated and interpreted as described for alternative 2.

■ Visitor Services

Outside the Park: Lodging, campgrounds, and restaurants would continue to be available outside the park.

South Rim: Visitor services would be increased and enhanced in the historic village and the business center, primarily by

adaptively reusing structures back from the rim. The number and scale of gift shops on the rim, as well as types of sales items, would be reduced, as described for alternative 2. Nonhistoric functions in high visitor use areas, or functions that conflict with the visitor experience (for example, maintenance, purchasing, and storage), would be relocated, and the structures would be adaptively used for visitor services or removed and the area revegetated.

Visitor services provided on the rim would be reduced, and additional services would be added back from the rim in the powerhouse area. All buildings in the Mary Jane Colter Historic District — Hermits Rest, Lookout Studio, and the Desert View Watchtower — would be rehabilitated to their historic character and used as originally intended, with gift shop space being reduced (the same as alternative 2).

Additional restroom and toilet facilities would be provided, and restrooms would be added at all interpretive and food service facilities in the powerhouse area, at the Bright Angel trailhead (in the Kolb Studio garage), and at the Tusayan museum. Water-conserving toilets would be provided in high use areas where water is not available, including Hermits Rest, Hopi Point, the South Kaibab trailhead, Yaki Point, and Grandview and Lipan overlooks.

• *Village Lodging and Camping* — The number of lodging units would be reduced from approximately 920 to 830. Lodging at El Tovar and Bright Angel would remain the same as the no-action alternative. As described for alternative 2, the removal of all nonhistoric structures in the core village area would result in the removal of the Kachina and Thunderbird Lodges (104 total units). The Maswik historic visitor cabins, now used by employees, would be rehabilitated and converted back to visitor lodging, and 10 nonhistoric cabins would be removed (the same as alternative 2).

The RV campground would be removed and the area revegetated. The Mather campground units would remain the same as the no-action alternative.

• *Village Food Service, Shopping, and Other Facilities:* The number of eating establishments would be increased and reconfigured. The El Tovar and Arizona Steakhouse restaurants would remain, but the Bright Angel restaurant would be expanded, and the Maswik cafeteria would offer evening table service (the same as alternative 2).

The outdoor space gained through the removal of the Kachina and Thunderbird Lodges would be converted to outdoor eating and interpretive program spaces (the same as alternative 2).

In the powerhouse area visitor services would be provided in the Grand Canyon National Park Lodges' maintenance building, the magistrate building, and either the historic laundry or the horse barn (depending on which was used for interpretation). These facilities could be used for a restaurant, gift shop, bike rental, and grocery/deli (actual uses for each building would be determined during a subsequent design phase).

In the business center the cafeteria and gift shop at the Yavapai Lodge would remain (the same as the no-action alternative). Babbitt's store would not need to be as large because of fewer park personnel and reduced visitor use in the area; therefore, a section would be used to provide additional restrooms, a post office station, ATM, and possibly an expanded deli, supply store, and/or laundry. The existing bank and post office buildings would be removed and the area revegetated.

Desert View: To emphasize viewing opportunities, especially from the Watchtower, only historic buildings would remain north of the existing Desert View parking lot, except for an expanded restroom. Babbitt's store and Grand Canyon National Park Lodges' gift shop and deli buildings would be removed and the areas revegetated. The gas station would be converted into joint NPS/concessioner management support facility. The campground would remain the same as now.

Area Operations

Under this alternative most new housing and community-related development would take place outside the park. Existing historic and standard housing in the park would be retained. All additional housing needed near the park, including replacement units for all substandard housing in Grand Canyon Village, would be constructed outside the park in a joint community developed with the U.S. Forest Service or through the land exchange.

Additional housing needed at Desert View would be developed as tightly clustered units in existing disturbed areas and near the orientation center outside the park.

As described for alternative 2, all jobs that could be performed an hour or more from the park would be moved to Flagstaff, Williams, or other areas where housing is more readily available. (A minimum of 3% of NPS jobs would be moved. The goals would be 20% for NPS staff and 5% for concessioner staff.) This would include the Albright Training Center.

Management support functions not directly related to health and safety or visitor needs would be moved to reduce conflicts with and intrusions on the visitor experience. Relocated functions would be moved outside the park to the joint NPS/USFS community, unless uses could be accommodated by adaptively reusing existing park facilities, particularly historic structures that contribute to the significance of the historic district and that were not intended for visitor services.

■ Outside the Park

Housing: Approximately 650 total new housing units for NPS and concession employees would be needed in a new community near Tusayan outside the park. This housing would provide a variety of densities and types of units; the overall density would be approximately 15 dwelling units per acre. Some services currently provided at Grand Canyon Village would be provided outside the park, with the same facilities as listed for alternative 2.

Approximately 20 NPS and concessioner employee housing units would be built outside the east entrance to the park, near the information and orientation/transit center. These units would be in addition to the USFS units and would ideally be in a well-screened, yet disturbed area. This housing would be used for east center employees and for drivers and maintenance personnel for both the public and concession transit service.

Management Support Functions: Major management support facilities for the National Park Service and Grand Canyon National Park Lodges that would be relocated outside the park include the following:

- interpretive offices and the NPS backcountry offices, which would be part of the new south information and orientation/transit center
- NPS administrative headquarters complex, which would be constructed in the new federal community and would include offices for the superintendent and support staff, administration (budget, housing, personnel), professional services, concessions, resources, fee management, and offices for all division chiefs.
- a new shared transportation maintenance complex for the National Park Service, Grand Canyon National Park Lodges, and the public transit operations, which would be built in the USFS/NPS community
- NPS maintenance and purchasing complex
- most Desert View management support functions, including all offices related to orientation services, a joint transit maintenance and bus storage facility (concessioner, public transit) and Grand Canyon National Park Lodges maintenance, which would be relocated to the east information and orientation/transit center area

Utilities: The Park Service would provide water for the south orientation and information/transit center and other park administrative and housing uses. Water payments would be shared by users of the joint orientation center. The most feasible and environmentally sensitive approach for providing water and storage would be used. The Park Service would work with the land trade developer, the U.S. Forest Service, or the town of Tusayan to link to whichever sewer system was most cost-effective. Park utility lines that would be extended to new developments outside park boundaries would be done in ways that minimized impacts on undisturbed park lands.

■ Grand Canyon Village

Housing: All employee dormitories would be retained (Colter, Victor, Victor annex, Rouzer, Brandt). No additional housing units would be built in Grand Canyon Village. Approximately 115 substandard housing units in the trailer village, Pinyon Park, and the YACC camp would be removed, and these areas would be revegetated.

Community Services: As described for alternative 2, the South Rim would continue to provide community services to primarily serve the in-park community (including the existing school, day care, grocery

store, and clinic). Services for community residents as well as visitors would be provided in the powerhouse area. The NPS mule and horse uses would remain in their current area at Yaki Point, while the remainder of the historic NPS maintenance area would be converted to various community uses (the same as alternative 2).

Under this alternative the post office and bank at the business center would be removed and the area revegetated. Babbitt's store would be remodeled to possibly include a postal station; the bank would be moved outside the park. Centralized outdoor residential postal delivery boxes would be provided (the same as alternative 2).

NPS Management Support Functions: NPS management support facilities that would remain the same as the no-action alternative include the Denver Service Center offices in the historic schoolhouse, the fire/safety facilities across from the existing Albright Training Center, the dry storage and helicopter base at the dry dump, the NPS mule and horse facilities at the historic NPS maintenance area, and the staging area for construction projects and trash compacting at the wet dump site. All other management support functions would be relocated outside the park, as previously described. The historic superintendent's house (now used by Grand Canyon National Park Lodges) would be converted into an NPS meeting facility for the superintendent and administration, and the Albright Training Center, which would be moved away from the park, would be converted to the NPS visitor protection operations and wildland fire facility. The existing visitor center/administration complex and the backcountry office would be removed and the area revegetated.

Other Management Support Functions: Management support functions that would remain the same as the no-action alternative include the mule barn and the blacksmith shop in the powerhouse area, the new laundry, and many of the uses in the El Tovar basement (with minor changes). The general manager, training, and personnel functions would be moved to the general office building, and the maintenance, purchasing, carpentry, and fire/safety functions would be moved to the present NPS maintenance/warehouse area. The existing personnel building would be removed and the area revegetated (the same as alternative 2).

The Babbitt's store offices would remain in the business center. The existing NPS and GCNPL mule barns would remain at the South Kaibab trailhead.

Utilities: Adequate water supply would be available, and no additional storage facilities would be needed in the park. The wastewater treatment facility would remain the same as the no-action alternative.

■ Desert View

Housing: Approximately 30 new units would be constructed in clusters in existing disturbed areas to replace substandard housing units and to provide housing for new employees. The one historic house would be rehabilitated and would remain a residence.

Community Services: A new laundry, lounge, and outdoor recreation area would be provided, as described for alternative 2.

Management Support Functions: A new maintenance and ranger operations building would be built in previously disturbed areas, as described for alternative 2. The gas station would be converted into a fire/safety facility jointly used by the Park Service and the concessioner.

Utilities: Water and sewage facilities needed at Desert View would be reduced, and no changes would be needed to the existing systems.

■ Other Areas

Housing: At Hermits Rest and the South Kaibab trailhead, the housing would be the same as alternative 2.

Management Support Functions: The NPS boat shop and related functions would be moved to Lees Ferry.

North Rim

Summary of North Rim Actions

A day reservation system would be established for the North Rim based on the existing capacities of parking areas on Bright Angel Point (the same number of visitors as alternative 1), and no roadside parking would be allowed.

Visitors would receive general information about visiting the North Rim outside the park at the U.S. Forest Service's Kaibab Plateau visitor center and at the orientation center on Bright Angel Point at Grand Canyon Lodge.

When visitation is at capacity on Bright Angel Point, visitor use on the Walhalla Plateau would be approximately half of that area's capacity. As described for alternative 2, a monitoring system would be established to track resource damage and visitor use patterns so the reservation system could be revised as needed.

Lodging accommodations would be increased by about 25% by restoring former visitor lodging currently being used for other purposes, while the number of campsites would be reduced slightly (the same as alternative 2). Adequate parking would be reserved so that all overnight visitors could enter the park whenever they arrived.

Visitor Experience

■ Access/Transportation

Regional Access: Like alternative 2, the National Park Service would work with the U.S. Forest Service and the Arizona Department of Transportation and other regional transportation entities (1) to encourage visitors to use vehicles no longer than 22′ in the park, (2) to keep Arizona Highway 67 from Jacob Lake to the park a small-scale, two-lane road that is closed in winter, and (3) to manage the visual quality along Arizona 67.

Roads, Parking, and Transit: The North Rim area would be retained primarily as an automobile-oriented experience. Approximately 495 private vehicles (462 cars, 25 RVs, and 8 tour buses) would be allowed in the park at any one time. This number is based on the number of parking spaces on Bright Angel Point (no roadside parking allowed) and on the assumption that about 80% of the visitors would go to Bright Angel Point first and 20% to Walhalla Plateau first. Approximately 1,775 visitors could be allowed on the North Rim at any one time.

To make better use of existing parking areas on Bright Angel Point, buses and RVs would be directed to the camper store parking lot. Total parking on Bright Angel Point would be 333 spaces.

Approximately 189 total parking spaces would be needed on the Walhalla Plateau, which means that most existing parking areas could be reduced in size and the areas revegetated.

No road widening or roadside visibility clearing would be done. Any vehicles allowed into the park would have access to Bright Angel Point and Point Imperial. The scenic roads from the intersection to Bright Angel Point and Walhalla Plateau would be restricted to vehicles no longer than 22′ and no wider than 8′ (the same as alternative 2).

A convenient, attractive, and energy-efficient public transit system would be developed for Bright Angel Point. All public transit vehicles would be about 22′ long (the same as alternative 2). The concessioner would provide transit service along the scenic roads of the Walhalla Plateau.

Employee parking would not be provided on Bright Angel Point, and the employee transit system would be expanded (the same as alternative 2).

Trails:

- *Outside the Park* — The Arizona Trail and trails in Kaibab National Forest would continue to be available for multiple uses (the same as the no-action alternative).

- *Inside the Park* — As described for the no-action alternative, the only off-road biking opportunity would be along the Arizona Trail; in all other areas bikers would have to share roadways with motorized vehicles and use existing shoulders.

The existing pedestrian trail system would remain, however, the Park Service would post roadside signs and publicize the existence of many trails, which now are not well known.

Mules would be eliminated from the North Rim.

■ Orientation and Interpretation

Gateway Information: A gateway information center would be developed at Jacob Lake in cooperation with the U.S. Forest Service, as described for alternative 2. The center would provide regional information and trip-planning services, park use permits, lodging and camping check-in, book sales, and a 24-hour kiosk.

Orientation Centers: The proposed contact station at Grand Canyon Lodge would provide visitor orientation on Bright Angel Point (the same as the no-action alternative).

Interpretive Facilities: The existing auditorium in the lodge, the amphitheater at the campground, and the extensive personal service program would be retained (the same as the no-action alternative).

■ Visitor Services

Outside the Park: Visitor services would continue to be offered in Kanab, Fredonia, and other areas. Under this alternative additional parking might be needed at Kaibab Lodge to accommodate visitors waiting to get in the park.

North Rim:

• *Lodging and Camping* — The number of lodging units would be increased by rehabilitating approximately 15 Grand Canyon Lodge cabins and approximately 30 Grand Canyon Inn cabins and making these historic buildings once again suitable for visitor use. This would total about 250 lodging units.

The campground would be redesigned, the number of sites reduced slightly, and the size of vehicles limited to 22′ or less, as described for alternative 2.

• *Food Service, Shopping, and Other Facilities* — As described for the no-action alternative, all existing facilities on the North Rim would remain. Restrooms and water-conserving toilets would be provided in some areas of the Walhalla Plateau.

• ***Winter Use:*** The park would remain closed to motorized use during the winter, and one group site would be available, as described for the no-action alternative.

Area Operations

■ Outside the Park

Housing for NPS employees working at the Kaibab Plateau visitor center would be provided in cooperation with the U.S. Forest Service (the same as alternative 2).

■ North Rim

Housing: Approximately 195 housing units would be provided to replace substandard units and to meet housing needs under this alternative. As in alternative 2, only disturbed land within and adjacent to the existing housing area would be used for housing. The average density would be 15 dwelling units per acre or higher; no single-family or other low-density types would be built.

Community Services: Same as alternative 2.

NPS Management Support Functions: All existing management support space would be the same as the no-action alternative. The maximum reuse of existing structures would be emphasized, as described for alternative 2. The only addition would be a new maintenance building, which would be constructed in a disturbed area (the same as alternative 2).

Other Management Support Functions: Management support for TWRS/ARAMARK would remain the same except a joint transit facility would be constructed on Lindbergh Hill.

The Grand Canyon Trail Rides mess hall would be used for TWRS/ARAMARK management support and the mule barns on CC Hill would be converted to storage or other management support functions. The mule barn corrals and the staging area would be removed and the area revegetated.

Utilities: The water supply system would remain the same as alternative 1. No additional facilities would be needed other than minimal line extensions and dual pumping facilities.

Water-conserving toilets would replace existing chemical toilets, as described for alternative 1.

Tuweep

Summary of Tuweep Actions

To ensure uncrowded, primitive experiences for visitors, day attendance limits would be established for Tuweep, based on existing parking. A total of approximately 20 vehicles (±55 visitors) would be allowed into Tuweep at any one time.

As described for alternative 2, the Park Service would seek to acquire the airstrip and adjacent private lands outside the park if they could not be acquired by the Bureau of Land Management, and it would encourage the bureau to trade for all lands near the park entrance to preserve the present visual quality.

Visitor Experience

■ Access, Roads, and Trails

The National Park Service would work with Mohave County to maintain the rural character of the access roads to Tuweep and with the Bureau of Land Management to ensure that the natural visual quality along the roads was preserved, as described for alternative 2.

Inside the park the existing roads would remain the same as the no-action alternative. Other actions would be the same as alternative 2: vehicles would be limited to no longer than 22′; the Toroweap overlook parking lot would be removed and revegetated, and a new 10-vehicle lot (instead of 25 cars under alternative 2) would be placed on rock surfaces near the Saddle Horse Canyon trail, with no overflow parking allowed along roadsides; and a small pull-off would be developed at the Tuckup trailhead.

The existing trail system would be retained (the same as the no-action alternative). The existing road to the Toroweap overlook parking lot would be converted to a pedestrian trail (the same as alternative 2).

■ Orientation and Interpretation

No additional information about Tuweep would be provided for potential visitors, as described for alternative 2. The National Park Service would work with the Bureau of Land Management, Mohave County, Pipe Spring National Monument, and other entities to provide appropriate information to visitors and use permits.

The existing information sign and brochures at the ranger station would remain, and waysides would be added at the Toroweap overlook parking lot (the same as alternative 2).

■ Visitor Services

The Bureau of Land Management would continue to provide camping opportunities outside the park.

Inside the park a campground reservation system would be established for peak season use (the same as alternative 2). The two campsites at the Toroweap overlook would be removed, reducing the number of campsites from 11 to nine. A maximum of six people and one vehicle would be allowed at each individual site and 11 people and two vehicles at the group site (the same as alternative 2).

No commercial use would be allowed (the same as alternative 2).

Area Operations

The Park Service would work with the owner of a private property outside the park to arrange a lease for a seasonal ranger. If this could not be arranged, then a new seasonal ranger trailer would be provided (the same as alternative 2).

Office space would remain the same as the no-action alternative.

If needed, a septic system for the seasonal ranger trailer would be added, as described for alternative 2. The visitor use toilets would be converted to water-conserving models (the same as alternative 1).

CORRIDOR TRAILS

Summary of Corridor Trail Actions

To reduce resource impacts and trail user conflicts, all visitor mule use on the North Rim would be eliminated, and on the South Rim all day mule use would be eliminated and overnight mule use would be cut in half. Hiker carrying capacities would be established once the mule changes were implemented.

Phantom Ranch lodging accommodations would be reduced slightly, but camping opportunities would remain the same.

VISITOR EXPERIENCE

■ Access and Trails

Trail maintenance, visitor education programs, and exhibits would be expanded, as described for alternative 2. Mule use would be eliminated from the North Rim, and all day mules would be eliminated from the South Rim.

Overnight mule use on the South Rim would be cut in half, with use only allowed on the South Kaibab Trail. No increases in pack mules for visitor supplies would be allowed (the same as alternative 2).

A visitor carrying capacity study for the three main corridor trails would be conducted after these changes were made to establish appropriate use levels for hikers.

A monitoring system would be established for all the corridor trails (the same as alternative 2).

The Old Bright Angel Trail would remain the same as in alternative 1.

■ Interpretation

At Indian Garden a visitor contact station would be provided in an existing building, and the roving interpreter program on corridor trails would be expanded (the same as alternative 2).

■ Visitor Services

The number of beds at Phantom Ranch would be reduced from approximately 170 to 85 (the number of beds originally provided at the ranch).

The campsites at Phantom Ranch would be reduced by a few sites to protect the cottonwood trees. The Indian Garden and Cottonwood campgrounds would remain the same as the no-action alternative.

Toilets along the trails would be converted to water-conserving models, and no additional toilets would be provided. This factor would be considered in establishing the carrying capacity of the corridor trails.

AREA OPERATIONS

Housing: Housing at Indian Garden would remain the same, with one house now used for storage being converted back to residential use (the same as alternative 2).

Management Support: Facilities would remain the same as the no-action alternative.

Utilities: The water system along the corridor trails would remain the same as alternative 1, unless a more cost-effect and environmentally sensitive system was discovered (the same as alternative 2).

PARK BOUNDARY
CANYON RIM
CANYON

EXISTING PROPOSED
ENTRANCE STATION
REMOVE ENTRANCE STATION AND REVEGETATE
LIMITED DAY USE
LIMITED NUMBER OF MOTORIZED VEHICLES

EXISTING PROPOSED
MAJOR TRANSIT CENTER
MINOR TRANSIT STATION / SHELTER
SHUTTLE BUS ROUTE
UNRESTRICTED ACCESS
RESTRICTED ACCESS
UNPAVED ACCESS
RESTRICTED VEHICLE SIZE ACCESS
EMPLOYEE ACCESS

EXISTING PROPOSED
PARKING
RAILROAD

EXISTING
TRAILHEAD
RIM TRAIL
MAJOR CORRIDOR TRAIL
MINOR CORRIDOR TRAIL
ARIZONA TRAIL
BIKE AND/OR PEDESTRIAN TRAIL

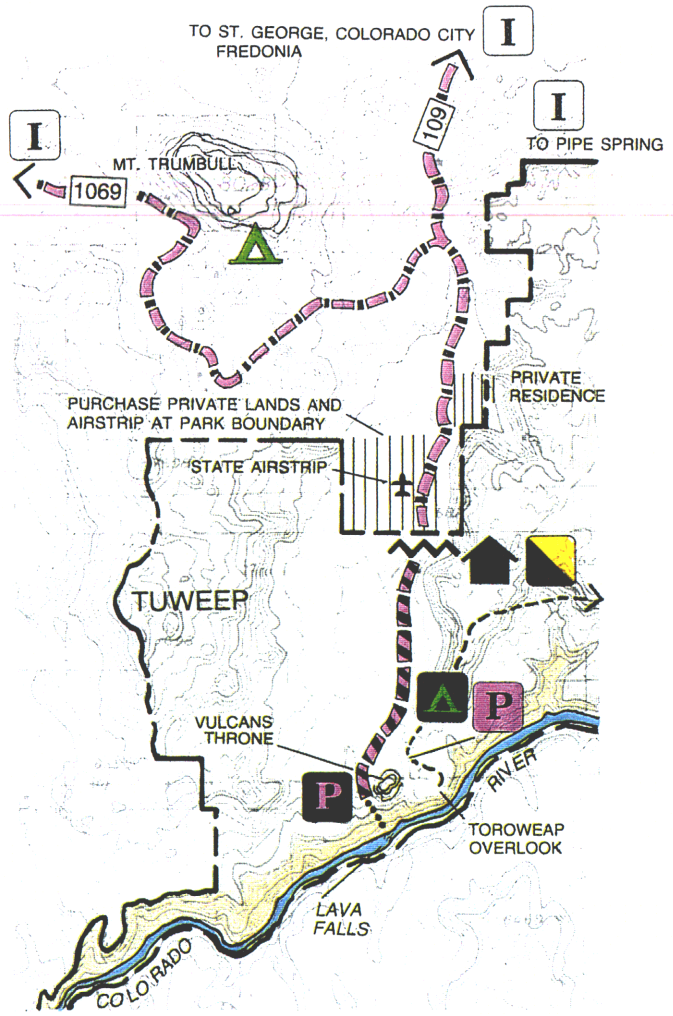
EXISTING
CONCESSIONER MULE BARN
CONCESSIONER MULE STAGING
MULE TRAIL

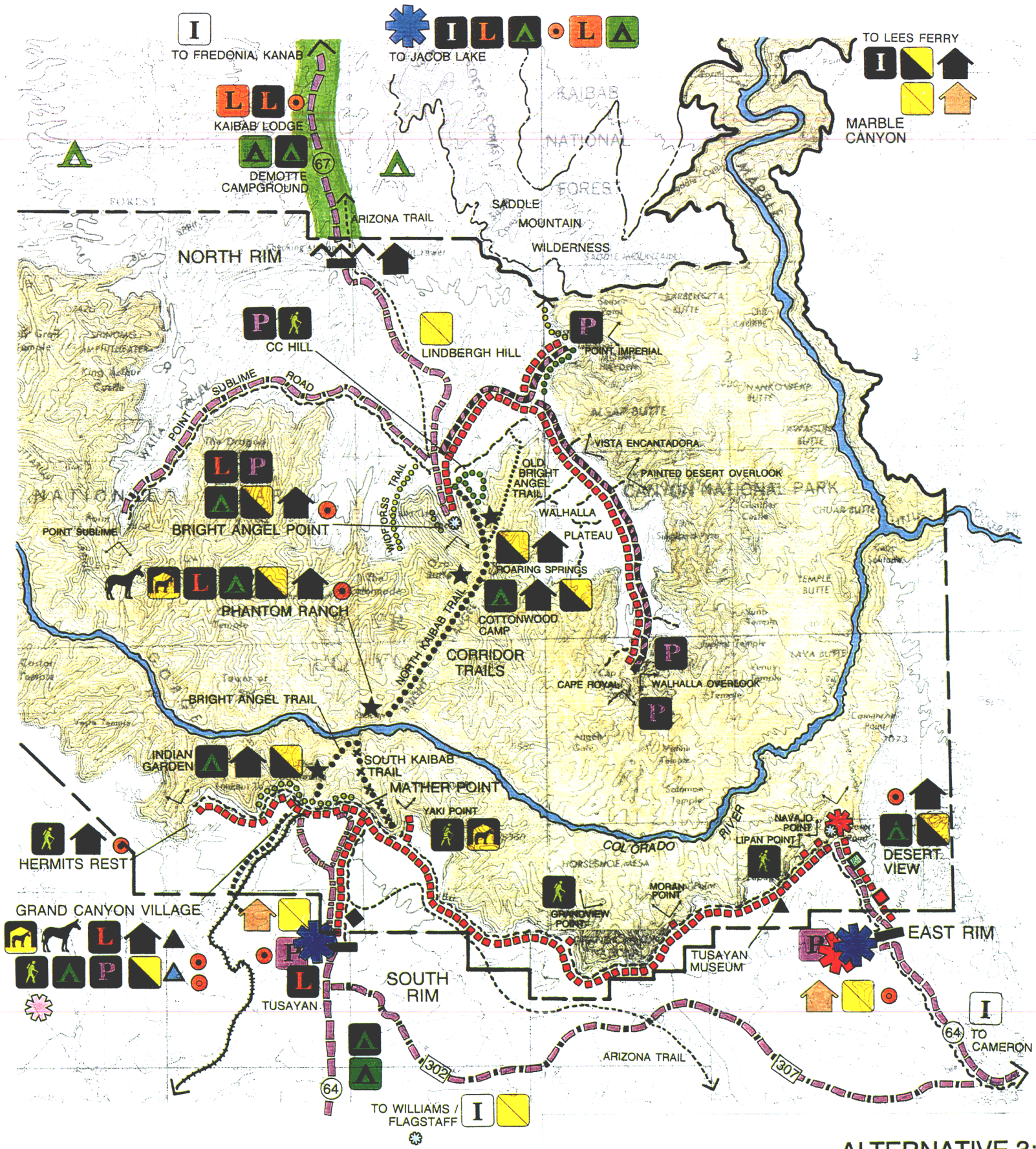
EXISTING PROPOSED
MAJOR ORIENTATION CENTER
CONTACT STATION
INFORMATION

EXISTING PROPOSED
LODGING
CORRIDOR TRAIL FACILITY

EXISTING PROPOSED
CAMPGROUND
PRIMITIVE / DISPERSED CAMPING

EXISTING PROPOSED
VISITOR SERVICES
MUSEUM / INTERPRETATION
HOUSING
MANAGEMENT SUPPORT
SCENIC HIGHWAY



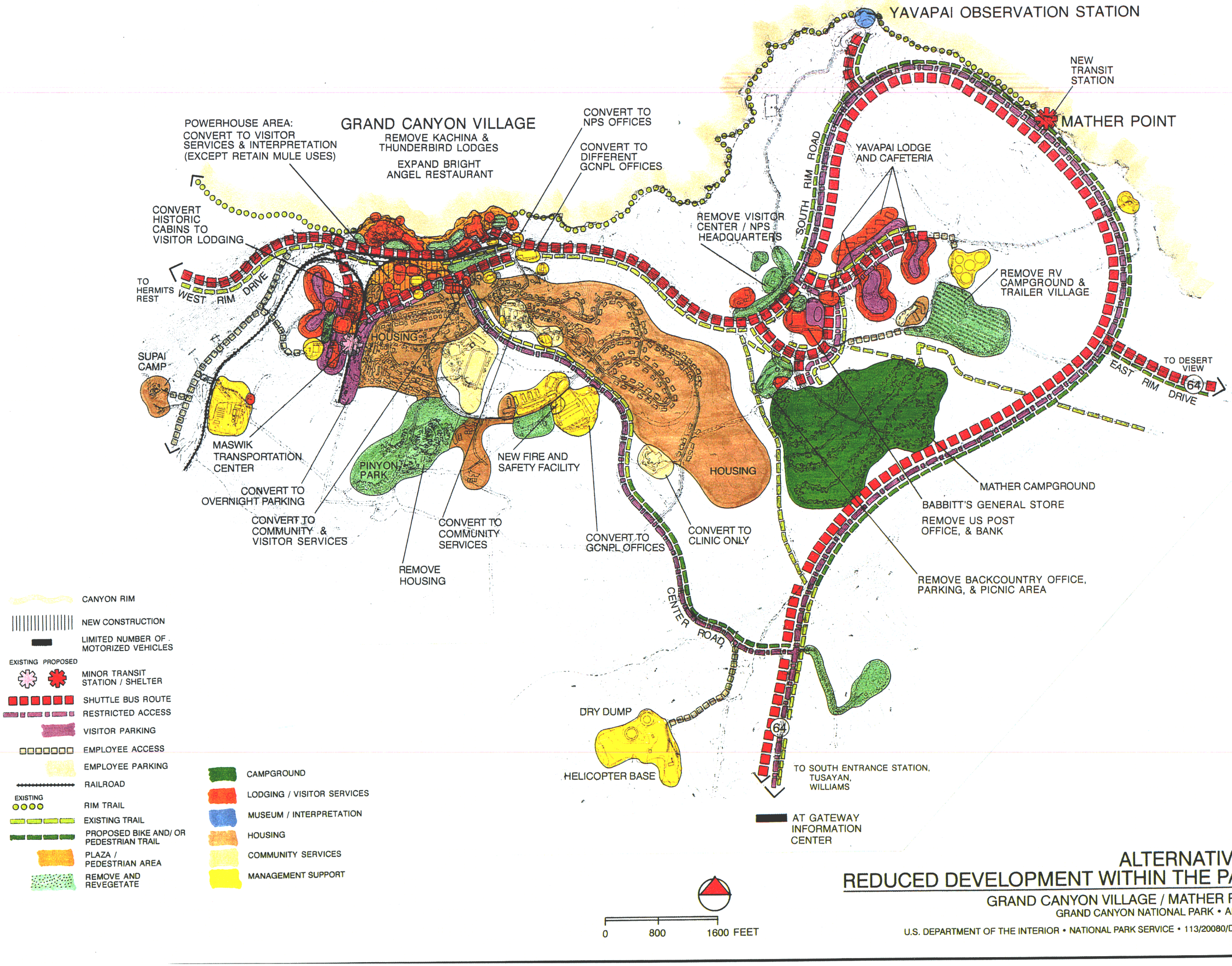


ALTERNATIVE 3:
REDUCED DEVELOPMENT WITHIN THE PARK

PARK DEVELOPED AREAS

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20075/DSC/1•95

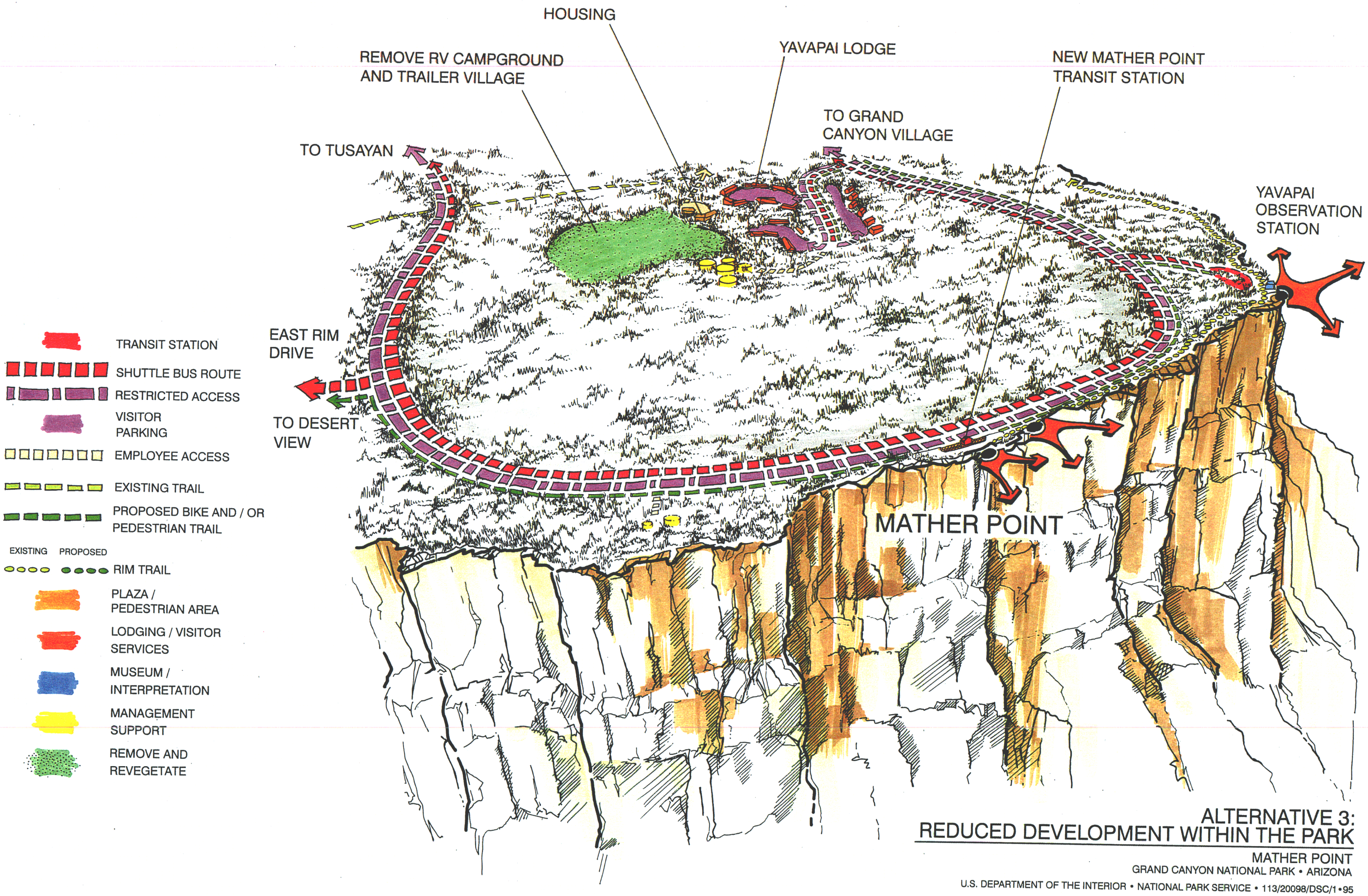


ALTERNATIVE 3:
REDUCED DEVELOPMENT WITHIN THE PARK

GRAND CANYON VILLAGE / MATHER POINT

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20080/DSC/1•95



ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK

MATHER POINT
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20098/DSC/1 • 95

GENERAL OFFICES BUILDING
• CONVERT ENTIRE BUILDING TO GCNPL OFFICES

OLD SUPERINTENDENT'S HOUSE
• CONVERT TO NPS OFFICES

RANGER OPERATIONS BUILDING
• CONVERT TO VISITOR & COMMUNITY SERVICES

NEW BUILDING
• VISITOR & COMMUNITY SERVICES

POWERHOUSE AREA
• RELOCATE CONCESSIONER MAINTENANCE
• RETAIN MULES
• ADD VISITOR SERVICES
• PLAZA / OUTDOOR USES
• IMPROVE PEDESTRIAN CONNECTION TO RIM
• EDUCATION CENTER

MASWIK TRANSPORTATION CENTER
• OVERNIGHT GUEST PARKING
• BUS / SHUTTLE TRANSFER POINT
• LIMITED EMPLOYEE PARKING

COLTER HALL
• RETAIN AS EMPLOYEE DORM

CONCESSIONER PERSONNEL BUILDING
• REMOVE

VICTOR / VICTOR ANNEX
• RETAIN AS EMPLOYEE DORMS

HISTORIC MASWIK CABINS
• CONVERT TO VISITOR LODGING

PARKING
• REMOVE

TO MATHER POINT & SOUTH ENTRANCE

DEPOT

VERKAMP'S

HOPI HOUSE

EL TOVAR

BRIGHT ANGEL LODGE

VILLAGE LOOP ROAD

OLD VILLAGE BYPASS ROAD
• CONVERT TO PEDESTRIAN / BIKE TRAIL

MASWIK LODGE

LOOKOUT STUDIO

KOLB STUDIO

THUNDERBIRD & KACHINA LODGES
• REMOVE

PARKING
• REMOVE

VILLAGE LOOP
• PARK TRANSIT ONLY

ROWE WELL ROAD

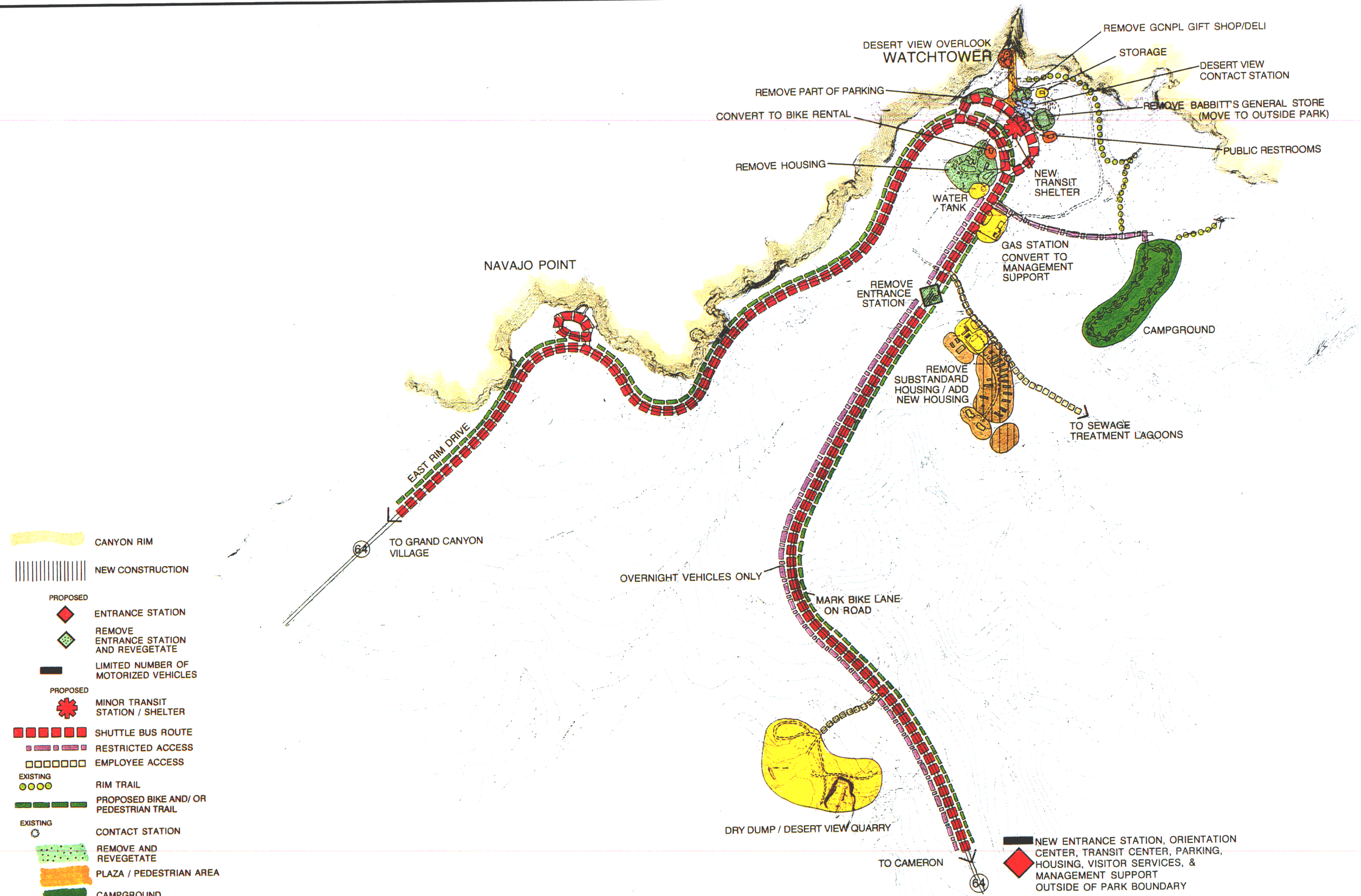
WEST RIM DRIVE
TO HERMITS REST
• TRANSIT & SERVICE VEHICLES ONLY

RESTRICTED ACCESS
VISITOR PARKING
SHUTTLE BUS ROUTE
EMPLOYEE ACCESS
PEDESTRIAN TRAIL
BIKE AND/OR PEDESTRIAN TRAIL
TRANSIT CENTER
PLAZA / PEDESTRIAN AREA
LODGING / VISITOR SERVICES
COMMUNITY SERVICES
MANAGEMENT SUPPORT
REVEGETATE

ALTERNATIVE 3:
REDUCED DEVELOPMENT WITHIN THE PARK

GRAND CANYON VILLAGE
GRAND CANYON NATIONAL PARK • ARIZONA

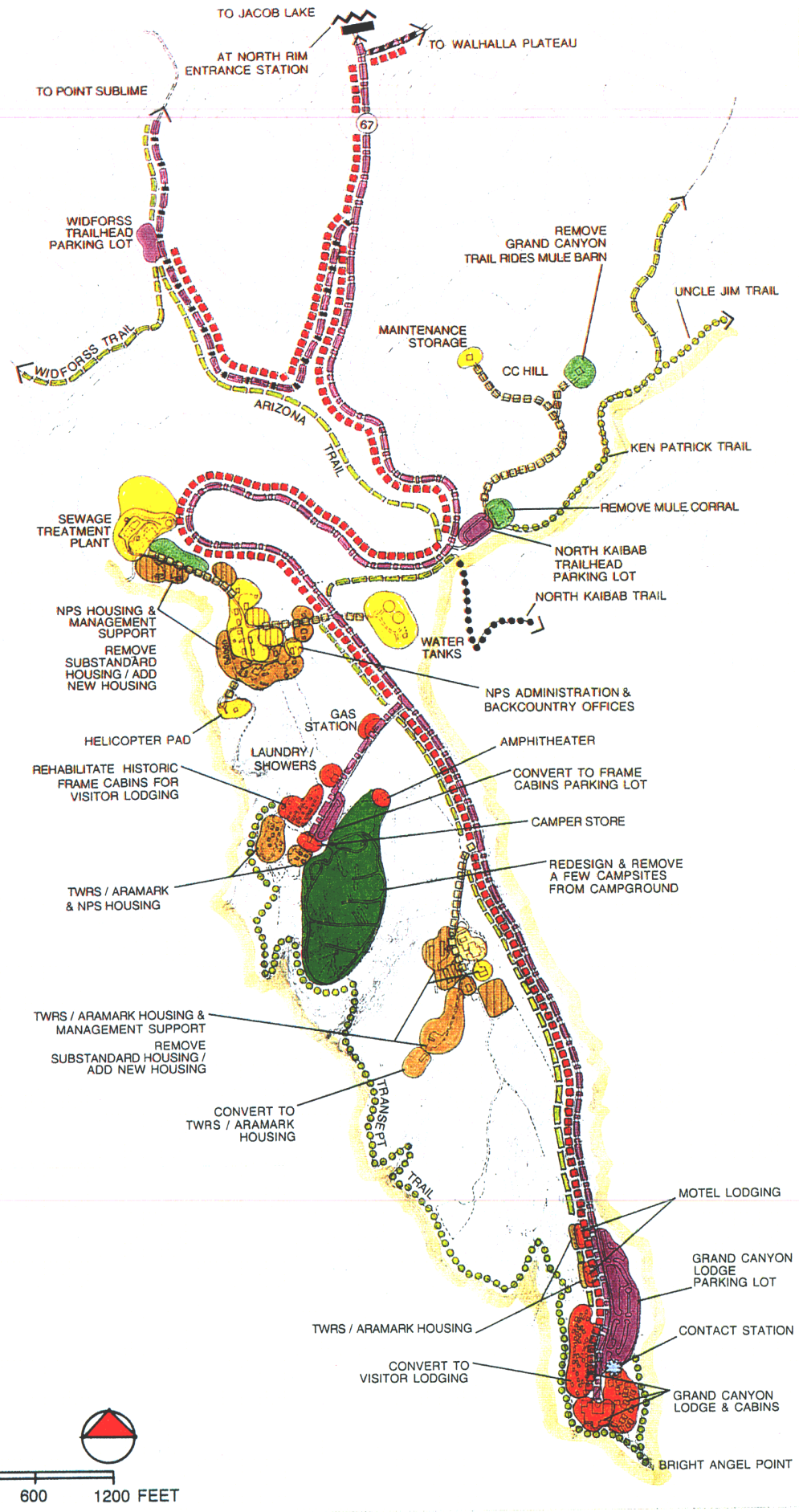
U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20097/DSC/1•95



ALTERNATIVE 3:
REDUCED DEVELOPENT WITHIN THE PARK

DESERT VIEW
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20085/DSC/1•95



CANYON RIM
NEW CONSTRUCTION
LIMITED DAY USE
LIMITED NUMBER OF MOTORIZED VEHICLES
SHUTTLE BUS ROUTE
RESTRICTED ACCESS
UNPAVED ACCESS
RESTRICTED VEHICLE SIZE ACCESS
VISITOR PARKING
EMPLOYEE ACCESS

EXISTING
RIM TRAIL
EXISTING TRAIL
CORRIDOR TRAIL

EXISTING
CONTACT STATION

REMOVE AND REVEGETATE
CAMPGROUND
LODGING / VISITOR SERVICES
HOUSING
COMMUNITY SERVICES
MANAGEMENT SUPPORT

ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK

NORTH RIM / BRIGHT ANGEL POINT

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20090/DSC/1•95

SUMMARY OF ALTERNATIVE 4

Alternative 4 proposes actions to improve visitor convenience by placing major park visitor services inside the park wherever reasonable and by distributing visitors throughout the developed areas of the park. No day use limitations would be established unless the visitor experience was being significantly degraded.

The type of vehicular use allowed in some areas would be restricted, and high use areas would be accessible only by transit vehicles or hiking or biking (the same as alternative 2); other developed areas would be accessible by private vehicles. Overnight accommodations would be increased in all developed areas on the North and South Rims by constructing some new facilities and adaptively reusing existing structures. New facilities would be placed either in or adjacent to disturbed areas.

Planning outside the park would emphasize regional information, as described for alternative 2. Cooperative planning with outside entities would focus on disseminating information, providing trip planning assistance, and distributing visitor use.

PARKWIDE MANAGEMENT ACTIONS

NATURAL RESOURCES

■ Air Quality and Noise

Actions related to vehicle emission standards (concession, NPS, private tour buses), type of concession and NPS buses, an employee shuttle system, train emissions, stoves and fireplaces, regional pollution, airport expansion locations, and fire management would be the same as alternative 2. As a result of aircraft noise concerns, the Park Service would encourage more convenient aircraft transportation services farther from the park than Tusayan.

■ Vegetation, Wildlife, and Ecosystems

The actions would be the same as for alternative 2, including an ecosystem approach to managing threatened or endangered species, research programs, and vegetation management planning. The use of borrow pits for trail maintenance would be minimized.

■ Water Resources

Actions related to drilling water wells outside the park, monitoring springs, protecting water rights, providing park water outside the park, implementing water conservation measures, and extending waterlines and expanding treatment and storage facilities would be the same as alternative 2.

■ Scenic Resources

Actions related to critical visual components, the character of historic districts and vista clearing would be the same as alternative 2.

CULTURAL RESOURCES

Actions for managing cultural resources would be the same as alternative 2. This includes the establishment of comprehensive inventory and management systems, resource data base development, and document updating. Preservation, maintenance, and stewardship programs would be developed for cultural resources.

Tribal memorandums of agreement would be negotiated to protect sacred sites and other ethnographic resources. A program would be initiated to complete the survey, inventory, documentation, and evaluation of cultural resources under the criteria of the National Register of Historic Places.

SOUTH RIM

Summary of South Rim Actions

Under alternative 4 land use patterns on the South Rim would be changed to enhance visitor conveniences while ensuring quality visitor experiences. No day attendance limitations would be needed on the South Rim. All vehicles would be permitted to enter and park at a large new parking facility at Mather Point. From here a public transit system would provide access to the village and West Rim overlooks (the same as alternative 2).

Most nonhistoric buildings in the village area would be retained and used for visitor services or park operations. Overnight lodging would be increased by about 40% and campsites by approximately 20%.

Substandard housing would be removed, and new housing would be provided in previously disturbed areas in the park at much higher densities, as described for alternative 2. However, not all needed housing could be accommodated in the park, and a new community would be developed in cooperation with the U.S. Forest Service outside the park.

VISITOR EXPERIENCE

■ Access/Transportation

Regional Access: The Park Service would work with regional transportation entities to encourage private entities to expand transit options, the same as alternative 1.

USFS 302/307 would be paved and maintained for year-round access. The road would be designated as Arizona Highway 64.

Roads, Parking, and Transit: The South Rim would be planned with various transportation options geared to specific areas and the intensity of use. Most of the South Rim would be oriented to private vehicles. However, safe, efficient, and cost-effective transit service would also be required in most of the South Rim developed area, and biking and hiking trails would be available.

A third formal park entrance on the South Rim would be provided by upgrading the Grandview entrance and improving the entrance station. The existing south entrance would remain the primary access route, while the Desert View entrance would be moved farther south and doubled in size.

All visitors would be able to drive their vehicles along major portions of the South Rim and park at the Mather Point orientation center, near all the overlooks on the East Rim (Yaki Point excepted), the Tusayan museum, and at Desert View. Major staging areas would be provided at the Mather Point and Desert View, and parking would be more than doubled near Grandview.

The area between Yaki Point and Hermits Rest, including Grand Canyon Village and West Rim Drive, would only be accessible by year-round public transit or hiking and biking, as described for alternative 2. The Maricopa Point overlook and parking area would be removed, and Hopi Point would be redesigned for bike and pedestrian use (the same as alternative 2). A new road would be added from the Abyss to Rowe Well Road to create a transit loop for the eastern section of West Rim Drive, and the existing road from the Abyss to Hermits Rest would continue to be used as a transit route.

On the East Rim visitors would be able to drive and park near all overlooks past Yaki Point. Parking spaces would be added to meet demand just off East Rim Drive near the road to each overlook and at the Yavapai observation station. Tour buses would be allowed to stop at overlooks A and B, Moran Point, and the Tusayan museum. In addition, a public/subsidized shuttle would be provided all along East Rim Drive, linking Mather Point to Desert View.

• *Grand Canyon Village* — The Mather Point staging area would be the principal parking area for visitors, with space for some 3,262 vehicles (±2,936 cars, 203 RVs, and 123 buses on about 32 acres). The parking area would be designed as many small, well-landscaped lots, and a tram system would circulate through the lots to take visitors to the Mather orientation/transit center. This center would be the primary point for visitors to make direct transit connections to the village and West Rim Drive, which would only be accessible by public

transit, hiking, or biking, as described for alternative 2.

As described for alternative 2, overnight visitors would continue to have access to their lodging accommodations off the rim, while visitors staying in lodges on the rim would park at the Maswik transportation center and take a shuttle to the rim. The Maswik transportation center would also serve as the in-park staging area for the railroad spur when that system became operational. A new road would be built to connect Center Road to the Maswik transportation center and Maswik Lodge.

Rowe Well Road would be upgraded to a gravel road, the same as alternative 2.

• *Desert View* — A Desert View bypass road would be constructed, as described for alternative 2, and a new entrance station would be built just south of the proposed bypass road. The road into Desert View would become a loop road, and a major new parking lot for 359 vehicles (330 cars, 19 RVs, and 11 buses, on 3.5 acres) would be built in the existing Grand Canyon National Park Lodges housing area (the housing in this area would be replaced in a consolidated housing area). Portions of this loop road would be realigned for safety and so that it functions efficiently in conjunction with the proposed bypass (the same as alternative 2).

The existing parking lot near the rim would be removed; most of the area would be revegetated (the same as alternative 2), and a portion of the lot would be used for a new Desert View information and orientation/transit center. The transit center would have a small shelter and waiting area and transit information panels.

• *Off-Season Roads, Parking, and Transit* — Public transit service would be available during off-seasons from Yaki Point to Hermits Rest (including the village); service levels would be adjusted to meet visitor needs, as described for alternative 2.

A public/subsidized transit service would also be provided year-round on East Rim Drive unless low visitor use warranted closing the system during the off-season.

• *Employee Roads, Parking, and Transit* — An efficient employee shuttle system would be developed for the NPS and concessioner employees, the same as alternative 2.

Some additional employee parking would be provided at the gateway information center in Tusayan, the Mather Point information and orientation/transit center, the existing administration/visitor center area, and near Maswik Lodge.

Employees would be directed to use roads away from the rim, and a new short road would be built to facilitate access between the residential area and the business center (the same as alternative 2).

Trails:

• *Outside the Park* — Cooperation to link the South and North Rims with the Arizona Trail would continue. Trails and roads in Kaibab National Forest would still be available for multiple uses by South Rim visitors, as described for the no-action alternative. In addition, the Park Service would work cooperatively to link regional bike and pedestrian trails with Grand Canyon (the same as alternative 2).

• *South Rim and Desert View* — As described for alternative 2, a bikeway system would be created to link Hermits Rest to Desert View, with a bikeway plan done at a later date to determine exact routes and design details. The pedestrian rim trail system would also be substantially expanded except in the Grandview/Sinking Ship area, where the trail would stay along the canyon rim until turning south along the Coconino Rim.

■ Orientation and Interpretation

Gateway Information Centers: A joint gateway information center would be provided in Tusayan near the airport. NPS functions at this gateway facility would be limited to providing park information and selling entry passes so visitors would not have to wait in line at entrance stations.

The Park Service would cooperate with the U.S. Forest Service and the other entities at the center to provide a portion of that center's parking. Approximately 100 spaces would be needed initially; use would be monitored, and the lot would be enlarged if necessary.

South Rim: Two orientation and information centers would be built — one at Mather Point and one at Desert View. The Mather Point center would be larger and provide more visitor services than those described under alternative 2, while the Desert View orientation center would be the same.

Interpretive facilities in the Grand Canyon Village area would be concentrated in the powerhouse area, and the Yavapai observation station and adjacent area would be an interpretive area (the same as alternative 2).

Under this alternative an American Indian cultural center would be developed at the Tusayan museum, and a new museum would be constructed in conjunction with the existing building (under alternative 2 the center would be in the powerhouse area). The existing Tusayan museum would become a prehistory museum, and prehistory interpretation would be expanded by doing a research dig and interpreting the dig and other archeological resources in the immediate area. The Orphan Mine would be rehabilitated and interpreted the same as alternative 3.

As described for alternative 2, book sales by the park's cooperating association would be provided at all major orientation and interpretive facilities.

• *Grand Canyon Village* — The Mather Point orientation and information center would have the same facilities as listed for alternative 2, except for the following changes:

- cafeteria-type food service rather than small-scale, limited food service
- a gift shop
- lodging check-in for all lodging and camping on the South Rim
- more restrooms than under alternative 2 since this would be the first stop for most visitors

The powerhouse area would be converted to interpretive and visitor services the same as alternative 2, except interpretive uses or visitor services would be provided in the structure that had been set aside for use as an American Indian cultural center under alternative 2.

Kolb Studio would be used for interpretation, office space, and conference rooms, as described for the no-action alternative. The Fred Harvey exhibit in the Bright Angel Lodge would be upgraded and a lounge area provided (the same as alternative 2).

• *Desert View* — The new Desert View orientation center would be the same as alternative 2, with general trip-planning information, small-scale interpretive exhibits emphasizing American Indian themes, as well as parkwide themes, book sales, phones for lodging reservations, and a 24-hour information kiosk.

The Watchtower would continue to be primarily a gift shop (the same as the no-action alternative).

■ Visitor Services

Outside the Park: Lodging, campgrounds, and restaurants would continue to be available outside the park.

South Rim: Visitor services provided on the rim would not be reduced. Additional services would be provided back from the rim by adaptively reusing structures and constructing new facilities.

All existing rim lodging, dining, and gift shops would be retained. The powerhouse area would become a major visitor use and service area, as described for alternative 2. The Mary Jane Colter structures — Hermits Rest, Lookout Studio, and the Desert View Watchtower — would remain the same as the no-action alternative, with a strong focus on gift sales.

Numerous restrooms and toilet facilities would be added along the South Rim, as described for alternative 2.

• *Village Lodging and Camping* — The number of lodging units would be increased from approximately 920 units at present to 1,280. The units at El Tovar, Bright Angel, Kachina, and Thunderbird Lodges, as well as Maswik Lodge, would remain. As described for alternative 2, the Victor and Colter dormitories would be converted to lower priced lodging, as would the Maswik cabins. The Victor annex would also be converted to lower priced units or a youth hostel, and the number of units at the Yavapai Lodge West would be increased from 160 units to 320 units by removing the one-story structure and constructing two-story structures in the same location.

The RV campground would be nearly doubled in size by incorporating the area now used for the trailer village. This would add approximately 80 campsites, for a total of approximately 510 in the village. The Mather campground would remain as it is currently operating.

• *Village Food Service, Shopping, and Other Facilities* — The number of food service establishments would be increased, as described for alternative 2. However, under this alternative additional food service could be added to the powerhouse area if needed.

All existing gift shops would remain, including those at Hermits Rest and Lookout Studio, and an additional shop would be provided in the powerhouse area as described for alternative 2.

Visitor services in the business center would be the same as alternative 2.

Desert View: Visitor services at Desert View would increase. The Watchtower uses and Babbitt's store would remain the same as the no-action alternative. The campground would be expanded by 50 sites the same as alternative 2. The Grand Canyon National Park Lodges gift shop and deli would be expanded to meet demand, as would the gas station. The restroom facility would be removed and replaced as part of the new Desert View orientation center.

Area Operations

All housing would be kept close to the park, with no jobs or housing being moved farther away than the town of Tusayan. As described for alternative 2, replacement units for substandard housing and additional required housing would be provided either in heavily disturbed areas in the village area and Desert View, and a new community would be developed in Tusayan, in cooperation with the U.S. Forest Service. All management support jobs would remain in the park.

■ Outside the Park

Housing: Only about 10 housing units would be needed in the region in addition to approximately 330 housing units needed in Tusayan.

Community Services: The primary center for community services would be shifted out of the park to the joint USFS/NPS community in Tusayan, the same as alternative 2.

Utilities: The Park Service would help provide water for federal facilities outside the park, including park housing and community services and the joint gateway information center. Lines would be extended as needed to supply these facilities.

■ Grand Canyon Village

Housing: Housing in the village would be the same as alternative 2. Approximately 675 units would be built in existing disturbed areas in the park to replace some 115 substandard units and to meet additional housing needs.

Community Services: Grand Canyon Village would continue to provide various community services; however, any expansion of facilities would occur outside the park in the new community (the same as alternative 2).

Management Support: Most actions related to management support would be the same as alternative 2, except that the personnel building would be retained and continue to be used as offices and a training center, the historic schoolhouse would be used for Grand Canyon National Park Lodges (possibly accounting and sales offices), a new mule barn facility for Grand Canyon National Park Lodges would be constructed near the South Kaibab trailhead (east of the intersection of the Yaki Point and South Kaibab roads), and approximately 10 acres of land would be disturbed adjacent to the current dry dump for the helicopter base. The following NPS management support functions would be the same as alternative 2:

- using the existing visitor center/administration building solely for park administration
- moving the interpretive and backcountry offices to the Mather Point orientation center, and removing the existing backcountry building and parking area and revegetating the area
- constructing facilities at the dry dump site for fire and safety, curatorial space, maintenance, offices, warehouses, and public shuttle transportation operations, as well as for Grand Canyon National Park Lodges
- using the Southgate disturbed area for maintenance material storage and for NPS mules and horses
- moving the boat shop to Lees Ferry

The Babbitt's store offices and South Kaibab trailhead mule barns would remain the same as alternative 1.

Utilities: Assuming water from Roaring Springs was used, the pumping period at Indian Garden would be increased to 21 hours, and additional storage facilities for approximately 5.5 million gallons would be needed on the rim.

The existing sewage treatment plant would run at 91% capacity.

Additional restroom facilities and water-conserving toilets would be provided the same as alternative 2.

■ Desert View

Housing: Approximately 75 new units would be provided in existing disturbed areas at Desert View, about five more units than under alternative 2 because of additional employees for visitor services.

Community Services: Community services, including outdoor recreation space, a new laundry, and an employee lounge, would be provided (the same as alternative 2).

Management Support: Existing management support facilities would be retained, with a new maintenance building for Grand Canyon National Park Lodges and a new NPS ranger operations and maintenance facility (the same as alternative 2).

■ Other Areas

The substandard housing at Hermits Rest would be removed and replacement housing provided (the same as alternative 2). Existing housing at the South Kaibab trailhead would remain.

North Rim

Summary of North Rim Actions

There would be no day attendance limitations for the North Rim developed areas. Visitors would get information about the North Rim at the U.S. Forest Service's Kaibab Plateau visitor center outside the park and at an orientation center on Bright Angel Point at CC Hill. Overnight lodging accommodations and camping would be increased by about 60%.

Visitor Experience

■ Access/Transportation

Regional Access: As described for alternative 2, the National Park Service would work with the U.S. Forest Service and the Arizona Department of Transportation to encourage the use of transit vehicles no longer than 22′, to keep Arizona 67 from Jacob Lake to the park a two-lane road that is closed in winter, and to manage the visual quality along this road section.

Roads, Parking, and Transit: The number of vehicles or people allowed into the park for day use would not be limited. All sizes of vehicles would be allowed to use developed area roads.

On Bright Angel Point much of the parking would change. A new lot would be developed at CC Hill to serve users of the North Rim orientation center; parking would be provided for 67 vehicles (40 cars, 21 RVs, and 6 buses on 1 acre of disturbed land), and a new access road would be built (the same as alternative 2). In conjunction with this action, the lot at the North Kaibab trailhead would be removed. A new access road and 185-vehicle parking lot (1.6 acres) for general visitor parking would be built in the area of the existing ballfield.

The use of the lots would be clearly defined to ensure maximum utilization and reduce the sizes. The parking area at Grand Canyon Lodge would primarily be for day users until the afternoon, when a natural shift in use would occur. A section would be designated for overnight users only so those visitors arriving early could park near their lodging.

A convenient transit service would be provided to take visitors to all the parking lots and other primary destination areas on Bright Angel Point. Concession tours would be available on Walhalla Plateau (the same as alternative 2).

Parking areas on Walhalla Plateau would be sized to meet demand. No additions would need to be made, other than formalizing the extra parking needed at Cape Royal (this would occur in the existing disturbed area now used for overflow parking).

An employee transit system would be developed the same as alternative 2.

Trails:

- *Outside the Park* — The Arizona Trail and trails in Kaibab National Forest would continue to be open for hiking, horseback riding, and biking (the same as alternative 2).

- *Inside the Park* — As described for alternative 2, a bike trail would be developed to link CC Hill, Bright Angel Point, and all

Walhalla Plateau overlooks. Rim hiking trails would be developed on Bright Angel Point (to link CC Hill, Grand Canyon Lodge, and the Transept Trail) and on Walhalla Plateau (to link Point Imperial and Vista Encantadora).

Mule trail use would be moved to the Six Rock Meadow Trail and the first several miles of the Old Bright Angel Trail. A small mule corral/staging area would be constructed adjacent to the Six Rock Meadow trail, and mules would be hauled to this area for day rides. Portions of the Ken Patrick Trail would also be used for short day rides. Mule use would be removed from the North Kaibab Trail but would continue on the Uncle Jim Trail and portions of the Ken Patrick Trail.

■ Orientation and Interpretation

Gateway Information: The National Park Service would join with the U.S. Forest Service to provide a joint orientation center at Jacob Lake. The NPS focus would be on providing information and distributing backcountry passes.

Orientation Center: A small orientation center would be built at CC Hill, as described for alternative 2, except under this alternative limited food service would be added. A contact station currently proposed at Grand Canyon Lodge would provide information and announcements of interpretive programs, as well as restrooms (the same as alternative 1).

Interpretive Facilities: A small museum would be constructed at Point Imperial. This museum would focus on American Indian, natural resource, and sustainable design themes. This facility would be planned to expand interpretation on the Walhalla Plateau and to help distribute visitors.

■ Visitor Services

Outside the Park: Visitor services outside the park would continue to be available in Kanab and Fredonia. Proposals by the U.S. Forest Service to expand lodging and camping and Kaibab National Forest would be evaluated as part of that agency's planning process (the same as the no-action alternative).

North Rim:

• *Lodging and Camping* — Approximately 120 rooms would be added to the 200 existing rooms. These units would be provided by converting some 20 current Grand Canyon Lodge employee units back to visitor lodging and replacing the historic frame cabins with approximately 100 new units, plus a restaurant.

The existing campground (±85 sites) would be retained, and 50 new campsites would be added on adjacent lands. No vehicle size restrictions would be placed on any campsites. A larger shower facility would replace the existing laundry and shower building (the same as alternative 2).

• *Food Service, Shopping, and Other Facilities* — As described for the no-action alternative, minor changes and rehabilitation work would be undertaken at Grand Canyon Lodge, and the inn restaurant, camper store/restaurant, and gas station would remain. A new restaurant would be added as part of the new lodging complex to handle the demand from the additional lodgers and campers.

Additional restroom facilities and toilets would be provided on Bright Angel Point and Walhalla Plateau, as described for alternative 2.

Winter Use: The park would remain closed to motorized use during the winter (the same as the no-action alternative). As described for alternative 2, designated motorized and nonmotorized use areas would be provided outside the park in cooperation with the U.S. Forest Service, and a system of winter huts for skier use would be established (no motorized access).

Inside the park three portable winter huts would be provided, and one group campsite, with portable toilets, would be available (the same as alternative 2).

Area Operations

Housing: Some 263 additional housing units would be constructed in existing disturbed areas to replace substandard units and to meet housing needs resulting primarily from increased lodging and restaurant services. As described for alternative 2, the average density would be 15 dwelling units per acre or higher, and the units would be designed to blend with the character and environment of the North Rim. No single-family units would be built; only a few lower density units would be provided.

Community Services: Community services would be the same as alternative 2.

Management Support: The reuse of existing structures would be maximized; any new construction would occur in disturbed areas whenever possible; and conflicts with visitors would be minimized the same as alternative 2.

All NPS management support actions would be the same as described for alternative 2 (a new maintenance building would be built, backcountry and interpretive offices would be provided in the CC Hill orientation center and at Jacob Lake, and the helipad would be moved to an area near the sewage treatment plant). Under this alternative the gas station would remain a visitor gas station and minor maintenance facility.

Management support for the TWRS/ARAMARK concessioner would remain the same as alternative 2. The mule barn would remain the same as alternative 1; the mule staging area, however, would be moved from CC Hill to the edge of Six Rock Meadows.

Utilities: The present water supply and treatment systems would be adequate; lines would be extended to CC Hill, as described for alternative 2. Water-conserving toilets would be placed on Walhalla Plateau (the same as alternative 2).

Tuweep

Summary of Tuweep Actions

To provide uncrowded, primitive experiences at Tuweep, day visitation would be limited during peak times the same as alternative 2 (85 people or ±30 total private vehicles). The total number of campsites would increase from 11 to approximately 15. As described for alternative 2, the Park Service would seek to acquire the airstrip and adjacent private lands outside the park if they could not be acquired by the Bureau of Land Management. The Bureau of Land Management would also be encouraged to acquire all lands near the park entrance to preserve the present visual quality.

Visitor Experience

■ Access, Roads, and Trails

The National Park Service would work with Mohave County and the Bureau of Land Management to keep the dirt access roads to Tuweep in order to preserve the natural visual quality of areas outside the park (the same as alternative 2).

Inside the park the existing roads would remain (the same as the no-action alternative), but vehicles would be limited to a maximum length of 22′ (the same as alternative 2). The existing parking area at the Toroweap overlook would be expanded to meet the established carrying capacity limit of approximately 25 vehicles at any one time. A roadside pull-off at Tuckup trailhead would be added the same as alternative 2.

The existing trail system would be retained, with a new loop trail from the east side of the Toroweap overlook to the Tuweep road near the Saddle Horse Canyon trail (the same as alternative 2).

■ Orientation and Interpretation

Gateway Information: As described for alternative 2, gateway information would be provided through roadside signs and at Pipe Spring National Monument, where reservations could be made and use permits distributed. With the cooperation of the Bureau of Land Management, use permits could also be distributed in Fredonia or St. George.

Tuweep: As described for alternative 2, a roadside information/interpretive kiosk would be provided just inside the park boundary and wayside exhibits would be provided at the Toroweap parking area.

■ Visitor Services

The Bureau of Land Management would continue to offer camping opportunities outside the park.

A campground reservation system would be implemented during the peak season, as described for alternative 2. The two campsites at the Toroweap overlook would be removed, and replacement sites would be provided at the existing campground (the same as alternative 2). Under this alternative three or four additional campsites would be added in the area of the existing campground. A maximum of six people would be

allowed at individual campsites and 11 people at the group site; vehicles would be limited to one per individual site and two for the group site (the same as the no-action alternative).

Area Operations

Housing, management support, and utilities would be the same as alternative 2.

Corridor Trails

Summary of Corridor Trail Actions

Day hiker use would be unlimited, and additional trails would be added for use only by hikers.

Interpretive facilities and programs would be improved at Phantom Ranch and Indian Garden.

Overnight accommodations would remain the same as at present. An additional ranger residence would be provided at Indian Garden (the same as alternative 2).

Visitor Experience

■ Access and Trails

Trail maintenance procedures and hardening techniques would be improved, and visitor education programs and exhibits would be expanded, as described for alternative 2. Private stock use would be retained at its current level the same as alternative 1.

South Rim: Unlimited hiker use would continue on the corridor trails the same as alternative 1. However, to expand hiking opportunities, loop trails would be added off the Bright Angel and South Kaibab Trails, and experienced hikers would be encouraged to use the Hermits and Grandview Trails, the same as alternative 2.

Current visitor mule use would remain the same on the Bright Angel and South Kaibab Trails. Pack mules would be added as needed to take visitors packs in and out of the canyon.

A rim mule trail would be added for several miles along the East Rim starting at the new South Kaibab mule barn.

North Rim: All mule use would be removed from the North Kaibab Trail and replaced on the Six Rock Meadow Trail and the upper few miles of the Old Bright Angel Trail. The first few miles of the Old Bright Angel Trail would be upgraded for mule use, while the rest of the trail would remain an undeveloped hiker trail.

Approximately 140 mule passes per day (for 70 round trips) would be issued for the Six Rock Meadow and Old Bright Angel Trails (the same as the current number on the North Kaibab Trail).

■ Interpretation

At Indian Garden a small amphitheater would be added near the picnic area. The program of roving interpreters on trails would be expanded.

■ Visitor Services

The number of beds (±170) and campground sites at Phantom Ranch would remain the same as alternative 1.

At Indian Garden toilets would be converted to water-conserving models, and such toilets would be added at strategic locations along the trail (the same as alternative 1).

Area Operations

An additional housing unit would be provided at Indian Garden by converting a storage building back to a residence (the same as alternative 2).

Management support facilities would be the same as alternative 1.

The transcanyon waterline would be reconstructed. Toilet facilities along the trails would be water-conserving models (the same as alternative 2).

ACTIONS CONSIDERED BUT REJECTED

In developing the alternatives, the following specific actions were considered and rejected. The reasons for their rejection are briefly described.

Visitor Use / Development, Park Operations

Regional. *Action:* The National Park Service should obtain the scenic corridor along the section of Arizona Highway 67 on the North Rim, which is currently managed by the U.S. Forest Service.

Reasons for Rejecting: This action is not needed because the Forest Service is willing to work closely with the Park Service to manage the scenic corridor in a manner that will ensure a high-quality viewing area and an attractive entryway to the park.

Transportation. *Action:* Several alternative actions relating to transportation were suggested, including public staging areas an hour or more from the park, a bullet train from Williams to the South Rim, a train from Phoenix to the South Rim, and fixed-guideway transit systems (like monorail or light rail) on the South Rim.

Reasons for Rejecting: While all these actions are consistent with the spirit of this plan and some may be undertaken, federally funding them with NPS funds has been rejected. Should any of these actions be proposed seriously, they would have to be funded either by non-NPS public funds or by the private sector. Any of these actions would require an environmental assessment and would be required to complement the transportation system identified in the record of decision that results from this plan.

Action: Another proposal was to provide a car-oriented experience in the village, with adequate parking in the village area and an upgraded south entrance road and village loop road to meet the projected year 2010 demand.

Reasons for Rejecting: This would require many more parking spaces in the village and a four-lane highway from the park entry to the village loop, with a two-lane, one-way village loop. This action would disturb a significant amount of park land for parking, and it would overwhelm the village with vehicles, making the visitor experience unsatisfactory and potentially unsafe.

Action: Mohave County Road should be paved from Arizona Highway 389 to the Toroweap overlook at Tuweep. Also, guardrails should be provided at the overlook.

Reasons for Rejecting: Paving the county road could significantly increase use, would be expensive (particularly considering the volume of use), and would be inconsistent with the vision for Tuweep. Providing guardrails would alter the character of Tuweep.

Housing and Management Support

Action: All needed housing, community services, and management support facilities should be provided within the park.

Reasons for Rejecting: This action would affect numerous acres of currently undisturbed park lands. Lands outside the park boundary (within 5 to 15 minutes of the park) may be available for use. Also, housing and management support space is available for jobs that can be located over an hour from the park.

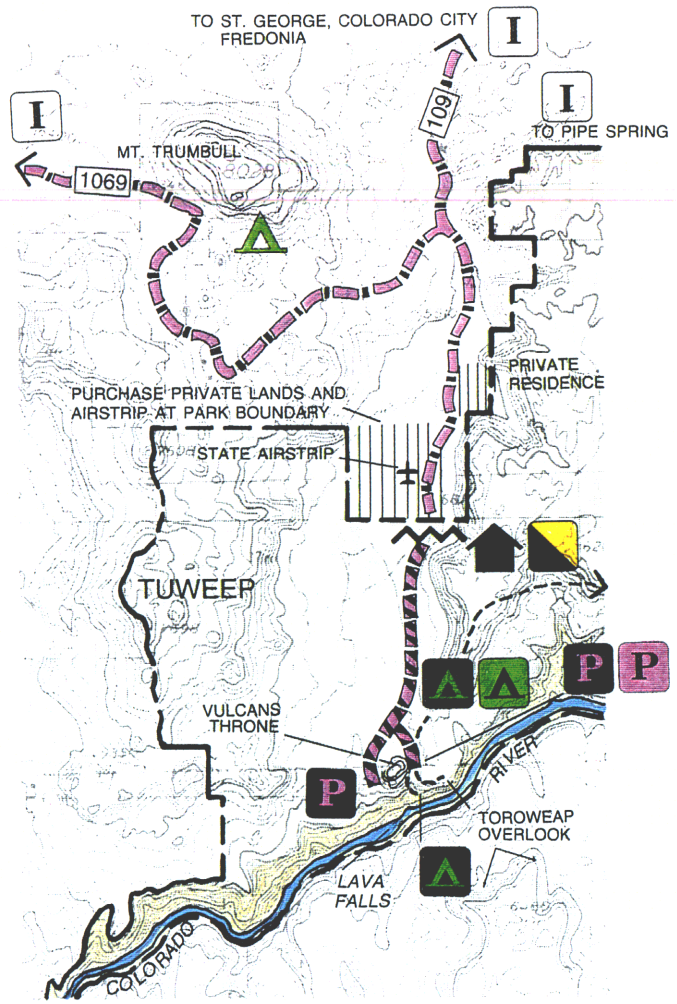
Action: Housing should be provided outside the North Rim of the park (except for housing for employees potentially working at Jacob Lake).

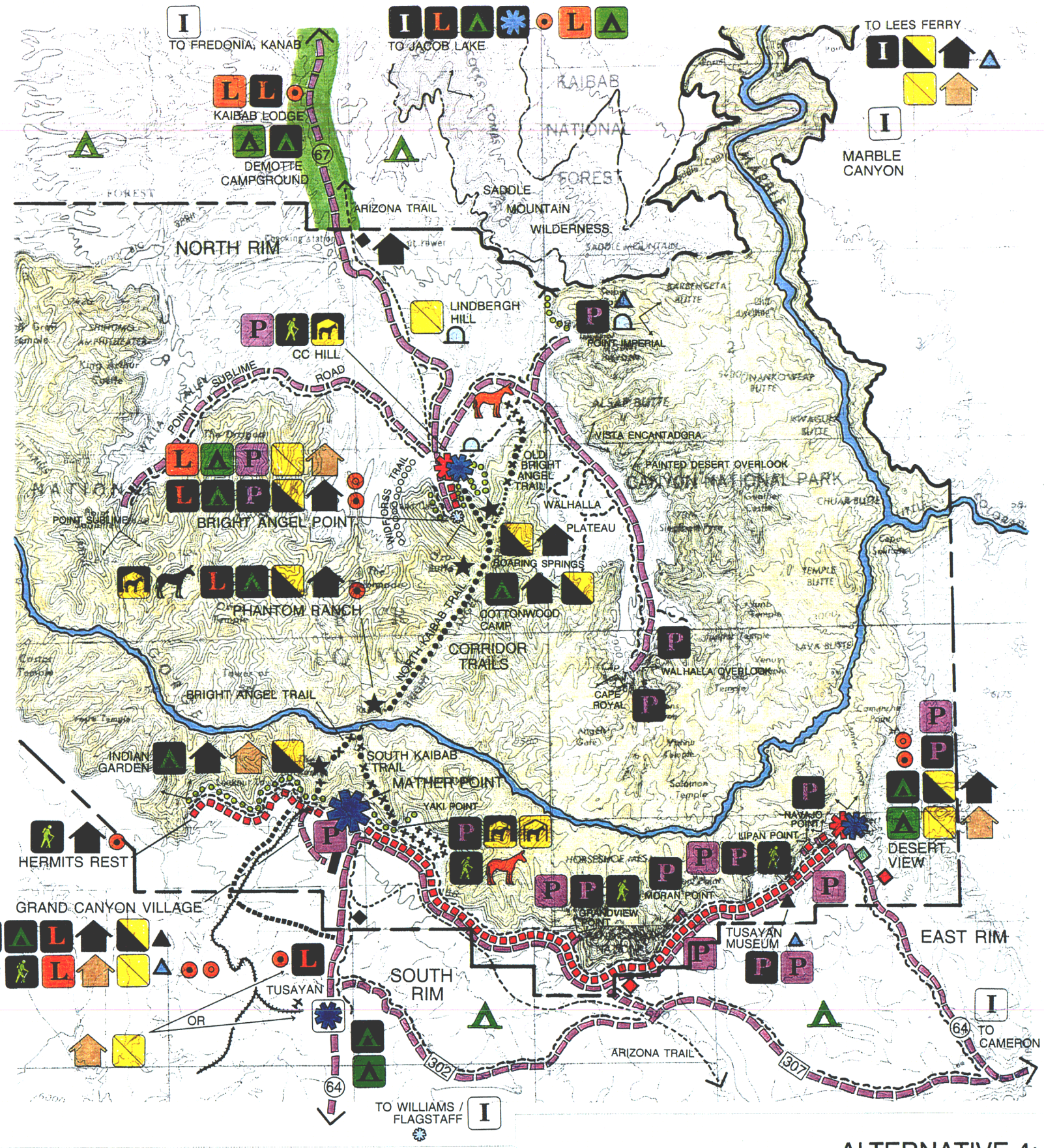
Reasons for Rejecting: This action would potentially disturb forest lands, where sewer and water are not available, or employees would have to drive long distances to work.

North Rim Winter Use

Action: Motorized use should be allowed on the North Rim during the winter.

Reasons for Rejecting: Providing motorized winter access to the North Rim would result in more visitors using the numerous USFS and NPS roads and facilities. Due to the severity and uncertainty of the weather, the safety of these visitors would be difficult to ensure. In addition, motorized winter use is not consistent with the vision for the North Rim.





PARK BOUNDARY
CANYON RIM
CANYON

EXISTING PROPOSED
ENTRANCE STATION
REMOVE ENTRANCE STATION AND REVEGETATE
LIMITED DAY USE
LIMITED NUMBER OF MOTORIZED VEHICLES

EXISTING PROPOSED
MINOR TRANSIT STATION / SHELTER
SHUTTLE BUS ROUTE
UNRESTRICTED ACCESS
RESTRICTED ACCESS
UNPAVED ACCESS
RESTRICTED VEHICLE SIZE ACCESS
EMPLOYEE ACCESS

EXISTING PROPOSED
PARKING
RAILROAD

EXISTING
TRAILHEAD
MAJOR CORRIDOR TRAIL
MINOR CORRIDOR TRAIL
ARIZONA TRAIL
BIKE AND/OR PEDESTRIAN TRAIL

EXISTING PROPOSED
CONCESSIONER MULE BARN
CONCESSIONER MULE STAGING
MULE TRAIL

PROPOSED
MAJOR ORIENTATION CENTER
MINOR ORIENTATION CENTER

EXISTING
CONTACT STATION

EXISTING PROPOSED
GATEWAY INFORMATION CENTER
INFORMATION

EXISTING PROPOSED
LODGING
CORRIDOR TRAIL FACILITY

EXISTING PROPOSED
CAMPGROUND
PRIMITIVE / DISPERSED CAMPING
WINTER USE HUT

EXISTING PROPOSED
VISITOR SERVICES
MUSEUM / INTERPRETATION
HOUSING
MANAGEMENT SUPPORT
SCENIC HIGHWAY

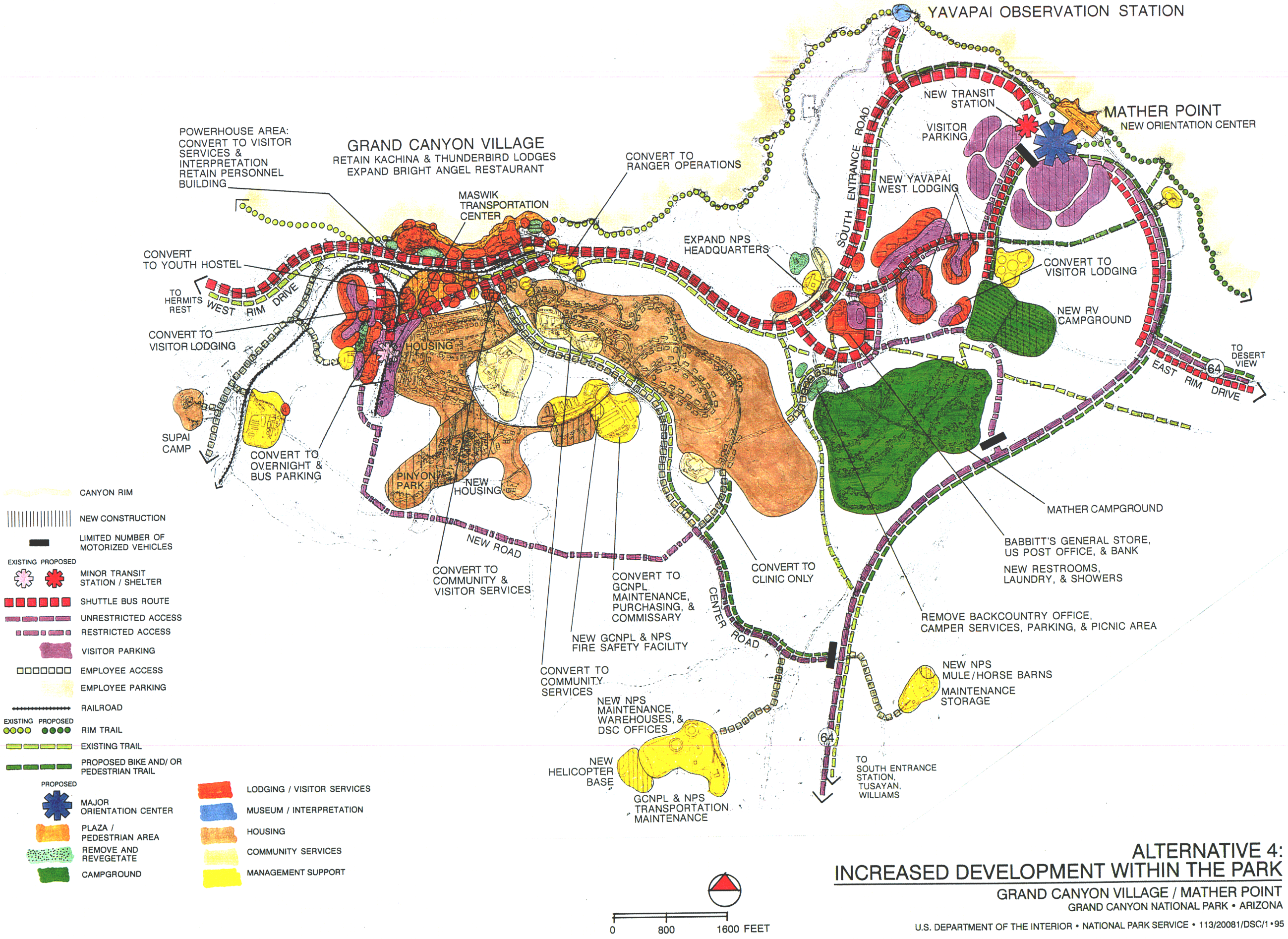
0 2.5 5 MILES

ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK

PARK DEVELOPED AREAS

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20076/DSC/1•95

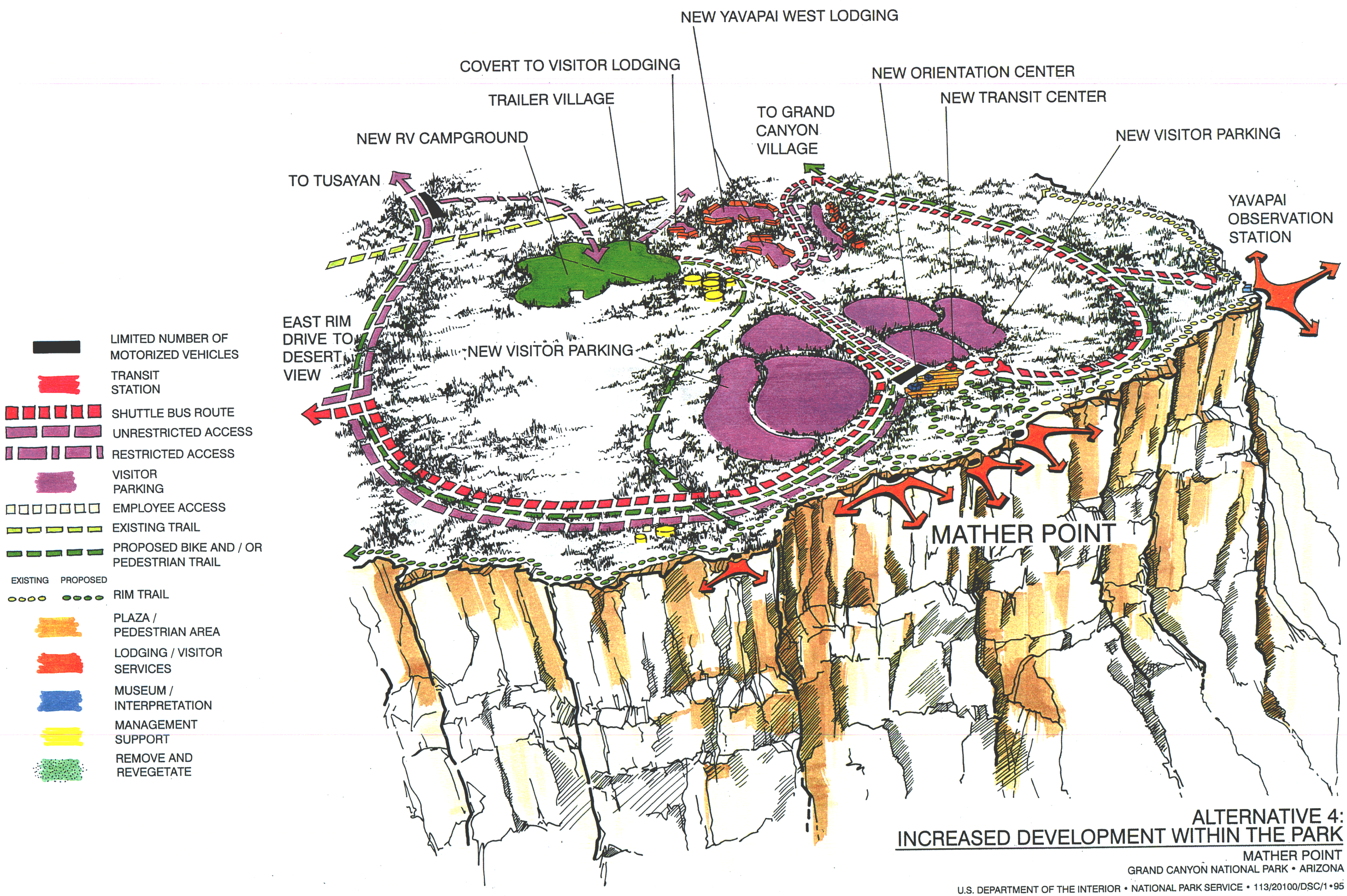


ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK

GRAND CANYON VILLAGE / MATHER POINT

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20081/DSC/1•95

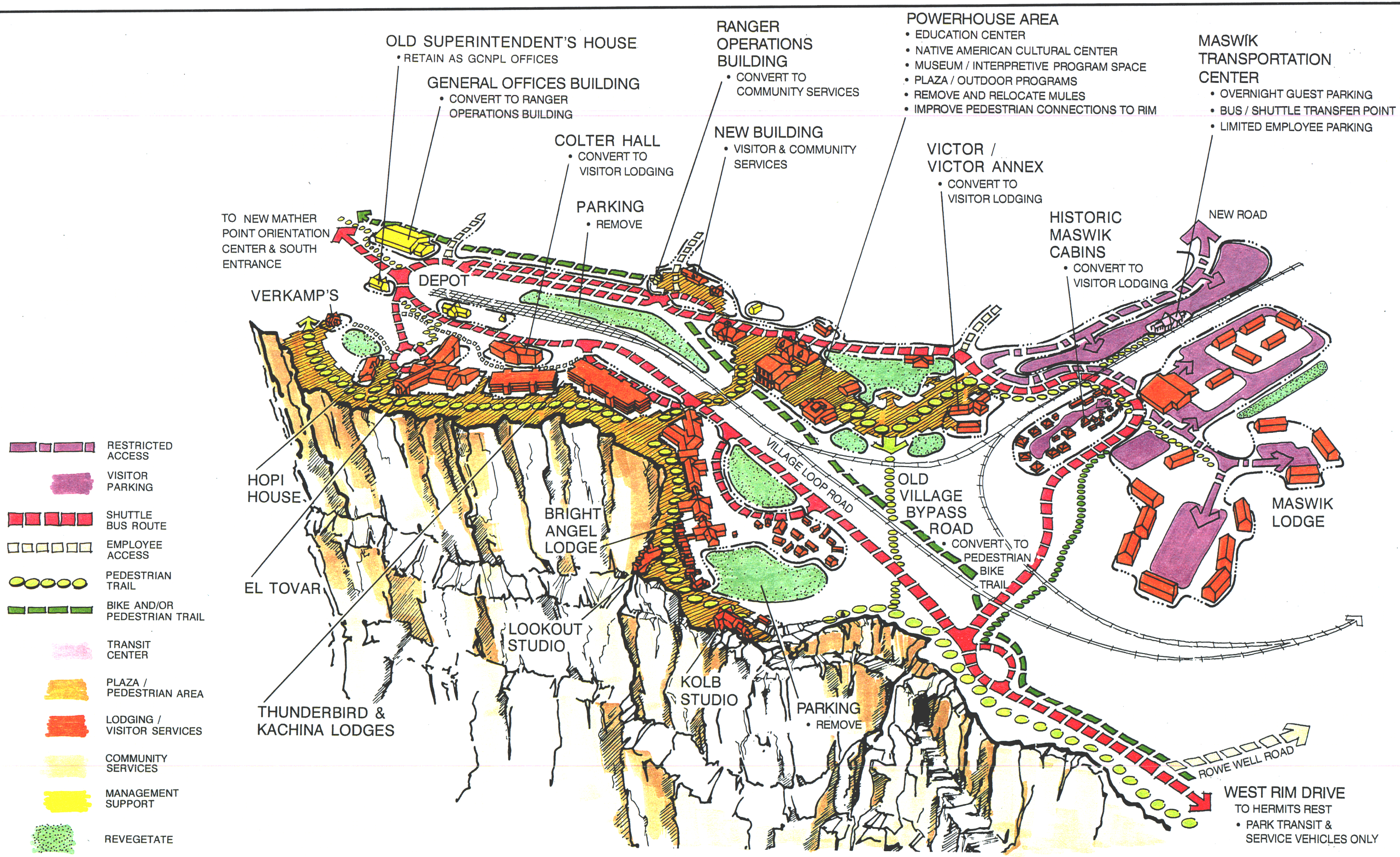


ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK

MATHER POINT

GRAND CANYON NATIONAL PARK • ARIZONA

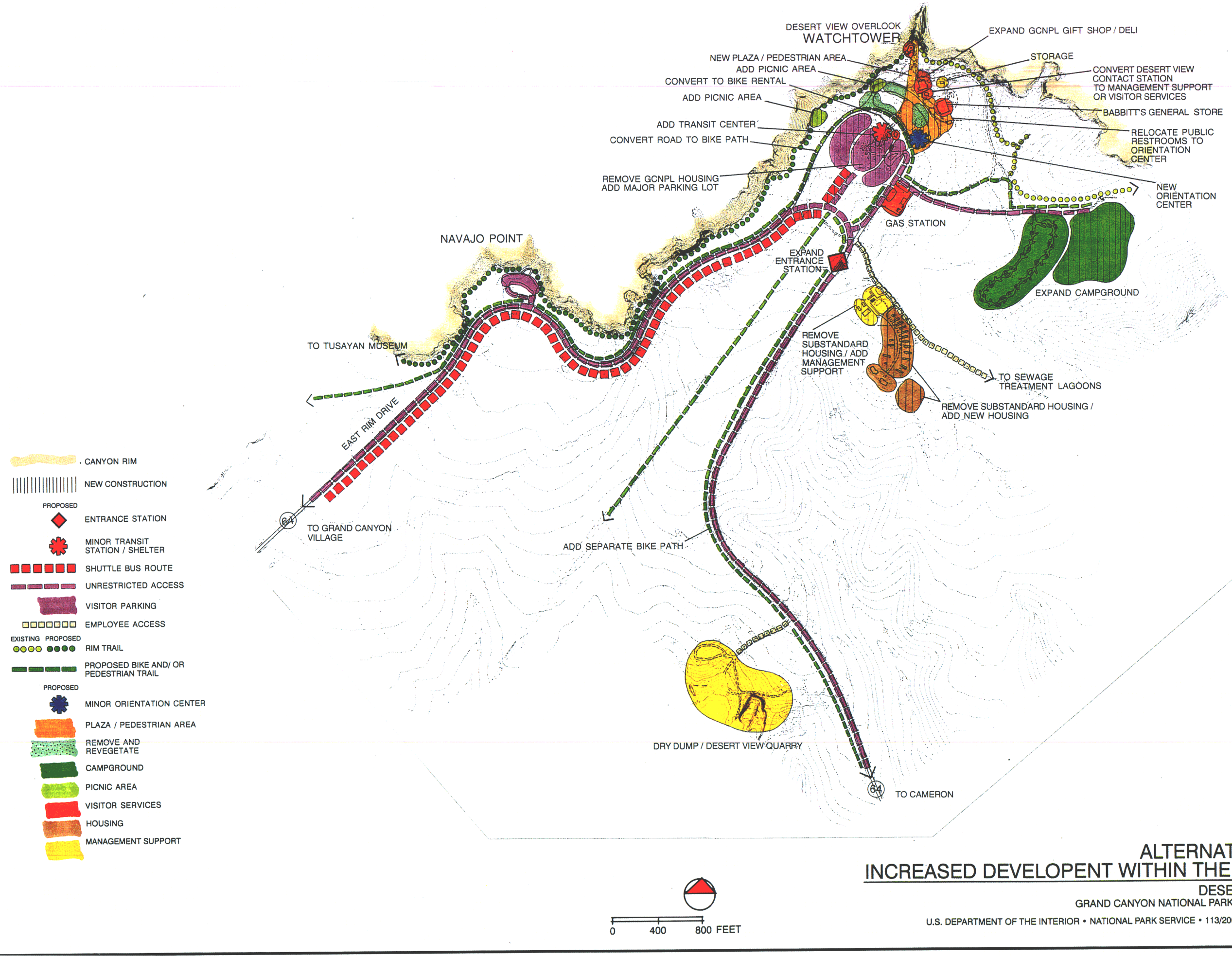
U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20100/DSC/1•95



ALTERNATIVE 4:
INCREASED DEVELOPMENT WITHIN THE PARK

GRAND CANYON VILLAGE
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20099/DSC/1•95

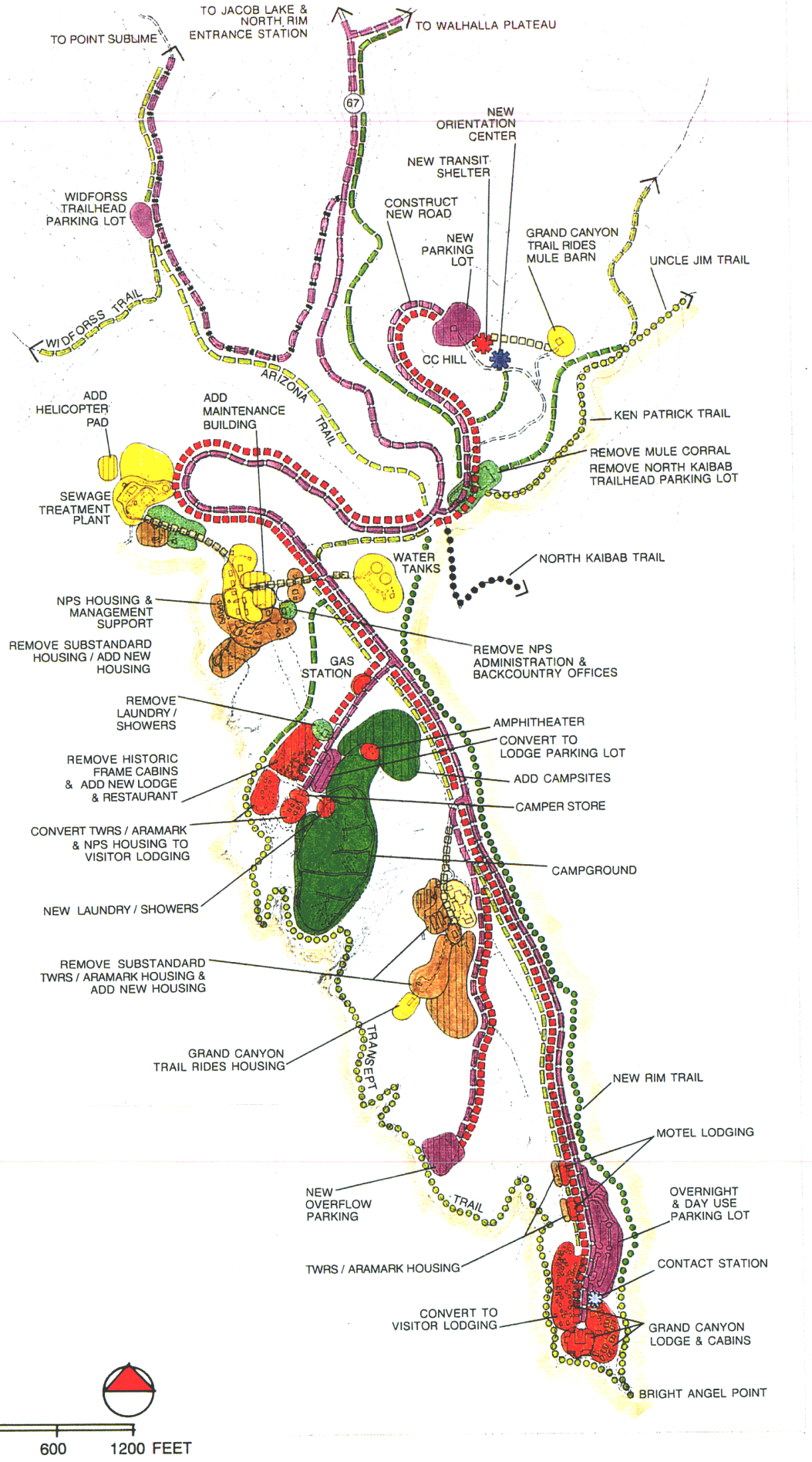


ALTERNATIVE 4:
INCREASED DEVELOPENT WITHIN THE PARK

DESERT VIEW

GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20086/DSC/1•95



CANYON RIM

NEW CONSTRUCTION

PROPOSED
MINOR TRANSIT STATION / SHELTER

SHUTTLE BUS ROUTE

UNRESTRICTED ACCESS

UNPAVED ACCESS

VISITOR PARKING

EMPLOYEE ACCESS

EXISTING PROPOSED
RIM TRAIL

EXISTING TRAIL

PROPOSED BIKE AND/ OR PEDESTRIAN TRAIL

CORRIDOR TRAIL

PROPOSED
MINOR ORIENTATION CENTER

EXISTING
CONTACT STATION

REMOVE AND REVEGETATE

CAMPGROUND

LODGING / VISITOR SERVICES

HOUSING

COMMUNITY SERVICES

MANAGEMENT SUPPORT

ALTERNATIVE 4:
INCREASED DEVELOPMENT WITHIN THE PARK

NORTH RIM / BRIGHT ANGEL POINT
GRAND CANYON NATIONAL PARK • ARIZONA

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE • 113/20091/DSC/1•95

TABLE 1: SUMMARY OF ALTERNATIVE ACTIONS

	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
PARKWIDE ALTERNATIVE CONCEPTS	The present course of action would continue, only minor changes would occur. No major facilities would be built, and no major functions would be relocated. Planning would be focused inside the park, with limited cooperative planning beyond park boundaries. Planning would be primarily in response to existing problems and done when situations became severe. Changes would occur in and adjacent to disturbed areas.	The present course of action would continue until resource damage, visitor safety, and a meaningful visitor experience could no longer be ensured because of too many visitors and vehicles. At that time a reservation system would be implemented to limit the number of vehicles and/or people. Park planning would remain inward focused, however, regional information would be expanded so visitors would understand the reservation system.	Planning and communication would be emphasized regionally. Cooperative planning would focus on distributing information about visiting the park and the area, resource preservation, and providing a quality visitor experience. Locations for needed park facilities would be considered regionally to protect resources throughout the area while still providing a quality visitor experience. Adaptive reuse of historic and functional structures would be maximized. A major shift away from the private automobile orientation would occur. Alternative modes of transportation would be stressed regionally and required in certain park areas. Construction of new facilities would be in existing disturbed areas wherever possible. Visitor experiences would be defined by the unique qualities of each individual area. The number of visitors admitted to certain park areas at any one time would be limited.	Emphasis would be placed on in-park preservation by placing as many facilities as reasonable outside the park. Adaptive reuse of historic structures would be maximized and existing historic uses preserved. Whenever possible, new facilities would not be placed in the park. Alternative modes of transportation would be mandatory in many areas (private vehicles eliminated) and/or the number of people permitted into the park at any one time would be carefully limited.	Emphasis would be placed on providing convenient facilities as near the park and use area as reasonable. Wherever feasible, major park visitor services would be placed in the park. Cooperative work would occur with outside entities to help ensure a quality visitor experience and stress visitor distribution and reduce the need for visitor limitations. Resources would be protected by placing needed facilities in or near disturbed areas or in nearby areas outside the park.
PARKWIDE MANAGEMENT ACTIONS					
NATURAL RESOURCE MANAGEMENT	**Air Quality and Noise** — Enforce pollution and noise emission standards for commercial vehicles in reaction to complaints. Replace NPS vehicles with low-polluting models that also meet noise standards. **Vegetation/Wildlife/Ecosystems** — Manage primarily to address immediate problems. Use native and self-sustaining plant materials in landscaping; allow non-native species to remain. Continue to use borrow pits inside and outside the park for trail maintenance, develop new pits as needed.	**Air Quality and Noise** — Same as the no-action alternative. **Vegetation/Wildlife/Ecosystems** — Same as the no-action alternative.	**Air Quality and Noise** — Require all commercial vehicles entering the park as well as all NPS/concession buses in the park to meet air and noise emission standards. Convert (by year 2010) all NPS and concession buses on the South Rim to either natural gas or battery electric or to an energy source with emissions equal to or better than those vehicles. Provide safe bikeway systems. Create an employee shuttle system for both North and South rims; extend shuttle service into the Tusayan area on South Rim. Require trains to meet federal train emission standards and minimize use of whistles and bells as safety allows. Discourage changes in the Tusayan airport; encourage any needed expansion to occur away from the park. **Vegetation/Wildlife/Ecosystems** — Develop and implement an ecosystem approach to managing threatened and endangered species. Develop an active research program for all ecosystems and species. Develop and implement a vegetation management plan. Landscape around historic structures to maintain the character of the cultural landscape; use naturally occurring plants. Minimize using borrow pits for trail maintenance; use maintenance materials from outside the park wherever possible.	**Air Quality and Noise** — Same as alternative 2. **Vegetation/Wildlife/Ecosystems** — Same as alternative 2.	**Air Quality and Noise** — Same as alternative 2 except encourage more convenient aircraft transportation services farther from the park. **Vegetation/Wildlife/Ecosystems** — Same as alternative 2.

	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
NATURAL RESOURCE MANAGEMENT (cont.)	**Water Resources** — Seek to reduce impacts associated with water use. Provide no additional water storage. Meet potable water needs through conservation, improved efficiency in the system, and greater use of recycled wastewater. Continue to discharge water from the transcanyon waterline at Indian Garden. **Scenic Resources** — Retain current mix of historic and nonhistoric structures and landscapes. Correct impacts at overlooks related to overuse and disturbance. Do vista-clearing on a case-by-case basis, but develop no parkwide guidelines. Shield new light sources in accordance with Coconino County exterior light standards.	**Water Resources** — Same as the no-action alternative. **Scenic Resources** — Same as the no-action alternative.	**Water Resources** — Same as no action except if alternative water sources proved infeasible, then repair the transcanyon waterline, and discharge any unneeded water as near Roaring Springs (rather than Indian Garden) as possible. Establish minimum flow requirements for Bright Angel Creek during droughts. Provide water for federal facilities proposed in Tusayan from the park system unless other sources where developed that had less impact on park resources. **Scenic Resources** — Enhance the character of the historic district by removing many nonhistoric structures and locating new facilities in appropriate areas. Actively maintain overlooks for resource protection and scenic quality. Shield new light sources (same as no-action).	**Water Resources** — Same as alternative 2. **Scenic Resources** — Same as alternative 2.	**Water Resources** — Same as alternative 2. **Scenic Resources** — Same as alternative 2.
CULTURAL RESOURCE MANAGEMENT Archeology, Ethnography, Historic Structures, Cultural Landscapes	Continue limited cultural resource management programs including: data collection and inventorying of archeological sites, traditional American Indian cultural properties, and historic structures primarily to meet specific project needs; intermittent updating of the list of classified structures; ethnographic studies needed for specific projects. Provide limited protection and stabilization of archeological sites. Preserve historic sites as funding allows. Protect identified sacred sites and a few traditional cultural properties. Continue on a limited basis current programs related to nominating historic sites. Continue the active cataloging of park research and library collections.	Same as the no-action alternative.	Establish a comprehensive inventory and data management system for archeological resources, historic structures, cultural landscapes, museum objects, and ethnographic resources. Develop park resource databases and incorporate into NPS national databases. Implement a comprehensive program to preserve and maintain archeological, historical, and ethnographic resources. Organize an active stewardship program for managing the adaptive reuse of historic structures. Execute a memorandum of agreement with each American Indian tribe to ensure the protection of ethnographic resources. Develop a proactive ruins stabilization program and protect sacred sites identified by the tribes. Reduce the backlog of archeological and historic site nominations by developing a plan to determine the relative significance of the resource and to then complete the nomination process. Continue programs for collections management and for cataloging park collections in the proposed curatorial building.	Same as alternative 2.	Same as alternative 2.

	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Visitor Experience					
Visitation	**South Rim** — Allow unlimited day visitation. Retain current overnight visitor accommodations. **North Rim** — Allow unlimited day visitation. Retain current overnight accommodations. **Tuweep** — Allow unlimited day visitation. Retain current overnight use levels. **Corridor Trails** — See "Transportation" below.	**South Rim** — Allow unlimited day visitation until visitor congestion, resource damage, and public safety warrant restricting access. Implement a two part reservation system, first limit only the number of private vehicles allowed to enter the park, then, if necessary, restrict the number of visitors allowed to enter. Retain current overnight visitor accommodations. **North Rim** — Implement by the year 2004 a day use reservation system based on the parking capacity of Bright Angel Point. Retain current overnight visitor accommodations. **Tuweep** — Same as no-action. **Corridor Trails** — See "Transportation" below.	**South Rim** — Allow unlimited day visitation, but limit modes of access (private vehicle parking would be restricted). Increase overnight lodging accommodations by about 25%; increase the number of campsites by about 18%. Limit the number of visitors admitted to the park at any one time by the year 2015. **North Rim** — Limit (by 2005 or 2010) the number of day visitors and establish a day use reservation system based on the number of visitors that can be accommodated within the North Rim developed area. Increase overnight lodging accommodations by about 10%; remove a few campsites as part of a redesign of the campground. **Tuweep** — Limit visitor use at any one time to 85 people or 30 vehicles total, whichever came first. Implement a day reservation system if other options to limit visitation do not work. Establish a camping reservation system; retain the same number of campsites but remove overlook sites and place in off-rim campground. **Corridor Trails** — See "Transportation" below.	**South Rim** — Remove day visitor vehicle use. Reduce overnight lodging accommodations by about 10% and campsites by about 20%. **North Rim** — Establish a day reservation system as described in alt. 1. Manage overnight lodging and campground same as alt. 2. **Tuweep** — Implement a day reservation system; limit visitation based on existing parking (set limit at approximately 20 vehicles total). Establish a camping reservation system; reduce the number of campsites by two sites. **Corridor Trails** — See "Transportation" below.	**South Rim** — Allow unlimited day visitation. Permit all vehicles to enter the park, but allow no private vehicles from Hermits Rest to Yaki Point (same as alt. 2). Increase overnight lodging accommodations by about 40% and campsites by about 30%. **North Rim** — Allow unlimited day visitation. Increase overnight lodging accommodations by about 60% and campsites by about 60%. **Tuweep** — Same as alt. 2 except increase the number of campsites by approximately four sites. **Corridor Trails** — See "Transportation" below.
Access / Transportation Regional Access, Roads, Parking, Transit, Trails	**South Rim** • *Regional Access:* Continue private bus and train service to the park. Encourage local and regional shuttle services. • *Village:* Continue present road use with only minor improvements; retain all existing parking spaces. Allow extensive roadside parking. Continue seasonal public transit service (May-Oct), add no new transit routes and only add new buses as funding allows. Allow concession tour buses throughout the park.	**South Rim** • *Regional Access:* Work with regional transportation authorities to encourage private entities to expand regional transit options. Encourage local and regional shuttle service. Ensure adequate parking is provided outside the park. • *Village:* Same as no-action except add oversized vehicle parking at Southgate; limit private vehicle length to 22′ on West Rim Drive in winter; allow no roadside parking.	**South Rim** • *Regional Access:* Encourage local and regional shuttle services (same as alt. 1). Provide a major parking facility and public transit center at the Tusayan gateway information center. Upgrade USFS 328/Rowe Well Road to a gravel road. • *Park:* Provide two primary parking/staging areas inside the park: one near Mather Point, and the other at Desert View. Provide an energy efficient transit system from Hermits Rest to Desert View with a central transit center located at the Mather Point orientation center. Provide a parking lot for day tour buses at Mather Point and at Desert View. Allow only public shuttle and concession bus access to West Rim Drive and East Rim overlooks year around. Allow private vehicles on East Rim Drive, but restrict access to overlooks. • *Village:* Allow no private vehicles from Hermits Rest to Yaki Point (including the main Village area). Allow overnight visitors to drive to lodging or camping areas. Designate long-term parking for hikers, with an on-call shuttle pick up service from major trailheads. Redesign the business center parking lot and reduce number of parking spaces. Develop an efficient employee shuttle system; provide no additional employee parking.	**South Rim** • *Regional Access:* Encourage local and regional shuttle services same as alt. 1. Provide major parking areas and public transit service from the two gateway centers outside the park (one near Tusayan, one near Desert View). • *Park:* Restrict transportation inside the park to public transit, concession bus, biking, or hiking (overnight vehicles excepted). Allow no private vehicle access on West or East Rim Drives. Expand transit system more than any other alternative; build small transit facilities at key locations. • *Village:* Allow only overnight visitors to drive into the park; once inside they must park in designated locations and use the transit system. Build no new roads or parking lots; reduce/remove and revegetate many existing parking lots. Employee transit and parking same as alt. 2.	**South Rim** • *Regional Access:* Work with regional transportation authorities to encourage private entities to expand regional transit options (same as alt. 1). Pave and maintain USFS 302/307 for year round access; designate it as Arizona 64. • *Park:* Provide major staging areas at Mather Point and Desert View; the Mather Point staging area would be the principal parking area for visitors. Provide a third entrance to the park by upgrading and improving the Grandview entrance station. Permit private vehicles on East Rim Drive; add parking and allow access to all overlooks past Yaki Point. Provide a transit service throughout the South Rim developed area, including East Rim Drive. Create a transit loop on West Rim Drive by adding a new road from the Abyss to Rowe Well Road. Develop an efficient employee shuttle service (same as alt. 2). Provide some additional employee parking. • *Village:* Allow no private vehicles from Yaki Pt to Hermits Rest, including the village and West Rim Drive (same as alt. 2).

	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Access / Transportation (cont.)	**South Rim** (cont.) • *Desert View:* Provide no public transit service to Desert View. Retain the existing parking lot. Allow extensive roadside parking. • *Trails:* Provide no off-road or paved bike trails. Retain existing pedestrian trail system, but no upgrades or expansions would occur. Retain all existing rim mule functions and services. **North Rim** • *Regional Access:* Support the Arizona Department of Transportation's decision to keep Arizona 67 from Jacob Lake to the park closed in winter. • *Park:* Allow unlimited vehicular access. Allow extensive roadside parking. Change no roads or parking on the Walhalla Plateau; allow all sizes of vehicles throughout the area. Provide no public transit, allow concession and private tour buses of all sizes. Provide no NPS employee shuttle. • *Trails:* Build no off-road bike trails. Develop no new pedestrian trails. **Tuweep** — Provide limited maintenance for existing dirt roads and parking areas. Allow roadside parking. Retain existing trail system. **Corridor Trails** — Allow unlimited hiker use and mule use as contracted (on the South Rim, 40 mule trips on the Bright Angel Trail and 20 on the South Kaibab Trail; on the North Rim, 70 mule trips on the North Kaibab Trail and unlimited use of the Ken Patrick and Uncle Jim Trails).	**South Rim** (cont.) • *Desert View:* Same as no action except add additional parking spaces in disturbed areas and allow no roadside parking. • *Trails:* Same as no-action. **North Rim** • *Regional Access:* Same as no action. • *Park:* Same as no action except limit vehicular access once the Bright Angel Point parking capacity has been reached; allow no roadside parking; allow no tour bus parking at the lodge; construct parking lot at CC Hill. • *Trails:* Same as the no-action alternative. **Tuweep** — Same as the no-action alternative. **Corridor Trails** — Same as the no-action alternative.	**South Rim** (cont.) • *Desert View:* Construct a bypass road and change the present road into a dead-end road. Relocate entrance station farther south and double entrance lanes. Remove existing parking lot and revegetate. • *Trails:* Develop an off-road bike/pedestrian trail system from Hermits Rest to Desert View. Provide separate trails for pedestrians and hikers in heavy use areas. Add a few overlooks along East Rim Drive for bike and pedestrian access only. Expand the pedestrian rim trail system. **North Rim** • *Regional Access:* Work with Arizona Department of Transportation, U.S. Forest Service, and others to preserve the visual quality along Arizona 67, and maintain it as small, two-lane road that is no plowed in winter. Encourage visitors to visit the park in vehicles less than 22′ long. • *Park:* Develop a small orientation/transit center on CC Hill. Provide a transit system for Walhalla Plateau and Bright Angel Point. Allow only overnight visitors to drive out to the point; require day visitors on the point to hike, bike, or take the transit system. Remove and revegetate the North Kaibab trailhead parking lot. Limit vehicles on the Walhalla Plateau to a maximum of 22′ long and 8′ wide. Retain the concessioner employee shuttle; establish an NPS employee shuttle system. • *Trails:* Develop an off-road bike trail to link CC Hill, Bright Angel Point, and all overlooks on Walhalla Plateau. Construct rim hiking trails on Walhalla Plateau and Bright Angel Point. Construct short mule trail sections to link the relocated mule staging area and trailheads. **Tuweep** — Work with Mohave County and BLM to ensure access roads remain primitive and retain their visual quality. Conduct limited maintenance on in-park roads (same as no action). Limit vehicle length to 22′. Remove the overlook parking lot and revegetate; create a new parking lot on rock surfaces. Develop a new loop trail from the new parking lot to the overlook. **Corridor Trails** — Allow unlimited hiker use. Harden main trail sections using a natural material, with mule concessioners also responsible for maintenance. • *South Rim:* Allow mule use as in the no-action alternative except permit no additional pack strings for visitor supplies; encourage experienced hikers to use non-corridor trails. • *North Rim:* Work with mule ride concessioner and undertake actions to immediately begin reducing mule-hiker conflicts; establish a monitoring system for resource damage and visitor experience; reduce mule use if user conflicts continue; upgrade the Old Bright Angel Trail.	**South Rim** (cont.) • *Desert View:* Remove all unnecessary parking lot paving and revegetate. Use existing roads for all services. • *Trails:* Allow bikes on roads same as the no-action alternative. Retain existing pedestrian rim trail system with no expansion. **North Rim** • *Regional Access:* Same as alternative 2. • *Park:* Direct buses, RVs, and overflow vehicles to park at the camper store parking lot. Reduce most existing parking area sizes on the Walhalla Plateau and revegetate; do not widen roads or clear vegetation for views. Permit access to Bright Angel Point and Point Imperial for all vehicles allowed in the park; restrict access from the Point Imperial intersection to Cape Royal to vehicles no longer than 22′ and no wider than 8′. Develop an energy-efficient public transit system for Bright Angel Point. Develop an employee transit system, provide no employee parking on Bright Angel Point (same as alt. 2). • *Trails:* Bike trails same as no-action alt. Retain existing pedestrian trail system, publicize the existence of these trails. **Tuweep** — Same as alternative 2. **Corridor Trails** — Conduct a visitor carrying capacity for the three main corridor trails to determine appropriate hiker use levels and establish a monitoring system. Eliminate mule use from the North Rim and eliminate all day mule use from the South Rim. Cut overnight mule use on the South Rim in half, with mules allowed only on the South Kaibab Trail. Allow no increase in pack mules for visitor supplies.	**South Rim** (cont.) • *Desert View:* Move the entrance station farther south and construct a bypass road (same as alt. 2). Build a major new parking lot in the existing GCNPL housing area. Remove existing parking lot near the rim and revegetate the area (same as alt. 2). • *Trails:* Create a bikeway and rim pedestrian system (same as alt. 2). Add a rim mule trail along the East Rim. **North Rim** • *Regional Access:* Same as alternative 2. • *Park:* Allow all sizes of vehicles to use developed area roads. Build a new parking lot and access road at CC Hill (smaller than alt. 2) and in the ballfield area. Remove the parking lot at the North Kaibab trailhead (same as alt. 2). Designate a section of the parking at the lodge for overnight users only. Provide a transit service to all parking lots and other primary destination areas on Bright Angel Point. Size parking areas on Walhalla Plateau to meet demand; make no additions. Develop an employee transit system (same as alt. 2). • *Trails:* Same as alternative 2 except for mule use. Move mule trail use to Six Rock Meadow trail and the first several miles of the Old Bright Angel Trail. Construct a small mule corral/staging area next to the Six Rock Meadow trail. Remove mules from the North Kaibab, Uncle Jim, and Ken Patrick Trails. **Tuweep** — Same as alternative 2 except expand existing parking area rather than relocate. **Corridor Trails** — Allow unlimited hiker use. Improve trail maintenance procedures and hardening techniques (same as alt. 2). • *South Rim:* Add loop trails off Bright Angel and South Kaibab Trails; mule use same as the no-action alternative. • *North Rim:* Keep number of mule passes same as no-action alternative; relocate all mule use to the Six Rock Meadow trail and the upper few miles of the Old Bright Angel Trail, upgrade the latter.

	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
ORIENTATION AND INTERPRETATION	**Regional Information** — Make information available in response to requests. Undertake a limited program to improve the availability of information and to update interested parties. **South Rim** • *Gateway Information:* Establish no gateway information center in Tusayan. • *Village:* Continue existing limited orientation and interpretation services; add no new facilities. Make minor interior changes to existing visitor orientation center. • *Desert View:* Make no changes. Continue contact station in small converted restroom.	**Regional Information** — Increase information distributed to outside entities, including regional information centers. Provide updated information to interested parties. Provide park information at major airports servicing the Grand Canyon. Work with state highway departments to place information signs along all major roads leading to the park. **South Rim** • *Gateway Information:* Establish a center in Tusayan to distribute reservations and other information; work with entities in Tusayan to find an existing space. • *Village:* Same as the no-action alternative except offer special programs in areas where visitors are waiting for long periods and where lines tend to form. • *Desert View:* Same as no-action.	**Regional Information** — Actively work with regional entities to ensure visitors have appropriate information before reaching the park; develop an information network for long-distance trip-planning information; provide updated information at airports (same as alt. 1); work closely with regional entities to provide joint information centers in communities about an hour from the park; place information signs along all major roads leading to the park (same as alt. 1). **South Rim** • *Gateway Information:* Provide an information center north of Tusayan with regional trip-planning information, an outside information kiosk, day parking, transit service, lodging/campground check-in, sales of park entry passes, NPS backcountry information, bike rentals. • *South Rim Overview:* Develop two orientation centers inside the park — a primary one near Mather Point and a smaller one at Desert View. Place the centers back from the rim but within easy walking distance. Allow limited book sales by the park's cooperating association at all orientation centers and major interpretive facilities. • *Village:* Design the Mather Point orientation/transit center as the main location for visitors to learn about the park. Continue to use Maswik transportation center as a minor orientation center. Concentrate interpretive facilities in rehabilitated historic buildings in the powerhouse area of the village. Make the powerhouse area a pedestrian zone and link it to the facilities on the rim. Add an amphitheater in the village historic area; relocate the existing visitor center amphitheater near the business center. Provide theme-oriented interpretive exhibits in the Yavapai observation station and the Tusayan museum. Clean up the Orphan Mine area and provide mine interpretation with waysides and in interpretive facilities. • *Desert View:* Design the orientation center with similar services as at Mather Point but with stronger emphasis on American Indian themes. Rehabilitate the Watchtower as a rest area with limited interpretive exhibits focused on American Indian culture.	**Regional Information** — Same as alternative 2 except establish joint information/orientation facilities outside the park. **South Rim** • *Gateway Information:* Develop two orientation/transit centers for most visitor orientation just outside park boundaries: a large center next to Tusayan (south center) and a smaller one near Desert View (east center). Provide functions similar to those in alternative 2, but expand to also include park backcountry offices, concessioner mule/tour bus registration and offices, limited food service, and basic hiking/camping supplies. Manage book sales the same as alternative 2. • *Village:* Retain the existing Maswik transportation center as the only in-park designated information center. Develop the powerhouse area the same as alternative 2 except allow historic uses still occurring in their original locations to remain (blacksmith, mule barn, dorms). Add new and expanded exhibits at Mather Point. Manage the following facilities the same as alternative 2: Yavapai observation station, Tusayan museum, and Orphan Mine (except do not close access to dangerous areas). • *Desert View:* Emphasize American Indian themes at the east center.	**Regional Information** — Same as alternative 2 **South Rim** • *Gateway Information:* Provide a joint gateway information center in Tusayan near the airport with NPS functions limited to providing park information. Cooperate with other entities at the center to provide a portion of that center's parking. • *South Rim Overview:* Build two orientation/information centers inside the park — one at Mather Point and a smaller one at Desert View. Manage book sales the same as alternative 2. *Village:* Locate the same facilities in the Mather Point center as described in alternative 2 except also provide cafeteria-type food service, lodging/camping check-in, and more restrooms. Develop the powerhouse area the same as alternative 2 except locate the American Indian cultural center at the Tusayan museum. Construct a new museum building and turn the existing museum into a prehistory museum. Rehabilitate and interpret Orphan Mine the same as alternative 3. *Desert View:* Build Desert View orientation center same as alternative 2.

	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
ORIENTATION AND INTERPRETATION (cont.)	**North Rim** • *Gateway Information:* Provide funding to assist in running the USFS Kaibab Plateau visitor center at Jacob Lake. • *North Rim:* Build the proposed contact station near the lodge. Retain existing interpretative facilities and services; provide no additional facilities or services. **Tuweep** — Provide limited information about Tuweep along present access routes; do not advertise the area. Retain existing interpretive brochure, provide no new interpretive services. **Corridor Trails** — Retain existing interpretation services, provide no new ones.	**North Rim** — Same as the no-action alternative except assign an NPS staff person to the USFS Kaibab Plateau visitor center at Jacob Lake to provide information and help distribute visitor use. **Tuweep** — Same as the no-action alternative. **Corridor Trails** — Same as the no-action alternative.	**North Rim** • *Gateway Information:* Develop a joint NPS/USFS gateway information center at Jacob Lake, with the following functions: information/trip planning, NPS day and backcountry permits, book sales, lodging/camping check-in. • *North Rim:* Build a small orientation center at CC Hill. Leave the proposed contact station at the lodge. Retain all existing interpretive facilities and programs. Add outdoor exhibits at Point Imperial. **Tuweep** — Work with other entities to provide better information about the area. Place information signs along major access roads. Allow the staff at Pipe Spring National Monument to make reservations for Tuweep (if reservations become necessary). Create a small wayside pulloff just inside the park boundary and add an information/interpretive kiosk. Provide waysides at the revegetated overlook parking lot. **Corridor Trails** — Expand the roving interpreter program. At Indian Garden provide visitor programs, add a small amphitheater, convert a storage building to a visitor contact station.	**North Rim** • *Gateway Information:* Develop a gateway information center as described for alternative 2. • *North Rim:* Build the proposed contact station at the lodge. **Tuweep** — Same as the no-action alternative except work with other entities to provide appropriate information and use permits to visitors; provide waysides at the Toroweap overlook parking lot (same as alt. 2). **Corridor Trails** — Same as alternative 2 except do not add an amphitheater at Indian Garden.	**North Rim** • *Gateway Information:* Provide a joint NPS/USFS information center at Jacob Lake, with the Park Service providing information and distributing backcountry passes. • *North Rim:* Build a small orientation center at CC Hill as described for alternative 2 except add limited food service. Build proposed contact station at the lodge. Construct a small museum at Point Imperial. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2 except do not provide a new contact station at Indian Garden.
VISITOR SERVICES Lodging, Camping, Restaurants, Gift Sales, Restrooms	**South Rim** • *Village:* Retain rim gift shops. Do not expand visitor services except provide more chemical toilets in high use areas. Retain all existing lodging/camping/RV facilities. Continue present food service facilities but take management action to increase food service capacity. Retain all visitor services in current locations. No change at Hermits Rest. • *Desert View:* No change.	**South Rim** Same as the no-action alternative.	**South Rim** • *Village:* Reduce number and size of rim gift shops; change sales items to reflect park-related themes. Develop a major visitor use / pedestrian area around the powerhouse; adaptively reuse historic structures for educational and visitor facilities (restaurant, gift shop, bike rental, post office, ATM, grocery, deli). Convert Maswik cafeteria to a sit-down evening restaurant. Add restrooms; use composting toilets where water is not available. Convert a portion of the business center parking lot into a picnic/interpretive program area. Relocate the Bright Angel gift and ice cream shops and expand the restaurant. Remove the Kachina and Thunderbird Lodges and convert the area to outdoor seating, dining, and program space. Replace the one-story Yavapai West units with two-story units. Convert the Victor, Victor annex, and Colter dorms to lower priced visitor lodging. Convert Rouzer and Brandt dormitories to lodging for special groups. Convert the historic Maswik cabins to visitor lodging; remove the Maswik plywood cabins. Retain Mather campground; redesign the RV campground. • *Desert View:* Move visitor services back from the rim; move the GCNPL trading post southeast of Babbitt's store; remove existing trading post. Increase the campground by 50 sites. Adaptively reuse a small home for bike rental. Develop the Watchtower as a rest and interpretive area, with limited food service and a small gift shop.	**South Rim** • *Village:* Manage rim gift shops and add toilets the same as alternative 2. Develop the powerhouse area as described for alternative 2 except do not reuse historic buildings still used for their original purpose (mule barn, blacksmith shop). Retain the Babbitt's store in the business center, but remove the bank and post office and revegetate the area. Increase and reconfigure the number of eating establishments. Remove the Thunderbird and Kachina Lodges and convert to outdoor space (same as alt. 2). Add no new lodging except for rehabilitating the historic Maswik cabins and converting them to visitor lodging units. Remove the RV campground, retain Mather campground as is. • *Desert View:* Retain only historic buildings north of the parking lot, remove/relocate all other buildings and revegetate the area.	**South Rim** • *Village:* Develop the powerhouse area, increase restrooms, and convert the business center as described in alternative 2. Make no changes to rim gift shops (same as no action). Retain the Thunderbird and Kachina Lodges. Convert Maswik cabins and dormitories as described in alternative 2. Remodel Yavapai West (same as alt. 2). Double size of the RV campground. • *Desert View:* Increase the campground by 50 sites (same as alt. 2). Expand GCNPL gift shop and deli. Relocate restroom facility to new orientation center. Retain Watchtower and Babbitt's store.

	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Visitor Services (cont.)	**North Rim** — Do not expand visitor services or facilities except for adding toilets in high use areas. Replace some existing facilities with water-conserving toilets. Keep the park closed to motorized use in winter. Leave one group campsite (with a chemical toilet) open in winter. **Tuweep** — Retain camping within the park and manage same as now. Ask campers without sites to camp on BLM land or issue backcountry camping passes (if available). **Corridor Trails** — Do not expand visitor services or facilities except for converting all toilets along the trails to composting models and adding toilets where needed.	**North Rim** — Same as the no-action alternative. **Tuweep** — Same as the no-action alternative. **Corridor Trails** — Same as the no-action alternative.	**North Rim** — Retain existing visitor cabins and motel units at the lodge. Convert lodge and inn cabins now used for employee housing to visitor lodging. Retain four to six historic frame cabins; remove the rest and revegetate the area. Redesign and revegetate the campground. Limit vehicle length in campground to 22′. Construct a larger replacement laundry and shower facility in the campground. Undertake minor changes at the lodge to improve visitor services; retain all existing services at the camper store. Adaptively reuse the gas station for bike rental. Add picnic sites and redesign those sites at overlooks. Add restrooms at the CC Hill orientation center and provide composting toilets on the Walhalla Plateau. Keep the North Rim closed to motorized use in winter; keep the concession facilities closed in winter. Work with outside entities to provide a system of winter huts; locate three portable huts inside the park. **Tuweep** — Establish a camping reservation system during the peak use season. Convert toilets to composting toilets. Relocate the two campsites from the overlook to the existing campground. **Corridor Trails** — Convert all toilets to composting models (same as no action).	**North Rim** — Same as the no-action alternative except redesign and revegetate campground (same as alt. 2) and rehabilitate lodge and historic frame cabins for visitor use. **Tuweep** — Same as alternative 2 except do not replace campsites removed from the overlook. **Corridor Trails** — Convert all existing toilets along the trails to composting models but add no additional toilets. Make no changes at Indian Garden or Cottonwood.	**North Rim** — Convert lodge cabins to visitor lodging. Replace historic frame cabins with approximately 100 new units, plus a restaurant. Retain existing campground and add 50 new campsites in adjacent areas. Replace laundry and shower facility and increase restrooms as described in alternative 2. Retain gas station. Keep the park closed to motorized use in winter. Provide winter huts (same as alt. 2). **Tuweep** — Same as alternative 2 except add three or four additional campsites in the area of the existing campground. **Corridor Trails** — Same as no-action except upgrade Indian Garden toilets.
Area Operations					
Housing NPS and Concession	**South Rim** • *Village:* Remove only the worst substandard housing units and retain all other existing housing in the park. Build only already approved housing units to replace worst substandard conditions. Require employees to find their own housing outside the park once in-park housing is filled. • *Desert View:* Build no new housing units. Retain all substandard units. **North Rim** — Construct some new dorm units within the park, build no other housing units. Allow seasonal travel trailers to relieve overcrowded housing conditions. **Tuweep** — Replace the substandard seasonal ranger trailer with a trailer in the same location. **Corridor Trails** — No change.	**South Rim** • *Village:* Same as the no-action alternative except remove all substandard housing. • *Desert View:* Remove substandard housing. Build some housing units to replace substandard units and to provide for additional housing needs. **North Rim** — Construct some new housing units within the park. **Tuweep** — Same as the no-action alternative. **Corridor Trails** — Same as the no-action alternative.	**South Rim** • *Village:* Remove all substandard housing and relocate dorm employees; keep remaining housing. Build all in-park housing in two heavily disturbed areas. Build remainder of needed housing near Tusayan. • *Desert View:* Replace substandard housing. Build new units in a disturbed area east of Arizona 64. Remove all housing from the GCNPL area south of the existing parking lot. Locate any housing not fitting in this area to areas where utility extensions already exist. • *Other Areas:* Remove the trailers at Hermits Rest, replace either in the village or in housing outside the park. Rehabilitate the existing housing at the South Kaibab trailhead. **North Rim** — Construct housing in existing disturbed areas as much as possible. **Tuweep** — Same as the no-action alternative except either rent a private residence outside the park for the seasonal ranger or locate a new seasonal unit in an unobtrusive location. **Corridor Trails** — Convert an Indian Garden storage facility back into housing.	**South Rim** • *Village:* Retain existing historic and standard housing and use existing dorms for employees. Remove substandard housing but build no new replacement housing in the park. Construct all new housing outside the park near Tusayan. • *Desert View:* Remove substandard housing. Build new units (min. 15 units per acre) in existing disturbed areas. Rehabilitate the one historic house and retain it as a residence. Build units outside the park near the orientation/transit center. • *Other Areas:* Same as alternative 2. **North Rim** — Same as alternative 2. **Tuweep** — Same as the no-action alternative except seasonal ranger housing same as alternative 2. **Corridor Trails** — Same as alternative 2.	**South Rim** — Same as alternative 2 except provide a few more housing units at Desert View. **North Rim** — Same as alternative 2. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2.

	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
COMMUNITY SERVICES All services for the community (i.e., schools, day care, clinic, recreation centers, churches)	**South Rim** • *Village:* Retain all existing services and facilities. Build no new facilities and convert no existing structures to community services. Permit temporary trailers to be placed in disturbed areas to address severe community service needs. • *Desert View:* No change. **North Rim** — No change.	**South Rim** — Same as the no-action alternative. **North Rim** — No change.	**South Rim** • *Village:* Expand community services outside the park. Continue in-park services, and adaptively reuse historic structures for any in-park additions (primarily in the historic NPS maintenance area). Rebuild Babbitt's store for a post office, grocery, deli. Retain the post office, bank, and grocery store in the business center. Centralize outdoor postal delivery boxes. • *Desert View:* Build a new employee laundry, lounge; provide a small outdoor recreation area. **North Rim** — No change.	**South Rim** • *Village:* Same as alternative 2 except leave the NPS mule and horse uses in the historic maintenance area; relocate the post office and bank from the business center to outside the park; add a postal station at Babbitt's store. • *Desert View:* Same as alternative 2. **North Rim** — No change.	**South Rim** — Same as alternative 2. **North Rim** — No change.
MANAGEMENT SUPPORT NPS and Concession	**South Rim** • *Village:* Build no new facilities. Allow NPS operations to remain dispersed throughout the village in overcrowded and temporary facilities. Continue GCNPL primary operations in the powerhouse area and along the rim; retain all mule facilities. Add temporary office trailers to meet severe space needs. • *Desert View:* Use temporary trailers to provide additional needed space. **North Rim** — Retain existing facilities; add temporary office trailers in disturbed areas if needed. **Tuweep** — No change. **Corridor Trails** — No change.	**South Rim** — Same as the no-action alternative. **North Rim** — Same as the no-action alternative. **Tuweep** — No change. **Corridor Trails** — No change.	**South Rim** • *Village:* Reorganize or relocate all NPS management spaces except for the Albright Training Center. Move all GCNPL functions out of the powerhouse area. Construct some new buildings in disturbed areas. Move as many jobs to Flagstaff or Williams as possible. • *Desert View:* Retain existing functions except for some minor construction of facilities in disturbed areas. • *Other Areas:* Move the NPS boat shop and related functions to Lees Ferry. **North Rim** — Retain all NPS space except for the following minor changes: build a new maintenance building; include a new backcountry office and some interpretive office space at a new Kaibab Plateau visitor center at Jacob Lake; relocate the helipad. Retain all existing concessioner facilities except build a new joint transit maintenance facility; relocate the mule staging area. **Tuweep** — Expand office space slightly. **Corridor Trails** — No change.	**South Rim** • *Village:* Relocate many NPS and concession management support facilities outside the park. Remove only some of the GCNPL support functions from the powerhouse area; retain existing functions at the mule barn and blacksmith shop. Move as many jobs to Flagstaff or Williams as possible. • *Desert View:* Same as alternative 2 plus convert the gas station into a joint fire/safety facility. • *Other Areas:* Same as alternative 2. **North Rim** — Same as the no-action alternative except emphasize maximum reuse of existing structures and build a new NPS maintenance building in a disturbed area (same as alt. 2); remove concessioner mule barn corrals and staging areas and reuse all other mule facilities. **Tuweep** — No change. **Corridor Trails** — No change.	**South Rim** • *Village:* Same as alternative 2 except retain the GCNPL personnel building; relocate the new GCNPL mule facility near the South Kaibab trailhead; relocate the helipad near the dry dump; move no jobs to Flagstaff or Williams. • *Desert View and Other Areas:* Same as alternative 2. **North Rim** — Same as alternative 2 except retain the gas station; build a smaller joint transit center; relocate the mule staging area. **Tuweep** — Same as alternative 2. **Corridor Trails** — No change.
UTILITIES	**South Rim** • *Village:* Make no utility changes for water supply, wastewater treatment, or electricity, except for minimal extensions of distribution lines. • *Desert View:* Make minor improvements (upgrade pressure pumps, improve existing lagoons, add low-flow fixtures to the facilities). **North Rim** — Undertake no major utility changes. **Tuweep** — Enlarge septic and water catchment system. **Corridor Trails** — Reconstruct the transcanyon waterline. Make no changes to the water system along the corridor trails.	**South Rim** — Same as the no-action alternative. **North Rim** — Same as the no-action alternative. **Tuweep** — Same as the no-action alternative. **Corridor Trails** — Same as the no-action alternative.	**South Rim** • *Village:* Emphasize water conservation, expand use of reclaimed water, use precipitation harvesting when applicable to reduce the amount of water pumped to the rim. Make no changes to the wastewater treatment facility; redesign and reduce the size of overflow lagoons. • *Desert View:* Same as no action. **North Rim** — Build new water- and sewerline extensions to the CC Hill orientation center. Add a water storage facility at Lindbergh Hill. **Tuweep** — Same as no action plus develop a septic system at the seasonal ranger unit (if needed). **Corridor Trails** — Modify the transcanyon waterline so no additional potable water is taken from Roaring Springs, minimum flows are maintained in Bright Angel Creek, and no unused water is released into Garden Creek.	**South Rim** • *Village:* Provide water for the south orientation/transit center and other park administrative and housing uses outside the park, using the most feasible and environmentally sensitive approach to provide and store water. Make no changes for water storage or at the sewage treatment facility. • *Desert View:* Make no changes to existing water and wastewater systems. **North Rim** — Make no changes to the water supply system other than minimal line extensions and dual pumping facilities. Expand the sewage treatment plant. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2.	**South Rim** • *Village:* Increase water storage; expand wastewater treatment plant. • *Desert View:* Same as the no-action alternative. **North Rim** — Same as alternative 2 except no new water supply at Lindbergh Hill. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2.

TABLE 2: SUMMARY OF ENVIRONMENTAL CONSEQUENCES

IMPACT TOPIC	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
OVERVIEW OF IMPACTS	Uncontrolled growth would continue within the park, with only limited improvements to visitor services. Damage to natural and cultural resources would continue to worsen, and the visitor experience would become degraded. Communication with visitors to help them plan their trip so they could have a quality experience in the park would continue to be minimal, resulting in negative experiences for park visitors. Extensive quantities of substandard housing would remain, along with an ever-increasing shortage of park housing, forcing more and more employees to find housing in adjacent areas, perhaps long distances from the workplace. The lack of operational space would become severe, reducing employee effectiveness. Over the long term the economy of the area could be damaged due to the worsening image of Grand Canyon National Park and the poor visitor experience.	Park resource damage and a worsening visitor experience at Grand Canyon would be alleviated by limiting the number of people visiting developed areas on the North and South Rims at any one time. Tuweep would continue to experience uncontrolled use, possibly leading to deteriorated natural resources and a degraded visitor experience over the long term. Some impacted areas would be rehabilitated, helping to restore resources within the park. The visitor experience would improve compared to the no-action alternative because fewer people would be competing to use facilities. However, visitors would continue to be frustrated by not being able to easily find places they want to see. Information, orientation, and education about park themes would remain ineffective because of inadequate and poorly located facilities. Visitors would not be well distributed throughout the park, reducing the number of people who could enjoy the park at any one time, and more and more visitors would be turned away. An increasing number of employees would not be able to live in the park, and many would have to find their own housing, often over an hour from the park. Housing in some developed areas would be improved, and the need for additional housing would be reduced by limiting visitation. Some improvements would occur outside the park due to NPS assistance to outside entities for regional visitor information. However, many park problems would fall to regional entities, for example, visitors parking outside the park and using private transit services to enter the park, disappointed visitors being turned away at the gate, and housing for park employees.	A stable situation for the future would be provided for all the developed areas of the park, significantly improving natural and cultural resources, providing a high-quality visitor experience, and ensuring quality living and operating conditions for park employees. Most development would occur in disturbed areas, historic structures would be adaptively reused, resource damage would be minimized, park operations and living communities would function well, and regional economies would be enhanced. By establishing visitor use capacities, the park would be able to ensure high-quality visitor experiences. Planning would be done regionally to encourage sustainable planning, design, and implementation in a regional context.	There would be an emphasis on preserving natural and cultural resources within the park, and many park disturbed areas would be rehabilitated. The visitor experience within the park would be highly controlled on the South Rim, and strict limitations of the number of visitors on the North Rim and at Tuweep would force many visitors to plan far in advance to experience those areas. Many more acres would be disturbed outside the park than any other alternative as a result of park-related facility development; services, housing, and operational facilities within the park would be limited. Many visitors would be inconvenienced since no private vehicles could be driven through the park.	Allowing all visitors to enter the park and developing facilities to accommodate their needs would result in continuing resource damage. This alternative would produce more resource damage inside the park than any alternative and would set a precedent for continued resource damage in the future. The greatest resource damage would be caused by widening roads and developing additional parking. Visitor convenience would be significantly enhanced. Park operations and development would continue to expand to meet visitor demand. After 2010 the visions and management objectives for the developed areas might not be attainable due to the increases in facilities and visitors. Impacts to regional resources would increase over the long term as a result of growth inside and outside the park to meet visitor needs. Due to ever-increasing needs for park construction, new employee housing, and larger visitor facilities, the regional economy would continue to increase.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Impacts on Natural Resources					
Species of Special Management Concern, Geological Resources, Vegetation, Wildlife, Soils, Water Resources, Air Quality	**Region** — Impacts on species of concern are likely due to increased use of USFS 302/307 and 328. Unlimited park visitation would also increase use of adjacent USFS and BLM lands, and increase demand for potable water. Air quality would be reduced locally due to increased vehicles, no emission standards, limited transit use, and wood smoke. No new disturbance outside the park would be directly caused by NPS actions. **Parkwide** — Species of concern would be managed on a case-by-case basis, rather than a more comprehensive ecosystem management approach. Limited vegetation management and revegetation programs would continue ecosystem impacts. Noise and visual intrusions would be managed on a case-by-case basis. Limited programs for research and data would hamper natural resource management. Extensive visual intrusions would remain, and vehicles would increasingly dominate the visual scene. **South Rim** — The endangered sentry milkvetch would receive limited protection. Extensive roadside parking would increase trailing and other impacts. Adding 200 housing units near the YACC camp would impact about 30 new acres. About 625 total acres would be disturbed, including ±33 acres of new disturbance; no restored acreage. **North Rim** — Extensive roadside parking would increase trailing and other impacts. The parking lot at CC Hill and new housing would be mostly in existing disturbed areas. There would be more noise and less solitude, and vehicles would increasingly dominate visual scene. Total disturbance would amount to ±198 acres, including 1 acre of new disturbance; no restored acreage. **Tuweep** — Impacts would increase because of more roadside parking, unlimited visitation, and greater campground use. Disturbance would total ±18.5 acres; no new disturbance and no acreage restored. **Corridor Trails** — Mule use impacts would continue, with a possible impact reduction on North Kaibab Trail due to trail hardening and bypasses; if mule numbers expanded to meet demand, positive effects of mitigating measures would be lost. Borrow pit impacts would increase. Water withdrawal impacts would probably increase. Unlimited day hiking would increase trail congestion, noise. About 21 acres total disturbance; no new disturbance and no acreage restored.	**Region** — Same as no action except possible adverse effects of visitors/vehicles waiting to enter the park. Fewer vehicles in the area due to the reservation system would slightly improve local air quality and noise. About 9 acres of new disturbance for parking in Tusayan. **Parkwide** — Same as no action except fewer vehicles (due to the reservation system) would slightly improve local air quality and noise. Also, eliminating roadside parking would substantially reduce impacts along roads. **South Rim** — Same as no action except ±5 acres more disturbance than the no-action alternative, including 33.5 acres of new disturbance and no restored acreage. **North Rim** — Same as no action except ±8 acres more disturbance, including ±8 acres of new disturbance and no restored acreage. **Tuweep** — Same as no action except ±0.5 acre of new disturbance for housing. **Corridor Trails** — Same as no action.	**Region** — Species of concern in Tusayan area could be affected by a gateway information center, federal housing, and increased use of USFS 328 and USFS 302/307. Vehicle limits on the South Rim and a staging area near Tusayan would transfer some impacts outside the park. Greater regional cooperation would reduce ecosystem impacts. An emphasis on transit and emission standards for commercial vehicles would reduce local air and noise emissions. Housing and parking outside the park would disturb ±65 acres, primarily in the Tusayan area. **Parkwide** — An ecosystem management approach would benefit species of concern and other ecosystem components. Emphasizing transit, alternative transportation, and emission standards for commercial vehicles would reduce air and noise emissions. Visual impacts from vehicles would be reduced in most areas. Eliminating roadside parking would substantially reduce ecosystem impacts. **South Rim** — The endangered sentry milkvetch would be protected. Not building about 200 housing units near the YACC camp would retain 30 acres of undisturbed forest. About 50 additional acres would be disturbed compared to no action, including ±100 acres of new disturbance and 5.5 acres restored. About 60% of new disturbance would be for new trails, 10% for the Mather Point area, and 10% for road changes. **North Rim** — Additional disturbance of ±70 acres compared to no action; all new disturbance and ±1.5 acres restored. About 80% of the new disturbance would be new trails, and 13% for new housing. **Tuweep** — New disturbance of ±1 acre compared to no action due to trail and parking changes. Limits on people and vehicles would limit impacts to existing areas and levels. New parking areas could affect ephemeral pools. **Corridor Trails** — No change in affected acreage. Hardening trails and other actions would reduce mule impacts and the need for borrow material. Minimum flows would limit impacts of water withdrawals on Bright Angel Creek, and reducing overflow at Indian Garden would help restore ecology of Garden Creek and Bright Angel Creek. Trail congestion, noise, and solitude would be the same as no action.	**Region** — Disturbance outside the park would be the greatest of any alternative: ±85 acres of new disturbance in Tusayan area, ±7 acres east of Desert View, and ±1.5 acres new disturbance outside the North Rim. Greater potential for adverse effects on species of special concern compared to alternative 2 because of more development in the Tusayan area. Requiring all day use visitors to park outside the park and use transit would transfer most vehicle impacts outside the park. Impacts associated with greater regional cooperation, transit and emission standards same as alternative 2. **Parkwide** — Same as alternative 2, except much greater reductions in air and noise emissions and vehicle impacts on visual scene. **South Rim** — About 18 fewer acres would be disturbed compared to no action, including ±11 acres new disturbance and 41 acres restored. Restored acreages would mostly occur through removing and revegetating parking areas, substandard housing areas, and the RV campground, while new disturbance would primarily be due to utility changes at Desert View. **North Rim** — About 8.5 acres more disturbance than no action, including ±10 acres new disturbance, primarily for housing, and 0.5 acre of restored parking lots. Removing mules would eliminate their adverse effects on rim trails, corrals, and staging areas. **Tuweep** — Same total acreage of disturbance as no action, including 0.5 acre new disturbance for parking, and 0.5 acre of former parking area restored. **Corridor Trails** — Affected acreage same as no action. Eliminating mules from the North Rim, reducing mules from the South Rim, establishing a hiker carrying capacity, and reducing overnight limits at Phantom Ranch would reduce impacts on trail ecosystems, decrease trail congestion and noise, and increase solitude. Reduced mule use would also reduce the need to use borrow material for trail maintenance. Water resources would be the same as alternative 2.	**Region** — About 50 acres new disturbance for housing, gateway information center, and parking in the Tusayan area, and ±2 acres new disturbance outside the North Rim. Paving USFS 302/307, with associated road widening and greater human/vehicle presence, would likely adversely affect species of special concern and roadside ecosystems for about 40 miles. Impacts on USFS roads on the North Rim would be the same as no action. **Parkwide** — Same as alternative 2, except the impact of vehicles on the visual scene would be greater than all alternatives except no action. Also, local air and noise emissions would be greater than alternatives 2 and 3, but less than no action and slightly less than alternative 1. Ecosystem impacts would also increase due to more lodging and camping. **South Rim** — Over 130 acres of new disturbance, by far the most of any alternative. Total disturbance would be over 100 acres greater than no action, even with ±5 acres restored. About 45% of the new disturbance would be trails, about 25% parking, over 10% roads, and about 9% management support facilities. **North Rim** — About 85 acres of new disturbance, the greatest of any alternative. Total disturbance would be ±90 acres greater than no action, with ±0.5 acre of restored parking lot. Over 65% of the new disturbance would be trails, about 14% housing, and about 12% lodging and camping increases. Moving mule staging to Six Rock Meadow would adversely affect that area. **Tuweep** — About 1 acre greater disturbance than no action, including 2.5 acres new disturbance and ±0.5 acre restored. **Corridor Trails** — Same as alternative 2, except disturbed acreage ±3.5 acres greater than other alternatives due to new loop trails off Bright Angel and South Kaibab Trails. Improving the upper part of the Old Bright Angel Trail for stock use would add mule impacts into that area, but removing mules from the North Kaibab Trail would allow that area to recover from stock impacts.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Impacts on Cultural Resources					
Archeological Resources and Traditional Cultural Properties	**Region** — Various management entities would continue to research and preserve archeological and traditional cultural sites, with limited NPS collaboration. Along USFS 302/307 resources would receive increased impacts because of additional use. **Parkwide** — There would continue to be a lack of context in which to evaluate relative resource significance. Due to a case-by-case approach, sites could be impacted. Illegal collections would continue. **South Rim** — Indirect impacts would increase as visitation and social trailing increased. Direct and indirect impacts would result from the proposed 200 housing units near the YACC camp. Unplanned village development could affect cultural properties. At Desert View no planned effects to sites and properties would occur, but impacts could occur due to unplanned development to address specific problems. Adding toilets at the Tusayan ruins could negatively affect archeological sites. **North Rim** — Indirect impacts to archeological and traditional sites could occur on the Walhalla Plateau because of social trailing. Negative effects could occur due to unplanned development in response to specific problems. **Tuweep** — Indirect impacts on archeological sites would continue in the campground. **Corridor Trails** — Upgrading the transcanyon pipeline would potentially affect at least one archeological site. Indirect impacts would continue along trails because of illegal collections and erosion.	All impacts would be the same as the no-action alternative.	**Region** — Improved research and preservation of resources would result from increased NPS collaboration with outside entities. Possible effects on archeological and traditional cultural sites from a gateway information center, parking/staging, and NPS housing outside the park would be addressed in a separate environmental document. **Parkwide** — Archeological resources would benefit through comprehensive inventory, research, and recovery programs, an integrated data base, an active collections program, and a monitoring system. Traditional cultural sites would benefit from ethnographic surveys, site inventories, consultation with American Indians, and early identification of potential sites. Monitoring and protection programs would curtail illegal collections and reduce impacts from visitation. Every effort would be made to avoid resources and sites and to mitigate adverse effects. **South Rim** — The Mather Point orientation center and parking lot, related road construction, and Maswik Road could directly or indirectly affect 11 sites. Expanded interpretation of archeology and American Indian culture would increase education and help protect sites and properties. Archeological resources and sites could be affected at Desert View during construction of a road bypass and construction of an East Rim–West Rim bikeway. **North Rim** — Additional picnic areas on Walhalla Plateau could cause indirect impacts to nearby sites and properties. Rim hiker trails could potentially affect a large number of sites and properties. Ethnographic studies would be done as needed. **Tuweep** — Rigorous monitoring would be done on the three archeological sites near the campground. **Corridor Trails** — Hardening trail sections would reduce erosion and reduce disturbance of adjacent archeological sites.	**Region** — The same as alternative 2 except more sites and properties outside park boundaries could be affected than under any other alternative because of the increased disturbance around Tusayan and the area east of Desert View. **Parkwide** — The same as alternative 2. **South Rim** — The same as alternative 2 except no sites or properties would be affected in the village or at Desert View. **North Rim** — No effects on known archeological sites or traditional properties. **Tuweep** — Same as alternative 2, except reducing the number campsites would reduce indirect impacts. **Corridor Trails** — Reducing mule use and the number of visitors at Phantom Ranch would reduce ongoing effects to nearby archeological and traditional cultural sites.	**Region** — Improved research and preservation through collaboration same as alternative 2. Some 37 archeological sites would be impacted by improving USFS 302/307 and upgrading the Grandview entry. Potential effects due to a gateway center, parking area, and housing in the Tusayan area would be similar to alt. 2. **Parkwide** — Effects on archeological sites and traditional cultural properties would be greater than under any other alternative due to more construction of roads, parking lots, trails, and buildings. **South Rim** — In Grand Canyon Village effects would be the same as alternative 2, except that three known sites and an unknown number of traditional cultural properties would be destroyed by the Mather Point parking lot; four sites could be affected by related new roads. Expanding parking near the rim at Desert View could affect an unknown number of sites. Adding a loop road at the Abyss, a new mule barn and rim mule trail in the area of the South Kaibab Trailhead, and parking on the East Rim could affect unknown sites. Constructing an American Indian cultural center at the Tusayan museum, with active archeological excavations, would provide a vehicle for education but may affect sacred Hopi sites. **North Rim** — Same as alternative 2 plus potential effects on more sites and properties due to new Point Imperial building, road widening, added parking at the ballfield, mule staging at Six Rock Meadows, and increased visitation. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2, except potentially more effects due to the new trail off the South Kaibab Trail and upgrading Old Bright Angel Trail.

IMPACT TOPIC	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
Historic Structures and Landscapes	**Region** — Limited NPS collaboration outside the park. **Parkwide** — A limited and piecemeal approach to research and preservation would continue, with deterioration of resources. **South Rim** — Structures in the Grand Canyon Village and Desert View historic districts that do not contribute to the significance of the historic landscape would continue to compromise resource values, as would nonhistoric uses in historic landmark properties. Limited rehabilitation would be conducted for many structures and would continue to serve functions poorly related to the historic character of the structures. The historic landscape would continue to be altered and deteriorate. **North Rim** — Historic frame cabins would continue to be boarded up and allowed to deteriorate. Routine maintenance and current uses of other structures would continue. **Tuweep** — The ranger station would be evaluated for eligibility to the National Register of Historic Places, as time and budget permit. Expanding the water catchment facility could have an adverse effect, depending on the eligibility study. **Corridor Trails** — Adverse effects would continue in the historic district primarily due to inadequate maintenance and mule use. Cultural landscapes at Indian Garden and Phantom Ranch would continue to be adversely affected.	All impacts the same as the no-action alternative.	**Region** — Through NPS collaborative efforts with outside entities, inventories, evaluations, preservation, and interpretation outside the park would be improved. **Parkwide** — Resources would benefit from inventory, research, recovery, database, collections, and monitoring programs. **South Rim** — The overall effect would be positive. Many structures would be converted to uses consistent with their original character or rehabilitated and adaptively reused. Restoring historic landscapes and removing noncontributing structures from the historic village would be beneficial effects. Expanding interpretive programs related to cultural resources would help protection. Removing the Orphan Mine headframe would be an adverse effect. **North Rim** — Converting historic frame cabins to guest lodging would retain these as viable historic structures. Removing all but four to six historic frame cabins would be an adverse effect. **Tuweep** — The same as the no-action alternative except an assessment of the historic landscape would be conducted for Toroweap overlook. **Corridor Trails** — Hardening trail sections and small bypasses (North Kaibab Trail) would constitute adverse effects on historic trail alignments.	**Region** — Same as alternative 2. **Parkwide** — Same as alternative 2. **South Rim** — This alternative would be more beneficial than any alternative to historic structures and cultural landscapes. Effects would be the same as alternative 2 except any remaining historic uses in historic buildings would be preserved. The Orphan Mine would be rehabilitated and preserved. Removing all noncontributing structures at Desert View would have a positive effect. **North Rim** — Same as alternative 2. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2 plus reducing mule use would have a positive effect on preserving the corridor trails. At Phantom Ranch this alternative would help return this area to its original setting more than any other alternative.	**Region** — Same as alternative 2, *except* the Hull cabin could be adversely affected by use of the new Grandview entry. **Parkwide** — Same as alternative 2. **South Rim** — Retaining existing use patterns in the historic buildings designed by Mary Jane Colter and retaining noncontributing buildings in the powerhouse area would have the same adverse impacts as under no action. The changes at the Tusayan museum would constitute adverse effects and would compromise the integrity of the museum and surrounding resources. **North Rim** — Converting the historic lodge cabins to visitor use would be positive (the same as alt. 2). Demolishing all but a sample of the frame cabins at the inn and building 100 new lodging units and a restaurant would negatively affect the character of the inn area. **Tuweep** — Same as alternative 2. **Corridor Trails** — Upgrading the Old Bright Angel Trail would alter that trail's historic character. Other effects would be the same as alternative 2.
IMPACTS ON THE VISITOR EXPERIENCE					
Visitation	**Parkwide** — Visitors would benefit from having no limits placed on day visitation or the number of private vehicles permitted into the park at any one time.	**Parkwide** — Visitors would have to plan ahead during peak times to be able to enter the South and North Rims since day use vehicle limits and reservations would be initiated during peak periods.	**Parkwide** — Visitors would be able to enter the South Rim with no limits; however, private vehicle numbers would be limited. The North Rim would have day visitor limits and reservations based on the capacity of Bright Angel Point. Tuweep visitors would have limits on persons and vehicles.	**Parkwide** — The number of vehicles would be limited on the South Rim and the North Rim, and visitor use would be more limited at Tuweep than any alternative.	**Parkwide** — All visitors would benefit from being able to enter the park on the South and North Rims. Tuweep would have day use reservations, same as alternative 2.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Visitation (cont.)	**South Rim** — By 2010 there would be 39,200 visitors per day in 8,780 vehicles, with 19,600 visitors at any one time on a peak day. **North Rim** — By 2010 there would be ±5,080 visitors per day in 1,443 vehicles, with 2,540 visitors at any one time on a peak day. **Tuweep** — Unlimited day visitor use would continue. **Corridor Trails** — Unlimited day visitor use would continue. Overnight limits would remain the same.	**South Rim** — Private day vehicles (tour buses parking in the park, cars, and oversized vehicles) would be limited during peak seasons (±2,686 private vehicles, ±9,805 visitors at any one time). About 4,000 visitors during peak times (11 A.M.–3 P.M.) would not be able to enter the park with a private vehicle. An additional 550 people could arrive by other means (e.g., train or bus) each hour until 3 P.M. The maximum number of people on the South Rim until 3 P.M. would be 12,765 and would be reduced to 10,725 between 6 and 9 P.M. This capacity would meet the evening demand for 2010, and no one would be turned away from the park after 3 P.M. unless use patterns significantly shifted. **North Rim** — A day use reservation system would be implemented in about 2004, with ±1,744 visitors/495 vehicles permitted to enter the park at any one time. An estimated 749 visitors/227 vehicles would be turned away during the peak time of day (11 A.M.–3 P.M.). **Tuweep** — The same as no action. **Corridor Trails** — The same as no action.	**South Rim** — Visitors would be able to enter the park, but there would be limits on modes of access, and parking would be restricted. By 2015 not all visitors would be able to enter the park during a peak day. **North Rim** — Depending on the success of visitor distribution, visitors would either have to obtain a day reservation in 2005 or after 2010 (2005 — ±4,700 visitors per day; 2010 — no limitations, same visitation as no action). If the reservation system started in 2005, then by 2010, 920 visitors during peak times would have to find another time or day to enter the park. **Tuweep** — Visitors might need to obtain day use reservations during peak times in order to use the park (±85 visitors at one time or 30 vehicles, whichever came first). Some visitors would have to reschedule their time of visit during peak periods. **Corridor Trails** — Unlimited day visitor use would continue, same as no action.	**South Rim** — Same as alternative 2. **North Rim**— Same as alternative 1. **Tuweep** — More visitors than under alternative 2 would have to obtain day reservations (maximum of 20 cars total or ±60 people). Visitors would be turned away on peak days. **Corridor Trails** — Limiting hikers and reducing or eliminating mule use would preclude some people from having a corridor trail experience, but it would increase the quality of the experience for those who were able to hike or take mule rides.	**South Rim** — Same as no action. **North Rim** — Same as no action. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as no action.
Regional Information	Due to the lack of regional visitor information and the lack of park presence and assistance in regional centers, visitor frustration would worsen and visitors would continue to arrive unprepared, which could be dangerous in areas like Tuweep.	Visitors would benefit from having multiple media sources of information internationally, regionally, and locally. Regional centers would more accurately assist visitors due to improved NPS communication. **South Rim** — The Tusayan information center would provide initial park information for visitors; however, the facility and parking might not be adequate. **North Rim** — Visitors would benefit from having NPS personnel at the Jacob Lake center; however, the facility would become overcrowded. **Tuweep** — Visitors would continue to have little information, same as no action.	Same as alternative 1, plus additional benefits from more network computer information programs, information at major server airports, creation of joint information centers with an NPS presence. **South Rim** — Visitors would have increased benefits from a new joint information center in Tusayan designed to meet visitor needs. **North Rim** — An enlarged joint USFS/NPS Jacob Lake information center would provide initial orientation for park visitors. **Tuweep** — Visitors would benefit from the information signs along major access roads and the information provided at Pipe Spring National Monument.	Same as alternative 2.	Same as alternative 2.

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Orientation/ Interpretation	**South Rim** — Few visitors would gain orientation or trip-planning assistance in the park. The lack of adequate interpretive facilities and overcrowded conditions would worsen. Many interpretive themes would not be represented. **North Rim** — The contact station would provide information and orientation; however, the present location encourages more crowding on Bright Angel Point. The personal interpretive programs would continue to enhance the visitor's understanding of the place and aid in visitor distribution. **Tuweep** — Visitors would continue to receive inadequate orientation and interpretive information. **Corridor Trails** — Except for the Phantom Ranch programs and a few waysides, visitors would have limited interpretation and orientation opportunities.	**South Rim** — Same as no action, *except* overcrowding would not be as severe due to day visitor limitations. The Tusayan museum would continue to be overcrowded, but would have a few less visitors. Crowding at the visitor center would be reduced, but the facility would still be over capacity during peak times. **North Rim** — Same as no action. **Tuweep** — Same as no action. **Corridor Trails** — Same as no action.	**South Rim** — Visitors would have significant additional orientation and interpretive opportunities at all stages of their visits. Visitors would benefit from having all major interpretive themes represented in the orientation centers and through additional interpretive exhibits/facilities, waysides, or programs. Interpretation at the Tusayan museum would be enhanced and crowding lessened by reducing the focus of interpretation and expanding the interpretation of the outdoor archeological resources. Tour, shuttle, and biking visitors would benefit from direct access to the Mather Point orientation center for information and orientation to all themes, and by being within sight of rim overlooks. The new facility would be sized for expected visitation, thus eliminating overcrowding. The Yavapai observation station would function as historically planned, and overcrowding would be reduced through expanded outdoor exhibits and controlled access. Significantly expanding interpretive facilities in the historic village and powerhouse area would allow many more visitor programs and exhibits to be presented. The new orientation center at Desert View would provide needed visitor information and orientation services in an appropriately sized facility, located in a visible area. **North Rim** — Visitors would benefit from a centralized orientation center, where they would learn about park themes, programs, and trip planning. The existing contact station would continue to assist Bright Angel Point visitors. **Tuweep** — Same as no action plus a roadside kiosk would better inform visitors. **Corridor Trails.** Adding a contact station and amphitheater at Indian Garden and providing roving interpreters on trails would enhance the visitor experience.	**South Rim** — Since orientation would be provided outside park boundaries away from the resource, it would not be as successful as alternative 2 or 4, but probably better than the no-action alternative or alternative 1. Visitors would benefit from all major themes being represented (the same as alternative 2). The Tusayan museum would remain the same as alternative 1, with crowding controlled by transit scheduling. The lack of an orientation/information center in the park would leave visitors without a central place for information and educational assistance in the park. Crowding at the Yavapai observation station would be remedied by reducing the themes interpreted and through transit scheduling. Interpretive facilities would be expanded in the historic village and powerhouse area the same as alternative 2, except the mule barn would not be converted to a major interpretive facility. Converting the existing visitor center at Desert View to a contact station would provide a facility for visitors to gain information. However, due to its location, limited use would be expected. **North Rim** — The contact station would remain the same as no action. **Tuweep** — Same as no action. **Corridor Trails** — Same as alternative 2 except no amphitheater at Indian Garden would reduce interpretive opportunities there.	**South Rim** — Same as alternative 2 except the interpretive benefits at the Tusayan museum would be enhanced by a new American Indian cultural center and archeological research/dig. However, due to the location, fewer visitors would benefit from the facility than in alternative 2. The Mather Point center would inform, orient, and educate visitors, the same as alternative 2. The interpretive benefits at the Yavapai observation station, the historic village and powerhouse area would be the same as alternative 2. Leaving the gift shops in the Mary Jane Colter rim structures would reduce their interpretive potential and the visitor experience, the same as no action. The Desert View orientation center would benefit visitors the same as alternative 2. **North Rim** — The new orientation center would provide visitors with information and orientation, the same as alternative 2. The interpretive structure at Point Imperial would help distribute visitors and provide more in-depth interpretation for certain themes. The personal programs would benefit visitors the same as alternative 2. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2.
Visitor Access and Convenience	**Parkwide** — All visitors and their private vehicles would be permitted into the park whenever they arrived. Visitors would continue to get lost, remain poorly informed, and be poorly distributed. Pressures would increase for outside services since no visitor services would be expanded in the park, and little effort for visitor redistribution would occur.	**Parkwide** — Visitors would need day vehicle reservations to enter the South and North rims during peak seasons. Visitor distribution, on-site information and pressures for visitor services outside the park would remain the same as No Action.	**Parkwide** — Limited private vehicle parking on the South Rim, a day reservation system on the North Rim, and limits on people and vehicles at Tuweep would reduce visitor access and convenience. However, visitors would still be able to drive private vehicles into the park, even during peak use times. Better information and broader distribution, plus additional visitor services, would help reduce crowding.	**Parkwide** — Day visitors would not be able to use private vehicles on the South Rim and would have to get reservations on the North Rim and at Tuweep. However, transit and reservation systems would be convenient and would help distribute visitor use.	**Parkwide** — Visitors would not encounter day restrictions except at Tuweep. Visitor distribution would be improved in some areas, and more visitor services would be provided than under any other alternative. The need for regional services would be reduced because more services would be provided in the park.

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Visitor Access and Convenience (cont.)	**South Rim** — Private vehicles would remain the primary source of travel, with visitors becoming frustrated by the lack of available parking and lack of transit service or hiking/biking paths. Congestion levels at gift shops would result in a high visitor turnaway rate. Adding chemical toilets would not meet most visitors' expectations, and waits at existing restrooms would worsen. Lodging would remain at ±920 rooms (including ±70 economy rooms), with visitors having to make reservations far in advance during peak seasons. Visitors would continue to have ±80 RV sites with hookups and ±350 other campsites, with advance reservations required during peak use seasons. Wait times at rim food service facilities would increase, while off-rim facilities would remain under capacity. At Desert View only visitors arriving early would be able to obtain campsites during peak seasons. Crowding at the food service facility would worsen. **North Rim** — Visitors would continue to concentrate at the lodge, resulting in major parking problems. Many visitors would not be able to obtain lodging or campsites within the park since accommodations would remain the same (±200 rooms, ±85 campsites). Crowding at food services and gift shops would continue to worsen. Restrooms would be adequate on Bright Angel Point, and toilets would be added in outlying areas. **Tuweep** — Crowds could be well over 100 at the main overlook during peak days, substantially reducing the quality of the visitor experience. The number of cars would increase, and rim camping would continue at the Toroweap overlook, reducing the quality of the experience. **Corridor Trails** — Mule use would remain the same, except for the possibility of some increase on the North Rim; hiker use would continue to increase. Hiker/mule conflicts would continue to increase, especially on the North Rim. Present overnight accommodations would remain.	**South Rim** — Although the number of vehicles would be restricted, prime parking spaces would often be taken, and visitors would have to park away from their destination, with no supplemental modes of transportation available; parking attendants would help visitors find parking. Lodging and camping would remain the same as no action. Many more visitors would be encouraged to eat at cafeterias/delis, and visitors would still have long waits for evening dining on the rim. Gift shops and toilet facilities would be the same as no action. At Desert View camping would be the same as no action. Crowding at the eating facility would be reduced due to the reservation system. **North Rim** — Same as no action except parking problems would continue to be a major inconvenience for visitors who had to park about 2 miles from the lodge, with no transit available. Food service and gift shop outlets would not be overcrowded due to day visitor limitations. **Tuweep** — Same as no action. **Corridor Trails.** Same as no action except hikers would experience less crowding since day reservations would be implemented on the North and South Rims.	**South Rim** — Since the number of private vehicles in the park would be limited, some visitors might find it inconvenient to leave their cars parked outside the park and use the transit service or bike or hike. However, visitors would benefit from the efficient and safe public transit system and additional safe bike/pedestrian paths. Most rim overlooks would be accessible only by transit or hiking or biking, providing a quieter and less crowded experience. Additional lodging (±200 economy rooms) would provide a wider range of visitor accommodations. Adding and rearranging food service facilities would reduce visitor crowding at meal times and provide more options. Visitors would benefit from rearranged and additional gift shop space. Adding 50 campsites at Desert View would improve overnight opportunities in that area. The new eating facility and gift shop would reduce crowding. **North Rim** — Some visitors might find it inconvenient to have to use transit service for access to Bright Angel Point. However, these restrictions, along with a bike/pedestrian system, would make the point quieter and less crowded. Providing ±50 additional cabins would increase the range of lodging options for visitors. Due to the day visitor limitations and improved distribution, food service facilities and the gift shop would not become overcrowded. **Tuweep** — The uncrowded experience would be retained and enhanced by removing parking and camping at the Toroweap overlook. **Corridor Trails** — Hiking use would continue to increase on inner canyon trails; but hardening trail sections, improving maintenance, and creating small mule bypass areas on North Kaibab Trail would improve conditions and reduce use conflicts. As a last resort, mule use would be reduced to alleviate use conflicts. Slight improvements to the Old Bright Angel Trail would provide more visitor options and help distribute use.	**South Rim** — Some visitors would find transportation inconvenient since all but overnight guests would leave their private vehicles outside park boundaries, even though a convenient transit system would be provided. Since all rim areas would only be accessible by transit or hiking/biking, the visitor experience would be even quieter and less crowded than under alternative 2. Using shoulders for bike lanes and keeping the rim trails the same as no action would reduce visitor recreational opportunities, not providing as pleasant and safe a biking experience as alternative 2. Lodging and RV campsites in the village would be reduced and no campsites would be added at Desert View, causing more visitors to have to find accommodations outside the park. The addition of eating facilities and rearranging gift shops would reduce crowding the same as alternative 2. **North Rim** — Day visitor limitations would ensure that the area remained uncrowded, the same as alternative 1. Visitor convenience would be improved for those who had reservations to enter the park and had vehicles under 22′ in length since they could drive throughout the developed area. The lack of additional hiking or biking trails would limit recreational opportunities, and the experience would remain primarily a car-oriented one. Visitors would have additional lodging units. Food services and gift shops would be the same as alternative 1. **Tuweep** — The fewest people would be permitted at any one time, providing the least crowded atmosphere. **Corridor Trails** — Moving all visitor use mules off the Bright Angel Trail and reducing visitor mule use by half on the South Kaibab Trail, and removing all mules from the North Kaibab Trail, would reduce user conflicts and trail maintenance. Establishing a hiker carrying capacity would help protect resources and ensure a quality visitor experience. The number of beds at Phantom Ranch would not be reduced, resulting in fewer overnight opportunities there.	**South Rim** — Visitors would be able to drive into the park whenever they desired. An extensive transit system would be convenient for visitors not driving and for those parking their cars. In the village direct and easy access and parking at the Mather Point orientation center would benefit visitors. Opportunities for quiet would be offered along 15 miles of rim drives accessible only by transit. More transit, bike, and rim trails would provide more recreational opportunities and increase visitor safety (the same as alt. 2). Adding ±385 rooms and ±80 campsites would allow the most visitors to stay in the park. Food service would be increased (the same as alt. 2). Adding gift shops would make shopping more convenient. At Desert View visitors would have access to more campsites and a new gift shop/deli (the same as alt. 2); retaining the Watchtower gift shop would afford the most shopping opportunities of any alternative. **North Rim** — Transportation would be the same as alternative 2, except any size vehicle could enter the park and stay at the campground. An additional ±116 rooms and ±50 campsites would increase visitor accommodations; eating facilities would be the same as alternative 1 plus a new restaurant. Gift shops would be the same as alternative 1 and could become overcrowded. Additional facilities, especially lodging, could adversely affect the North Rim's atmosphere. **Tuweep** — Visitors would be limited during the day the same as alternative 2. Visitors would have five additional campsites. **Corridor Trails** — Hiker/mule conflicts on the Bright Angel and South Kaibab Trails would be the same as alternative 2. Branch trails off the Bright Angel and South Kaibab Trails would provide more hiking options. Existing trails would have increased hiking. Mule use on the South Rim would be same as no action, with a loop rim trail added in the South Kaibab area. North Rim hiker/mule conflicts would be reduced by removing mules from the North Kaibab and Uncle Jim Trails. Mule impacts would shift to the Old Bright Angel Trail, but fewer hikers there would result in fewer hiker/mule conflicts.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Impacts on the Socioeconomic Environment					
Visitation Visitor Expenditures, Park-Related Employment and Earnings	By 2010 under present visitor trends the number of yearly visitors would increase by about 2.51 million (+57.6% to 6.9 million); 92% of the visitors would continue to enter from the south. Visitor expenditures would grow by $294.9 million (+73.3% to $697.5 million). Growth in park visitation would result in more NPS and regional tourist industry jobs, primarily benefiting Coconino County; Utah's Kane and Washington Counties would benefit from greater visitor expenditures. Park-related and tourist industry jobs (direct, indirect, and induced) would increase by 4,839 jobs (+69.9% to 11,762), and park-related personal earnings would increase by $80.5 million (+68.4% to $198 million). Park-related population effects would support 8,214 more county residents, accounting for 22% of the county's projected growth. Tourist sector business and employment growth would be greatest south of the park in Tusayan, Williams, Valle, and Flagstaff. Increased NPS jobs and population growth would worsen existing housing shortages and burden public facility infrastructure and community services. Flagstaff would benefit most from indirect and induced economic effects of more park visitation. Economic growth in communities east of the park would be slower than to the south due to fewer visitor services and less traffic. Successful Navajo economic development could bring more visitors to the area and foster additional tourist-related employment and earnings in reservation communities.	Establishing a reservation system on the South Rim by 1995 and on the North Rim by 2004 (except at Tuweep) would limit the number of visitors during peak times. By 2010 visitation would be only slightly less than under no action, as would visitor expenditures. The reservation system would cause a slight shift in visitation from the Grand Canyon area to other southwestern areas, resulting in a slight reduction in the growth of expenditures, mainly in Coconino County. Southern Utah economies could benefit if people chose to visit other Utah sites while waiting to enter Grand Canyon or instead of visiting the canyon. Park-related employment would increase slightly less than no action because of fewer park visitors and less growth in NPS employment. Park-related population effects would support about 700 fewer residents in Coconino County than under no action. Surrounding communities would benefit from tourism more than under no action because of limits on the expansion of in-park concessioners. Flagstaff would continue to benefit most from indirect and direct economic effects, but slightly less than under no action. Tusayan would benefit from the unmet demand for visitor services, even though demand would be slightly reduced from no action. The demand for affordable housing in Tusayan would increase (the same as no action). Communities east of the park would experience decreases in drive-by traffic unless they became an attraction of their own.	Not limiting visitation on the South Rim, possibly limiting visitation on the North Rim by 2005 or 2010, and limiting visitors at Tuweep during peak times would result in approximately the same number of visitors and the same visitor expenditures in 2010 as the no-action alternative. Park-related jobs and earnings would grow 4%–5% more than no action, primarily because of added public transit services. Park-related population effects would support 590 more residents in Coconino County than under no action. Successful Navajo economic development could increase the number of tourists entering the park from the east and foster greater park-related development in communities east of the park. The greatest increase in expenditures would be in communities south of the park, with more economic benefits than no action. Tusayan would absorb much of the unmet demand for visitor services and would further benefit from more park employees living outside the park.	Not limiting visitation on the South Rim, but establishing a reservation system on the North Rim by 2004 and at Tuweep during peak times would not result in significant changes in visitation or expenditures as compared to the no-action alternative. Park-related jobs and earnings would increase about 3% more than no action, primarily because of NPS and transit service jobs. Park-related population effects would support about 500 more residents in Coconino County than under no action. Visitor expenditures south of the park would be slightly higher than alternative 2. Flagstaff would benefit most, with economic benefits greater than under any other alternative. More park employees would be housed and work in Tusayan, and more affordable housing would be needed in Tusayan than any alternative. A parking/staging area north of Tusayan would have minimal adverse effects on Tusayan businesses. Negative effects on businesses east of the park would be greater than under alternative 2.	Establishing no limits on visitors would result in the same effects on visitation and visitor expenditures as the no-action alternative. Park-related jobs and earnings would increase about 3% more than no action, primarily because of NPS and transit service employment. Park-related population effects would support 239 more people in Coconino County than under no action. Utah's Washington and Kane Counties would benefit from added tourist related jobs and indirect and secondary economic effects more than any alternative. Communities benefiting most from increased visitor expenditures would be the same as under no action. Eastern areas and communities would benefit economically the same as no action, as improvements to USFS 302/307 facilitate tourist traffic between the south and east. The new road would also benefit Navajo economic development projects.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Impacts on Transportation, Parking, and Transit					
Access and Circulation Parking, Transit, Bike/Pedestrian Trails	**SOUTH RIM** **Region** — All major access roads would continue to have satisfactory service. Increased use of USFS 302/307 would increase airborne dust and safety hazards. Private transit service and related parking/staging would expand, especially in Tusayan. The Forest Service would continue to provide dirt roads and off-road trails. The Arizona Trail would continue to connect through the South Rim. **South Rim** — All roads used primarily by visitors would deteriorate and operate at LOS D or worse (slow travel, bumper-to-bumper traffic, long delays). During winter all roads would operate at LOS C or better except West Rim Drive and sections of the village loop road, which would deteriorate to LOS D. Existing visitor parking would remain at 3,320 spaces, and 13 of the 16 village parking lots would exceed capacity, resulting in extensive roadside parking. Six of 10 parking lots on East Rim Drive would exceed capacity, with the lack of parking at the South Kaibab Trailhead and Desert View being extreme. The current poor transit service would worsen. Except for the Arizona Trail, bikers would have to ride on roadways, resulting in safety hazards. Limited rim trails would result in extensive social trailing and a concentration of visitors in only a few areas.	**SOUTH RIM** **Region** — Impacts would be the same as no action except private transit service and related parking/staging would likely expand more because of regional information centers and advertising, as well as a limit on the number of private vehicles. An estimated 1,704 private vehicles (tour buses, RVs, cars) would not be able to enter the park during peak times. About 931 parking spaces would be needed in Tusayan, provided by the private sector. **South Rim** — Due to vehicle limitations, most roads would operate at LOS D. Center Road would operate at LOS B/C and East Rim Drive at LOS C/D. During winter only West Rim Drive would operate at LOS D (the same as no action). The existing number of parking spaces would remain. Because no roadside parking would be permitted, safety and traffic flow would increase significantly. Vehicle limits would be 2,686 vehicles on the South Rim at any one time. Parking attendants would minimize parking capacity problems and maximize use; however, some imbalances would occur, especially on the East Rim, requiring enforcement to limit roadside parking. Public transit service would remain inadequate; however, due to visitor carrying capacity limits, the system would function better than under no action. Adding an 85-space gravel parking lot at Desert View would help meet existing demand. Biking safety and trails would remain poor.	**SOUTH RIM** **Region** — Major access roads would provide satisfactory service (the same as no action). Private transit service would increase, both regionally and from Tusayan and Cameron because of vehicle limits in the park, plus better information from regional centers. Some visitors would stay longer in Tusayan waiting to drive into the park. Visitors in an estimated 1,770 vehicles would not be able to drive into the park between 11 A.M. and 3 P.M.; it is assumed half of these visitors would enter by shuttle or train and half would leave. Because visitors would have other options than private vehicles for entering the park, all visitors who wanted could enter the park. The Park Service would assist other agencies in providing bike/pedestrian trails to link Tusayan and areas south and to link the park to Cameron. **South Rim** — A maximum of ±2,130 private vehicles would be allowed to enter the South Rim (approximately 80% from the south and 20% from the east). Total parking would be increased by 22% by using existing lots and disturbed areas back from the rim; rim parking would be removed. Some 50 miles of separated biking/hiking trails plus 20 miles of rim/community trails would improve access for visitors and residents. Traffic volumes on most roads would be well below capacity (LOS B or better), but East Rim Drive and the south entrance road would experience LOS C/D and Center Road LOS C. Separating private vehicle and public transit routes would increase transit efficiency. With transit and biking/hiking paths, visitors would have relatively easy access to all areas; rim areas would be free of traffic congestion. A total of 2,832 parking spaces would be provided near the village; the village itself would be strictly a pedestrian area, with no day visitor traffic allowed. An employee transit system would reduce parking and traffic. Realigning East Rim Drive and the access road, and removing the rim parking lot at Desert View would greatly reduce traffic near the rim and create a pleasant pedestrian area. The bike/pedestrian trail system and bike rentals would enhance visitor opportunities.	**SOUTH RIM** **Region** — Traffic volumes would increase on surrounding regional roads, but their operation and level of service would not be affected. Private transit service could increase more than any other alternative since no day visitors could drive into the park. Traffic volumes would increase through Tusayan. Major staging areas outside park entrances would hold all day use vehicles. Visitors would likely go directly to the staging areas rather than lingering in nearby communities. Public transit would be adequate to accommodate all park visitors. The availability of USFS trails and the Arizona Trail would be the same as no action. NPS assistance would foster bike/ pedestrian trail linkages between the park and outside areas (the same as alt. 2). **South Rim** — Visitors would have a transit-oriented experience; only overnight vehicles would be permitted in the park, but their use would be heavily restricted. The operation and level of service on all roads would be excellent. Parking spaces would be reduced by 34%; rim parking would be removed (same as alt. 2). Year-round transit service would be the same as alternative 2. No additional trails would be provided. The lack of offroad bike routes would result in bikers sharing roads with public transit vehicles, a potentially dangerous situation, even with some shoulder widening. Traffic volume would be low and level of service excellent on all roads. Parking would be provided only for overnight guests. The employee shuttle system would be the same as alternative 2. East Rim Drive at Desert View would be the same as no action. All parking at Desert View would be removed and the area converted to a transit stop or revegetated.	**SOUTH RIM** **Region** — Major access road service would be the same as no action. Paving and adding a park entry off USFS 302/307 would increase traffic by ±2,500 vehicles per peak day. No public transit would be provided, but private transit service could increase; however, less than alternatives 2 and 3 since all visitors could drive into the park. Added parking in Tusayan would accommodate visitors wanting to visit the gateway center and use a private shuttle service. Traffic volume in Tusayan would be just slightly less than under no action. The availability of USFS trails and the Arizona Trail outside the park would remain. The Park Service would provide assistance to create bike/pedestrian trail linkages between the park and outside areas (the same as alt. 2). **South Rim** — All private vehicles would be permitted to enter the park. The south entrance road would deteriorate and operate at LOS E during peak times. East Rim Drive would operate at LOS C. Vehicles would be restricted within the village, and roads and parking would be the same as alternative 2. Parking would be significantly expanded at Mather Point, Desert View, and along East Rim Drive to accommodate demand. Total South Rim visitor parking would increase by 68%. Year-round transit service and bike and pedestrian trails would be the same as alternative 2. Parking in the village would increase. Parking at Mather Point (3,282 spaces) next to the orientation center would offer direct and convenient access to the center. The Mather Point transit center and parking in the village would be the same as alternative 2, except spaces would be added to accommodate more employees. An employee shuttle and bike/pedestrian trails would be the same as alternative 2. Realigning Arizona 64 through Desert View and removing the rim parking area would have the same impacts as alternative 2. Parking would be provided in the former concessioner housing area.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Access and Circulation (cont.)	**NORTH RIM** **Region** — Major roads to the park should provide satisfactory service. No public transit would be available; however, private tours would likely continue and increase. Dirt roads and off-road trails would continue to be available on national forest lands. The Arizona Trail would continue to provide a fairly direct connection to the Bright Angel Lodge. **North Rim** — All roads would operate well at LOS B; some road sections would have to be widened. Visitors could experience delays on the Cape Royal road due to oversized vehicle traffic. Localized parking problems would continue to worsen, especially at the lodge (250 spaces, demand for 358), and roadside parking would occur for about 800′ on either side of the road. Providing 30 more parking spaces at CC Hill would improve safety problems at the North Kaibab trailhead. Visitors would have no public transit service and be dependent on tours or private vehicles. Except for the Arizona Trail, no bike trails exist, and safety hazards would worsen. Rim trails would continue to be limited. Mule conflicts with hikers would worsen on the rim. **Tuweep** — Access roads would continue to be dirt with accessibility dependent on weather. Road upgrading might occur as a result of future development on BLM lands (e.g., mining). Within the park roads would continue to have limited maintenance and remain narrow and dirt, causing problems for oversized vehicles and low-riding cars in some areas. Parking problems would worsen during peak times, with over 30 cars parked along roadsides. Present hiking trails would remain.	**NORTH RIM** **Region** — Impacts would be the same as no action except the reservation system would cause people to wait at nearby commercial establishments (Jacob Lake, Kaibab Lodge) to enter the park. **North Rim** — The same as no action except all roads would operate somewhat better due to visitor limits by 2004. No road widening would be needed. The number of vehicles would be limited based on existing parking capacity. The total number of parking spaces would be the same as no action. Due to uneven distribution, parking problems would occur at the lodge, but attendants would redirect these visitors to other parking areas. The lack of public transit could cause problems for visitors not being able to park near their destination. **Tuweep** — Same as no action.	**NORTH RIM** **Region** — Impacts would be the same as no action. **North Rim** — All roads would operate well. Restricting vehicle sizes would improve traffic flow and reduce the need to widen roads on Walhalla Plateau. Parking would be increased by 55%, reducing impacts on roadside resources. On Bright Angel Point adequate parking (397 spaces) would be provided at the CC Hill orientation center/staging area, and only overnight guests would be able to drive onto the point. The transit center would provide a central location for visitors to get to any part of the developed area. An employee shuttle would reduce employee traffic and parking needs. Providing an additional ±50 miles of separated bike/pedestrian trails, ±10 miles of rim trails, and ±3 miles of mule trails would increase recreational opportunities, provide more areas to see the park, and reduce hiker/mule conflicts. **Tuweep** — Access roads and accessibility would remain the same as no action, except the Park Service would work closely with Mohave County to ensure roads retained the same character. Inside the park roads would remain the same as no action; however, vehicles over 22′ in length would not be permitted. Parking needs would be controlled through the carrying capacity limitations (±85 people or 30 vehicles). Removing the parking area at the Toroweap overlook would create a quieter, more attractive overlook. Additional trails would improve visitor distribution.	**NORTH RIM** **Region** — Impacts would be the same as no action except a reservation system would further reduce the number of vehicles. Visitors waiting to enter the park would be the same as alternative 1. **North Rim** — Due to the reservation system all roads would operate well (same as alt. 1). Vehicle size limits at the Point Imperial/Cape Royal intersection would eliminate the need for any road widening. The number of vehicles in the park at any one time would be limited the same as alternative 1. Parking would be reduced by 15%; designated areas for certain types of parking (RVs, buses, standard vehicles) would help distribute vehicles. A public transit system would be added. An employee shuttle would be the same as alternative 2. Bike and rim hiking trails would be the same as no action. **Tuweep** — Impacts would be the same as alternative 2 except for a smaller parking lot.	**NORTH RIM** **Region** — Impacts would be the same as no action. **North Rim** — All roads would operate at LOS B or better. Parking would be increased by 25%, allowing all visitors to drive and park near their destinations. Lots would be designated for overnight guests and visitors with oversized vehicles, helping distribute vehicles and reduce congestion. Public and employee transit and bike/pedestrian and rim trails would be the same as alternative 2. **Tuweep** — Same as alternative 2.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Impacts on Area Operations					
Housing NPS and Concessioner **Community Services**	**SOUTH RIM** **Region** — An estimated 195 employees (±148 units) would not be provided park housing and would need to find housing outside the park, likely resulting in more missed workdays due to long commutes. Community services would be available in Flagstaff or Williams but would be severely lacking in Tusayan or Valle if not provided by new development. **South Rim** — The park has 1,676 employees and ±1,000 housing units, with 427 employees living in substandard conditions (deteriorated units, trailers, or two or more employees to a room, referred to as double or triple bunking). To meet 1994 NPS housing standards, 313 new units are needed; 285 have been approved. An estimated 1,739 employees would be needed by 2010, resulting in a shortage of 148 units. An estimated 250 employees would either have to live in substandard housing conditions or find accommodations outside the park. Employee dissatisfaction and turnover would continue to be extremely high. Employee conflicts with visitors due to the improper building function/location or lack of community services would continue to worsen. **NORTH RIM** **Region** — No housing would be needed outside the park. **North Rim** — There are 297 employees and 173 units now; 84 additional units are needed to come to standard, and 125 new units would be needed by 2010. The construction of 37 concession units for 44 employees would allow a switch to a five-day workweek, helping to reduce employee turnover and dissatisfaction. About 100 employees would be living in substandard conditions in 2010, including trailers, adding to employee turnover and dissatisfaction. Employee conflicts with visitors due to housing in visitor use areas would be high. Community services would continue to function well for the concessioner but would be inadequate for NPS employees. **Tuweep** — The existing residence would be rehabilitated and the seasonal ranger unit replaced, thus improving living conditions. **Corridor Trails** — There are 29 employees and 22 housing units. No new employees would be needed. **Lees Ferry** — There are two employees, two housing units. One substandard unit would remain.	**SOUTH RIM** **Region**— Impacts would be the same as no action except substandard housing would be removed, causing more employees to find housing outside the park. **South Rim** — Limiting the number of visitors and private vehicles through a reservation system would reduce the need for additional employees and housing. To provide housing for the 1,725 total employees needed under this alternative, 313 additional housing units would be built. While all substandard units would be replaced, some employees would still have to find their own housing outside the park. High employee turnover would continue. Community service conflicts with visitors would worsen (the same as no action). **NORTH RIM** **Region** — The two employees needed at Jacob Lake would be housed at the USFS housing area or find housing in the nearest communities. **North Rim** — A total of 344 employees and 268 housing units would be needed by 2010. New housing would replace all substandard units and meet additional housing needs. The 33 additional concessioner units would be the same as no action. Due to the reservation system only three new NPS employees would be needed, and 44 additional concessioner employees (same as no action). Employee turnover and dissatisfaction would be significantly reduced. Employee conflicts with visitors due to housing locations/community services would be the same as no action. Community services would be the same as no action. **Tuweep** — Same as no action. **Corridor Trails** — Same as no action. **Lees Ferry** — The substandard unit would be replaced with a standard one.	**SOUTH RIM** **Region** — As many jobs as possible would be located in Flagstaff or Williams. An estimated 486 employees would live in Tusayan, where some 303 housing units would be provided in a joint NPS/USFS community, resulting in 480 employees commuting into the park from Tusayan. The nearby location and availability of an employee shuttle would minimize missed workdays. Since many community services would be provided outside the park and away from visitor use areas, conflicts would be significantly reduced. Tusayan would experience significant community changes with the addition of many community services. **South Rim** — For the 2,069 total employees needed under this alternative, 748 new units would be built in the park, and all substandard housing conditions would be eliminated. Employee dissatisfaction and turnover would be reduced, as would employee conflicts with visitors in community service areas. Most employees would live near their workplace. All dorm units would be provided in the village so employees would be closer to meals and work. Some community services would be duplicated, and village employees would be split between two communities. **NORTH RIM** **Region** — Same as alternative 1. **North Rim** — A total of 357 employees and 270 new housing units would be needed. New housing would replace substandard units and meet 2010 housing needs. New housing would help reduce employee turnover and dissatisfaction. **Tuweep** — If possible, a seasonal ranger unit would be leased just outside park; if not possible, then same as no action. **Corridor Trails** — One employee would be added at Indian Garden, and an existing structure rehabilitated; all other impacts the same as no action. **Lees Ferry** — Relocating the boat shop and related employees from the village would put employees nearer their workplace.	**SOUTH RIM** **Region** — The same number of employees and housing units would be located in Flagstaff/Williams as under alternative 2. A total of 891 employees in 648 housing units would be placed in Tusayan in the joint NPS/USFS community. An estimated 570 employees would commute into the park for work, with the same impacts as alternative 2. Tusayan would experience significant community changes, greater than any other alternative. A total of 31 employees in 22 housing units would be located just outside Desert View in a new community. **South Rim** — A total of 1,782 employees would be needed under this alternative. All substandard housing units would be eliminated and replacement housing provided outside the park. All additional housing would be provided outside the park. As a result, more employees than under any other alternative would commute into the park, with the same impacts as alternative 2. All existing dorms would be retained. Employee conflicts with visitors would be reduced more than under any other alternative because of living and using community facilities outside the park. The sense of living in a park community would be reduced with employees living in two separate communities. **NORTH RIM** **Region** — Same as alternative 1. **North Rim** — A total of 335 employees and 246 new housing units would be needed. All substandard housing would be replaced. No additional concession housing units would be provided to allow a change to a five-day workweek, with continued employee turnover and dissatisfaction. Employee conflicts would be more than alternative 2 but less than 1. **Tuweep** — Same as no action. **Corridor Trails** — Same as alternative 2. **Lees Ferry** — Same as alternative 2.	**SOUTH RIM** **Region** — Impacts would be similar to alternative 2. **South Rim** — Impacts would be the same as alternative 2 except for a few more housing units at Desert View. **NORTH RIM** **Region** — Same as alternative 1. **North Rim** — A total of 422 employees and 320 new housing units would be needed. Concession housing units would be added to allow employees to switch to a five-day workweek. Employee turnover and dissatisfaction would be reduced more than any alternative. Employee conflicts would be reduced the same as alternative 2. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2. **Lees Ferry** — Same as alternative 2.

IMPACT TOPIC	NO-ACTION ALTERNATIVE: EXISTING CONDITIONS / ONGOING PROGRAMS	ALTERNATIVE 1: MINIMUM REQUIREMENTS	ALTERNATIVE 2: PROPOSED ACTION	ALTERNATIVE 3: REDUCED DEVELOPMENT WITHIN THE PARK	ALTERNATIVE 4: INCREASED DEVELOPMENT WITHIN THE PARK
Management Support Facility and Space Needs, Operational Relationships, Conflicts with Visitors	**Region** — Regional communities would experience little change. **South Rim** — Severe deficits in space and substandard facilities would continue; the most critical NPS problems are in maintenance and ranger operations. Concession spatial and substandard facility deficits, plus conflicts with visitors would primarily occur in the powerhouse area of the village, where most concession operations occur. **North Rim** — Inside the park most NPS operations would continue to function with space deficits in substandard structures, with the worst situations for maintenance, ranger operations (emergency vehicles), administration, and backcountry offices. Concession operations would be adequate, except mule operations. Few operational conflicts with visitors would occur. **Tuweep** — No impacts on regional communities. Inside the park storage, workshop, and office space are provided in a substandard historic structure. **Corridor Trails** — Indian Garden operations would be adequate; Phantom Ranch NPS operations would continue to be inadequate.	**South Rim** — Same as no action. **North Rim** — Same as no action. **Tuweep** — Same as no action. **Corridor Trails** — Same as no action.	**Region** — Moving as many employees as possible to Flagstaff or Williams would help solve inadequate space problems. The only NPS operation outside the park would be at the joint gateway information center in Tusayan and the boat shop at Lees Ferry. Management of offsite employees would be a little more difficult. There should be no conflicts between visitors and these offices. **South Rim** — Nearly doubling NPS and concessioner operations space would significantly improve NPS and concession operations and reduce conflicts with visitors. Most of the spatial increases would be due to relocating facilities to different existing structures. Any new buildings would be constructed on disturbed lands. Most employees would continue to have a close living relationship to their jobs; others would have easy access to a shuttle. Conflicts with visitors would be significantly reduced, particularly with GCNPL operations. At Desert View additional space would be provided for NPS operations and GCNPL transportation operations. **North Rim** — Facility expansion and relocation of uses would remove space deficits, with the largest increases in NPS maintenance and a new cooperator/public transit maintenance/operations complex. Consolidating facilities (particularly maintenance) would make operations much more efficient. Conflicts between operations and visitors would remain minimal. **Tuweep** — Same as no action, except expanding office space would improve efficiency. **Corridor Trails** — Same as no action.	**Region** — Impacts would be the same as alternative 2 with respect to shifting jobs to Flagstaff/Williams. More effects in Tusayan than any other alternative from relocating major NPS and concession operations. Work-related traffic would increase between the park and Tusayan, increasing conflicts with visitor traffic, plus higher costs for employee shuttles, gasoline, road maintenance, and environmental factors. Separation of facilities would change operational relationships. Consolidating many NPS offices would benefit operational efficiencies over no action but would be offset by the need for offsite management. Moving the boat shop to Lees Ferry would be the same as alternative 2. On the North Rim there would be no regional impacts. **South Rim** — Operational space on the South Rim would be reduced by 14%. All remaining facilities would have adequate space (primarily by adaptively reusing existing structures). Conflicts with visitors would only occur in a few areas. No new buildings would be constructed, and no undisturbed spaces would be used for operations. Many visitor/employee conflicts would be eliminated; the primary remaining conflict would be with the GCNPL mule barn. Desert View facility additions would be the same as alternative 2 except some inefficiencies and coordination problems would occur due to having two separate operational developments. Operational costs would increase for travel and the demolition and reconstruction of new facilities. Minor conflicts would occur between employees and visitors. **North Rim** — Same as alternative 2 except reduced transit facility needs. Operations would be less than any alternative. **Tuweep** — Same as no action. **Corridor Trails** — Same as no action.	**Region** — Effects on Tusayan would be similar to alternative 2 except for fewer NPS employees at the gateway information center. Regional effects on the North Rim would be the same as no action. **South Rim** — The largest amount of management support would be needed for this alternative, more than double the present space. Facilities would be relocated or expanded so spaces would be adequate and relationships functioned well. Conflicts with visitors would be minimized, and most employees would be able to live close to their workplace. In the village operation space would be increased by 80%. The largest increases would be for NPS maintenance, GCNPL food and beverage, and GCNPL transportation. Moving the GCNPL mule barn to the South Kaibab trailhead would make this operation more difficult and could reduce visitor use. Keeping GCNPL reservation operations in the park would provide a closer relationship to the park but would mean adding more space and parking. At Desert View all effects would be the same as alternative 2 except that minor additional space would be required due to higher visitation. **North Rim** — Effects on operations would be the same as alternative 2 except relocating the mule staging facility would increase operating costs. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 2.

Impact Topic	No-Action Alternative: Existing Conditions / Ongoing Programs	Alternative 1: Minimum Requirements	Alternative 2: Proposed Action	Alternative 3: Reduced Development within the Park	Alternative 4: Increased Development within the Park
Utilities Potable Water, Wastewater, Power, Phone Service	**Parkwide** — Roaring Springs would continue to be the park's water source. The park's power supply would not be affected. No major changes to the phone system would occur, so it would continue to be overloaded at times. **South Rim** — Increased potable water needs (18% in the village and 10% at Desert View) would be provided through the existing supply system, with no additional impacts; water conservation measures would be limited. Reclaimed water use would increase. Wastewater treatment facilities would have adequate capacity to handle increases operating at 90% capacity. **North Rim** — The use of potable water would increase by 19.5%, imposing no additional impacts to the water supply system and requiring no additional storage. The proposed wastewater treatment expansion would be designed to handle peak flows. **Tuweep** — The water cistern and septic system would be expanded. Increased power would be required for the seasonal residence at Tuweep. Tuweep would not have phone service. **Corridor Trails** — Pump time at Indian Garden would increase from 11–14 hours to 19 hours during peak times. The wastewater treatment plant would continue to operate near capacity.	All impacts would by the same as no action.	**Parkwide** — The Park Service would provide water to NPS facilities outside the park. Wastewater treatment needs would be met by either tieing into existing systems or creating a localized system. Additional power loads would be imposed, but adequate power is available (secondary lines would be added in certain areas). Relocating the substation out of the powerhouse area would require minor line reconfiguration. Relocating GCNPL reservation offices to Flagstaff or Williams would reduce the number of calls coming into the park. Phone changes for regional information would be the same as alternative 1. **South Rim** — Increased housing and visitor services would increase potable water consumption by ±23%. Water conservation and the use of reclaimed water would be maximized. Improvements to the reclaimed water storage and distribution system would be needed. The village wastewater treatment plant would remain adequate (operating at 95% capacity during peak times). The proposed Desert View wastewater plant would be designed to handle demand. **North Rim** — Potable water needs would increase by 30% over the no-action alternative. Water conservation would be maximized. No additional water storage would be required. Lines would be extended to CC Hill and in the expanded housing area, with water storage at Lindbergh Hill. The proposed wastewater system would be designed to handle demand. **Tuweep** — Same as no action. **Corridor Trails** — The Indian Garden pump station would need to pump 21 hours per day. Measures to limit withdrawals from Roaring Springs and to ensure minimum flows for Bright Angel Creek would limit impacts from park water withdrawals. Reducing or eliminating treated water overflow at Indian Garden would help restore natural conditions to Garden Creek.	**Parkwide** — The Park Service would provide water to NPS facilities outside the park. Wastewater treatment would be handled by the developer or a joint system could be developed with the Forest Service. A main water line would be extended to the east rim orientation center outside Desert View, and a new wastewater facility would be needed. Power supply impacts would be the same as alternative 2. Phone calls would be significantly reduced because of relocating the reservation offices (same as alt. 2) and many facilities outside the park. **South Rim** — Potable water needs would increase by 10%. Water conservation and the use of reclaimed water would be maximized. Wastewater treatment would operate 15% below capacity during peak times. Desert View would have a reduction in wastewater of 1,500 gallons per day, which could leave the lagoons operating marginally at capacity. **North Rim** — Inside the park the same as alternative 2 except no waterline extension would be needed to CC Hill. The proposed wastewater treatment plant would have to be designed to handle an additional ±30,000 gallons per day during peak times. **Tuweep** — Same as no action *plus* a septic system for the seasonal ranger station. **Corridor Trails** — Same as alternative 2.	**Parkwide** — Same as alternative 2 except phone lines would need to be increased and upgraded since lodging reservations would remain in the park. **South Rim** — Potable water demands would increase by 25%, but adequate water would be available. Additional water storage would be needed in the village. The proposed village wastewater treatment facility proposed plan would have to be expanded to meet this demand. **North Rim** — Water consumption would increase by 35%. Adequate water is available, with the Roaring Springs pumps operating 20 hours per day during peak times. Additional water storage would not be needed. The proposed wastewater plant would have to be designed for ±40,000 gallons per day additional capacity. **Tuweep** — Same as alternative 2. **Corridor Trails** — Same as alternative 1.

Table 3: Summary of Land Disturbance by Alternative

NOTE: All acreages represent the maximum disturbed areas. In most cases these acreages are slightly greater than the actual area that is or would be affected. The category "impacted acreage" includes all areas that would be affected under each alternative, including old and new disturbed lands. The category "new lands disturbed" mostly includes lands that have not been previously disturbed, but in some cases also includes lands that have been disturbed in the past and have been revegetated, such as utility corridors or minor disturbances such as social trailing. An asterisk (*) denotes an acreage is unknown at this time because it is either not feasible to measure or site-specific designs are needed subsequent to this plan.

	No-Action Alternative			Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Type of Development	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**
South Rim - Outside the Park															
Main Roads	*	0	0	*	0	0	*	*	*	*	*	*	*	*	*
Parking	*	0	0	*	8.5	0	*	25.3	0	*	34.5	0	*	10	0
Gateway Information, Orientation, Interpretation	*	0	0	*	0.1	0	*	0.4	0	*	1	0	*	0.5	0
Visitor Services	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Housing	*	0	0	*	0	0	*	37.5	0	*	43.5	0	*	39.5	0
Community Services	*	0	0	*	0	0	*	*	*	*	*	*	*	*	*
Management Support	*	0	0	*	0	0	*	0	0	*	5.5	0	*	0	0
Utilities	*	0	0	*	0	0	*	*	*	*	*	*	*	0	0
Subtotal: South Rim Outside the Park	*	0	0	*	8.6	0	*	63.2	0	*	84.5	0	*	50	0
East Rim - Outside the Park															
Gateway Information, Orientation, Interpretation	*	0	0	*	0	0	*	0	0	*	0.5	0	*	0	0
Housing	*	0	0	*	0	0	*	0	0	*	1.5	0	*	0	0
Management Support	*	0	0	*	0	0	*	0	0	*	0.5	0	*	0	0
Utilities	*	0	0	*	0	0	*	0	0	*	4.8	0	*	0	0
Subtotal: East Rim Outside the Park	*	0	0	*	0	0	*	0	0	*	7.3	0	*	0	0
Total: South/East Rims Outside the Park	*	0	0	*	8.6	0	*	63.2	0	*	91.8	0	*	50	0

	No-Action Alternative			Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Type of Development	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**
Grand Canyon Village															
Main Roads	81	1	0	81	1	0	92.5	8.5	0	81	0	0	99	15	0
Parking	17.5	0	0	20	0	0	22	12.5	3	6	0	3.5	41.5	32.5	3
Maintained Trails	3	0	0	3	0	0	22.5	19.5	0	13	0	0	22.5	19.5	0
Gateway Information, Orientation, Interpretation	8	0	0	8	0	0	13	0.5	0.5	11	0	0	13	1	0
Visitor Services	119.5	0	0	119.5	0	0	115	0	0	113.5	0	0	133.5	0	0
Housing	212.5	30	0	212.5	30	0	171.5	0	0	152	0	31	171.5	0	0
Community Services	21.5	0	0	21.5	0	0	25.5	0	0	24	0	0	25.5	0	0
Management Support	39.5	0	0	39.5	0	0	39.5	1.5	0	35	0	1	44.5	11.5	0
Utilities	7.5	0	0	7.5	0	0	7.5	0	0	7.5	0	0	8.5	1	0
Subtotal: Village	510	31	0	512.5	31	0	509	42.5	3.5	443	0	35.5	559.5	80.5	3
Desert View															
Main Roads	91	0	0	91	0	0	93	2	0	91	0	0	93	2	0
Parking (includes East Rim Drive)	4.5	0	0	6	0	0	7	2	2	9	0	3.5	8.5	2	1.5
Maintained Trails	0	0	0	0	0	0	39	39	0	39	0	0	40	40	0
Gateway Information, Orientation, Interpretation	0.5	0	0	0.5	0	0	1	0.5	0	0.5	0	0	1	0.5	0
Visitor Services	8.5	0	0	8.5	0	0	15	6.5	0	6.5	0	1	15	0	0
Housing	5	0	0	5.5	0.5	0	7.5	3.5	0	4	0	1	7.5	3.5	0
Community Services	0.5	0	0	0.5	0	0	0.5	0.5	0	0.5	0.5	0	0.5	0.5	0
Management Support	1	0	0	1	0	0	1.5	0	0	2	0	0	1.5	0	0
Utilities	4	2	0	4	2	0	5	3	0	12	10.5	0	5	3	0
Subtotal: Desert View	115	2	0	117	2.5	0	169.5	57	2	164.5	11	5.5	172	51.5	1.5
Total: South Rim Inside the Park	625.0	33.0	0.0	629.5	33.5	0.0	678.5	99.5	5.5	607.5	11.0	41.0	731.5	132.0	4.5

	No-Action Alternative			Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Type of Development	Total Impacted Acreage	New Lands Disturbed	Restored Acreage	Total Impacted Acreage	New Lands Disturbed	Restored Acreage	Total Impacted Acreage	New Lands Disturbed	Restored Acreage	Total Impacted Acreage	New Lands Disturbed	Restored Acreage	Total Impacted Acreage	New Lands Disturbed	Restored Acreage
North Rim - Outside the Park															
Main Roads	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Parking	*	0	0	*	0	0	*	1	0	*	1	0	*	1	0
Gateway Information, Orientation, Interpretation	*	0	0	*	0	0	*	0.5	0	*	0.5	0	*	1	0
Visitor Services	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Housing	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Community Services	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Management Support	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Utilities	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Total: North Rim Outside the Park	*	0	0	*	0	0	*	101	0	*	1.5	0	*	2	0
North Rim - Inside the Park															
Main Roads	108.5	0	0	108.5	0	0	109.5	.5	0	108.5	1.5	0	110	1	0
Parking	4	0	0	4.5	0	0	7.5	2.5	1	4	0	0.5	6	1	0.5
Maintained Trails	29	0	0	29	0	0	83.5	55	0	29	0	0	85	56.5	0
Gateway Information, Orientation, Interpretation	1	0	0	1	0	0	1	0.5	0	1	0	0	1	0.5	0
Visitor Services	30.5	0	0	30.5	0	0	33.5	.5	.5	30.5	0	0	44.5	10.5	0
Housing	14	0	0	21	7	0	22.5	8.5	0	21.5	7.5	0	26	12	0
Community Services	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
Management Support	4.5	0	0	4.5	0	0	6	1	0	4.5	0	0	6	1	0
Utilities	5	1	0	5	1	0	5.5	2	0	5	1	0	5.5	2	0
Subtotal: North Rim Inside the Park	197.5	1	0	205	8	0	270	70.5	1.5	205	10	0.5	285	84.5	0.5

	No-Action Alternative			Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Type of Development	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**	**Total Impacted Acreage**	**New Lands Disturbed**	**Restored Acreage**
Tuweep - Outside the Park															
Total	*	0	0	*	0	0	*	0	0	*	0	0	*	0	0
Tuweep - Inside the Park															
Main Roads	11	0	0	11	0	0	11	0	0	11	0	0	11	0	0
Parking	0.5	0	0	0.5	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0
Maintained Trails	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0
Gateway Information, Orientation, Interpretation	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0.5	0
Visitor Services	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Housing	0.5	0	0	0.5	0.5	0	0.5	0	0	0.5	0	0	0.5	0.5	0.5
Management Support	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0
Utilities	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0
Total: Tuweep Inside the Park	18.5	0	0	18.5	0.5	0	19.5	1.5	0.5	18.5	0.5	0.5	19.5	2.5	0.5
Corridor Trails															
Maintained Trails	15	0	0	15	0	0	15	0	0	15	0	0	18.5	3.5	0
Gateway Information, Orientation, Interpretation	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0
Visitor Services	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0
Housing	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0
Management Support	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0.5	0	0.5	0	0
Utilities	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0	0
Total: Corridor Trails	21	0	0	21	0	0	21	0	0	21	0	0	24.5	3.5	0
Total: Inside the Park Grand Canyon Region	862.0	34.0	0	874.0	42.0	0	989.0	171.5	7.5	852.0	21.5	42.0	1,060.5	222.5	5.5
Total: Outside the Park	*	0	0	*	8.6	0	*	64.7	0	*	86.0	0	*	52.0	0

TABLE 4: SUMMARY OF MANAGEMENT SUPPORT NEEDS
(IN SQUARE FEET)

	NO-ACTION ALTERNATIVE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
Grand Canyon Village					
National Park Service	307,410	307,410	504,745	196,909	552,438
Grand Canyon National Park Lodges	272,056	272,056	412,919	190,039	429,280
Grand Canyon Association	5,451	5,451	6,417	6,417	7,500
Mayflower Contract Services	14,500	14,500	108,900	0	87,120
Total	599,417	599,417	1,032,981	393,365	1,076,338
Desert View					
National Park Service	91,091	91,091	98,527	98,527	101,121
Grand Canyon National Park Lodges	23,822	23,822	30,950	22,400	31,710
Grand Canyon Association	284	284	750	0	1,000
Mayflower Contract Services	0	0	10,890	0	0
Total	115,197	115,197	141,117	120,927	133,831
Hermits Rest					
National Park Service	488	488	900	900	900
Grand Canyon National Park Lodges	190	190	190	190	190
Total	678	678	1,090	1,090	1,090
North Rim					
National Park Service	70,498	70,498	77,721	77,721	84,856
TWRS/ARAMARK	24,516	24,516	24,516	24,516	24,516
Grand Canyon Trail Rides	17,780	17,780	17,780	0	17,780
Grand Canyon Association	100	100	500	300	500
Mayflower Contract Services	0	0	13,068	6,534	4,356
Total	112,894	112,894	133,585	109,071	132,008
Tuweep					
National Park Service	1,343	1,343	1,475	1,475	1,475
Total	1,343	1,343	1,475	1,475	1,475
Corridor Trails					
National Park Service	22,739	22,739	22,739	22,739	22,739
Grand Canyon National Park Lodges	17,981	17,981	17,981	17,981	17,981
Total	40,720	40,720	40,720	40,720	40,720
Grand Totals					
National Park Service	493,569	493,569	706,107	398,271	763,529
Grand Canyon National Park Lodges	314,049	314,049	462,040	230,610	479,161
TWRS/ARAMARK	24,516	24,516	24,516	24,516	24,516
Grand Canyon Association	5,835	5,835	7,667	6,717	9,000
Grand Canyon Trail Rides	17,780	17,780	17,780	0	17,780
Mayflower Contract Services	14,500	14,500	132,858	6,534	91,476
Grand Total	**870,249**	**870,249**	**1,350,968**	**666,648**	**1,385,462**

Desert View, South Rim

AFFECTED ENVIRONMENT

Climate

Climatic conditions in the Grand Canyon region are diverse and elevation-based (see table 5). Most of the region is arid to semi-arid, although some of the higher elevation areas can be moderately moist. Most precipitation comes from summer thunderstorms originating in moist air masses moving into the area from the south, and from winter weather systems originating in cold, moist air masses from the northern Pacific Ocean. Spring and fall are usually dry, although a defining characteristic of Grand Canyon weather is its variability.

Heavy rains producing spectacular floods have occurred in the area as a result of summer thunderstorms and from masses of tropical moisture in the fall and winter.

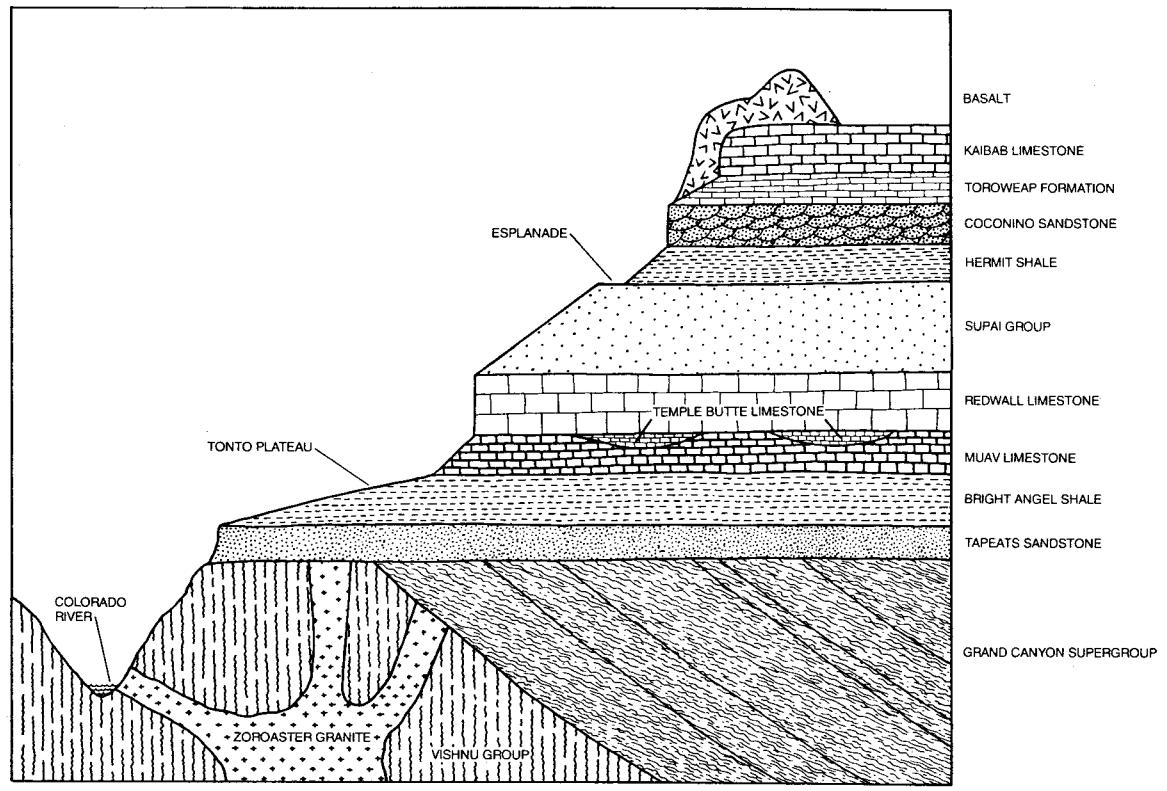
Topography, Geology, and Soils

Grand Canyon National Park contains some of the most spectacular topography in the world. The canyon itself is about a mile deep and varies in width from a minimum of 75 feet at river level in the Middle Granite Gorge (river mile 135) to about 18 miles at rim level along the Bright Angel fault between Grand Canyon Village and the North Rim. The colorful sedimentary rock layers have been carved into buttes, temples, and spires by water, wind, and faults. These formations have inspired awe and wonder for centuries. In addition to its sedimentary rock layers, the canyon also possesses outstanding examples of igneous and metamorphic rock, volcanoes and lava flows, waterfalls, springs, and caverns.

The Grand Canyon region comprises the southern portion of the Colorado Plateau. The Colorado River and its tributaries have primarily created the Grand Canyon by cutting through a series of uplifted plateaus, each separated by north-south trending fault zones or monoclines. The canyon is consistently more than 4,000 feet deep for more than 220 miles from Nankoweap Creek to the canyon's abrupt end at the Grand Wash Cliffs.

The form of Grand Canyon has developed as a result of a combination of the high plateaus, which are composed of alternating layers of very resistant and relatively soft rocks, and the Colorado River. Few surface streams exist to erode away the high plateaus, with the notable exception of the Colorado River and its tributaries. Gravity, water, wind, and frost work together to erode the canyon walls, and the sediment is carried by floods in steep tributary canyons to the Colorado River, where its large volume of water and steep gradient cause it to act as a conveyor belt to carry sediment downstream out of the canyon. The processes that formed Grand Canyon continue to enlarge it today.

Figure 1: Grand Canyon Geologic Cross Section



Earthquakes occur occasionally in the region, but the probability of a destructive earthquake in the area is considered very low (USFS and NPS 1993).

Rockfalls are common along the canyon walls, especially during heavy rains. They occasionally cause trail closures, but injuries due to rockfalls and slope failures are rare. The danger of rockfalls and slope failures is sufficient to warrant concern in planning for structures near and below the canyon rim. Also, activities such as blasting have potential to cause rockfalls.

The park contains extensive cave resources, including an abundance of significant geological, paleontological, archeological, and recreational features. Blasting may also affect some of Grand Canyon's cave resources.

The Grand Canyon region includes the volcanic San Francisco Peaks (including Sunset Crater), Meteor Crater, the Painted Desert, and several other national park areas known for their geology and topography (e.g., Bryce Canyon, Zion, Glen Canyon).

Grand Canyon contains significant examples of most of the themes or categories of natural phenomena represented within the Colorado Plateau physiographic region, including "Landforms of the Present" (Plains, Plateaus, and Mesas; Mountain Systems; Works of Volcanism; Sculpture of the Land; River Systems and Lakes), "Geologic History" (all periods except Triassic-Cretaceous), "Land Ecosystems" (Boreal Forest; Dry Coniferous Forest; Grassland; and Deserts), and

Table 5: Climatic Conditions

Location of Measurement Station	Elevation of Measurement Station (feet)	Average Annual Precipitation (inches)	Average Winter Snow Accumulation (inches)	Temperature Range (low to high in ° F.)	Average Temperatures for January/ July (° F.)	Frost-free Period (days)
North Rim Ranger Station	8,340	23	125	-25 to 91	29/62	101
Grand Canyon Village	6,970	14.5	65	-16 to 98	30/69	148
Tuweep Ranger Station*	4,760	11.7	9.2	0 to 108	38/80	273
Phantom Ranch	2,560	8.5	0.2	-9 to 120	46/92	331

Sources: Phillips et al. 1987; Bureau of Reclamation 1994.
*Warren et al. 1982; NPS 1976.

TABLE 6: APPROXIMATE ELEVATIONS WITHIN GRAND CANYON NATIONAL PARK

South Rim	Elevation
Grand Canyon Village	
El Tovar Hotel	6,920
Business Center	7,000
Mather Point	7,120
South Entrance Station	6,750
West Rim Drive	
West Rim Interchange	6,800
Hermit's Rest	6,640
Hopi Point Fire Tower	7,000
East Rim Drive	
Grandview Point	7,400
Bottom of Coconino Rim (Buggeln Hill)	7,060
Desert View	7,500
North Rim	
North Rim Entrance Station	8,830
North Rim Lookout Tower	9,165
Lindbergh Hill	8,800

North Rim (cont.)	Elevation
Grand Canyon Lodge	8,200
North Rim Ranger Station	8,340
Point Imperial	8,800
Cape Royal	7,865
Tuweep	
Toroweap Overlook/Campground	4,450
Tuweep Ranger Station	4,700
Tuckup Point	6,000
Mount Emma	7,700
Corridor Trails	
Phantom Ranch/Colorado River	2,400
Indian Garden	3,800
Cottonwood Camp	4,000
Roaring Springs	5,000
Bright Angel Trailhead (South Rim)	6,850
South Kaibab Trailhead (South Rim)	7,200
North Kaibab Trailhead (North Rim)	8,240
Old Bright Angel Trailhead (North Rim)	8,450

"Aquatic Ecosystems" (Underground Systems, and Streams; NPS 1990b).

The developed areas of both the South and North Rims are underlain by Kaibab limestone, a very porous and fossil-laden rock layer. The porous nature of several of the upper sedimentary layers of Grand Canyon create a subdued karst topography, in which numerous solution channels and sinks have formed. Little or no surface water is present because water penetrates through soil and rock layers quickly.

Soils tend to be shallow and poorly developed, but stable, with frequent rock outcroppings. The only exceptions are moderately deep soils in the stable valley bottoms on both rims and on a few stable terraces in the canyon. Deep and stable soils are usually indicated by meadows and sage flats. Soil horizons and structure are fairly well developed on the rims, while soils in the canyon generally show little development. Except for a few sinkhole lakes and wet meadows on the North Rim, soils are all well drained.

No soil surveys exist for developed areas of the park though they have been completed for similar settings on nearby Kaibab National Forest lands.

Gullies in some of the meadows on the North Rim were treated with erosion control structures in the 1930s and 1940s. Similar gullies on nearby forest lands have been attributed to excessive livestock and wildlife use early in this century. Accelerated sheet and rill erosion are apparent in park areas subject to recent livestock grazing.

Productivity of most soils is low, so that revegetation is slow and usually requires considerable maintenance. These factors tend to increase the cost of certain types of development, but do not usually preclude them (NPS 1976b, USFS and NPS 1993).

Cryptogamic soil crusts can be extensive and highly developed, protecting soil from erosion and providing nutrient capture.

The canyon has been found to contain asbestos, copper, iron, silver and uranium, and minerals have been mined through the years with varying degrees of success. No mineral claims exist within park boundaries.

Continued low uranium prices have resulted in a substantial decrease in mineral exploration and mine development outside Grand Canyon National Park. Previously active mines have been placed on standby status. While considerably slower, development continues at three additional mines. Development at several sites has been limited to permitting activities.

Very little actual mining is being done near the park, but the National Park Service is continuing to work with adjacent land management agencies to identify potential impacts on and mitigating measures for park resources. Most companies appear to have suspended their activities pending an increase in ore prices.

SOUTH RIM

The Coconino Plateau, which forms the South Rim, generally slopes south, away from the canyon. Slopes overall are gradual, but the plateau is excised by numerous small canyons 50–100 feet deep where slopes may exceed 20% locally. With the exception of the area northeast of the Coconino Rim (which drains east to the Little Colorado River), the entire South Rim study area drains into Havasu Creek (also known as Cataract Creek). This is a major tributary of the Colorado River, which flows through the Havasupai Indian Reservation into the park. The Grand Canyon Village area drains west then south away from the canyon along Bright Angel Wash. The wash follows the Bright Angel fault, which forms a bluff almost 200 feet high separating the village from West Rim Drive.

The other most dramatic topographic feature on the South Rim is the Coconino Rim — a monocline about halfway between Grand Canyon Village and Desert View along the East Rim Drive, which falls about 400 feet from west to east.

The highest points on the South Rim are Desert View and Grandview at about 7,500 feet, while the lowest point on the South Rim is on the Bright Angel fault at about 6,600 feet.

NORTH RIM

The North Rim developed area is topographically separated into the Bright Angel Point peninsula, the Walhalla Plateau (which includes most of the scenic drive between Point Imperial and Cape Royal), and a portion of the Kaibab Plateau. The highest point in the park is about 9,100 feet near the North Rim entrance station. The lowest point in the North Rim developed area is Cape Royal (about 7,865 feet).

The entire North Rim drains south into the canyon. Although it appears relatively flat, the North Rim is cut by numerous drainages and canyons as deep as 400 feet.

TUWEEP

The Tuweep area is below the upper rim of the canyon and is underlain by the Esplanade sandstone of the Supai group or lava flows around the base of Vulcans Throne. Large areas near the Toroweap overlook (including the campground vicinity) are exposed bedrock, sometimes called slickrock. The parking area to the west of Vulcans Throne is covered by pulverized volcanic rock with very little soil and sparse desert vegetation. The Tuweep ranger station area tends to have more soil than these other areas, but the soils are shallow and poorly developed. Where soils exist, grasses and/or cryptogamic soil crusts generally keep erosion to a minimum. Disturbance of the soils, however, can result in rapid erosion by wind and water.

The most striking topographic features of the Tuweep area are the dramatic, nearly vertical drops to the Colorado River about 3,000 feet below the Toroweap overlook. Vulcans Throne, a 500-foot-tall black cinder cone, overlooks the river at the edge of the Toroweap Valley rim. Toroweap Valley was formed from sediment deposited behind a lava dam, which created a relatively flat valley about 3 miles wide from the Vulcans Throne area to about 7 miles north of the park. West of Toroweap Valley are the volcanic Uinkaret Mountains, including Mount Emma and Mount Trumbull. East of Toroweap Valley is Tuckup Point on the upper rim of the canyon.

CORRIDOR TRAILS

The corridor trails cross most of the canyon's geologic formations, with each formation presenting its own characteristics in terms of trail building, soils, erodibility, and topography. Slopes are often unstable, with shallow soils that tend to be highly erodible when vegetation cover is removed or soil crust is disturbed.

The corridor trails primarily follow the Bright Angel fault, which forms the widest part of Grand Canyon. The trails travel through a series of cliffs, slopes, and benches as they follow faults and drainages between the rims and the Colorado River. Indian Garden is located where Garden Creek cuts through the broad bench of the Tonto Plateau. Phantom Ranch is located on alluvium deposited near the confluence of Bright Angel Creek with the Colorado River. Cottonwood campground is on a stream terrace and alluvial fan near the

TABLE 7: APPROXIMATE ELEVATIONS OF SITES IN THE GRAND CANYON REGION

Location	Elevation
Grand Canyon Airport (about 3 miles south of park boundary)	6,600
Valle (about 25 miles south of park)	6,000
Williams (about 60 miles south of park)	6,700
Flagstaff (about 90 miles southeast of park)	7,000
Mount Humphreys (just north of Flagstaff)	12,635
Cameron (about 30 miles east of park)	4,300
Kaibab Lodge (about 5 miles north of park)	8,700
Jacob Lake (about 40 miles north of park)	8,150

confluence of Transept Canyon with Bright Angel Creek. The Roaring Springs pump operator's residence area is on a stream terrace at the confluence of Manzanita Creek with Bright Angel Creek, and the Roaring Springs day use area is on the slope of Roaring Springs Canyon below Roaring Springs.

VEGETATION, WILDLIFE, AND ECOSYSTEMS

The Grand Canyon region is one of the most ecologically diverse in North America. Plant communities vary from cool, moist subalpine forests and meadows between 8,000 and 9,000 feet elevation, to those of the hot, dry Great Basin, Sonoran, and Mojave Deserts at elevations as low as 1,200 feet. While the influence of microhabitats and site-specific factors are acknowledged, Grand Canyon vegetation is still primarily controlled climatically, "with precipitation, maximum summer temperatures, and minimum winter temperatures interacting to distribute plants into more or less discrete elevational zones" (Phillips et al. 1987; see table 8).

About 1,500 plant species occur within the park, including one officially listed as endangered (see table 9).

Park vegetation is primarily natural, with fewer exotic species than most places in the Southwest. Nonnative species compete poorly with well-established, undisturbed native species, but habitat disturbance that removes or weakens the native vegetation can lead to rapid increases in exotic species (Phillips et al. 1987).

Windthrows occur occasionally, especially during the spring when soils are wet and winds are strong. On the rims dead or unhealthy piñon pines are considered the most likely to represent potential hazards to persons and property, by their limbs falling or dropping. Large ponderosa pines occasionally fall in the area, while junipers almost never fall, even years after death. Spruce, firs, and aspens are intermediate between these trees in terms of potential hazards. The greatest potential hazards in terms of falling trees in the park are large cottonwood trees that grow in some of the riparian areas within the canyon, especially at Phantom Ranch and Indian Garden.

Other than poison ivy found at a limited number of water sources in the inner canyon, and pollen produced by several plants, no plant species are known to be generally hazardous to the health or comfort of humans. Cacti, agave, and other spiny native shrubs are considered useful for landscaping where barriers are desired.

While not noted as a "wildlife park," the diversity of animal life at Grand Canyon is nevertheless quite remarkable. There are 290 bird species, 90 species of mammals, 60 reptile and amphibian species, and 25 fish species in the park. This includes seven animals officially listed as endangered.

Common mammals include mule deer, elk, coyote, gray fox, black-tailed jackrabbit, bobcat, striped skunk, ringtail, golden-mantled ground squirrel, and several other rodent and bat species. Mountain lions and black bears are rarely observed.

Common resident bird species include the common raven, Steller's and piñon jay, three nuthatch species, western bluebird, red-tailed hawk, several wren and sparrow species, northern flicker, and dark-eyed junco.

Animals that may pose some hazard to the health or comfort of humans in the park include rattlesnakes, scorpions, gnats (along the river), and fleas on rodents, which may serve as disease vectors for relapsing fever and Hanta virus. Rabies is occasionally found carried by bats in the park. Skunks, rock squirrels, and deer can become nuisances when fed either directly or indirectly (via trash).

The park has recently been noted as a major raptor flyway, as recognized by the federal "Watchable Wildlife Program." These birds are usually dispersed, but more than 100 per hour have been observed migrating through the area from single vantage points.

Six research natural areas totaling 8,845 acres were officially designated in the park in the 1970s, but this program has not been active in recent years, and no special management of these areas is occurring.

Many wildlife species migrate or otherwise move between the park and adjacent lands managed for multiple use.

SOUTH RIM

The major vegetation types on the South Rim between Hermits Rest and Desert View are ponderosa pine forest, piñon/juniper woodland, and big sagebrush associations. In general, ponderosa pine occupies the cooler and moister sites with deeper soils above 7,000 feet elevation. Piñon/juniper typically inhabits drier sites with shallower soils below 7,000 feet. Sagebrush occupies the broader valley bottoms with deeper soils. This description also applies south of the park boundary, to Kaibab National Forest lands, although livestock grazing, timber harvesting, and other multiple use practices have resulted in some ecological differences compared to similar habitats in the park.

Growth rates of the predominant plant species are relatively slow, so that revegetation following disturbance is also quite slow (USFS and NPS 1993). Replanting, seeding, and other procedures used when revegetating disturbed areas usually require considerable maintenance to ensure success, because climatic conditions favorable to the establishment of native species occur infrequently.

A substantial number of introduced species occur in developed areas of the South Rim.

TABLE 8: MAJOR ECOSYSTEMS

MAJOR ECOSYSTEM TYPE	ELEVATION
Sonoran, Mojave, and Great Basin Desert	Below 5,000 feet
Great Basin Sagebrush	3,000–5,000 feet
Great Basin Piñon/Juniper Woodland	4,000–7,000 feet
Rocky Mountain Montane Conifer Woodland (ponderosa pine and/or spruce/fir/aspen)	7,000–10,000 feet
Alpine Tundra	Above 10,000 feet

SOURCE: NPS 1990b, USFS and NPS 1993, NPS 1976b.

NORTH RIM

The major vegetation type on the North Rim is Rocky Mountain montane conifer woodland, with major sub-types of subalpine forest (spruce/fir/aspen associations), ponderosa pine forest, and mountain meadow associations (mixed grasses and forbs). There is also a "canyon rim effect" in which the warm, drying updrafts from the desert environment of the canyon cause vegetation normally seen at much lower elevations, primarily piñon/juniper woodland, to grow along the canyon rim. This canyon rim effect is especially evident at Cape Royal, and at Bright Angel Point near Grand Canyon Lodge. Similar associations occur on nearby Kaibab National Forest lands, although livestock grazing, timber harvesting and other multiple use practices have resulted in some ecological differences compared to the park.

Subalpine forests on the North Rim occur on ridgetops and north- to northeast-facing slopes (Phillips et al. 1987) above 8,000 feet elevation. The spruce/fir/aspen forest is climatically the coldest and wettest part of the park, with thunderstorms an almost daily occurrence on summer afternoons and deep snow during winter.

Ponderosa pine mixed with white fir and aspen tend to dominate on south- and west-facing slopes, especially below 8,000 feet, and are often associated with Rocky Mountain Douglas-fir or Gambel oak.

Although the reason for their formation is not well understood, mountain meadows usually occur in valleys where the Kaibab limestone has eroded away, exposing the upper Toroweap formation. The meadows tend to have very high soil moisture in spring, but hot surface temperatures and dry soil in early summer.

Revegetation success is generally better on the North Rim compared to other parts of the park because of greater moisture and deeper soils.

TUWEEP

The vegetation at Tuweep tends to be transitional between piñon/juniper woodland, big sagebrush, grassland, and saltbush semi-desert scrub, with intermixing between the various types common. Toroweap Valley contains the most extensive grassland in the park, but it is heavily disturbed from years of grazing

(Warren et al. 1982). Piñon/juniper is most prevalent on the slopes and higher elevations, and big sagebrush is found in extensive stands on the area's volcanic flows. Four-wing saltbush occurs in some of the grassland areas. The campground and Toroweap overlook area tend to be a mixture of all the major vegetation types interspersed among patches of bare rock.

Revegetation success in disturbed areas, especially in the campground and Toroweap overlook area, is expected to be severely hampered by lack of soil.

Corridor Trails

Vegetation along the corridor trails transitions from the forests of the North and South Rims through the desert of the inner canyon. For the first 2,500 feet below the South Rim and 4,000 feet below the North Rim, piñon/juniper woodlands prevail (Phillips et al. 1987).

Just below the South Rim, Rocky Mountain Douglas-fir grow in steep, shady pockets of moister, cooler microenvironments. As one descends the Bright Angel and South Kaibab Trails, the piñon/juniper woodland gradually gives way to desert scrub, dominated by blackbrush.

In the lower elevations of the inner gorge along the corridor trails, Sonoran Desert vegetation dominates outside the riparian zone.

Riparian vegetation is dominant near Garden Creek and Pipe Creek along the Bright Angel Trail, Bright Angel Creek and Roaring Springs Creek along the North Kaibab Trail, the Colorado River near Phantom Ranch, and below the river trail. The South Kaibab Trail and Old Bright Angel Trail do not follow any perennial water courses.

A substantial number of historically introduced species occur at Phantom Ranch, including sycamore, fig, and bamboo.

Species of Special Concern

See appendix B for a record of consultation with the U.S. Fish and Wildlife Service in compliance with the Endangered Species Act. Known plant and animal species protected under the Federal Endangered Species Act of 1973 and the Arizona Native Plant Law are listed in table 9 by planning area where they are known to occur.

Water Resources

Regional Water Influences

The Grand Canyon sits at the middle of the Colorado River basin. The river originates 500 miles upstream in Wyoming and northern Colorado. Several water projects upstream from the park drastically alter the flow and water quality characteristics of the river. While Glen Canyon Dam has the most obvious impact on the river, many other agricultural, industrial, and municipal land uses on the watershed have real or potential impacts on the amount, timing, or quality of water reaching the park.

Several large tributary creeks and canyons that join the Colorado River in the park have watersheds that extend well beyond the park boundary and contain a variety of land uses. All are intermittent streams for some portion of their length.

- **Little Colorado River** drains much of northeastern Arizona and a portion of New Mexico. It includes lands that are highly erodible in their natural state, and lands that are extensively grazed and overgrazed, and several abandoned mine sites. It is the major contributor of sediment to the Colorado River in the Grand Canyon.
- **Kanab Creek** drains areas north of the Grand Canyon extending into southern Utah. Land uses include extensive grazing, uranium mining, and the communities of Kanab and Fredonia.
- **Havasu Creek** (also known as Cataract Creek) drains much of the South Rim inside and outside the park, as well as the Havasupai and portions of the Hualapai Reservations. Land uses are predominantly grazing and residential (the communities of Grand Canyon Village, Tusayan, and Williams near the head of the watershed, and Supai in the canyon.
- **National, Mohawk, and Prospect Canyons** drain portions of the Hualapai and Havasupai Reservation lands; grazing is the major use.
- **Diamond Creek and Peach Springs Canyon** drain a large part of the Hualapai Reservation that are used as grazing lands and contain the community of Peach Springs.

Table 9: Species of Special Concern in and adjacent to Grand Canyon National Park

North Rim	Category
American peregrine falcon	E*
Mexican spotted owl	T*
Cliff milk vetch	C2*
Grand Canyon rose	C2
Northern goshawk	C2*
North Rim primrose	C2
Bitterweed	C3*
Century plant	C3
Dutch primrose	C3
Eriogonum zionus var. *coccineum*	C3*
Kaibab beardtongue	C3*
Kaibab paintbrush	C3*
Kaibab saber daisy	C3*
Mogollon columbine	C3*
Tawny turpentine bush	C3*
Western fairy slipper	SR*
South Rim	
American peregrine falcon	E*
Sentry milk vetch	E
Mexican spotted owl	T*
Grand Canyon catchfly	C2
Grand Canyon rose	C2
Northern goshawk	C2*
Phacelia serrata	C2*
Tusayan flameflower	C2*
Camissonia specuicola var. *specuicola*	C3
Mogollon columbine	C3*
Slender rock cress	C3*
Arizona leather flower	C1 (*only)
Disturbed rabbit brush	C2 (*only)
Kaibab bladderpod	C2 (*only)
Tuweep	
American peregrine falcon	E*
Bunch flower evening primrose	C2*
Grand Canyon rose	C2*
Mt. Trumbull beardtongue	C2*
Carex scirpoidea var. *curatorum*	C3
Our Lord's candle	SR*

Corridor Trails	Category
American peregrine falcon	E
Roaring Springs prickly poppy	C2
Grand Canyon catchfly	C2
Mogollon columbine	C3
Camissonia specuicola var. *specuicola*	C3
Bigelow onion	SR
Our Lord's candle	SR
Other Sensitive Species Not Affected by General Management Plan Alternatives	
Bald eagle	E
Brady pincushion cactus	E**
Hualapai Mexican vole	E
Humpback chub	E
Kanab ambersnail	E
Razorback sucker	E
Southwestern willow flycatcher	PE
Fickeisen pincushion cactus	C1**
Coconino pocket mouse	C2
Ditch evening primrose	C2**
Flannelmouth sucker	C2
Grand Canyon cave pseudoscorpion	C2
Greater Western mastiff-bat	C2
Houserock Valley chisel-toothed kangaroo rat	C2**
Pediomelum castoreum	C2**
Southwestern river otter	C2
Spotted bat	C2**
Whiting dalea	C2
Grand Canyon flaveria	C3
Blue curls	SR**
Navajo Bridge cactus	SR**
Western red bat	SC-S
Black-crowned night heron	S

* Species that could potentially be affected by plan actions outside park boundaries as well as inside.

** Only known outside the park

E = Endangered (U.S. Fish and Wildlife Service)
T = Threatened (U.S. Fish and Wildlife Service)
PE = Proposed endangered listing
SC = Candidate for state's threatened native wildlife list.
S = Sensitive (U.S. Forest Service)
SR = Salvage restricted (as defined by Arizona Native Plant Law)

Category 1, 2, or 3 Candidate Species — taxonomic groups or species being considered for threatened or endangered status:
C1 = data exist to support listing; additional data being gathered about precise habitat needs or boundaries for critical habitat designations.
C2 = data exist to possibly support listing, but substantial data about biological vulnerability and threats lacking; further research and field study required.
C3 = no longer being considered for listing because of extinction, not classified as species, or more abundant or widespread than previously believed.

- **Parashant and Andrus Canyons** drain part of the Arizona Strip which are predominately Bureau of Land Management lands used for grazing.
- **Paria River** drains a portion of southern Utah and the northern slopes of the Kaibab Plateau, which are used for grazing and some timbering. The watershed contains the communities of Tropic and Cannonville, and it is also a major contributor of sediment to the Colorado River.

Regional influences are therefore important in planning for the park. Cooperation with landowners and other interests outside the park is important for a large downstream park, such as Grand Canyon National Park.

Although Colorado River management and Glen Canyon Dam issues are not addressed in detail in this document, it is important to understand a few things related to these issues for context of the plan and for interpretation. Grand Canyon National Park includes 277 miles of the Colorado River, one of world's premier whitewater rivers, with superlative scenic and scientific values, natural and cultural resources, and recreational values, including 160 recognized rapids. It meets the criteria but has not been designated as part of the national wild and scenic rivers system.

An extensive research program and environmental impact statement are being conducted to evaluate the effects of Glen Canyon Dam on the Colorado River environment and experience through the park and to evaluate alternative operations and potential mitigating measures for Glen Canyon Dam. This program is discussed in detail in other documents (e.g., see Bureau of Reclamation 1994).

Domestic Water Supply

Roaring Springs below the North Rim is currently the source of virtually all domestic water in the park (see "Utilities" section for a description of how water from this source is diverted to domestic use in the park). The springs emerge from a cave system that has several passages extending several thousand feet north of the spring opening. The spring is approximately 3,200 feet below the rim and can be seen and heard from a trail near the Grand Canyon Lodge on the North Rim. Flow from Roaring Springs cascades down a moist slope into Roaring Springs Creek then joins Bright Angel Creek about 1/4 mile downstream. It contributes 30%–40% of the flow of Bright Angel Creek, which flows past Cottonwood campground and Phantom Ranch to the Colorado River.

Roaring Springs is believed to drain about 8,400 acres of the wettest portion of the North Rim, bounded on the south by the Roaring Springs fault and the east by the Uncle Jim fault. It is unusual among large North Rim springs because the drainage basin is thought to be located almost entirely within the park, so there is little opportunity for the aquifer to be tapped or adversely affected by an outside entity. Base discharge from Roaring Springs is about 8.5 cubic feet per second (cfs) and mean discharge about 11.5 cfs. Discharge is relatively constant year round except in the spring when snowmelt may swell the flow to more than 30 cfs. Summer thunderstorms have also produced surges in spring flow.

Roaring Springs has been used as a water source for the North Rim since 1928 and the remainder of park developments since 1971. During that period, it has never gone dry or experienced notably low flow. Current withdrawals for domestic use are about 20% of the base flow of Roaring Springs and 8% of Bright Angel Creek. Water quality is generally good for a drinking water supply, with less than 200 mg/l of dissolved solids (calcium, magnesium, and bicarbonate). Turbidity has been a problem during spring snowmelt.

Garden Spring at Indian Garden was developed as a water supply for the South Rim from 1928 until 1971, when it was replaced by the transcanyon waterline from Roaring Springs. The small flow from Garden Spring, 0.30 cfs, was almost entirely diverted and still had to be supplemented with water brought in by rail. Even though Garden Spring now flows freely, the flow regime of Garden Creek remains unnatural because water from the transcanyon waterline that is not needed on South Rim is discharged at Indian Garden. This amounts to about 100 gallons per minute (gpm) or 0.22 cfs of supplemental flow when the pumps are operating and 700 gpm (1.56 cfs) when they are shut down. Adverse effects on Garden Creek are flow surges and changes in water quality, which may injure aquatic organisms. The park has a state discharge permit for releasing chlorinated water at Indian Garden.

Many other water sources occur throughout the park. They originate as springs in the inner canyon below the higher and moister plateaus and provide important habitat and water sources for humans as well as wildlife in the arid canyon. Any action that would affect these water sources could have serious effects on water dependent park resources, and river and backcountry users.

Groundwater

Much of the water in the vicinity of the Grand Canyon moves as groundwater because of the porous nature of the rock and the effectiveness of the deep canyon at draining water off the plateaus. A few sinkhole ponds, wet meadows, and small springs on the North Rim are the only natural perennial water sources on the plateaus. In contrast, the more arid canyon, contains at least 70 major springs and streams, all supported by groundwater draining from the plateaus. The amount and patterns of flow and water quality is quite variable among the springs and is dependent on the geohydrology of each aquifer.

The surface of almost all the plateaus surrounding the canyon is the Kaibab limestone. Even though soils are shallow, the rock is so permeable that very heavy rainfall is necessary to produce surface runoff. Karst features like sinkholes are common. Virtually all water that enters the groundwater systems of the plateaus surrounding Grand Canyon ultimately drains into the canyon. Any water withdrawn through wells in or near the park will almost certainly remove water that would otherwise emerge through springs in the canyon. Some of these springs, most notably Havasu and Blue Springs, are located outside the park, but their flows are critical to maintaining aquatic and riparian ecosystems within the park.

Small springs below the South Rim could be substantially impacted because they flow at only a few gallons per minute. Discharge from the Cataract Creek basin system, which includes Havasu Spring, exceed 29,000 gpm (66 cfs), so the impact of similar withdrawals would be less apparent.

Water Rights

Water rights are a legal tool the National Park Service can use to protect water needed for administrative purposes and resource preservation. There are both state appropriative rights and possible federal reserved water rights for Grand Canyon National Park. The former are administered by the state. In order to acquire a state appropriative right, a water user must demonstrate that the water has been put to a beneficial use, as defined by the state. Federal reserved water rights are established when Congress reserves land from the public domain for a specific purpose, such as a national park or monument, and therefore, also reserves sufficient water unappropriated at that time to meet the purposes of the reservation.

The park has applied for and received water rights certificates for five water diversions in the park. Federal reserved water rights for the park have not been quantified. An adjudication for all water rights in the Little Colorado River basin are currently in progress, and the National Park Service has filed a claim for waters in that portion of eastern Grand Canyon.

Floodplains and Wetlands

Floods are a regular occurrence in tributaries of the Colorado River and are a major erosional process in the Grand Canyon. Steep slopes, sparse vegetation, shallow soils, and occasional large storms provide the conditions necessary to produce large and dangerous flash floods in most of the canyons.

An important factor in understanding flood hazards is debris flows, which occur in Grand Canyon tributaries about every 20–50 years (Webb et al. 1989). They are made up of a slurry of sediment and water, with the consistency of wet concrete that is capable of moving tremendous amounts of sediment, including large boulders. Traditional floodplain delineations, which assume stable channel geometry and water flows, must be viewed with some discretion in light of debris flows. They can cause major changes in stream channel geometry and, since they contain up to 60% sediment, increase the actual volume of flow over normal calculated runoff.

Developments in the inner canyon have historically been located near water courses to take advantage of the water supply and shade from riparian vegetation. This has resulted in flood damage at all of the corridor trail developments. Floodplains have been mapped for Indian Garden and Phantom Ranch, but

no changes to these areas are being contemplated as part of this plan. Floodplains have been mapped for part of the Cottonwood campground area, but because this is part of an aggrading system, such delineations are reliable only in the very short term. Other parts of the Bright Angel and North Kaibab Trails are also known to be subject to flood damage. Flood hazards are present at many other popular inner canyon campsites away from the corridor trails (backpackers like to camp near water sources) and at most Colorado River campsites.

Floods on the rims are much rarer because of greater vegetation cover, deeper soils, and lower gradients. Heavy rainfall on the rims is more frequent than in the canyon, and floods do occur, but they do not reach the destructive potential of floods in the canyon. All of the developed areas on North and South Rims are near the top of watersheds so flood problems are minimal and local.

Flood hazard mapping is not needed in any of the North or South Rim developed areas. The only area where flooding may be a problem is in Grand Canyon Village at the general offices/-public garage building. This structure sits in a small drainage with a watershed of about one square mile. Culverts intended to carry water around the building routinely plug, causing water up to four feet deep to flow through the building. This is recognized as a drainage problem rather than a floodplain problem. The routing of this channel through the village will be a consideration for all facilities located along the drainage from the railroad depot to West Rim interchange. Any facilities on the watershed that increase runoff are required to incorporate stormwater retention measures in their design to avoid aggravating drainage problems downstream.

There are no natural wetlands on South Rim, though a few wetland areas have been created. Sewage treatment ponds remain an important source of water for wildlife even though only one of five cells remains in use for emergency overflow. Outflow from the new South Rim wastewater treatment plant is discharged into Bright Angel Wash and will undoubtedly result in the establishment of a riparian wetland along the wash for 3-6 miles. Kaibab National Forest has applied for the appropriation of any effluent flow that crosses the park boundary for watering wildlife and livestock. There are several earthen stock ponds along South Rim. Of these, only the Hearst and Buggeln tanks, both in the Grandview area, hold water for any substantial portion of the year.

Wetlands do exist on the North Rim. The largest in areas that might be affected directly by this plan are Little Park Lake near the North Rim entrance station, and Greenland Lake next to the scenic drive between Point Imperial and Vista Encantadora. Although called lakes, these are more properly characterized as ponds and wet meadows. Several other ponds occur in wilderness parts of the North Rim, in addition to springs both in wilderness and nonwilderness locations (notably Upper and Lower Thompson Springs, Cliff Springs, Neal Spring, Basin Spring, Bright Angel Spring, and Kanabownits Spring). Meadows along the roads on the North Rim may also meet the criteria to be considered wetlands.

Air Quality

Grand Canyon has some of the cleanest air in the contiguous United States, with a visual range that sometimes exceeds 240 miles. The park's class I designation under the federal Clean Air Act carries with it the most stringent standards (or increments) for maximum allowable increases in ambient pollution concentrations over baseline conditions. Increments for sulfur dioxide, nitrogen dioxide, and total suspended particulates are more stringent in class I areas than in other areas and are quite protective of air quality.

Grand Canyon air quality is influenced by humidity; precipitation, and temperature inversions, as well as long-distance, regional, and local pollution sources.

During the winter, strong cold fronts bring in clean air from sparsely populated areas to the north, and visibility can reach more than 200 miles. However, the air stagnates between cold fronts, and strong temperature inversions form that can trap pollutants below the canyon rim until a new front breaks the inversion and again brings in clean air (USDI 1994).

Sulfates are the major contributors to haze at Grand Canyon. These pollutants travel into the park from distant sources to the south and west and from powerplants to the east and west.

Fire Management

Wildfires in the park are managed under the park's *Fire Management Plan,* which is reviewed and amended as needed each year. The developed areas of the park and adjacent forested rim areas are generally managed under a policy of full wildfire suppression. Prescribed burning and mechanical means are used in these areas to reduce hazard fuels and to reduce the risk of catastrophic wildfire.

Undeveloped park areas are managed under a policy of prescribed natural fire, where naturally occurring fires are monitored but allowed to burn if conditions are within prescribed limits, otherwise they are fully suppressed.

All the alternatives considered in this document are consistent with the *Fire Management Plan*, so no changes or impacts are anticipated.

Natural Quiet and Solitude

The park continues to be a focus of attention regarding the effects of aircraft overflights on natural quiet and visitor experience, and methods to mitigate such effects. This issue has nationwide significance for its potential to influence policy regarding overflights of all natural areas. Natural quiet is also adversely affected by other human sound sources in the park, such as cars, buses, trains (including train whistles and bells), and people.

Extensive noise measurements have been gathered in the park, with relevant portions summarized in table 10.

Because sound levels change with the natural environment (e.g., wind and other climatic conditions), several different representations of ambient levels are provided to present a clearer picture of the sound environment. A close approximation of natural quiet is the measured natural ambient sound conditions (with all sounds of human origin excluded). This is represented in table 10 by the low end of the ranges and the L_{90} sound levels (i.e., the sound level exceeded 90% of the time during the measurement period). The high end of the ranges, the L_{10} levels, and the typical levels represent ambient levels when nonaircraft sound sources are included (buses, automobiles, and visitors where applicable). The data show that Grand Canyon is generally a very quiet place.

Sound levels for sources such as buses, trains, aircraft, and automobiles at Grand Canyon are shown in table 11. Distances shown are from the sound source to the receptor and are assumed to be typical.

The decibel (dB) is a standard unit of measurement for sound. Each 10 dB increase on the decibel scale represents an increase of 10 times the amount of sound energy, which is perceived by humans as a doubling of the loudness. Because sounds of different frequencies may or may not be perceived as noise, sound measurements are weighted for sensitivity in particular frequencies and are expressed in A-weighted units (dBA).

As a point of reference, a conversation between two people would typically measure about 60 dBA. Sound levels above 80 dBA can cause hearing loss if prolonged.

Typical ambient levels in Grand Canyon Village are in the 50 to 60 dBA range (USFS and NPS et al. 1993). In the park's more arid environments, with less vegetation and human influences to contribute noise, the natural ambient sound levels approach 10 dBA, which is at the threshold of human hearing.

Noise can be simply defined as any unwanted sound. Impacts such as annoyance from sound sources have been shown to relate to audibility. In very low ambient environments, like those at Grand Canyon, sound sources can be much more audible, thereby having greater impacts, than the same levels from the same sound source in a higher ambient environment.

Visual Quality

Several scenic views extending beyond the park boundaries are part of the visitor experience within the park, including

- views of the San Francisco Peaks and Red Butte from many points on the North and South Rims
- views of Navajo Mountain and the Little Colorado River gorge from overlooks between Desert View and Lipan Point on the South Rim and from the overlooks from Point Imperial to Cape Royal on the North Rim
- views of Mount Trumbull from Hopi Point and Desert View

TABLE 10: AMBIENT SOUND LEVELS IN AND NEAR GRAND CANYON NATIONAL PARK

LOCATION	TYPICAL MEASURED AMBIENT LEVEL (dBA)	RANGE OF MEASURED AMBIENT LEVELS (dBA)	L_{90} (dBA)	L_{10} (dBA)
Desert View Watchtower area[1]	34-48	29-58	36	51
Lipan Point (East Rim Drive)	37	20-49	27-30	38-41
Yaki Point (East Rim Drive)	46	30-56	33	50
Bright Angel Point (near Lodge on North Rim)	27	19-38	21	30
Point Imperial[1]	33	20-47	24-28	35-41
Point Sublime	23	10-38	12	28
Toroweap Overlook[1]	22-24	11-44	14	33
Phantom Ranch Overlook (Bright Angel Creek clearly audible)	41	39-44	40	42
Other Inner Canyon Locations away from the sound of moving water[1]	22-28	12-38	16-17	25-29
Grand Canyon Village[2]	50-60	NA	NA	NA
Tusayan[2]	64	NA	NA	NA

SOURCE: Horonjeff et al. 1993, except where noted.

1. Data from Fidell et al. 1992 for typical levels in addition to data from Horonjeff et al. 1993.

2. Data from USFS and NPS 1993.

NA — Not available because the levels reported in USDA et al. 1993 were simply labelled as measured levels without any further clarification. It is assumed that these levels are considered typical by the authors of that document.

TABLE 11: SOUND LEVELS FOR TYPICAL NOISE SOURCES AT GRAND CANYON NATIONAL PARK

SOUND SOURCE	DISTANCE (FEET)	SOUND (dBA)	SOUND SOURCE	DISTANCE (FEET)	SOUND (dBA)
Bus	10	82-86	Steam Train Whistle	100	90-100
Bus Passing	20	82	Steam Train Whistle	1,000	72-74
Shuttle Bus Passing	20	78	Diesel Train Whistle	1,000	80
Automobiles Passing	20	65	Train Bell	200	60
Plane Taking Off	1,000	75-82	Steam Train	50	90
Plane Landing	1,000	62	Train	500	70
Helicopter Taking Off	200	88	Diesel Train	50	80
Helicopter Landing	200	80	Diesel Train Whistle	150	76
Bus	50	60-70			

SOURCE: USFS and NPS 1993.

- night views of the lights of Tusayan and the Grand Canyon Airport from Bright Angel Point on the North Rim
- views from Toroweap overlook to the south, east, and west

Development on the rims, including effects such as sunlight reflecting from metal and glass on cars and unshielded lights along the rim edge, can be seen from some natural areas in the inner canyon and on the rims. Because the Grand Canyon Lodge on the North Rim is about 1,000 feet higher in elevation than Grand Canyon Village, roofs and buildings on the South Rim can be visible from the North Rim viewpoints. At night unshielded building lights, outdoor lighting, and car headlights can be seen. The beacon at the airport in Tusayan can be seen directly from rim viewpoints on the North Rim, and its flashing glow can be seen from many remote locations on both rims.

Developed areas in the inner canyon can be especially visible from the rims. While some visible signs of civilization can add references that help visitors comprehend the enormity of Grand Canyon, they can also detract from the wilderness setting and intrude upon views of nature.

Views of the night sky are generally quite spectacular at Grand Canyon, which has few light sources and generally good air quality. Unshielded outdoor lighting has the greatest potential to affect views of the night sky.

CULTURAL ENVIRONMENT

ARCHEOLOGICAL RESOURCES

PARK GENERAL

The earliest suggestion of human use of the Grand Canyon is a Folsom projectile point discovered in the Marble Canyon area, which may have been left there as early as 10,500 years ago. However, a single artifact can only suggest that humans were in the canyon that early. Until other data are recovered verifying a Paleo-Indian presence, archeologists can only speculate that there may have some use of the area that early.

Consistent, well-documented evidence of human use of Grand Canyon appears in the form of small figures made of split-willow twigs that represent game animals and date to about 2,500 B.C. Found only in isolated caves of the inner canyon, the figures are associated with no other artifacts and thereby reflect only a small part of the lives of the early people who made them. Archeologists believe these items were connected with hunting magic, suggesting that the canyon was both a place for procuring food and a place of sanctity. Desert Archaic projectile points, known to be of the same time period, have been found near Red Butte south of the canyon, on the South Rim, and on the Kanab Plateau.

Occupation of the canyon appears to have been relatively continuous until around A.D. 500, when small groups of Basketmakers began living in modest villages of circular pit-houses with mud and brush roofs, and using a distinctive gray pottery. The population of the canyon began to grow considerably. The Basketmakers hunted bighorn sheep, deer, and rabbits, and they cultivated corn, beans, and squash. They were particularly adept at making baskets and other items from woven grasses, which the dry desert environment has preserved well for today's scientists. Their remains have been found throughout the canyon in caves, on deltas in the inner canyon, and on drainages of both rims.

By A.D. 800, these people had become the ancestral Puebloans (known by archeologists as the Kayenta Anasazi). They lived in larger groups and their homes moved above ground, becoming sturdier, rectangular blocks of rooms. The pit-house was retained in the form of a religious room — the distinctive kiva. These people appear to have relied more on agricultural products than their predecessors, building away from prime agricultural land to free it for farming. Rooms for the storage of food indicate long-term planning for lean times, and suggest that the desert environment was somewhat unpredictable.

The population increased dramatically by A.D. 1100; of the more than 2,700 archeological sites known within the park, 70% were occupied between A.D. 1050 and A.D. 1150. This period was the height of the ancestral Puebloan culture throughout the desert Southwest, and the high population in the canyon may be as much a result of neighboring population pressures as was the availability of resources in and near the canyon. When drought struck throughout the Southwest, people began to leave the canyon. By A.D. 1225, it was all but abandoned, with only a few places like Tusayan Ruins still being occupied.

After about a hundred years, people relying more on hunting and gathering began to return to the Grand Canyon area. The ancestors of the Hualapai and Havasupai occupied most of the lower canyon as far east as the Little Colorado River, living in rock shelters or brush wickiups and practicing a limited horticulture. The Southern Paiute moved onto the Kaibab Plateau and North Rim to hunt and gather food. The modern descendants of the ancestral Puebloans — the Hopi and Zuni — maintained connections with the canyon through trade and for religious journeys to obtain salt and other minerals. Although no longer a home for them, the canyon has retained a distinct role in their religion.

Although visited by Spanish conquistadors and missionaries in the 16th century, it was not until John Wesley Powell's 1869 explorations that the historic period began at the Grand Canyon. His entry into the area heralded the advance of people seeking other kinds of resources from the canyon — its precious metals and minerals. The miners were followed by modern visitors who use the canyon as a place for tourism and recreation.

Only a small portion of the park has been formally surveyed for archeological sites, but more than 2,700 have been recorded. The river corridor, the southern extension of the Walhalla Plateau on the North Rim (known as Walhalla Glades), portions of the Grand Canyon Village, the transcanyon corridor, and portions of East Rim Drive have been systematically surveyed for archeological resources; these are all areas that receive heavy visitation and disturbance by modern visitors. The remainder of the park has not been thoroughly inventoried. Some studies have been conducted outside heavy use areas and include responses to visitors' reports of pot caches, formal archeological surveys directed toward inventorying sites for specific construction or development projects, intensive surveys of fire control plots, and selected sampling inventories by academic groups in places like the Kaibab and Kanab Plateaus. The sites include sparse artifact scatters, isolated storage bins, agricultural walls, multi-room pueblos, and historic trash dumps. All have their own degree of potential to answer scientific questions.

Archeologists estimate there may be as many as 61,000 sites in the park; less than 5% have been formally recorded. The density of sites in surveyed areas averages one site in 20 acres and ranges from one site for every 7 acres in the vicinity of the Grand Canyon Village to one site in 349 acres on Swamp Ridge. The estimated density for the North Rim is one site in every 14 acres and one site in every 31 acres on the South Rim.

Existing knowledge of site distribution in the park is biased because of the concentration on areas being impacted by visitors and natural processes. Archeological sites in the park appear in all ecological zones in roughly equal proportions. No one ecological zone seems to have been favored by human beings across the entire time humans have been in the canyon.

There is still much to learn about human use of the Grand Canyon and how its unique physiography influenced the course of humanity in the American Southwest. The canyon lay at the crossroads of three major groups of ancestral Puebloans — the Virgin, the Kayenta, and the Little Colorado — and another group known as the Cohonina, each with their distinctive styles of pottery and architecture. How did these people interrelate? Did they wage war or cooperate? Were there resources enough for all, or did the demands of a large human population exceed the capacity of the environment? Was it an environmental failure in the canyon itself or an infrastructural failure in Puebloan culture as a whole that caused the abandonment of the canyon in the late 12th century? Is there archeological evidence to support the modern Pueblo explanation that it was merely time to move on in their slow migration to their ultimate homelands? The answers to these kinds of questions can satisfy more than a mere curiosity about past lives; they can help us understand humanity's tenuous relationship with the natural environment and enhance our appreciation of the Grand Canyon.

Only two of the 2,700 identified archeological sites in Grand Canyon are on the National Register of Historic Places — the Tusayan Ruin archeological site on the East Rim, and the Little Jug archeological site west of the Toroweap Valley. The Arizona state historic preservation officer has concurred with an NPS determination of eligibility for a multiple resource property of 323 sites along the Colorado River. A draft multiple resource nomination for all remaining archeological sites in the park is being compiled. Until this group of nominations can be completed, the Park Service is treating all archeological sites as if they are eligible for listing on the national register.

The park's list of classified structures includes 61 archeological sites with standing ruins.

SOUTH RIM

There has been no archeological survey of the West Rim Drive. If the density of archeological sites along the East Rim Drive is any indication, there are likely to be a large number of important resources near the West Rim.

A series of lithic scatters and small Puebloan clusters are known to exist near Buggeln Hill and Grandview Point. Archeological remains of Hance's original hotel and tourist accommodations are also in the vicinity. Archeological sites become more dense and frequent east of the Coconino

Rim, at least near the canyon rim.

The Tusayan ruins are listed on the National Register of Historic Places, and the area appears to have extensive remains related to late Puebloan occupation up through historic American Indian uses. Archeological investigations in the area began in 1929 and culminated with the stabilization of the ruins for interpretation and the construction of the Tusayan museum. Considerable reconnaissance survey in the area at this time discovered many sites in the general vicinity, but that work resulted in only one brief publication, and site records were poor. Many of those sites have yet to be rediscovered. A nearby pithouse was excavated in the 1950s. The site suggests a cultural history for the area that overlaps with the Cohonina culture. Archeological surveys for various construction projects near the Tusayan ruins during the last 10 years have located nearly 100 sites, mainly representing ancestral Pueblo and Cohonina occupations between A.D. 900 and A.D. 1200.

Sites on the South Rim tend to be larger than those found on the North Rim or in areas west of Grandview. Archeologists believe people began to aggregate into larger habitation sites sometime after A.D. 1100. From that time until about A.D. 1225, the size of sites increased, suggesting the consolidation of families into larger extended groups. The Tusayan ruins site is typical of this latter type of site. Other nearby sites are generally smaller and were built by earlier inhabitants. The other large pueblos found in the area have many of the same characteristics as Tusayan and date to the end of the Pueblo II period. Archeological remains built after A.D. 1225 are scant, suggesting the continuation of Puebloan movement toward the Hopi mesas.

Site density on the South Rim is high, with archeological materials nearly continuous from Buggeln Hill (east of the Kaibab monocline) to Desert View. In addition to the prehistoric materials, the area contains remains suggesting limited and continuous use into historic times. The area is known to have been used by the Hopi, Havasupai, and Navajo. The rim was a trade route between Hopi and Supai. The area near the Hance trailhead is known to be sacred to the Havasupai.

A 300′ wide corridor along East Rim Drive has been surveyed. Site densities appear to be high. For instance, within the corridor from Grandview Point to the Tusayan museum (8.8 miles), 38 archeological sites were recorded. Eleven of those sites contained the remains of masonry structures dating before A.D. 1200; one pueblo ruin contained four rooms and an outlying kiva; and all the rest had remnants of only a single-room structure. Five of the sites were related to 20th century Euro-American occupation of the rim and ranged from the remnants of the John Hance homestead and the 1927 Desert View ranger station to historic trash scatters. Twelve of the remaining 18 sites were scatters of artifacts containing both pot shards and stone chipping debris; six sites consisted simply of lithic scatter. It is expected that similar densities and types of sites exist away from the road corridor, and along the rim from Desert View to Hermits Rest.

■ Grand Canyon Village

Some of the densest concentrations of sites are in the Grand Canyon Village area, but few of these are large, extensive sites. Sites date from some of the earliest occupation through historic Havasupai camps and trash dumps associated with early tourist development on the rim.

■ Desert View

Portions of Desert View have been surveyed for archeological resources. While there are no sites in the immediate area of the development, there are some small isolates and lithic scatters nearby. The Navajo consider the Desert View point area to be a significant feature for their people.

North Rim

The North Rim has some of the most important archeological sites in the park, especially in the Walhalla Glades area. The expansion and exploitation of the North Rim by ancestral Puebloan peoples is evidenced by the extensive remains found on the North Rim, particularly in Walhalla Glades. Intensive surveys of this 4,000-acre area have located hundreds of sites.

The settlement history for the area reflects considerable occupation during the period A.D. 1050 to A.D. 1150. Both habitation sites and their associated agricultural features indicate an area intensively used for farming during the summer for approximately 100 years. Remains generally consist of small field houses of one or two rooms with associated agricultural field areas. The entire Walhalla peninsula is warmed by updrafts from the canyon, making the entire area favorable for agriculture.

There are only three known archeological sites near Bright Angel Point, but none within the existing development area. One small masonry structure lies near the Rim Transept trail and is currently interpreted to the public.

There have been no archeological surveys of the CC Hill area. It was originally used as a Civilian Conservation Corps camp in the 1930s, and there is a potential for historical archeological sites related to that use nearby.

Tuweep

There are a large number of archeological remains in the Tuweep area; the entire Esplanade consists of a dispersed scatter. Three recorded sites are within the campground and are sustaining ongoing impacts from visitor use.

Corridor Trails

The corridor trails were used prehistorically and pass near many archeological sites of varying size and importance. The trails have been surveyed for archeological resources, but subsequent checks have indicated that the existing data are of poor quality. Archeological sites near trails often receive some of the greatest impacts from erosion and illicit collection. Human burials associated with ancestral Puebloan occupation have been found at an archeological site near Cottonwood Camp on the North Kaibab Trail.

Phantom Ranch contains one well-studied pueblo and a number of features associated with it. Human burials have been found nearby. Besides having considerable evidence of Puebloan use, Indian Garden was the home of several Havasupai families until well into the 20th century.

American Indian Traditional Uses and Sacred Areas

Six American Indian groups, represented by eight separate tribal governments, have ancestral ties to the Grand Canyon. Each group has its own account of its history and relationships with other groups, a history that can be only partially supplemented by archeological research. The Colorado River, the canyon, the larger landscape in which they occur, and many of the park resources are considered sacred by some American Indians. Within this larger landscape are sites, locations, and resources that are of traditional significance to all tribes in some cases, and to only some tribes in others. These American Indian traditional cultural properties are tangible historic properties potentially eligible to the National Register of Historic Places because of their association with cultural practices and beliefs rooted in history and their importance in maintaining the cultural identity of ongoing American Indian communities. The following discussions summarize the value of Grand Canyon National Park for each of the affected American Indians of the region. The source of much of this information is the 1994 *Draft Glen Canyon Dam Environmental Impact Statement.*

All groups consulted consider the canyon itself to be sacred, although in slightly different ways for each group. The presence of non-Indians in and around the canyon compromises this sacred quality, especially in that most American Indians have expressed the belief that much of non–Indian behavior is disrespectful toward the canyon's spirituality. The special feeling of sacredness portrayed by American Indians is more deeply felt, more integral to daily life, and more essential to their spirituality and religion than the reverence non-Indian peoples may feel for the canyon. Most of their statements of spiritual "ownership" of the canyon stem from this deeply held belief.

Furthermore, all groups contacted manifest a long-term traditional use of the park and its resources that dates back several generations, if not several centuries. When non-Indian governments restricted each tribe to reservations, individuals from the tribes continued to use the canyon for both traditional and economic activities. Tribal representatives expressed the belief that their uses are conservation-oriented and do not deplete the resources: for example, the Navajo take only three parts of a resource and leave the fourth for the land. They believe their rights to use plants and minerals are inalienable, not to be questioned, and are fully legitimate.

American Indians believe that their rights to use the park's

natural resources are protected under the American Indian Religious Freedom Act and the National Historic Preservation Act. Any action taken by the National Park Service to preserve resources or to facilitate use by all visitors, but which at the same time curtails American Indian traditional use, is viewed as discriminatory and infringing upon the Indians' right to the land.

The National Park Service currently allows American Indians to collect certain plants, animal parts and minerals for use in traditional activities.

All of the American Indian groups consulted have expressed a concern that the National Park Service has limited its interpretation of the story of the Grand Canyon primarily to the natural resources. As they view themselves as a part of nature, not separate from it, they resent being left out of most of the story. They make the point that they have been present in the canyon for a very long time: for some of them, for as long as time has existed; for others, as long as humans have existed. From their perspective American Indian use of the canyon is well grounded in sound ecological principles. They are concerned that Euro-American use, and the values that govern that use, are not unified with the resources of the canyon, and that such use will ultimately destroy the canyon's environs and the spirituality that permeates it.

There is a further perception on the part of most American Indians that when their story is told, it is not a correct version. The Park Service has relied on archeological or historical data to present the story of human use of the canyon, and has not fully incorporated the self-defining histories of the groups concerned. They believe that the telling of those histories is important in cultivating mutual understanding and respect of peoples, and enriches the story of the canyon. They further believe that they can help to educate the non-Indian in the special relationship people can have with the land.

The deeply felt beliefs of spiritual ownership and traditional rights to use the land, combined with a mistrust of Euro-American government and a belief that their heritage is not well-represented, has created a climate of resentment toward the National Park Service. In the past, most groups believed that the Park Service had not consulted with them enough on matters for which they have a great deal of interest and cultural investment. In recent years, communications have been enhanced, and relationships have improved in regards to issues dealing with sacred or religious realms. For example, all members of the six interested tribes are now allowed free access to the park to pursue traditional and spiritual activities.

While the canyon itself is of especial importance to all of the American Indian groups, the rims have significance as well, because that is where they approach the canyon. An unstructured increase in visitation on the rims, in particular the South Rim, is of grave concern to them, because it has the potential to affect sacred and traditional areas.

With respect to economic traditions associated with park resources, most tribes wish to exert their traditional rights by being able to participate in the tourist economy. In some senses, such a use is not viewed any differently than hunting or gathering food. It is simply an adaption to the loss of traditional hunting and gathering pursuits by substituting the proceeds from a tourist economy.

In discussions with American Indian groups, more issues were generated than can be dealt with in the general management plan. That does not mean that the Park Service will not be addressing those concerns. Issues related to boundary disputes and water rights are legal issues that cannot be resolved here. Issues such as permitting visitor access to tribal lands, threats to sacred sites adjacent to but outside the park, fishing regulations, and cutting firewood are related to the backcountry management of the park and are being addressed in the backcountry, Colorado River, and resource management plans.

The Park Service, in cooperation with other agencies, is currently undertaking ethnographic studies of the Hopi, Hualapai, Navajo, Southern Paiute, and Zuni tribes, in addition to a general cultural affiliation study. Some of these studies may have restricted access to the information about ethnographic resources, in particular sacred sites, due to American Indian sensitivity about divulging the location of areas that are of particular importance to them.

The Park Service knows very little about the specific locations of sacred sites and traditional cultural properties, and their uses. These surveys and studies would be oriented toward facilitating communications with the six American Indian groups so that such sites could be adequately protected.

Not all groups feel exactly the same towards the land and their reciprocal relationship with it. The following is a summary of each group's spiritual and traditional interests in the canyon to supplement these general statements. The tribes are discussed in alphabetical order.

HAVASUPAI

The Havasupai Reservation lies within and on both rims of Cataract (Havasu) Canyon. Havasupai ancestral lands covered an area from the Colorado River on the north to the Bill Williams Mountains and the San Francisco Peaks on the south, the Aubrey Cliffs on the west and the Little Colorado River gorge to the east. Limited archeological evidence suggests use of this area dates back to A.D. 700, although the majority of Havasupai remains within Grand Canyon date to after A.D. 1300.

Havasupai legend places the creation of the Grand Canyon with a flood that covered the earth. The canyon was formed when the waters of the flood rushed away to the sea. One of the Havasupai gods, Tochopa, sealed his only daughter up in a log, and she became the only human being to survive the flood. She came to rest on the South Rim of the Grand Canyon, and her children became the progenitors of the Havasupai, Apache, Hualapai, Hopi, Paiute and Navajo peoples. Tochopa told all of these people that the land was theirs and they should live in it for the rest of time. He also gave the Havasupai the responsibility for guarding the South Rim of the canyon (James 1910:229).

Red Butte, located outside the park, is considered to be the birth place of the Havasupai (Wray 1990a). Hance trail, in Grand Canyon National Park, has religious significance, as it is part of their migration route north from Red Butte into the Grand Canyon.

The Havasupai are extremely reluctant to divulge the location of sacred sites. Once non–Havasupai are aware of the location of a sacred area, it loses its special significance. Therefore, they will only reveal the location of a sacred site if it is severely threatened.

In 1882 the Havasupai were confined to a 518-acre reservation in Havasu Canyon, which eliminated a major portion of their traditional hunting and gathering lands. The reservation was expanded in 1975 with the Grand Canyon National Park Enlargement Act, which added 185,000 acres to the 518 acres in Havasu Canyon and provided an additional 95,300 acres within the park as a permanent traditional use area.

Although they hunted and gathered wild plants throughout their territory on the rim and in the canyon, the Havasupai also farmed in Havasu Canyon, Indian Garden and Fossil Bay. Residences were located below Hermits Rest on the same plateau as Indian Garden and as far east as Desert View, where a Havasupai family lived below the present watchtower. They traditionally lived in log wickiups similar to Navajo hogans, as well as in small caves (Wray 1988).

At the turn of the century four or five Havasupai families were living at Indian Garden, growing squash, pumpkins, melons, corn and peaches. While their year-round residence was in the canyon, they would move up onto the rim in April to exploit a greater number and type of resources during the time when their crops were just starting to grow. They camped along the rim as well as in the canyon. In the spring and early summer, they gathered mescal and yucca pears. When the piñon season started in the fall, they climbed to the rim again to gather piñons.

Large numbers of Havasupai and other American Indian peoples gather in the park in the fall to harvest piñon nuts as part of this centuries old tradition.

The Grand Canyon Village area was traditionally a seasonal camp for the people living at Indian Garden. As early as 1900, some Havasupai began living in their seasonal brush and earthen structures year-round as they worked for both the Park Service and concessioners.

Havasupai families working for park and concessions lived in the vicinity of Grand Canyon Village during the 1920s and 1930s. Camps were located near the present Maswik Lodge (where there was also a cemetery), on Rowe Well Road, and near the present Fred Harvey garage. By 1935, the CCC built six cabins at what had become known as Supai Camp on Rowe Well Road. These were rented to Havasupai who worked for wage labor in the park. Descendants of these original families who work in the park still live in the camp.

Because of their traditional connection to the Grand Canyon

Village area, the Havasupai are concerned about future development having impacts on the archeological remains of their homes, villages, and burials.

The Havasupai hold many of the native flora and fauna of the canyon as important both economically and religiously. Animals provided food and a variety of useful products for everyday living, and plants were used for medicines and for the production of practical items such as baskets. The wide and varied range of their ancestral lands supplied most of the resources they needed to live successfully in and around the canyon.

The Havasupai graze cattle, horses and sheep in their traditional use lands, as allowed by law and the expansion of the their reservation. The park also permits limited hunting, the gathering of plants, and other traditional activities, including the minimal improvement of springs within the Havasupai Use Lands. The park controls visitor use of these use lands through the *Backcountry Management Plan.*

All springs have some importance to some members of the tribe. The only ones that appear to have extra religious significance are within the Havasupai Traditional Use Lands. They are also concerned about tapping water wells to the south of the park which may affect the flows of Havasu Creek.

The Grand Canyon Enlargement Act encourages the Park Service to cooperate with interested Indian tribes for the unified interpretation of the Grand Canyon. Only minimal information on the Havasupai is currently presented to visitors.

Because they consider themselves the guardians of the canyon, the Havasupai are very much concerned about uranium mining and water quality in mining areas adjacent to the park. The Havasupai view the National Park Service as co-caretakers of the canyon's resources, and as federal government entities, leaders in conservation efforts. They look to the Park Service to take the lead in keeping water and air quality good for all the people who use the canyon.

HUALAPAI

The Hualapai tribe has a long history in the Grand Canyon. Their reservation borders 108 miles of the river, although their ancestral interests are much broader. Hualapai tradition places their ancestral boundary at the Colorado River on the north and west, the San Francisco Peaks on the east, and the Bill Williams and Santa Maria rivers on the south. Within this region, they lived in groups composed of fourteen bands consisting of nuclear and extended families. The entire range was shared by all bands.

All bands descended from one people, known archeologically as the Cerbat. Culturally, both the Hualapai and Havasupai, along with the Yavapai, are referred to as the Pai, meaning "the people," and consider themselves as one ethnic group, "the only true human beings on earth." Cerbat remains date as early as A.D. 600 at Willow Beach in Lake Mead National Recreation Area, while physical remains of the Pai in the Grand Canyon appear about A.D. 1300.

The Colorado River (*Ha'yitad*) is a significant landmark for the Hualapai, both physically and spiritually. Historically, all of the Yuman language family tribes were located on or near the river. There is a common bonding creation myth which took place at "Spirit Mountain," (*Wikahme*) along the Colorado River near Bullhead City, Arizona. They further believe that they were created from the mud and sand of the Colorado River.

The Grand Canyon and surrounding plateaus offered the Hualapai the necessary resources to live successfully in the region. Wild game, most notably desert bighorn sheep, were the prime source for survival of the people. Other game animals included deer, elk, and antelope, all of which provided shelter, clothing, tools, weapons, and ceremonial objects. The major wild foods, used for food and medicine, were derived from plants such as cactus fruit and grass seeds.

The names of the sacred canyons in the Grand Canyon are derived from important historical events recounted through oral traditions. Trails and trade routes within the canyon allowed the Hualapai to co-exist successfully, not only with the other Pai bands, but also with neighboring tribes such as the Hopi, Paiutes, Mohaves and Navajos.

The Hualapai have occupied and used the lands and water lying within their aboriginal territory, as well as within the present reservation, for more than a thousand years, long before the records and history of Euro-American society in Arizona. Evidence for their occupancy, use, and ownership of the territory is contained in their family and tribal records, traditions and legends. These records are unwritten, but faithfully transmitted from parent and leader, to offspring and follower.

HOPI

The Grand Canyon is very significant to the cultural and religious life of the Hopi people. Archeological sites, religious shrines, springs, locations of medicinal herbs, and other sacred places in Grand Canyon are important because of their role in perpetuating Hopi life and culture. These places provide a vital spiritual and physical link between the past, the present, and the future.

The Hopi people began with their emergence into the present world through the *Sipapu,* a travertine cone in the Little Colorado River gorge outside the boundaries of the park. From that place, they spread throughout the southwestern United States until their eventual consolidation at the center of their universe: the Hopi Mesas. The migrations of some of the clans included residence in the Grand Canyon. Archeological investigations substantiate these claims; the Western Puebloan peoples are synonymous with the *Hitsatsinom,* (ancestors of the Hopi), indicating they have used the canyon since about A.D. 700.

Many of the archeological sites in the canyon bottoms, on both rims and in the transitional zones between, which date from A.D. 700 to A.D. 1200 are associated with the *Hitsatsinom* (commonly known as the Anasazi). While most *Hitsatsinom* then migrated out of the Grand Canyon, there is evidence that they continued to use the area for religious purposes up to the present time. Ritual pilgrimages to the Grand Canyon for salt, minerals, and other resources, as well as to visit shrines, have continued.

The Hopi value any *Hitsatsinom* archeological site, because it is a marker on the landscape documenting their cultural claim to the land. Rock art, in addition to ruins, serve as claim markers. The Hopi possess a rich interpretive scheme for assigning meaning to elements of art appearing on rock, and have identified symbols for living clans on sites within the canyon. In addition, they understand the many hand-prints and clan symbols seen on the rock panels as markings by clan leaders during the prehistoric migrations.

Any pueblo that contains a kiva can be assumed to have shrines important to the Hopi people. While these shrines may no longer be used actively, they are still considered sacred, as such, active in a spiritual sense.

All of the springs in the canyon have a spiritual importance. For example, Vaseys Paradise provided not only drinking water, but also holy water used by Spanish priests at Awatovi and Oraibi Catholic missions.

Hopi people continue to use the Grand Canyon for important ceremonial and ritual purposes. Some of their most sacred sites are inside and immediately adjacent to the park, such as the Hopi Salt Mines on the Colorado River inside the park. They are the focus of an arduous pilgrimage associated with initiation rites for young men. The mines within the park and the *Sipapu* along the pilgrimage route within the Navajo Reservation Lands are the destinations for a trail of shrines, each of which requires its own obeyance and set of rituals. These places are the primary reason that the canyon is so important to their culture. The Hopi are concerned that the often unintentional disrespect of visitors in the vicinity of these sites is eroding the spiritual well-being of the their people.

In addition, the Hopi believe that the spirits of the dead return to the Grand Canyon, the source of their life. Therefore, the canyon is not only holy, but also extremely dangerous. All use of the canyon requires proper spiritual preparation and a respectful demeanor. Disrespect by any visitor can be dangerous not only to the Hopi but to the individuals who encounter the spirits.

Given the sanctity of Grand Canyon, the Hopis are concerned about the attitudes of people who use the canyon for recreation or scientific research. As they no longer live in the canyon, the Hopi are concerned because they can no longer care for the spiritual and physical well-being of sacred sites and spirits.

In addition, the Hopi use a number of traditional plants and minerals for ceremonial materials and paints. These resources can only be gathered from sacred places in order to be used in the religious ceremonies. For example, the Hopi traditionally hunt deer for ceremonial purposes near the town of Tusayan.

The Hopi believe they were the first true people in the Grand Canyon, followed by the Spanish, then the Navajo, and finally other people of European descent. They have an extensive repertoire of names for places in the canyon in their own language, and they

believe that the names given by speakers of English reinforce the mistaken idea that European Americans were the first to see and appreciate the canyon. They believe it is important that their history be presented to the public, to increase understanding and harmony between peoples.

NAVAJO

The Navajo Reservation borders Grand Canyon National Park from Lee's Ferry to the confluence of the Little Colorado River. The Navajo tribal government is divided into local governances called chapters. The Cameron and Gap-Bodaway chapters border Grand Canyon National Park.

Archeological and linguistic evidence suggest that the Athapaskan-speaking ancestors of the people now known as the Navajo migrated into the American Southwest sometime between about A.D. 1000 and A.D. 1500. They spread into the area to the east of the Colorado River and north of the Little Colorado during the 19th century, and, with the exception of Euro-Americans, are the most recent arrivals to the Grand Canyon area. Navajo customs and traditions grew out of an alliance between the original Athapaskan migrants and the Western Pueblo peoples who inhabited the area, so many of the traditions of the Navajo and surrounding tribes are similar.

The Navajo believe that their history is misrepresented by other peoples around them, and that they were in the canyon before the Spanish came. They state that the Spanish wrote of their presence throughout the Grand Canyon area referring to them by many other names, such as Querechos, Tacabuy, and Apaches, among others. They hold that their presence is well documented from the first historic records. In addition, they can provide written testimony to oral traditions dating to the early 1800s of several different Navajos living in the vicinity of Grand Canyon Village, in the area of Havasu Canyon, on the Kaibab Plateau, on the Kaiparowitz Plateau. They also state that five Navajo families lived and farmed with the Havasupai during the years before the Navajo were moved to Fort Sumner.

Historical accounts support the Navajo contention that they were in the Grand Canyon area by the 1600s. By the mid-1800s, they were farming, grazing livestock, gathering plants, hunting and performing religious acts in the canyon vicinity. During the 1860s, when the U.S. Army incarcerated many of the Navajo at Fort Sumner, New Mexico, several families sought refuge in the canyon. Navajos continued to graze herds of sheep, goats and horses in the canyon during federally imposed livestock reduction programs of the 1930s and 1940s.

The boundary of the traditional Navajo homeland is symbolized by their four sacred mountains, although the aboriginal use area extends beyond these markers. The sacred mountains are Blanca Peak (*Sis Naajinii)* near Alamosa, Colorado; Mount Taylor (*Tsoo Dzil*) near Grants, New Mexico; the San Francisco Peaks (*Dook'o'oosliid*) near Flagstaff, Arizona; and the La Plata Mountains (*Dibe Ntasaa*), near Durango, Colorado.

The Navajo believe they emerged from a previous world into this, the fifth world, located within the embrace of the four sacred mountains. They have a special mandate to care for this world by means of ceremonies and through careful stewardship of the land.

According to a statement by the Cameron Chapter of the Navajo Nation (1992), the Navajo see evidence of the four previous worlds in the stratigraphy of the Grand Canyon. The Vishnu schist is evidence of the first world, which was dark and without form, and where only the wind and spirit people lived. The second world, in which the insect people lived, and when male and female were created, can be seen in the fossils of trilobites and other marine life. The third world, in which birds existed, are likewise recorded in the canyon, as is the fourth world, that of four-legged animals. The age of humans is the fifth world.

The Navajo view the Colorado River and the Little Colorado River as sacred beings, inseparable from the larger sacred landscape of which they are an integral part. They do not believe that they can go into the canyon without a specific purpose, and that any visit into the canyon must be preceded by certain ceremonial rituals. There are some secret sacred places that must be visited and certain ceremonies observed whenever one goes into the canyon. The salt in the canyon is very sacred and cannot be obtained without the proper ceremonies. They also used the salt mines attributed to the Hopi.

Like the Hopi, the Navajo are concerned about the use of the park and its resources by visitors and resource managers. They view non-religious use as disrespectful of the canyon's spiritual aspect. Even research is considered to be secular and disrespectful. They are further concerned about visitors who do not respect their way of life by not respecting the park boundaries, and going onto the reservation and into private use areas without permission.

The Blessing Way of Life is a core religious concept for the Navajo, a foundation of the way they live their lives. They believe that people come from the earth and return to it. All life is related and equally sacrosanct. This philosophy permeates all behavior and is illustrated in the way they gather food, medicines, and firewood, in that they take only three of four parts, leaving a quarter of all resources in an area.

Through their oral history, it is obvious that the Navajo have a tradition of using the park's resources for both sacred and economic purposes, such as the gathering of medicinal herbs and rock salt. Part of their ceremonial practices involve leaving sacramental paraphernalia in sacred places or connected with resource gathering areas.

Many areas of religious and economic importance to the Navajo are located within the park. The many trails used to access the canyons are used for both sacred and secular purposes. The Navajo have a tradition dating back several generations of using park resources for economic purposes. They regularly harvest nuts and berries from the park. They believe their long-term use of these resources entitle them to continue to gather the nuts.

The Navajo believe that the National Park Service is not adequately managing and protecting sacred sites and traditional use areas. In particular, village sites of ancestors, shrines, plant collection areas, and places where prayers are offered or herbs gathered are of concern.

The Navajo express some confusion over the way the National Park Service manages its lands, believing the park does not take a "holistic" approach to planning. Because they believe that all things in their world are interrelated, they do not understand how the park can separate natural resources from cultural ones, for instance.

SOUTHERN PAIUTE (KAIBAB, SHIVWITS, AND SAN JUAN PAIUTE TRIBES OF UTAH)

While the Kaibab, Shivwits, and San Juan Southern Paiutes are three separate tribes, their beliefs, ties to the Grand Canyon, and concerns are practically identical. Therefore, they will be discussed as one people, the Southern Paiute.

The Southern Paiute recognize that they were residents and users of the canyon long before Euro-Americans came, and believe that their history precedes that of the Hopi in the canyon. Archeological evidence of Southern Paiute use of the area may be found dating as early as A.D. 1150 and continuing into historic times. Numerous bands of semi-sedentary Southern Paiute controlled the Arizona Strip during that period. The traditional boundary for the Southern Paiute within Grand Canyon extended from the junction of the Paria and Colorado rivers downstream to Kanab Creek. It is part of a larger sacred land, *Puaxant Tuvip.* The Southern Paiute believe they were created with a supernatural mandate to protect and manage the land, including its water and natural resources.

As part of their preservation philosophy, they view the water, minerals, animals, plants, artifacts and burials as having their own human-like life force. The Colorado River is one of the most powerful of these resources, and all children are taught to treat it with especial respect. The *Puaxant Tuvip*, including the Grand Canyon, is full of culturally meaningful human artifacts and natural elements.

The Grand Canyon itself is a source of great power to the Paiute peoples and it has a powerful spiritual aspect. For instance, people who wish to become medicine men go to high places along the canyon rim to learn to sing, which is the same as praying. Seeps, in particular, are holy, and should not be disturbed under any circumstances.

They used native flora and fauna wherever they found it. Edible flora included 32 families encompassing at least 96 species of edible plants, ranging from cacti to grasses, berries, piñon and juniper. Significantly more medicinal plants were used by the Paiutes. They exploited animal resources with the same knowledge and vigor as the plants. In addition, they practiced limited agriculture and horticulture, with evidence of irrigated gardens of maize, beans and squash near permanent water sources.

Modern Southern Paiute continued to use the resources of the Grand Canyon in their

traditional ways because their Creator requires them to do so. Some herbs used for medicine and food can only be obtained in the park because of overgrazing on the reservation. They believe that if the canyon and the rest of their traditional homeland is not used appropriately, the Creator will become disappointed or angry and withhold food, health and power. For this reason, Southern Paiute people continue to visit the canyon and river to harvest plants and fish and to conduct ceremonies, even though access to these areas is sometimes limited.

The Paiute have a rich tradition of basket-making, and are justifiably proud of their talents. They would like to be able to share this craft with others.

Zuni

The Zuni, while not residents of the affected environment, have ancestral ties to the Grand Canyon. The traditional area of Zuni land use is bounded by the San Francisco Peaks and portions of the Little Colorado River on the north. Like the Hopis, the Zunis believe they entered this world through the Grand Canyon. To the Zuni, their account of origin is a sacred truth. They began their journey through the canyons of Arizona and New Mexico, finally settling at Zuni. In the legends, there are named collection areas for medicinal plants and minerals along the Colorado River at the "origin place." Written accounts place this area to be the main Colorado River, south of the confluence with the Little Colorado River.

Archeological sites, traditional cultural properties, and other sacred locations along the Colorado River corridor and the Little Colorado River are important to Zuni traditional and cultural values, providing important spiritual linkages to the place of emergence for the Zuni Tribe. Areas where soil, water, plants, and rocks are collected for ceremonies, as well as a portion of the Zuni trail along the Little Colorado River gorge, are within the affected environment.

From the moment the Zunis arrived on the surface of the earth, Grand Canyon and the Colorado River have been sacred. Creation narratives describe the emergence of the Zuni from the Earth Mother's fourth womb, coming out into the sunlight at the bottom of Grand Canyon. The narratives also describe the Zunis' subsequent search for the center of the world, the Middle Place, or what later became the Zuni villages. These people moved up the Colorado River, then up the Little Colorado River, periodically stopping and settling in locations along the rivers.

Trails used by the Zunis for religious purposes have special significance and are cared for by means of particular blessings and prayers. Once a trail is blessed, it remains blessed permanently. The Zuni people thus have important concerns about the ancient Zuni trail from their village to the bottom of the Grand Canyon.

Zunis pray not only for their own lands but for all people and all lands. To successfully carry out the prayers, offerings, and ceremonies necessary to ensure rainfall for crops and a balanced universe, Zunis must collect samples of water, plants, soil, rocks, and other materials from various locations. While collecting these materials, Zunis also pray and leave offerings at these various locations. Samples of water from the bottom of the Grand Canyon carried in sacred gourds have special significance to Zuni ceremonies and very special meaning to the Zuni people.

The Zuni Tribe is in the process of identifying cultural resources of importance to the tribe along the river. When this identification has been completed, the Zuni Tribe will be able to more fully assess impacts to the resources, as well as to traditional and cultural values.

Historical Overview

Historic properties and landscapes in Grand Canyon National Park illustrate a historical continuum from the early inhabitants of its plateaus and canyons to its most recent arrivals. It is a history of human adaptation to a unique and often harsh environment.

Spanish Exploration

When Spanish explorers first attempted to find riches in northern New Spain, American Indians occupied the area that would later become Grand Canyon National Park.

A Spanish expedition led by Francisco Vasquez de Coronado moved northward in 1540 to locate the proverbial Seven Cities of Cibola. Coronado reached the Zuni Pueblo, but found no riches. Stories of more cities to the west led to exploration toward the Hopi towns. Word there indicated a large river farther west, and ultimately Coronado sent a detachment commanded by Garcia Lopez de Cardenas to explore the area. During September 1540 Cardenas and his men, guided by Hopis, approached the South Rim of the Grand Canyon, probably in the area between present-day Desert View and Moran Point, thus becoming the first Europeans to see the canyon.

After these early attempts to find riches in northern New Spain, the Spanish concentrated their efforts elsewhere, although they conducted missionary work among the nearby Hopi towns during the 17th century. In 1776 a Jesuit priest, Francisco Tomas Garces, who consistently used Rio Colorado as a name for the Colorado River, journeyed north from near Tucson to visit the Hualapais, Havasupais, and Hopis.

That same year Franciscan fathers Silvestre Velez de Escalante and Francisco Atanasio Dominguez traveled through present-day northern Arizona seeking a route between Santa Fe, New Mexico, and Monterey, California. They traveled through Marble Canyon and crossed the Colorado River at a spot they named El Vado de los Padres (Crossing of the Fathers) in present-day Glen Canyon.

U.S. Exploration

American exploration of the Grand Canyon region began during the fur trade era. Fur traders, however, did not attempt the difficult descent into the canyon. With the end of the Mexican War in 1848, the United States obtained virtually all of the present-day American Southwest. Soon U.S. exploration increased in the Grand Canyon region as military expeditions mapped land and water routes in and near the canyon during the 1850s and 1860s. Those led by Capt. Lorenzo Sitgreaves and Lt. Amiel Whipple explored the south side of the canyon, while Lt. Joseph Ives explored the Colorado River upstream from the gulf in a small steamboat until it sank near present Hoover Dam. Ives traveled eastward on the plateaus and descended Diamond Creek to the river.

The most significant exploration of the Grand Canyon was led by Maj. John Wesley Powell. After considerable study, Powell and his men left present Green River, Wyoming, in May 1869. The expedition completed the difficult journey through the torturous rapids in the canyon during August of that year. Powell made scientific observations, drawings, and maps of the trip. Reports of this and a subsequent expedition led by Powell in 1871 attracted interest to the Grand Canyon as an outstanding natural wonder.

Although development came to the Grand Canyon region later than to many areas of the American Southwest, ranching, mining, and timber harvesting enterprises were established in the region during the 1870s. With development came the construction of transportation arteries and the establishment of communities, the earliest commencing with Mormon colonizing efforts from southern Utah. Livestock companies expanded rapidly, and range land which American Indians had utilized for centuries soon had numerous claimants.

Transportation and Development

Roads were gradually constructed near the Grand Canyon. A crossing of the Colorado River at the mouth of the Paria River, later named Lee's Ferry, became a significant element of the region's transportation system. Another important crossing developed at Pierce's Ferry below the Grand Canyon. In 1882 the Atlantic and Pacific Railroad built a line westward across northern Arizona, connecting the communities of Flagstaff, Williams, and Peach Springs. Due to its proximity to Grand Canyon, the latter community became a popular stop for those who went to the rim by stagecoach and stayed at the Diamond Creek Hotel.

Mineral prospecting in the Grand Canyon region commenced during the 1870s. Virtually no areas of the canyon remained untouched by the miners who sought riches throughout the desert and mountain west. Copper mining activity occurred near the Grand Wash Cliffs and Mount Trumbull, and later in the canyon below Hopi Point.

Daniel L. Hogan located the Orphan mining claim below present Maricopa Point in 1893. It was not a productive copper mine, but later during the 1950s and 1960s it became a profitable uranium mine.

Most of the mines did not become major producers, thus causing some prospectors to envision the economic potential of tourism. Perhaps the most significant of these entrepreneurs was John Hance who entered the region in the 1880s. He improved what had been a Havasupai trail, now known as the Old Hance

Trail, which led to the bottom of the canyon near present Grandview Point, and conducted some asbestos mining across the river. He also built the first hotel on the rim near Grandview Point, where his story telling to visitors became legendary.

William Bass was another early entrepreneur at Grand Canyon. He began a tourist business at Havasupai Point and guided visitors from Ash Fork and Williams to Bass Camp and Havasu Canyon. From there he took tourists to the river via the Bass Trail which he had constructed.

The best known and most controversial of the tourist enterprises was the Bright Angel Trail. Like several of the other early tourist-oriented trails, it contained remnants of earlier Indian and mining trails. Peter Berry and the Cameron brothers, Ralph and Niles, collaborated in mining ventures and trail construction into the canyon. In 1890–91 they improved a Havasupai trail to Indian Garden and extended it to the river about 1902. They charged a toll for use of the Bright Angel Trail, leading to years of dispute with NPS authorities. Later they built the Grandview trail and hotel.

Ralph Cameron undertook considerable effort to stymie railroad construction and NPS operations by filing mining claims to control tourist enterprises. He managed to collect tolls from users of the Bright Angel Trail for some years until the Park Service built the competing South Kaibab Trail to the river.

Tourism continued to increase, and the Bright Angel Hotel opened for business on the South Rim in 1906. Regular stage service to the canyon commenced from Williams and later from Flagstaff. In 1901 the Grand Canyon Railway Company, a subsidiary of the Atchison, Topeka, and Santa Fe Railway, completed a new line from Williams to the South Rim at Grand Canyon Village. Initially the railroad laid track to mines south of the rim near Anita; however, after the mines failed the rail line was extended northward along Bright Angel Wash to the rim.

Numerous points on both rims became increasingly popular spots for visitors to view the Grand Canyon. Grandview was the earliest and most popular overlook on the South Rim because of its accessibility and association with hotel facilities.

Other viewpoints along the rim were related to early roads from Williams and Flagstaff. These roads reached the South Rim between present Maricopa Point on the west and Mather Point on the east. The development of facilities near the head of the Bright Angel Trail and the arrival of the railroad promoted the popularity of these viewpoints.

The entrance road to the North Rim led to Bright Angel Point. Early U.S. Forest Service roads to Cape Royal and Point Sublime opened those popular areas to visitors in 1924.

Preserving Grand Canyon

In 1893 President Benjamin Harrison designated Grand Canyon as part of a forest reserve and four years later the canyon was placed under the administration of the General Land Office. In 1908 President Theodore Roosevelt designated the canyon as a national monument. A growing effort to accord it national park status gained momentum after Arizona achieved statehood in 1912. President Woodrow Wilson signed legislation establishing it as a park in 1919.

During the first decade of the 20th century, the Santa Fe Railway actively promoted tourism to the Grand Canyon. With the railroad service came construction of El Tovar Hotel and Hopi House. The Fred Harvey Company managed and ultimately purchased these and other visitor facilities, and a developed area known as Grand Canyon Village was established on the South Rim. In addition, the railroad built a road between 1910 and 1912 along the rim westward from El Tovar to a rest stop called Hermits Rest. A trail by the same name extended from that point into the canyon.

In 1907 construction crews completed a cable across the river near the mouth of Bright Angel Creek. The camp for workers along the creek was later used by tourists and became known as Rust's Camp. In 1922 the camp was developed further and became known as Phantom Ranch under the management of the Fred Harvey Company.

The South Kaibab Trail was opened to visitors during the summer of 1925. Blasted from rock for much of its length, the trail linked Phantom Ranch with the South Rim. In 1927 the North Kaibab Trail was constructed to Roaring Springs, and the next year the Kaibab bridge was built across the river, linking the North and South Rims.

An extensive road network was built within the national park during the first several decades of the 20th century. Early stage roads from Flagstaff, Williams, and Ash Fork were extended to the Grand Canyon Village area, the main route connecting from Williams. A road was constructed from Cameron to the park in the 1920s and was improved during the 1930s. After the Navajo (Marble Canyon) bridge was completed in 1928, the mileage between the South and North Rims was reduced significantly. A road to Bright Angel Point on the North Rim was in use during the 1920s and improved during the early 1930s. Between 1919 and 1927 the Park Service developed and improved roads along the South Rim between Hermits Rest and Desert View.

After 1919 the Park Service constructed several buildings for maintenance, storage, and administrative purposes in the park. Locations of these facilities included Grand Canyon Village and Desert View on the South Rim and Bright Angel Point on the North Rim.

During President Franklin D. Roosevelt's New Deal the Civilian Conservation Corps (CCC) was established. At Grand Canyon CCC crews worked on hundreds of park improvement projects. The crews repaired, maintained, and constructed new alignments of the Bright Angel, Kaibab, and other trails. The CCC also constructed entrance and ranger stations and recreational facilities, such as a swimming pool at Phantom Ranch.

Tuweep, a remote area on the North Rim, is located in a region known as the Arizona Strip. Originally occupied by Southern Paiute bands, the strip attracted the interest of Mormon settlers, and timber and grazing enterprises developed beginning in the 1860s. After the decline of timbering, stock-raising became the predominant economic pursuit in the 1870s. This activity continued into the 20th century and was supplemented by mining.

When a second Grand Canyon National Monument was established in 1932, spectacular rim overlooks such as Toroweap became part of the protected area near the Colorado River.

Prior to the outbreak of World War II, the Park Service stationed a ranger at Tuweep. A house, barn, and water catchment system were constructed there for the staff. Camping near the rim at Toroweap began during the 1930s and became a popular activity during the post-World War II era, and a small campground was constructed.

In 1975 Congress included monument lands at Tuweep in Grand Canyon National Park.

Historic Resources

Historic properties in Grand Canyon National Park that are listed on the National Register of Historic Places consist primarily of buildings associated with tourism, park administration and operations, and mining enterprises. Additionally, 485 buildings are included in the park's list of classified structures; 61 of these are archeological sites with standing walls.

South Rim National Register Properties

Four historic districts and two historic buildings on the South Rim are listed on the National Register of Historic Places. The Grand Canyon Village Historic District includes some 238 buildings, four of which have been designated as national historic landmarks — El Tovar Hotel, the Grand Canyon park operations building, the Grand Canyon powerhouse, and the Grand Canyon railroad station. The Mary Jane Colter Historic District (also designated a national historic landmark) consists of four buildings — Hopi House, Lookout Studio (both of which are also in the Grand Canyon Village Historic District), Hermits Rest, and Desert View Watchtower. The Grandview Mine and Orphan Mine historic districts, the latter having been determined eligible for listing in 1994, are representative examples of mining operations in the park. Two other national register properties are located on the South Rim — the water reclamation plant and the Tusayan Ruins.

■ Mary Jane Colter Historic District

The Mary Jane Colter Historic District consists of four widely separated buildings, all of which are designated national historic landmarks.

Hermits Rest: Designed by Mary Jane Colter for the Santa Fe Railway, this stone and wood structure opened in 1914 as a rest stop on the stage line along West Rim Drive. The Fred Harvey Company operated tours westward along the rim to the

end of the road at an old trailhead, where at a small refreshment stand passengers could rest after a dusty stage ride. This rest stop was built into a man-made earthen mound near the edge of the rim and overlooks the canyon. Along the approach to the buildings is an archway through which visitors used to pass; stone walls and pipe railings complement the setting and walkways. The interior of the building contains a large two-story fireplace equipped with hand wrought irons and tools as well as other original furnishings. The Fred Harvey Company managed and then acquired the building which currently serves as an outlet for souvenirs and snacks.

Hopi House: Opened in 1905, Hopi House contained a souvenir shop, storage, apartments, and a room that is a Hopi shrine. The shrine holds religious artifacts such as kachinas, prayer feathers, and other Hopi articles. Entry is through a tiny handmade door. The shrine room is similar to the Powamu shrine room in the Fred Harvey Indian Building in Albuquerque. Designed by Mary Jane Colter, Hopi House was built by the Santa Fe Railway and managed and later acquired by the Fred Harvey Company. It is located near the rim of the canyon across from El Tovar Hotel and continues to be owned and operated by the Fred Harvey Company.

Desert View Watchtower: Designed by Colter, the Watchtower emulated watchtowers constructed by American Indians in nearby areas of the Southwest. Completed in 1932, the main room is circular in plan and was originally known as the kiva room. The ceiling is made of logs salvaged from the old Grandview Hotel on Horseshoe Mesa. The Watchtower housed a small souvenir shop and observation deck and served as a rest stop. The tower conveys a mystical feeling derived from light and shadow, textures, and murals depicting Hopi mythology and religious ceremonies. Climbing a circular stairway to the panoramic observation area at the top, one can observe many paintings of pictographs and petroglyphs on the interior walls. South of the watchtower is a small frame house used by the Fred Harvey manager at Desert View.

Lookout Studio: This rustic structure, built of native materials and rising from the edge of the rim, was opened in 1914. Colter designed this structure for the railway, and it initially served visitors as a location to photograph the canyon and view it through telescopes.

■ Grand Canyon Village Historic District

This historic district encompasses the majority of the original village site and includes some 238 buildings. Its establishment and development are directly related to initial tourist activities on the South Rim and subsequent expansion in accordance with the national park's original master plan. The setting of the historic village is dominated by the canyon edge and the surrounding, gently rolling topography of the Coconino Plateau with its forests of ponderosa pine, pinon, and juniper. The district conveys a strong sense of unity in architectural appearance, with most buildings designed in the rustic style using native building materials such as stone and wood. The district possesses a high degree of integrity in design, materials, and workmanship related to its period of significance (1898–1941). The largest number of resources date from the 1930s. Modifications to most of the historic structures are minor.

Some of the more significant structures in the historic district include the superintendent's residence (first park headquarters), post office, Apache Street residences, ranger's dormitory, horse barn, mule barn, and blacksmith's shop. The latter three were completed in 1906 for the Santa Fe and Fred Harvey Company Transportation Department. All of the aforementioned structures exhibit rustic qualities, evoking an image of pioneer construction with dominating roofs and cross gable wall dormers, shingled walls, and board and batten skirts below the sill line.

Four structures in the district have been designated national historic landmarks. These include:

El Tovar Hotel: This luxury hotel opened for business in January 1905. Charles Whittlesey, an architect with the Santa Fe Railway, designed the stone, log, and frame structure. Exhibiting a rustic style of architecture, this railway hotel, which consisted of 2 1/2 and 3 1/2-story sections in a modified T-shape, was managed and later acquired by the Fred Harvey Company. The lobby and mezzanine lounge are directly below the roof turret capping the hip roof, and three-story guest wings extend out from the central core of the structure. Wide projecting porches with stone corner piers and log columns extend along the front and canyon sides of the structure. The hotel was rehabilitated in 1983, but it retains essential elements of its original rustic architectural features.

Grand Canyon Railroad Station: This log and frame structure, completed in 1910, became the focal point for railroad passenger entry into Grand Canyon National Park. Travelers had only a short walk to the rim for a view of the canyon. The first floor contained passenger facilities while the top floor housed the station agent. The top floor has been adapted for use as park offices and storage. The first floor is currently used by train passengers. Only three similar log railway stations remain extant in the United States.

Grand Canyon Powerhouse: This extensive structure, clad in native rock veneer, was designed to look like a Swiss chalet nestled in a shallow valley parallel to and near the South Rim. It was built by the Santa Fe Railway to supply power to the railroad and Fred Harvey facilities nearby. Power generation ceased in 1956, and currently the building is used by the Fred Harvey Company as a warehouse.

Grand Canyon Park Operations Building: In 1929 the park administrative offices moved into this new headquarters building nestled in pine trees within sight of the Grand Canyon railroad station. Of rustic design, the building consisted of a combination of native stone and logs. An addition was constructed in 1938, and various interior remodeling efforts have been undertaken during recent decades. The structure currently houses the offices of the park ranger services division.

■ Water Reclamation Plant

The Grand Canyon water reclamation plant, one of the earliest such operations in the nation, was constructed in 1925–26 on the western edge of Grand Canyon Village along Rowe Well Road. The plant's construction was jointly funded by the Santa Fe Railway and the National Park Service. Its major purpose was to supply recycled water for the railroad (90%) and the Park Service (10%). The plant, composed of bar-screen boxes, pre-sedimentation and aeration tanks, filters, and storage and holding tanks, supplied water more cheaply than the earlier system which used railroad tank cars; however, it was less effective as a sewage treatment facility. The plant was closed in the mid-1980s and replaced by a new water treatment facility.

■ Tusayan Ruins

The Tusayan ruins, located along East Rim Drive, consist of significant Puebloan ruins excavated by Emil W. Haury, one of the best known archeologists of the Southwest. The ruins represent an early stage of Anasazi development on the periphery of their heartland. The ruins include a U-shaped pueblo with two round kivas and a two-story residential structure. A small rock building near the ruins houses an archeological museum constructed in 1932 with funds provided by Mrs. Winifred MacCurdy.

■ Grandview Mine Historic District

This mining site is located below Grandview Point. Begun in 1890 by Peter D. Berry, the mine produced limited amounts of copper, which Berry packed out by mule on a trail he constructed to the South Rim. Berry sold the mine in 1901, and by 1907 mining operations had ceased. The historic district consists of the ruins of a mining complex that includes a stone house, shanty, mine shafts, and machinery.

■ Orphan Mine Historic District

Located between the Maricopa Point and Powell Memorial overlooks on the South Rim, the Orphan Mine Historic District includes resources from both turn-of-the-century copper mining operations and uranium production during the 1950s and 1960s. Located and filed in 1893 and patented in 1906 by Daniel L. Hogan, an early prospector in the region who was one of Theodore Roosevelt's Rough Riders during the Spanish American War, the mine yielded minimal amounts of copper and traces of gold and silver until the 1930s. Between 1953 and 1969 the Orphan Mine became one of the leading producers of high-grade uranium ore on the Colorado Plateau and of some of the richest uranium ore in the United States during the post-World War II period.

NORTH RIM NATIONAL REGISTER PROPERTIES

Three historic districts on the North Rim are listed on the National Register of Historic Places. These include the Grand Canyon Inn (North Rim Inn) and Campground Historic District, the Grand Canyon North Rim Headquarters Historic District, and the Grand Canyon Lodge Historic District, the latter a designated national historic landmark.

■ Grand Canyon Lodge Historic District

The Grand Canyon Lodge Historic District consists of a main lodge building, 23 deluxe cabins, and 91 standard cabins on Bright Angel Point, a notable promontory on the North Rim. The lodge is banked into the side of the rim and is the central feature of the district. The deluxe cabins are clustered northeast of the main lodge, and the standard cabins are to the southwest. The main lodge is U-shaped and constructed of Kaibab limestone, ponderosa logs, and log-slab siding on a wood frame. The stone work consists of random rubble masonry bonded with cement mortar. The deluxe cabins are made of half-log siding on wood frames with stone corner piers and stone foundations. Chimneys consist of highly textured limestone laid in rough courses. All of the units have peeled log entrance porches on stone foundations. The 91 standard cabins are smaller than the deluxe cabins and are located closer together. The standard cabins are constructed of true log construction rather than log siding on frame construction.

■ Grand Canyon North Rim Headquarters Historic District

This district consists of a number of cohesive-looking utilitarian buildings, several having features of rustic architectural design, scattered in intermittent clearings or meadows. Surrounding the buildings are mixed conifer and aspen forest areas near the head of Transept Canyon. The headquarters contains two groupings of structures. The eastern group consists of several residences, a garage, and a ranger station. The western group consists of maintenance buildings, a resource management office, barn, and several residences. Construction of the North Rim Headquarters began in 1926 with a ranger residence, wood shed, and horse barn. During the late 1920s and early 1930s, other structures were built, including shop, equipment storage, and warehouse buildings to support park operations.

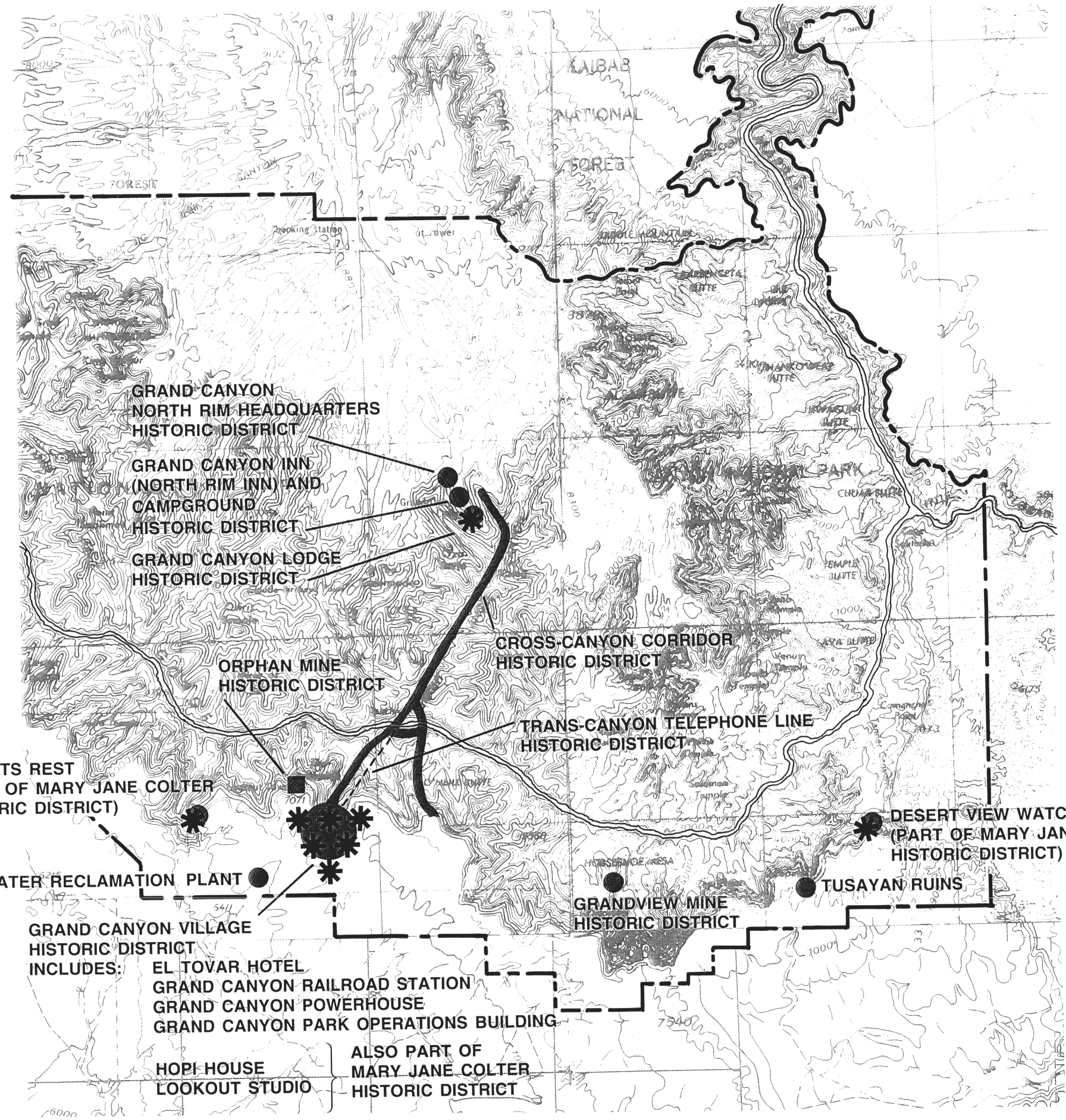
■ Grand Canyon Inn (North Rim Inn) and Campground Historic District

This complex includes a main building, 30 deteriorating exposed frame cabins, and 10 duplex log cabins. These low-cost facilities were supplemented by a nearby NPS campground with fireplaces, stone enclosures for firewood, restrooms, and shower facilities and an amphitheater for interpretive programs. Of rustic design, the North Rim Inn was constructed in 1929. Some of the cabins were built that year, while the remainder were constructed in 1934.

■ Other National Register Properties in the Park

Cross Canyon Corridor Historic District: This historic district includes 44 buildings and structures and the Bright Angel, South Kaibab, North Kaibab, and connecting river trails. Among the principal structures in the district are four trailside rock shelters and the Phantom Ranch complex, including the five original stone buildings designed by Mary Jane Colter for the Fred Harvey Company along Bright Angel Creek at the bottom of Grand Canyon in 1922.

Trans-Canyon Telephone Line Historic District: The transcanyon telephone line is approximately 18 miles long and roughly parallels the Bright Angel and North Kaibab Trails from the South Rim to Roaring Springs, with a spur line running 2 miles up the South Kaibab Trail. The line consists of 592 metal poles strung with copper-weld wire. The poles, installed in 1935 and modified in 1938–39 to provide the national park with its own telephone system, retain their original appearance. Although two small sections of the line have been removed in recent years, the line possesses a high degree of integrity.



- NATIONAL REGISTER PROPERTY (LISTED)
- NATIONAL HISTORIC LANDMARK
- NATIONAL REGISTER PROPERTY (DETERMINED ELIGIBLE)

HISTORIC PROPERTIES

GRAND CANYON NATIONAL PARK • ARIZONA

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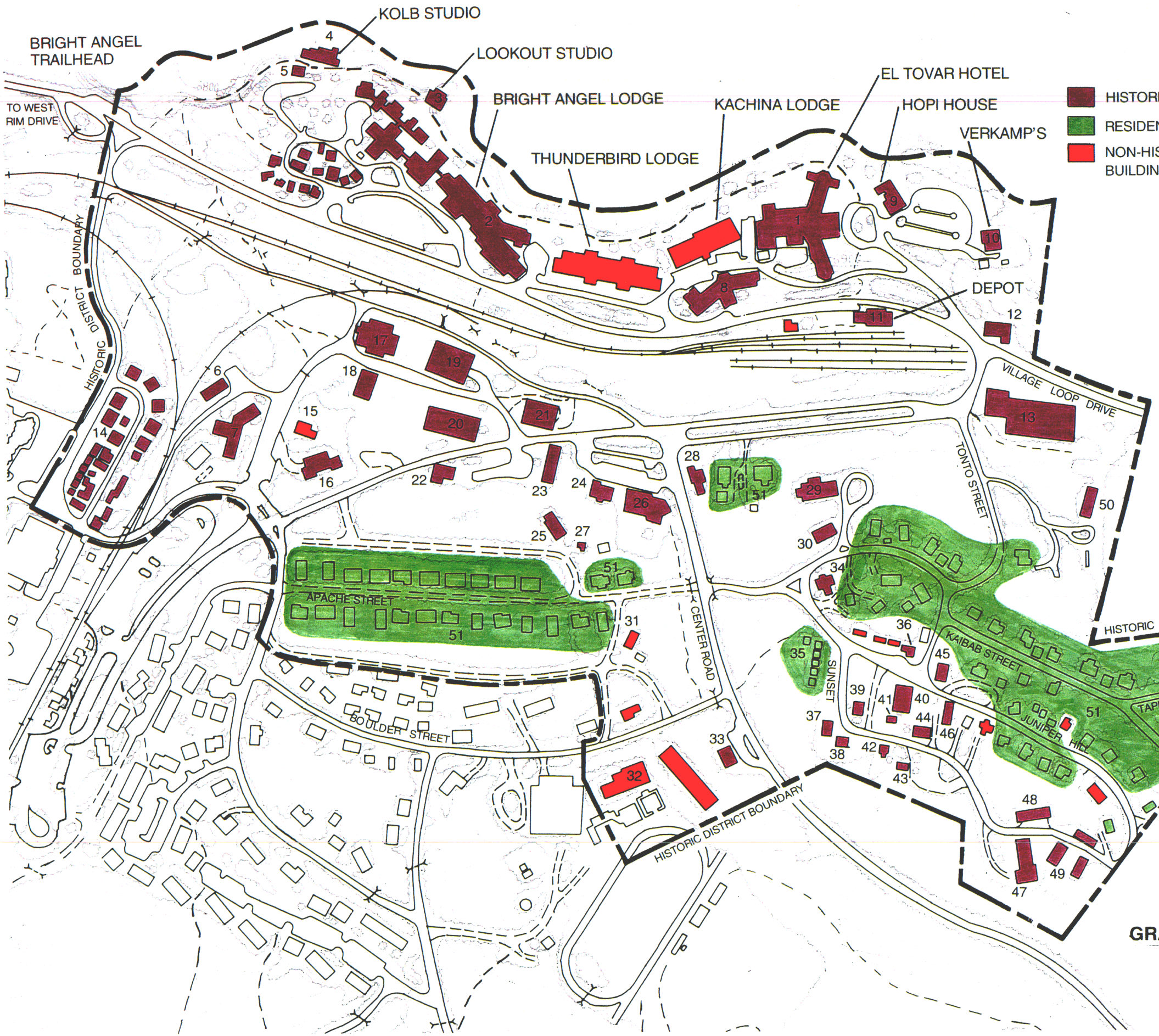

FRED HARVEY BUILDINGS

1 EL TOVAR HOTEL
2 BRIGHT ANGEL LODGE
3 LOOKOUT STUDIO
6 F. H. OFFICER'S DORM
7 VICTOR HALL
8 F. H. WOMEN'S DORM
9 HOPI HOUSE
13 F. H. GARAGE
14 GUEST LODGE CABINS
17 LAUNDRY
18 F. H. PAINT SHOP
20 LIVERY BARN
21 F. H. MULE BARN
22 BLACKSMITH SHOP
23 SERLY HALL
33 F. H. GAS STATION

NPS BUILDINGS

11 RAILROAD STATION (DEPOT)
12 SUPERINTENDENT'S HOUSE
15 CARPENTER'S SHOP
16 COMMUNITY BUILDING
19 POWERHOUSE AND TRANSFORMERS
24 3RD POST OFFICE
25 TELEPHONE AND TELEGRAPH BUILDINGS
27 GARAGE
28 PARK OPERATIONS
29 HOSPITAL
30 RANGER DORM
34 MESS HALL
35 LABOR CABINS AND LAVATORY
36 CARPENTER SHOP
37 BLACKSMITH SHOP / GARAGE / CARPENTER
38 PAINT SHOP
39 MACHINE SHOP
40 WAREHOUSE
41 GAS STATION
42 JAIL
43 COAL SHED
45 FIRE HOUSE
46 STORAGE
47 MULE BARN
48 VEHICLE / STORAGE BUILDING
49 VEHICLE / STORAGE BUILDING
51 RESIDENTIAL AREAS

MISCELLANEOUS BUILDINGS

4 KOLB STUDIO
5 KOLB GARAGE
10 VERKAMPS
26 BABBITTS STORE
31 CASE HOUSE
32 SCHOOL
44 ECW WAREHOUSE
50 GRAND CANYON SCHOOL

ORIGINAL USES
GRAND CANYON VILLAGE HISTORIC DISTRICT

GRAND CANYON NATIONAL PARK
United States Department of the Interior • National Park Service
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Parkwide Orientation

Many visitors planning a vacation that includes a visit to the Grand Canyon rely on national and international tourist literature to give them necessary trip planning information. This information often is very general, sometimes out of date, and difficult for people to obtain at their homes. Many people who do get advance park information have difficulty making reservations due to the overloaded telephone lines at the park.

Visitors who stop at regional information facilities often cannot get accurate and up-to-date information regarding the availability of accommodations in or near the park. Many people who do not stop at the regional centers drive all the way to the park, only to discover that all overnight facilities are full, and they must return to one of the gateway communities for the night.

South Rim

Regional Visitor Experience

Most visitors travel to the park from I-40, exiting at Flagstaff or Williams. Arizona Highway 64 leads north from Williams to the southern entrance. U.S. 180 from Flagstaff intersects Arizona 64 at Valle, Arizona. All these visitors pass through the community of Tusayan on their way to the park entrance. From the east visitors exit U.S. 89 at Cameron and head west on Arizona 64 toward the Desert View entrance.

Almost all visitors who reach Tusayan, just outside the southern entrance to the park, have made an earlier decision to visit Grand Canyon. The Grand Canyon National Park Airport, which serves as a point of entry for a growing number of Grand Canyon visitors, sits on the south end of town.

Many of the park's foreign visitors and an increasing number of others arrive by air. Most of these people take a three- to four-hour bus tour of the park and go back to the airport for return flights to Las Vegas. These visitors almost never stop at the visitor center and rarely have contact with park employees. Consequently, they must rely entirely on their tour leaders for all necessary park information, orientation, and most interpretation.

Regular air service is also provided between Flagstaff and Phoenix. In addition, two Amtrak trains per day stop at Flagstaff. Many visitors arrive via train and by air. These people frequently rent cars to drive to the canyon and other points of interest in the region.

Since most visitors enter the park from the south, Tusayan has shown a rapid growth in businesses catering to the tourist trade. This unplanned growth has resulted in strip development with little regard to creating a pleasant visitor experience or quality sense of entry to the park.

Steam train excursions from Williams offer another mode of arrival for approximately 2.5% of the park visitors. Upon arrival around noon almost all passengers head toward the historic core of Grand Canyon Village and a view of the canyon. By about 3 P.M. passengers return to the station and wait for the afternoon departure. Activities during their stay include shopping in the gift shops, eating lunch, or walking along the rim trail. Each day the train creates a pulse of visitors in the village that must be absorbed by nearby services.

Orientation

The U.S. Forest Service and the Williams/Grand Canyon Chamber of Commerce operate a welcome center in the community of Williams. The center provides information about Grand Canyon and other attractions in the region and state. Of the 70,500 visitors who stopped at the center in 1993, the staff estimates that about 90% were bound for the canyon.

The Williams center attempts to maintain contacts with the lodging concession at Grand Canyon, although phone lines are often busy and up-to-date information is difficult to obtain. There is no NPS presence at this center, and few contacts are made with NPS personnel at the park.

The Flagstaff Chamber of Commerce operates a welcome center in the former train station only one block from Arizona 180, which leads to the canyon. In 1991 nearly 80,000 people visited the center. About 50%–60% of these visitors were traveling to the Grand Canyon. Parking and visibility are limiting factors in attracting visitors to the Flagstaff center.

The Flagstaff center attempts to maintain weekly telephone contacts with the lodging and tour bus concessions at the park. As with the Williams center, phone lines are usually busy, and up-to-date information is difficult to obtain. There is no NPS presence at this center, and infrequent contacts are made with NPS personnel at the park.

No official information about the park is provided at the airport or in Tusayan, but general visitor information is provided at the Arizona Tourist Information Host Office at the IMAX Theatre. Still, unless visitors stop in Williams or Flagstaff, they may not have received accurate or current information about Grand Canyon.

The IMAX Theatre is one of the main visitor attractions in Tusayan. Many visitors and bus tours stop at the theater, which shows a film on the Grand Canyon. For many visitors this film serves as their introduction to the canyon, and it provides visual experiences that most people will not encounter during their stay.

No orientation facilities for park visitors are located in Cameron or along Arizona 64 leading to the east entrance. Park statistics indicate that about 18% of the visitors to the South Rim enter the park from this direction.

Visitors heading to the park from Cameron encounter a small tribal information facility at the highway intersection.

Arrival on the South Rim

After passing through the south entrance station, many visitors find it difficult to get oriented to the park. The signing is inadequate, and no orderly progression of experiences or appropriately located visitor orientation facilities help people plan their visit. Day visitors are mixed with overnight visitors, which adds to traffic and congestion problems.

The visitor experience on the South Rim is primarily oriented to the automobile. People move from one scenic area or visitor facility to another mainly by car, stay a short time, then drive on to the next attraction. Some visitor facilities, parking areas, and overlooks are too small to accommodate all the functions they now perform, or cannot handle the high volumes of visitors. Consequently, many visitors spend considerable time hunting for parking. Others park along the road shoulders and walk in traffic to reach their destination.

A few rim trails lead away from the developed areas and create opportunities for visitors to avoid the crowds and experience some degree of solitude. These trails only exist in the village and along the West Rim, and most visitors do not take advantage of these opportunities.

A village loop shuttle system is used by a little over half the visitors. To use the system visitors must find a place to park, which in some areas serves to increase the parking problems.

To help relieve traffic congestion, during summer a mandatory shuttle system takes visitors to overlooks along West Rim Drive. The buses are often packed, and long waits are frequently required. Few people get off at stops at various overlooks until they reach Hermits Rest. Those who do get off often find there is no room to reboard.

■ South Entrance Station

According to park statistics, nearly 80% of the visitors to the South Rim arrive at the south entrance station. Before reaching this point, visitors are invited to tune their car radios to the travelers information service (TIS) station for park information. A parking lot at the south entrance station has a bulletin board and some general information.

At the south entrance station each vehicle receives an official park brochure along with a copy of the park newspaper. It is not known to what extent these publications are used as people drive into the park; however, the newspaper receives fairly wide distribution at lodging facilities and visitor contact centers throughout the region.

From the south entrance station to the canyon rim, highway signs provide little direction to various destinations. Many visitors become confused about where they should go next.

■ Mather Point

The Mather Point overlook presents the first opportunity for most visitors to view the canyon. There is no water, and only two chemical toilets are provided. During the peak season the parking lot is often very crowded, with both sides of the adjacent road lined with cars and buses. Information at the overlook is inadequate for introducing visitors to the park and does not provide basic orientation so visitors can plan their park visit in an informed manner.

■ Yavapai Observation Station

Approaching the village complex from Mather Point, signs for the Yavapai observation station direct visitors who have entered from the south to their first park facility. This is one of the few buildings on the rim where people can get exceptional views of the canyon and be protected during harsh weather. For many visitors the observation station is also the first opportunity to use restrooms and get water. From the village visitors can drive, ride the shuttle bus, or walk the rim trail to the observation station.

The small observation station building has an information desk, cooperating association sales area, and an observation area. The building is often extremely crowded and performs too many functions. Summer visitation can run as high as 6,000 per day.

Parking at the observation station also presents a serious problem during the peak season. The lot is frequently filled beyond capacity, and vehicles are often found parked along both sides of the entrance road. Many commercial bus tours also stop at the museum, and the guides often give talks in front of the windows. This adds to the already crowded conditions and to the noise levels inside the building.

Outside the observation station building visitors can walk to the overlook, take the rim trail toward the visitor center, or follow an unpaved trail to Mather Point.

■ South Rim Visitor Center

The South Rim visitor center was designed to serve as the park's primary visitor contact and interpretive facility. The facility is far from the rim and is located past the points where people need information and orientation. The design is outmoded and does not provide for good visitor circulation. Many visitors express disappointment that there is no nearby view of the canyon.

Only about 10% of the visitors use the center, and almost no buses stop there. Parking is grossly inadequate during the busy season. The main lot generally fills by mid-morning, and it remains so through most of the afternoon and evening. RVs are directed to the parking lot at Babbitt's store, and many automobiles use this lot as an overflow area. From the Babbitt's parking lot visitors must cross the heavily traveled village loop drive to reach the visitor center.

Part of the problem with parking at the visitor center stems from the fact that there are too many things to hold people's interest and occupy their time. For example, viewing the exhibits, attending the audiovisual program, browsing in the bookstore, walking the rim trail to get a view of the canyon, participating in a guided interpretive activity, or purchasing items at Babbitt's store all take time and lengthen the turnover rate in the parking lots. In addition, some people opt to ride the village shuttle, thus leaving their cars in the lot for extended periods of time.

Inside the visitor center an information desk allows visitors to ask questions and receive information about park facilities, services, activities, and programs. On peak days the number of people at the desk area exceeds the capacity, with visitors filling the lobby, lined several deep to get information.

Across the visitor center lobby is a bookstore operated by the Grand Canyon Association. This sales area was not part of the building's original design. On peak days the space is overcrowded.

Most of the displays in the exhibit room focus on the history and prehistory of the canyon. Four natural history dioramas illustrate typical ecosystems in the park. The center of the room is devoted to changing art displays that feature theme-related exhibits. These exhibits do not introduce visitors to all of the park's primary themes, or advise where they can go to learn more about them.

The middle of the visitor center is an open plaza, where several rivercraft are displayed and the story of running the Colorado River through the canyon is told. The boats and rafts are not well protected from the elements, several show evidence of deterioration, and few visitors use this space.

An audiovisual program covers many aspects of the canyon's history, natural history, and resource management issues. The film also conveys safety messages regarding steep dropoffs and hiking into the canyon without water; however, only 10% of the park's visitors stop in the visitor center, and only a small percentage of this group attends the audiovisual program.

■ Kolb Studio

Perched directly on the rim, the historic Kolb Studio building offers a commanding view of the canyon and the Bright Angel Trail, and has the auditorium where the Kolbs showed their river running film to visitors. The Grand Canyon Association operates a publication sales outlet in one room of the building, with profits donated to preservation activities. Park interpreters give regular conducted tours of the building, and the auditorium space is often used for special and traveling exhibits.

■ Mather Amphitheater

Located near the visitor center, the Mather amphitheater is used for evening programs during the warmer months of the year. The programs are very popular, but the location has little relationship to where visitors are staying. This forces many people to use their cars to get to the amphitheater, and parking often becomes difficult.

■ Shrine of the Ages

Although it is used for religious services, the Shrine of the Ages also functions as an indoor theater for park evening programs. Programs are presented several nights a week during the summer, and the facility becomes the primary evening program site during colder months of the year. The area is heavily utilized, and tension occurs between the interpretive and religious uses.

■ Visitor Services

Grand Canyon Village presents a fast-paced, urban experience, complete with many of the amenities found in city settings (lodging, restaurants, post office, bank, gift shops, taverns, live entertainment, paved walkways, etc.). Traffic congestion, large but inadequate parking lots, and crowded facilities also contribute to this urban atmosphere.

The village offers visitors a variety of food service options, the most popular being the Bright Angel, Arizona Steakhouse, and El Tovar restaurants near the rim. Visitors often experience long waits — sometimes up to three hours — before they can be served. This forces many people to eat at less desirable places or at undesirable times.

The demand for in-park lodging and camping accommodations far exceeds supply. This results in some people trying to camp illegally inside the park, and places heavy pressure on the Kaibab National Forest. Many of those seeking lodging must drive as far as Flagstaff or Williams to find vacancies.

The business center consists of a major parking facility partially surrounded by visitor services. The character of the facility is much like American shopping centers, with little that reflects the unique character of Grand Canyon. This atmosphere provides little educational or enhancement value to the visitor.

In the village visitors have a wide selection of gift shops. Many of these shops, especially those along the rim, become very crowded during the peak season, resulting in a high turnaway rate. Some of these shops occupy historic buildings originally designed for other functions. In some cases the use of these structures as gift shops conflicts with the historic character, and detracts from their original proposes.

EAST RIM DRIVE

East Rim Drive extends 25 miles along the canyon rim between the Grand Canyon Village and Desert View. Except for a few areas, most of the drive is set back from the rim. Visitors must drive to specific overlooks to see the canyon. Picnic areas along the road have no relationship to the rim, which is where visitors want to be.

East Rim Drive offers a less congested visitor experience compared to the village. Visitors must depend on their private vehicles for transportation, or on park concessioner tours. No public transit exists. Some overlook parking lots as well as the developed areas at the Tusayan museum and Desert View become seriously crowded on peak days (see the "Transportation" section).

Besides an auto tour route, the East Rim offers several hiking opportunities into the canyon; however, no trails have been developed along the rim. The Tusayan museum and ruins introduce visitors to the area's prehistory and to later American Indian cultures in the region. As with the Yavapai observation station, the Tusayan museum is

far too small to accommodate current visitation.

The Tusayan museum and the nearby ruins offer visitors an opportunity to experience aspects of the park's various American Indian cultures. During the peak season the parking lot often fills to capacity, and cars frequently line the shoulders of the access road. Chemical toilets are provided, but there is no public drinking water.

The small stone museum building contains an information desk, cooperating association sales area, and an exhibit room. Displays in the exhibit room present the different American Indian cultures and illustrate several artifacts related to each. Since the site currently focuses on prehistory, more exhibit space is devoted to ancient cultures.

In the peak season visitation in the museum can run to 1,000 people a day. At these times the building becomes extremely crowded, to the point that other visitors choose not to enter and go directly to the ruins. Many of those who do enter often stay only a few minutes. This building is inadequate for today's demand.

Outside the museum a paved trail leads to the adjacent ruins. Excavated in 1929, the ruins illustrate the way people lived on the rim of the canyon about 800 years ago. A series of wayside panels interpret key features along the trail. Interpreters also conduct tours of the site. Focusing on environmental themes, the interpretive stories try to reach visitors (many of them foreign) who have only seen American Indians in movies or on television.

More recent archeological surveys indicate that the ruins extend well beyond those excavated in the 1930s and that remnants of other American Indian occupations exist nearby. Further research at Tusayan could extend the educational potential of the site and greatly add to the park's resource base.

Desert View

East Rim Drive terminates at Desert View. Desert View serves as both a destination for travelers from the village and as the eastern entrance for visitors arriving from Cameron (about 20% of South Rim visitation). For visitors entering the park from the east, Desert View offers the first stop for more information, restrooms, water, food, souvenirs, and gasoline. Signs encourage visitors to use the TIS radio station, which broadcasts information about visiting the park. Information on the status of campgrounds and lodges is posted as visitors approach the station. At the entrance station visitors receive a copy of the official brochure and park newspaper.

■ Orientation

The park operates a contact station at Desert View, which is located in a former restroom building between the grocery store and the restaurant. It contains an information desk, publications sales area, and a small lobby. About 70% of the visitors who use the information center have just entered the park. The remainder have journeyed from Grand Canyon Village. Most questions at the information desk relate to trip planning.

■ Watchtower

The Watchtower, listed on the National Register of Historic Places, is the major attraction at Desert View; however, there is minimal interpretation and its use as a gift shop keep people from understanding its significance. Most visitors consider the Watchtower the primary attraction at Desert View, although the area also offers splendid views of the Painted Desert and the Little Colorado River. Originally designed as a hospitality house to serve visitors beverages, the first floor is now used as a gift shop.

On busy days visitors gather at the tower, while only a few may be found at the contact station, and few visitors stop at the contact station before heading to the Watchtower. Other than one or two NPS-conducted tours a day and a wayside exhibit outside the building, no interpretive media is provided in the Watchtower.

The potential for interpreting the Watchtower, as well as establishing an interpretive contact with the majority of visitors to Desert View, is not being realized. The contact station is not in the right location to accomplish this task, and the entrance to the tower evokes a gift shop atmosphere rather than an intriguing historic structure.

■ Interpretation

On a seasonal basis park interpreters offer a variety of conducted activities at Desert View. Daily programs include tours of the Watchtower, rim walks, and sunset walks. Several nights a week evening programs are held at the campfire circle in the campground.

■ Visitor Services

Parking at Desert View is a serious problem. The lot frequently fills to capacity, and vehicles often park on the shoulders of the entrance road. A dirt overflow lot has no designated parking stalls, and RVs often have a difficult time backing up or turning around.

The restroom facilities are located at the opposite end of the parking lot from the Watchtower.

The 50-site Desert View campground is open from May through October. The demand exists for a year-round operation, but the waterlines are currently too shallow to allow for winter use. The campground is not a primary destination for most canyon campers, although many people go there when they learn that other park facilities are full. When full, overflow campers are directed to nearby USFS lands.

North Rim

Regional Visitor Experience

Visitors to the North Rim appreciate the leisurely pace, and a more traditional park experience. The approach road through the Kaibab National Forest offers spectacular scenery and a relaxing drive. Compared to the South Rim, visitors encounter less traffic congestion, parking problems, and other visitors.

Visitors are almost equally divided as to whether they travel to the North Rim from the north (55%) or south (45%). From Las Vegas or from the northern portions of the Grand Circle, most visitors pass through St. George, then to Kanab or Fredonia. Unless they are traveling to some of the more remote sections of the North Rim, all park visitors pass through Jacob Lake at the junction of Arizona 67, where the U.S. Forest Service operates a new visitor contact station. Except for a small information center in Kanab, Jacob Lake is the first regional facility where visitors can get information about Kaibab National Forest and Grand Canyon National Park.

Orientation

■ North Entrance Station

At the entrance station just inside the park boundary each vehicle receives an official park brochure along with a copy of the North Rim edition of the park newspaper. It is not known to what extent these publications are used as people drive into the park.

■ Visitor Contact Station

The NPS visitor contact station adjacent to the Grand Canyon Lodge is the only staffed interpretive facility on the North Rim where people can go for information and orientation. The facility contains an information desk, cooperating association sales, mule ride registration, and restrooms.

The location of the center, and the fact that most other visitor services are found near the lodge, creates parking problems and visitor congestion in this area. Visitors who do not seek out the center use directional signing and the literature given out at the entrance station to determine their destinations and activities.

■ Walhalla Plateau

Visitors experience the Walhalla Plateau primarily by car, with people typically driving from one overlook to another and spending little time away from their vehicles. Biking is popular but dangerous, as bikers must share the road with motorized traffic.

■ Interpretation

With the exception of wayside exhibits, all of the North Rim interpretive activities are presented by means of personal services programs. During much of the visitor season the interpretive staff conduct a wide variety of walks, talks, and evening programs. The programs are well attended, and they help draw people away from the lodge to the lesser visited sites on the Walhalla Plateau.

■ Visitor Services

As on the South Rim, the demand for in-park lodging and camping accommodations far exceeds supply. Overnight facilities are full most of the time, forcing many visitors to seek alternatives outside the park. Food service, especially in the lodge area, is also crowded during peak periods.

Tuweep

Remote and primitive aptly describe the visitor experience at Tuweep. Visitors appreciate the lack of development, many seeking it out for the solitude and ruggedness it offers. The area also presents some of the most diverse geology in the park.

Visitors approach this little known area over 60 miles of dirt roads. A bulletin board and the ranger station are the only contact facilities for information, orientation, camper and backcountry registration, and emergency services.

Tuweep receives almost no promotion in the region, and few visitors to the area know of its existence. Even so, the numbers of visitors, especially foreign visitors, is increasing. In the spring as many as 40 cars are parked at the one overlook large enough for 10 vehicles.

There is no water at Tuweep, routes into the canyon are treacherous, and when wet, the dirt roads become very slippery. The lack of any regional information on visiting the unit results in some visitors arriving unprepared.

CORRIDOR TRAILS

The corridor trails provide the main visitor access to destinations below the rim, including the Colorado River, and they connect the North and South Rims. The trails include the Bright Angel, South Kaibab, North Kaibab, the Old Bright Angel on the North Rim, and the section of the Tonto Trail linking the Bright Angel and South Kaibab Trails. Of these, the North and South Kaibab Trails and the Bright Angel Trail are the primary trails in the canyon.

Hiking and backpacking on the corridor trails or into the more wild and remote areas are popular activities. To guard against overcrowding and degradation of resources, permits are required for overnight stays in the canyon.

Day hikers, backpackers, and mule riders make these routes the most heavily used of the inner canyon trails. Trail shelters, ranger stations, restrooms, campgrounds, and lodging units mark popular stopping points and help meet visitor needs. Other visitors use this trail system to initiate or terminate river trips, or to access the backcountry.

The majority of visitors on the corridor trails are day hikers. These people may hike a short distance down the trails, perhaps going as far as Indian Garden or Plateau Point on the Bright Angel Trail, Cedar Ridge on the South Kaibab Trail, and Roaring Springs on the North Kaibab Trail. Campgrounds are provided at Indian Garden, Cottonwood, and Phantom Ranch, which also offers lodging accommodations, with advance reservation required.

Mule rides are extremely popular and visitors must make reservations well in advance. Many people are disappointed to find that all trips are full during the time they have allotted to visit the park.

The corridor trails become crowded during the peak season, and use conflicts occur between hikers and mule strings. The largest number of complaints in the park are focused on the mule use on the North Kaibab Trail. Hikers are not adequately informed ahead of time about how to deal with encountering mules on the trails.

ORIENTATION AND INFORMATION

Bulletin boards and wayside exhibits at each trailhead provide information about the trails and caution visitors about hiking below the rim. Signs also tell people that permits are required for overnight camping, and that reservations are needed for staying in the cabins at Phantom Ranch. The backcountry offices on the North and South Rims issue permits for overnight camping and provide more detailed information about safety and survival. The backcountry office is in a poor location, visitors have difficulty finding it, and very few day hikers use the facility.

Despite efforts by the park to inform visitors about the dangers of hiking in the canyon, many people ignore these cautions and later encounter problems requiring ranger assistance. Most problems stem from people neglecting to carry any or enough water, or from underestimating the physical exertion required to hike out. Near the trailheads, hikers who neglect to bring water have no convenient places to acquire water containers.

INTERPRETATION

Other than informal ranger contacts, few personal services interpretive programs are offered on the corridor trails. The exceptions include some conducted walks on the South Rim which go to Cedar Ridge on the South Kaibab Trail or a short distance below the rim on the Bright Angel Trail, and nightly talks and occasional guided walks at Phantom Ranch. Mule rides below the rim offer another interpretive experience for visitors.

PHANTOM RANCH

Phantom Ranch is the largest developed area within the inner canyon. Located near the river at the mouth of Bright Angel Creek, the area sits next to the North Kaibab Trail and only a short distance from the pedestrian bridges that connect the North and South Rims. Here visitors can find camping, lodging, telephones, food service, souvenirs, restrooms, water, and interpretive programs. The overnight accommodations operate at capacity from early March to early December, and reservations must be made well in advance.

While Phantom Ranch is a destination for most, some hikers pass through the unit on their way to other locations. An increasing number of river trips now stop here to take on or let off passengers. Visitors joining river trips often hike in the day before, and those leaving the river frequently spend the night at the ranch before hiking out.

Hikers traveling to or through Phantom Ranch generally have received information and directions from various sources on the rim. Informational literature about Phantom Ranch is available from the South Rim concessioner and at the park visitor center.

Trail signs direct approaching hikers to the ranch and the spur trails to the campground. Bulletin boards at these locations provide additional information, including maps, regulations, safety precautions, and interpretive program schedules.

Other than the few wayside exhibits in the area, all other interpretive activities at Phantom Ranch are presented through personal services programs. The ranch is open year-round, and for seven to eight months of the year interpreters are stationed here and conduct a regular schedule of interpretive talks, short walks, and evening programs.

Most interpretive activities are given in the amphitheater. Visitors are tired (or sore) from their hike into the canyon, and many prefer a stationary talk to walking activities. Evening programs are very popular, with attendance often exceeding the 90-seat capacity. Most visitors have attended an interpretive program on the rim before coming down, and many people know about some of the issues facing the park (e.g., air quality). This often allows for interesting and in-depth discussions during the programs.

LEES FERRY

Lees Ferry is the primary access point to the Marble Canyon section of Grand Canyon. River runners (both commercial and private) and fishermen constitute the main user groups who access the river from this point.

The majority of the Lees Ferry area is managed as a unit of the Glen Canyon National Recreation Area; however, the boat launching site and facilities associated with running the Colorado River are operated by Grand Canyon. Lees Ferry is the primary launch point for river trips through Grand Canyon.

The park ranger station is in a trailer, with the ranger providing information about permits, regulations, safety, and river conditions. The facility contains a room where a 45-minute training session is conducted as a condition of the non-commercial permits.

A bulletin board at the boat launch area provides much of the same information regarding river access, but also includes facts about fishing.

For those going on river trips, many of the guides are well versed in Grand Canyon history and geology. The interpretive staff assists in guide training programs.

Most of the discussion of socioeconomic characteristics focuses on communities and Indian reservations located in Coconino County, Arizona. Grand Canyon National Park also contributes to the national economy and to the economies of states and communities located along travel routes to the park.

The Nation and Southwestern States

Expenditures by foreign visitors benefit the national economy. As a world heritage site, the Grand Canyon is one of several American attractions that motivate foreign tourists to visit this country. Foreign visitors' expenditures contribute positively to the U.S. balance of payments and to overall economic growth. In 1993, 1.2 million persons from other countries visited the Grand Canyon. Estimated foreign visits are predicted to reach 2.6 million in 2010.

The economies of states and communities along travel routes to the Grand Canyon benefit from expenditures made by travelers going to and from the park. Most visitors to the Grand Canyon are taking much more extensive tours of the Western or Southwestern United States (Albrecht 1992; Lee 1993). Tourism is a major contributor to these state economies, and to the extent that the Grand Canyon contributes to overall tourist expenditures, it benefits these state economies. The three state economies receiving the greatest benefit are Arizona, Utah, and Nevada, three of the country's fastest growing states (see table 12).

Las Vegas, Phoenix, and Salt Lake City are the centers of commerce in the Grand Canyon area. Las Vegas and Phoenix especially serve as staging areas for airplane, charter bus, and auto trips. Los Angeles also serves as a regional staging area for airline shuttle services to the Grand Canyon area (Cole 1993).

TABLE 12: POPULATION TRENDS, ARIZONA, NEVADA, AND UTAH, 1970–1990

	Arizona	Nevada	Utah
1970	1,775,399	493,000	1,065,700
1980	2,716,546	809,900	1,472,600
1990	3,665,228	1,223,900	1,729,400
1991/2*	3,748,000	1,283,000	1,770,100
Percentage Increase 1970-1991	+ 112%	+ 160%	+ 66%
Average Annual Increase	+ 5.3%	+ 7.6%	+ 3.1%

SOURCES: Bureau of the Census 1993; Bureau of Economic Analysis 1993.

* Estimates.

Coconino County, Arizona

Coconino County contains the three main entrances to Grand Canyon National Park and the communities most directly affected by the social and economic effects of park operations. Most South Rim visitors spend at least one night in Coconino County. Communities in Coconino County and Utah's Kane and Washington counties are service areas for visitors to the North Rim and Tuweep.

Coconino County is the second largest county in the United States. In addition to encompassing much of the area of Grand Canyon National Park, it contains all or portions of the Navajo, Hopi, Havasupai, Hualapai, and Kaibab Paiute Indian reservations.

Population Trends

Coconino County is the most populated county in northern Arizona. From 1970 through 1990, its population approximately doubled, increasing from 48,326 to 96,591 (Bureau of the Census 1991a). The county has maintained a 5% average annual growth rate for over 20 years, making it one of the nation's fastest growing areas. The county's 1993 population was estimated to be 103,670. Its population is projected to be 141,353 in 2010 (Arizona Department of Economic Security 1993).

Key Demographic and Social Characteristics

In 1990 whites composed 64%, American Indians 29.2%, blacks 1.5%, Asians (1%), and others 4.4% of Coconino County's population. The census reported that 10% of the county's population is of Hispanic origin. From 1970 to 1990 the county's Indian and Hispanic populations grew much more rapidly than did the county's other racial and ethnic populations.

The 1990 census reported the median age for Coconino County's population to be 26.3, compared to 32.3 for Arizona as a whole. This younger age profile results partly from southern Arizona's role as a retirement area and partly from the socioeconomic characteristics indigenous to Coconino County. The age profiles of Indian and Hispanic populations are younger than for the white population. The median age for the county's Indian residents was 20.8, and the median age for Hispanic residents was 23.9. The median age for Coconino County's white population was 28.9, which is also below the state average.

The young age profile of the county's Indian and Hispanic populations means that these populations will continue to grow faster than the county population as a whole. Many Indian and Hispanic women are in or are approaching peak fertility age groups, and high birth rates will cause these populations to experience fast rates of natural population increase.

Per capita and median family incomes for Coconino County residents are lower than the state norm. The income disparity between the county and the state results both from the prevalence of lower paying service-type jobs in the local economy and limited employment opportunities for the county's large Indian and Hispanic populations. The 1990 census reported 23% of county residents had incomes below the federal poverty level, compared to 16% of statewide residents.

TABLE 13: EMPLOYMENT TRENDS, ARIZONA, NEVADA, AND UTAH, 1970–1990

	Arizona	Nevada	Utah
1970	744,172	255,574	453,831
1980	1,278,611	487,898	685,353
1990	1,879,896	747,626	906,757
1991*	1,882,843	756,569	930,791
Increase 1970–1991	+ 153%	+ 196%	+ 105%
Average Annual Increase	+ 7.3%	+ 9.3%	+ 5.0%

SOURCE: Bureau of Economic Analysis 1993.

The census reported per capita income levels for the county's Indian population to be only about a third (34%) of the statewide average. In 1989, 45% of the county's Indian residents (12,557 people) had incomes below the poverty level. Per capita income for the county's Hispanics was 63% of the state average and 21% of Hispanic residents (1,904 people) had incomes below the poverty level.

A shortage of affordable housing is a major problem in much of the county (Joe Weidman 1994). The census reported the median value for owner-occupied housing in the county to be $82,600, while the median housing unit value for Arizona was $79,700. Housing costs are very high for an area where much of the population has below average income levels (David Wilcox 1994). The median rent paid in Coconino County was reported to be $431 compared to $438 for Arizona. Housing sale and rental prices have risen considerably since the 1990 census. The census reported that 3.6% of the countywide housing stock was vacant and available for sale or rent, compared to 7.3% of the statewide housing stock (Bureau of the Census 1991a).

Employment Trends

From 1970 through 1991 average annual employment in Coconino County increased from 20,000 to 49,000 jobs, an increase of 145% (Bureau of Economic Analysis, U.S. Department of Commerce 1993). Average annual employment for 1993 is estimated to be 57,000. This rapid growth in employment reflects the impact of overall expansion of the county

TABLE 14: MEDIAN INCOME LEVELS AND PER CAPITA INCOME, 1989

Median Income Levels	Arizona	Coconino County
Household	$27,540	$26,112
Family	32,178	30,648
Nonfamily Households	17,487	15,721
Per Capita Income Levels	**Arizona**	**Coconino County**
All Persons	$13,461	$10,580
White	14,964	13,516
American Indian	4,878	4,573
Hispanic	7,374	8,518

SOURCE: Bureau of the Census, U.S. Department of Commerce 1991a.

and regional economies. Increased tourism has contributed importantly to the area's employment growth.

The number of people employed in Coconino County has been increasing faster than has the county's population, mainly because of increasing labor participation by women. In 1990, 59% of the labor force was women over the age of 16. In 1990, 73% of males were in the county labor force, which is about the same labor force participation rate as in 1970 (Bureau of the Census 1991a).

New job creation in Coconino County has been concentrated in the service businesses, retail trade, and state and local government. These three economic sectors account for 74% of the net increase in county employment from 1970 through 1991. Increases in regional tourism have contributed importantly to growth in employment in the retail trade and service sectors. In 1991 the retail trade and service sectors accounted for 51% of total jobs in the county. Growth in employment in the state and local government sectors results from demands for public services created by rapid population growth and increases in student expansion of Northern Arizona University.

While employment in Coconino County has increased by 145%, inflation-adjusted worker and business proprietor earnings increased by only 125%. From 1970 to 1991 per job earnings for county residents actually decreased. Average annual earnings per job was $21,060 in 1970 and decreased to $19,290 in 1991 (1970 values are adjusted for inflation and presented in 1991 dollars). Decline in average worker earnings results from the concentration of employment growth in the lower paying economic sectors. Many jobs in retail trade and services are low paying or part-time. In 1991 the mean annual earnings for persons employed in retail trade was $12,500, and the mean annual earning in service businesses was $17,200 (Bureau of Economic Analysis, U.S. Department of Commerce 1993).

TABLE 15: EMPLOYMENT AND EARNINGS TRENDS IN THE RETAIL TRADE AND SERVICE SECTORS, COCONINO COUNTY, ARIZONA

	Retail Trade Employment	Retail Trade Earnings (millions $)	Retail Trade Earnings per Job	Services Employment	Services Earnings (millions $)	Services Earnings per Job*
1970	4,342	$ 71.3	$16,400	4,305	$ 68.5	$15,900
1975	5,211	81.8	15,700	6,370	100.9	15,800
1980	7,133	99.2	13,900	8,938	144.1	16,100
1985	8,246	115.6	14,000	11,346	176.1	15,500
1990	10,849	134.4	12,400	13,539	223.2	16,500
1991	11,500	141.2	12,300	13,647	234.2	17,200
Percentage Change 1970–1991	+165%	+ 70%	- 25%	+217%	+166%	+ 8%

SOURCE: Bureau of Economic Analysis 1993.

NOTE: Earnings are in millions of 1991 dollars.

*The increase in per job earnings in the service sector results mainly from earnings growth in medical and other professional service businesses.

EMPLOYMENT AND UNEMPLOYMENT

Coconino County experiences higher than normal unemployment. In 1993 the county's average annual unemployment rate was 8.1%, compared to a statewide rate of 6.2%. The county's unemployment is affected by seasonal fluctuations in tourism, and agriculture and natural resource-based industries. County unemployment exceeded 10% during January 1993. During summer 1993 the county's unemployment county's rate ranged from 6.9 to 7.4%.

The unemployment rate is greatest among Coconino's County's Indian population, with the 1990 census reporting a 21% unemployment rate. The unemployment rate for Hispanics was 8.9%, and 6.0% for whites (Bureau of the Census 1991a).

In 1993 the average annual unemployment rate was 22.1% on Coconino County's reservations and 6.0% off the reservations (Arizona Department of Economic Security 1994).

LANDOWNERSHIP AND LAND USE TRENDS

Coconino County encompasses 11,896,720 acres or 18,589 square miles. As shown below, the majority of land in the county is federally owned or part of Indian reservations; only 14% is privately owned. The prevalence of public and reservation ownership of land greatly limits the area available for private development.

TABLE 16: LANDOWNERSHIP, COCONINO COUNTY

Landowner	
U.S. Forest Service	28%
BLM	5%
Indian Reservations	37%
State of Arizona	9%
National Park Service	7%
Private (fee land)	14%
Total	**100%**

Difficulty in obtaining water and poor water quality are major constraints to land development throughout much of Coconino County. Excessive depth to groundwater and uncertainty about the availability and quality of groundwater make it uneconomical for single residences, small subdivisions, and small business developments to construct individual water wells. Most recent residential and commercial development in Coconino County has occurred inside city and town boundaries and unincorporated communities served by community water systems. The absence of economically obtainable water has greatly limited urban sprawl-type residential development and spot commercial development along rural highway segments.

Much of the privately owned land in rural areas of Coconino County is regulated by a county zoning ordinance which requires 10-acre minimum lot sizes for residential developments. Zoning changes allowing for more intensive developments can be approved when proposals comply with design and public service requirements and meet environmental criteria.

The cities of Flagstaff, Page, and Williams have adopted comprehensive plans. All three cities are in the process of updating their plans. The unincorporated community of Tusayan has also initiated a comprehensive planning process. Tusayan's planning process is being assisted by the Coconino County Community Development Department. Several communities have received major development proposals from private developers.

THE PARK'S EFFECT ON LOCAL ECONOMIES

Nearly all communities in Coconino County benefit from tourism and other employment and earnings opportunities created by Grand Canyon National Park. Communities closest to the park and communities along major travel corridors receive the greatest economic benefits. The annual and monthly park visitor statistics are shown in table 17.

The Grand Canyon area communities are discussed below in five categories based on proximity and common transportation links to the park. Local population and employment information are provided where available.

TABLE 17: GRAND CANYON VISITATION

Annnual Visitation	
1984	2,360,767
1985	2,983,436
1986	3,347,872
1987	3,513,084
1988	3,858,708
1989	3,968,605
1990	3,752,901
1991	3,905,989
1992	4,547,027
1993	4,928,509
1994	4,702,989
1994 Monthly Visitation	
January	149,601
February	260,146
March	348,827
April	346,027
May	465,041
June	572,688
July	735,951
August	704,058
September	477,800
October	375,090
November	210,345
December	168,376

SOUTH RIM COMMUNITIES

The South Rim communities are Grand Canyon Village, Tusayan, and Valle. These three communities are located on Arizona 64/U.S. 180. These communities are service areas for the majority of park visitors; they also function as residential areas for households of NPS and private service business employees. The economies of all three communities are oriented to serving park visitors. Goods and services not oriented to tourists are limited. South Rim residents make most of their expenditures for household goods and personal services in Flagstaff and other non-local communities.

Most housing in the South Rim area is supplied to employees by the Park Service or other employers. The prevalence of employer-owned housing results in a very low unemployment rate in the South Rim area; in 1993 average annual unemployment reported for the Grand Canyon Village area was 2.7%.

■ Grand Canyon Village

Grand Canyon Village provides housing for NPS or concessioner employees and their families. The village's population was reported to be 1,499 at the time of the 1990 census. During mid-summer the addition of seasonal workers increases the village's population to about 2,100. The state of Arizona projects the year-round population of Grand Canyon Village to be 1,950 in 2010 (Arizona Department of Economic Security 1993a). Based on the current ratios for permanent-to-seasonal workers, the peak summertime population is projected to be 2,730 in 2010.

The 900+ rooms owned and operated by Grand Canyon National Park Lodges in the village are booked with advance reservations from April through October. Travel trailer and camping spaces, and other concession services are crowded during the peak season. The village also contains several churches, a school, bank, and post office.

■ Tusayan

Tusayan is an unincorporated community 3 miles from the park's south entrance. The 1990 population of Tusayan was 555. Tusayan's population is estimated to increase to about 1,000 during the peak of the tourist season. The state of Arizona projects the year-round population of Tusayan will be 1,000 in 2010 (Arizona Department of Economic Security 1993a). Based on the current ratios for permanent-to-seasonal workers, the peak summertime population would be 1,800 in 2010.

Tusayan is within a 144-acre private inholding surrounded by USFS land. The absence of additional private land and the difficulty in obtaining water are constraints to town expansion. Tusayan has two producing wells, but most water is hauled in by truck.

Tusayan's business district is almost exclusively oriented to serving tourists going to and from the park. Most of the 500+ hotel/motel rooms in Tusayan are filled with advance reservations from April through October. The IMAX Theatre in Tusayan is a major attraction for canyon visitors. Several hotel properties are being expanded. Travel trailer camping facilities are also provided within Tusayan.

The airport south of Tusayan is the third busiest in Arizona, with 535,000 deplanements in 1993. Long-range plans are to expand the airport in anticipation of continued growth in air travel. Commercial helicopter flights over the Grand Canyon are staged out of the airport area. Some helicopter air tour services also fly out of the Tusayan townsite.

A shortage of affordable housing is a major problem for employees of Tusayan businesses. About half of the businesses in Tusayan make housing available to their employees. The housing stock consists of mobile homes, dorm rooms, apartments, and employee cubes. There are currently about 560 year-round residents in Tusayan. Only 136 of the housing units are located off-site for commercial use (Pratt 1994).

Tusayan residents are participating in a Coconino County-sponsored planning process. Also a major land exchange is proposed between a private developer and the Forest Service for an area adjacent to Tusayan. This exchange could increase the town size by an undetermined amount. The developer is proposing mixed-use development, with commercial, residential, and community facilities and services.

■ Valle

Valle is a small unincorporated community at the junction of Arizona 64 and 180. The 1990 census reported its population to be 123; its population increases during the tourist season. No population projections are available.

The Valle business district includes a small amusement park, a motel, overnight camping facilities, and gasoline and convenience store services. The Grand Canyon Inn in Valle has over 60 units and is full during the summer peak season. Difficulty in obtaining water is a constraint to development in Valle. Water is currently supplied to the community by truck.

A private airport being developed near Valle will provide airplane and shuttle bus service to the park. The same developer is proposing additional commercial properties along the highway north of Valle.

In the 1960s hundreds of lots in the Valle area were subdivided and sold to uninformed purchasers. These lots were never developed because of lack of water and services.

WILLIAMS

Williams is an incorporated city about 60 miles from the South Rim, at the junction of I-40 and Arizona 64. The 1990 population of Williams was 2,532, with the population increasing slightly during summer months due to higher local employment. Williams' population is projected to be 2,840 in 2010 (Arizona Department of Economic Security 1993a).

Williams depends heavily on park visitors, providing overnight lodging and traveler services. Tourist-oriented businesses also cater to other travelers passing east and west along I-40. The average annual unemployment rate for Williams was 3.9% in 1993. Unemployment is highest during the off-season (5.1% in January; Arizona Department of Economic Security, Research Administration 1993).

The Grand Canyon Railway, which was revived in 1989, has had a positive impact on the Williams economy. In 1993 the railroad carried 106,000 passengers. Railway ridership has been growing at 11% a year. The creation of railway jobs has contributed positively to the Williams economy. In addition, many visitors traveling to the canyon via the train choose to stay overnight in Williams, which benefits other local businesses. The railroad company has plans to build a major new hotel in Williams.

The U.S. Forest Service is another major employer in the Williams area. Williams is also a bedroom community for people working in Flagstaff. A small number of Williams residents commute to jobs in Grand Canyon National Park and Tusayan.

Housing costs are generally lower in Williams than elsewhere in Coconino County. The business district provides a range of shopping and personal services for local residents, and its water supply and other public infrastructure have capacity to support additional population growth.

FLAGSTAFF

Flagstaff is the largest community and has the most diverse economy in the Grand Canyon area. Flagstaff serves as the county seat of Coconino County and is also the headquarters for federal and state government offices serving northern Arizona. Flagstaff is home to Northern Arizona University (18,000 students). Flagstaff's 1990 population was 45,857. The city captured over half of the county's population growth between 1980 and 1990. Flagstaff's population is projected to be 68,000 in 2010 (Arizona Department of Economic Security 1993a).

Despite relative diversity, tourism is a substantial sector of the town's economy. Flagstaff's location at the intersection of two interstate highways, I-40 and I-17, its airport, its Amtrak station, and various amenities, all help the town serve as an overnight lodging and transportation center for tourists traveling to Grand Canyon National Park. Flagstaff also serves as a hub for other attractions in northern Arizona, such as the Navajo and Hopi reservations and several national monuments in the area.

U.S. 180 from Flagstaff leads to the south entrance of the Grand Canyon. Some park visitors travel U.S. 89 north from Flagstaff to the park's east entrance. Flagstaff is the most frequent overnight lodging place for Grand Canyon visitors who do not stay in the park or in Tusayan.

Flagstaff serves as a regional trade center for much of northern Arizona. The city's economy experiences secondary economic benefits from tourist expenditures made throughout the region, as persons working for the Park Service and tourist businesses in smaller communities tend to purchase personal goods and services in Flagstaff. Flagstaff is also the regional center for wholesale trade and ground transportation, supplying goods and services to businesses in the region's smaller communities.

In 1993 Flagstaff's unemployment rate was 8.5% in January and 5.7% during August. Its average annual unemployment rate was 6.4%.

EAST RIM COMMUNITIES

Communities outside the east entrance to the park include Page, Tuba City, Cameron, and Gray Mountain. U.S. 89 links these communities and is traveled by tourists visiting either the park's North or South Rim. Desert View is just inside the park's east entrance.

Much of the East Rim area is on the Navajo Reservation. Tuba City and Cameron are on the reservation, and Page and Gray Mountain are adjacent to it. About 80% of the people living in and around East Rim communities are American Indians (U.S. Department of Commerce, 1991a).

■ Desert View

The year-round population of Desert View is estimated to be about 45. The population is estimated to increase to 70 during the summer. The 40 housing units at Desert View consist mainly of mobile homes and dorm rooms.

Desert View offers visitors a convenience store, gas station, restaurant, gift store goods and services, and overnight camping facilities. Desert View area does not provide hotel/motel facilities for park visitors.

■ Page

Page is Coconino County's fastest growing city. Page was transformed into a destination resort community by the creation of Lake Powell when the Glen Canyon Dam was constructed. Page's 1990 population was 6,598. Page's summertime population increases substantially due to second-home residents. The city's year-round population is projected to be 10,000 in 2010 (Arizona Department of Economic Security 1993a).

Page directly benefits from tourists visiting Glen Canyon National Recreation Area. Lake Powell has also fostered substantial recreational home development in the Page area. Income levels and housing costs in Page are among the highest in Arizona.

Grand Canyon visitors stay in Page when closer accommodations are not available, although many choose to visit the Glen Canyon National Recreation Area along with their park trip. Page's economy also benefits from employment at the Glen Canyon Dam and Arizona's Salt River Project.

Page's average annual unemployment was 6.4% in 1993. Unemployment was 8.5% in January and 5.7% in August.

■ Cameron

Cameron is an unincorporated community next to the turnoff from U.S. 89 leading to the East Rim via Arizona 64. Most residents of Cameron are Navajo. Cameron's 1990 population was 493; the community's 2010 population is projected to be 941 (Arizona Department of Economic Security 1993a).

Most commercial development in Cameron is tourist-related. The 45 rooms at the Cameron Motel are used primarily be park visitors. The Cameron trading post is a well-known retailer of souvenirs and American Indian arts and crafts. In addition, Navajos operate numerous open air stands along Arizona 64 between Cameron and the park's east entrance and sell jewelry, blankets, and other Indian crafts.

■ Tuba City

Tuba City is an unincorporated community 10 miles east of U.S. 89 on U.S. 160. Tuba City is the largest community on the western portion of the Navajo Reservation. The city's 1990 population was 27,436. The area's population is projected to be 36,900 in 2010 (Arizona Department of Economic Security 1993a).

Tourism businesses in Tuba City mainly serve visitors interested in American Indian culture, although during the peak season visitors are referred to Tuba City from other locations for accommodations. Tuba City has an 81-room motel and 30-room youth hostel. Many visitors are touring regional Indian attractions and southwestern national parks.

The Tuba City area experiences very high unemployment. Average annual unemployment was 20.8% in 1993, with a rate of 26.3% in January and 18.9% in August.

■ Gray Mountain

Gray Mountain is on U.S. 89 between Flagstaff and Cameron. Only a few people live here, as most of its land area is devoted to commercial development. The 1990 population for the general area was about 50.

Highway commercial development is oriented to park visitors and other travelers along U.S. 89, offering a convenience store, gift shop, and motel. The Gray Mountain Inn has 120 rooms, mainly serving visitors to the South Rim.

NORTH RIM COMMUNITIES

The Colorado River and the Grand Canyon serve as barriers that isolate North Rim communities from the more populated areas of Coconino County. The North Rim communities include the developed North Rim area within Grand Canyon National Park, Jacob Lake, Fredonia, and Marble Canyon. Visitors to the North Rim travel U.S. Alternate Route 89 east through Fredonia or west through Marble Canyon to Jacob Lake. From Jacob Lake, Arizona 67 provides a direct route to the park's North Rim.

The Arizona Department of Transportation's closes Arizona 67 from November until May 15, and whereas visitor services are at capacity during the peak season, demand for visitor services in the North Rim communities during the off-season is minimal. The economic and population impacts of the North Rim are essentially limited to warm weather months.

Local employment statistics are only available for Fredonia. This community experiences above average unemployment throughout the year. In 1993 its average annual unemployment rate was 7.6%. Unemployment peaked in January at 10.0%, and was 6.7% in August.

■ Bright Angel Point

Only about 20 people live year-round on the North Rim. The park's population increases to about 290 persons in summer. Park facilities are limited to lodging and basic visitor services, and facilities supporting park administration and maintenance activities.

■ Jacob Lake

Most development in the Jacob Lake area is on lands leased from the U.S. Forest Service. The census reported seven year-round residents in the Jacob Lake area. The area's summertime population increases to over 100, including people working for the Forest Service and households associated with local tourism businesses.

The primary development in the Jacob Lake area is the Jacob Lake Inn, with approximately 40 rooms that are full from mid-May through October. Restaurant, gas, and convenience store services are available. A recreational vehicle park is located on private land in the Jacob Lake area.

■ Fredonia

Fredonia is an incorporated town about 75 miles north of the North Rim and less than 5 miles south of the Utah border. Because of its nearness to Kanab and St. George, Utah, and its relative isolation from Coconino County population centers, Fredonia is more socially and economically linked to southern Utah than to northern Arizona. Fredonia's 1990 population was 1,207. Fredonia's population in 2010 is projected to be 1,878 (Arizona Department of Economic Security 1993a).

Fredonia's economy is less oriented to tourism than are other North Rim communities. With only 17 rooms, Fredonia offers few lodging services to visitors. Fredonia has several non-tourism industries, such as forest products, mining, and agriculture. The U.S. Forest Service is another major employer in the area. The recent decline in lumber production has hurt Fredonia's economy. Fredonia's business district provides basic services for both tourists and local residents.

■ Marble Canyon / Lees Ferry

The Marble Canyon / Lees Ferry area is located below Glen Canyon Dam, at the beginning of the free-flowing section of the Colorado River. Cliff Dwellers, Vermilion Cliffs, and Badger Creek are other small communities in this area. The year-round 1990 population was about 100.

The summer population increases because of tourism and second-home residents. No population forecasts are available for this area.

The area's 80 motel rooms are fully occupied for most of the year. Most overnight visitors are making float trips or fishing trips on the Colorado River or visiting Lake Powell. Local businesses also serve U.S. Highway 89 travelers, many of whom are tourists going to Lake Powell or the Grand Canyon and other regional attractions. Some North Rim visitors seek lodging in the Marble Canyon / Lees Ferry area because lodging facilities are full closer to the park.

Most of the land in the Marble Canyon / Lees Ferry area is in public ownership. New development is generally restricted to small private inholdings. A major planned-unit development is being proposed in the Marble Canyon area, including a hotel and other commercial facilities, plus multifamily housing.

Southwestern Utah

Washington and Kane Counties are north of the Arizona border in southwestern Utah. Both counties are connected to the North Rim of Grand Canyon National Park by U.S. 89 (including U.S. Alternate 89 between Kanab and Jacob Lake), and Arizona 67 from Jacob Lake and the park. St. George, the county seat and largest city in Washington County, is about 160 miles from the North Rim. Kanab, the county seat and largest city in Kane County, is about 80 miles from the North Rim.

Washington is Utah's fastest growing county: From 1970 through 1990 its population grew from about 13,885 to over 48,560. State population projections predict the county's population will approach 120,000 by 2010. Most of the county's growth is predicted to occur in the St. George area (Utah Governor's Office, Office of Planning and Budget 1993). Average annual employment in Washington County grew from 4,800 jobs in 1970 to nearly 22,000 jobs in 1991 (Bureau of Economic Analysis, U.S. Department of Commerce 1993).

Tourism is an important industry for the Washington County economy. Zion National Park is the county's major tourist attraction. County businesses also serve tourists going to other national parks, monuments, and recreation areas and regional tourist attractions, as well as travelers on I-15. Grand Canyon National Park is one of the mix of regional attractions that causes tourists to travel through Washington County. The county is also becoming a significant retirement area, and St. George serves as a regional trade center for southwestern Utah and the Arizona Strip (north of the Grand Canyon). Growth in tourism and regional trade, and an expanding resident population are contributing to the county's population and economic growth. Employment in trade and service industries has grown steadily .

Kane County, on the Colorado Plateau, is isolated from Utah major population centers and growth corridors. From 1970 to 1990 Kane County's population increased from 2,421 to 5,169; its population is predicted to grow to 10,472 by 2010 (Utah Governor's Office, Office of Planning and Budget 1993). Average annual employment in Kane County grew from 1,100 jobs in 1970 to nearly 2,300 jobs in 1991 (Bureau of Economic Analysis, U.S. Department of Commerce 1993). Growth in tourism and the effects of population in-migration have helped to off-set the adverse effects of decreased employment in the county's natural resource based industries. Tourist-oriented employment tends to be seasonal, and wages tend to be lower than in the mining and forest products industries. Portions of the Glen Canyon National Recreation Area and Bryce Canyon National Park are located in Kane County. Tourist-oriented businesses also serve travelers going to the Grand Canyon and other regional attractions.

A major coal mine is being proposed near the town of Big Water in southeastern Kane County. At full capacity, the direct, indirect, and secondary effects of the Smoky Hollow coal mining project are estimated to create about 600 jobs, most of which would be in southwestern Utah and northern Arizona. Kanab, Utah, and Page, Arizona, are the closest cities and would likely attract much of the population growth attributable to the mine.

ACCESS AND TRANSPORTATION

Regional Access and Transportation

Visitors arrive at the Grand Canyon National Park by automobile, bus, air, and rail. Various public and private transportation systems and services have been developed to accommodate visitors traveling to and within the park.

Road System Linkages to the Grand Canyon

Regional and local road systems provide access for visitors traveling by private automobiles or buses to Grand Canyon National Park (see the Regional Access Routes map).

■ Interstate Highways

I-40 and I-15 provide the primary links between the Grand Canyon region and other parts of the United States. I-40, an east-west route that crosses north-central Arizona, passes directly through Flagstaff and Williams, two gateway cities to the South Rim of the Grand Canyon. I-15, a north-south route west of the Grand Canyon, accommodates regional travel between Salt Lake City, Las Vegas, and Los Angeles. Other interstate highways provide important connections to regional population centers in the Southwest. I-17 connects Flagstaff and Phoenix and links the Grand Canyon region with I-10, a major east-west route serving the southern United States.

■ Regional Road Access to the South Rim

Direct access to the South Rim from I-40 is possible at Williams using Arizona Highway 64. Access from Flagstaff is possible by following U.S. Highway 180 from Flagstaff to Valle, and Arizona 64 from Valle to Grand Canyon Village. The South Rim can also be accessed by U.S. 89 from Flagstaff to Cameron where the route meets Arizona 64. Access to the South Rim from I-15 is possible by following U.S. 93 from the Las Vegas area to Kingman, Arizona where the route joins I-40.

U.S. 180, between Flagstaff and Valle, traverses a portion of the San Francisco Peaks area and is closed at times during winter because of snow. All of the other access routes mentioned are open to traffic year round.

■ Regional Road Access to the North Rim

Kanab, Fredonia, and Jacob Lake are gateway communities near the North Rim. The principal access to this area and the North Rim is from I-15 near St. George. Utah Highway 9 connects I-15 to Kanab and Fredonia. U.S. Highway 89 links Fredonia to Jacob Lake.

Arizona Highway 67 connects Jacob Lake to the North Rim. U.S. Highway 89 also connects Jacob Lake with the Lees Ferry/Marble Canyon area and Cameron. Arizona Highway 67 is closed to vehicle traffic during the winter months between Jacob Lake and the North Rim.

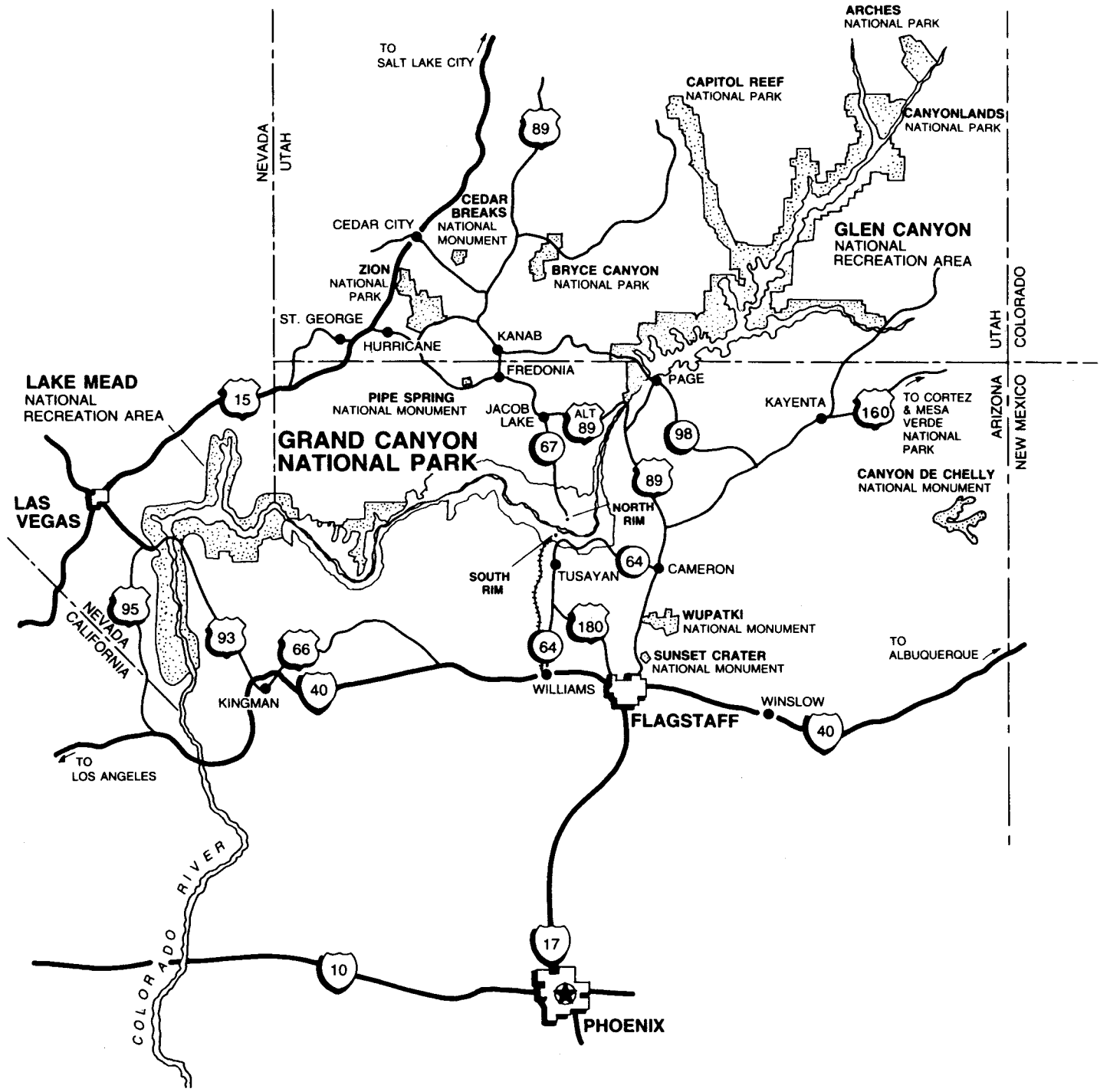
■ Regional Road Access to Tuweep

The remote Tuweep section of the Grand Canyon is accessible from I-15 by way of local dirt roads at St. George, Utah; Colorado City, Arizona; and near Pipe Spring National Monument. Principal access is by way of a 56-mile local dirt road from Arizona Highway 389 near Pipe Spring National Monument. This road also connects Colorado City and Fredonia and with Utah 9 and U.S. 89. All the dirt access roads to Tuweep become marginally passable during periods of rain.

■ Roads Connecting the North and South Rims

The principal highway connection between the North and South Rims is about 213 miles long (from Grand Canyon Village on the South Rim to Grand Canyon Lodge on the North Rim) and involves the use of Arizona 64 and 67 and U.S. 89 east of the park. U.S. 89 connects Jacob Lake with Cameron by crossing the Colorado River at Marble Canyon. This route provides the shortest and most direct route for visitors driving between the canyon rims.

Access between rims of the Grand Canyon is also possible west of the park by following I-40 to U.S. 93, which links Kingman, Arizona with Las Vegas. I-15 connects Las Vegas with St. George, Utah. Utah Highway 9 is then used to access Jacob Lake and Arizona 67, which leads to the North Rim. This route is about 548 miles.



REGIONAL ACCESS ROUTES
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Other Regional Transportation Services to the Grand Canyon

Many park visitors rely on other forms of regional transportation for access to the Grand Canyon, including rail service, air service, and tour bus service, all of which are readily available.

AMTRAK rail service is available for visitors traveling from other parts of the United States to the Grand Canyon region. AMTRAK stops in Phoenix, Las Vegas, and Flagstaff.

National and regional airlines provide access to the Grand Canyon region from airports in Arizona, Nevada, and southern California. Connections to all points in the United States and international destinations are possible from these locations.

An increasing number of visitors are relying on tour bus companies for access to the Grand Canyon. These companies operate out of most major cities in the southwestern United States and offer both bus transportation and tour services to the Grand Canyon.

Access and Transportation on the South Rim

The south and east entrances serve as access points for visitors to the South Rim of the Grand Canyon. The south entrance is north of Tusayan and accessed by Arizona Highway 64 and the south entrance road. The east entrance is just south of Desert View and accessed by East Rim Drive and Arizona 64.

NPS visitation data for 1990 showed that about 73% of park visitors entered through the south entrance and 19% entered at the east entrance. The visitation data also shows that the South Rim receives about 92% of the park's total visitation.

Local Access Routes and Transportation

According to data collected in 1992 at the south and east entrances, 78.2% of park visitors arrive by private vehicle, 11.5% by tour bus, 7.1% by airport shuttle bus, and 2.8% by train. The mode of arrival for visitors to the South Rim does not vary significantly throughout the year.

■ Local Access Roads.

U.S. Highway 180 and Arizona Highway 64 are the primary local highways linking regional routes to the South Rim. U.S. 180 passes directly through the gateway community of Tusayan and leads to Grand Canyon Village. Arizona 64 follows the South Rim to Desert View and Cameron, where it intersects U.S. 89.

Two USFS roads on Kaibab National Forest lands south of the park (Roads 302/307) provide an east-west connection between Tusayan and Arizona 64, east of Desert View, as well as access to USFS lands east of Tusayan. USFS Road 302/307 has a dirt surface and is not passable during periods of snow or heavy rain. This road also provides access to a local garbage dump compacting station near Tusayan. The road has been upgraded for the short distance between Tusayan and the dump station, making this section passible in all weather conditions.

Rowe Well Road is in Kaibab National Forest west of U.S. 180; it is a dirt road connecting Tusayan and park lands west of the village. This road is only used by local residents and is not passable during much of the winter and spring.

■ Rail Transportation

Historically, the Atchison, Topeka, and Santa Fe Railroad Company provided passenger train service from Williams to the park. The railroad was once the primary mode of visitor transportation to the park. However, dominance of automobile travel to the park caused the Santa Fe Railroad to suspend its park passenger service in 1968.

In September 1989 the Grand Canyon Railroad Company (GCRR) reinstituted weekend train service between Williams and the park. In March 1990 year-round daily train service to the park was initiated. The railroad operates a vintage steam-powered train that pulls five or more passenger cars carrying 90 passengers each. The historic train depot in Grand Canyon Village is the only train stop in the park. More than 106,000 visitors used the train for access to the park in 1993 (Marshall Bryant, president, GCRR).

Grand Canyon Railroad is planning on constructing a new spur line in Tusayan and providing train service between the airport and Grand Canyon Village. The Maswik transportation center would serve as the depot at the north end of the route. GCRR would provide up to eight trains per day on the proposed airport spur route.

■ Air Transportation

Grand Canyon National Park Airport is about 5 miles south of the park near Tusayan. This is the closest airport to the park capable of accommodating commercial passenger activity. The airport, which is owned and operated by the Arizona Department of Transportation, has a 9,000-foot-long paved runway capable of being used by jet aircraft.

Commercial passenger service is available to this airport from several cities in the region, including Las Vegas, Los Angles, and Phoenix. According to Arizona Department of Transportation, there were 187,444 takeoffs and landings in 1993, including helicopter operations based out of Tusayan. An estimated 1,065,000 passengers enplaned and deplaned in 1993.

Grand Canyon National Park Airport is served by about 30 commuter airlines operating in the southwestern United States. The airport is also the base of operations for six air tour companies, which represent about 20% of the airport's total operations.

The Arizona Department of Transportation has proposed to expand the airport in Tusayan in response to forecasts of substantial increases in aviation activity. The department anticipates that the airport will handle over 1.5 million passenger arrivals and departures in the year 2010 (ADOT, *Grand Canyon National Park Airport Master Plan,* 1991). Based on current activity, it appears that this number will be achieved earlier than 2010. The proposed expansion would include a new 30,000 square-foot terminal building and a second runway. The airport has recently provided an area for the development of helicopter facilities and has constructed a new access road.

A new airport is being constructed at Valle by the former owner of Scenic Airlines. Although the airport will be privately owned, it will be open to the public. The facility is being constructed with the intent of providing an alternate landing site for aircraft delayed at the Grand Canyon Airport and as a maintenance facility. The owner intends to provide ground transportation from the airport to the park using transit buses.

■ Bus Transportation

According to the records maintained by Fred Harvey Transportation Company, as many as 70 tour companies offer bus service to the park.

NPS visitation data indicate that approximately 541,000 visitors arrived by tour bus in 1990; similar data showed that some 700,000 visitors arrived by bus during 1992. NPS visitor statistics show that about 85% of the tour buses arrive at the park through the south entrance, 12% through the east entrance.

A privately owned transit company provides shuttle service between the airport at Tusayan and Grand Canyon Village. The shuttle makes multiple stops in Tusayan and three stops in the park on its 19.6 mile-long route.

The Tusayan-Grand Canyon Shuttle uses transit buses with capacities ranging from 30 to 45 passengers. Service is provided throughout the year on 30-minute intervals (headways) between the hours of 7:15 A.M. and 7:10 P.M. each day. The shuttle carried approximately 35,000 passengers during 1990.

Vehicle Circulation and Parking on the South Rim

■ Roads

West Rim Drive, Grand Canyon Village roads, East Rim Drive, and Desert View roads comprise the major routes for vehicle travel on the South Rim.

West Rim Drive: West Rim Drive begins at the west end of Grand Canyon Village at the intersection of the village loop road. This scenic route, the only vehicle route west of the village, follows the rim of the canyon for 7.9 miles and ends at Hermits Rest. It is a paved, two-lane road and has the steepest grade (6%) of any road on the South Rim. This narrow road is in poor condition.

West Rim Drive is closed to private vehicles from June through September, and access to this area is provided by shuttle buses. Private vehicle access is allowed for disabled individuals throughout the year.

East Rim Drive: East Rim Drive (Arizona 64) is a paved two-lane roadway that begins at the eastern boundary of the park near Desert View and extends approximately 25 miles west to where it intersects the south entrance road near Grand Canyon Village. This route is the only state highway in this area. East Rim Drive generally follows the rim of the canyon and provides visitors with viewing opportunities at various dead-end spur roads and at parking areas at overlooks.

Grand Canyon Village: The south entrance road, the village loop road, and Center Road are the major vehicle circulation routes in the village (see the Village Roadway System map).

The south entrance road is the major visitor access route to the South Rim. This two-lane road begins at the park's southern boundary, just north of Tusayan, and extends 6.4 miles north to the village. The visitor center and the business center of the village lie along the south entrance road.

The village loop road is a paved, two-lane, 1.6-mile-long road used for circulation within the village. The northern half of the loop road between the concessioner's general office building and Maswik Lodge is currently operated as a one-way road. The loop road provides access to most of the lodges and restaurants, the railroad station, and the historic portions of the village. Some local village roads serving employee residential and community facilities connect to the loop road.

Center Road is a two-lane road extending some 1.6 miles from the intersection of the village loop road near the NPS operations office to the south entrance road. It is the principal access route to the residential area and many of the community facilities, such as the school and the medical clinic. The road also provides access to many park maintenance and operations areas.

Desert View: Desert View has a limited paved road system that provides visitor access to a gas station, housing area, campground, store, and an NPS information center. Arizona Highway 64 passes through Desert View near the rim.

■ Level of Service

A level of service (LOS) analysis provides a way to assess the operation and effectiveness of a road system. The accepted methods for calculating level of service is provided in the *Highway Capacity Manual, Special Report 209* (Transportation Research Board 1985). Level of service is rated from LOS A, representing excellent operation, to LOS F, representing system failure.

The LOS analysis establishes the carrying capacity of each particular road, based on the individual characteristics of the road. These characteristics include road width, number of lanes, lateral clearance, terrain, passing availability, and the percentage of trucks and buses in the vehicle mix.

A 1990 traffic safety study in the Grand Canyon included traffic counts and a determination of the peak hour factor for the park (Traffic Engineers, Inc.). The peak hour was established to be 10% of the total daily traffic volume, based on the traffic count data. This peak hour factor is similar to that found in most urban areas.

The 1990 and 2010 traffic volumes and the corresponding level of service for the main roads on the South Rim are shown in Summer Traffic Volumes / Level of Service map.

West Rim Drive: Since traffic on West Rim Drive is limited to transit service during peak times, it operates at LOS A. However, during the months of the year when the route it is open to private vehicles, it operates at LOS B/C.

Grand Canyon Village: An analysis conducted in 1991 showed that the level of service provided by the existing road system in the village is very poor (Traffic Engineers, Inc.). Most of the roads currently operate at LOS D and most of the major intersections in the village operate at LOS D/E. The level of service for the major roads in the village area is shown in the Summer Traffic Volumes and Level of Service map. The level of service on most of these roads would deteriorate as traffic increased.

The poor operation of the road system can be attributed to the effects of limited parking in the village. When the parking areas are full, visitors often park along the road shoulders, which causes traffic congestion since the space available for vehicles on the road is reduced and pedestrians are often present on the roadway. Other factors contributing to the poor level of service are inadequate lane widths, lack of channelization at intersections, poor sight distance, and poor roadway alignment.

East Rim Drive: East Rim Drive currently operates at LOS B for most of its length. However, the segment between Yaki Point and the intersection with the south entrance road currently operates at LOS C due to higher traffic volumes.

Desert View: All of the roads in the vicinity of Desert View currently operate at LOS B or better.

■ Parking

Approximately 3,320 visitor parking spaces are provided at various roadside overlooks on West Rim Drive, overlooks and other facilities along East Rim Drive, and in the developed areas at Grand Canyon Village and Desert View. Surveys were completed during the summer of 1992 to determine the current level of use for parking areas on the South Rim (Operations Research Consulting Associates).

West Rim Drive: There are eight roadside pullout areas along West Rim Drive — Trailview, Maricopa Point, Powell Memorial, Hopi Point, Mohave Point, the Abyss, Pima Point, and Hermits Rest. During the peak visitation months access to this area is provided by shuttle buses, and these parking areas are used for shuttle bus stops, for parking by visitors with disabilities, and for concessioner tour buses.

The shuttle system on West Rim Drive has effectively eliminated parking problems during the peak visitor season. Parking demand at many of these areas exceeds the supply during the months when the road is open to unrestricted travel.

Grand Canyon Village: Sixteen designated parking areas within Grand Canyon Village provide a total of 2,686 parking spaces (see the Grand Canyon Village / Parking Lot Location map). The parking supply for the village includes parking areas at Hermits Rest and Yavapai East.

A July 1992 survey established the demand for parking in the village at 2,298 spaces, representing 86% of the total parking supply in the village. Competition for parking spaces continually occurs between day use visitors and lodge guests during the peak use months. The demand for parking at eight of the 16 parking areas, including parking areas around the lodges nearest the rim, the visitor center, the Yavapai observation station, and Mather Point in the village, exceeded the available supply of parking spaces. The Yavapai East parking area is greatly underutilized.

Overflow parking occurs along road shoulders in the village, most often near the rim parking areas. This roadside parking contributes to traffic congestion and pedestrian conflicts in the village area.

East Rim Drive: Nine parking areas along East Rim Drive provide 494 parking spaces. Parking areas along East Rim Drive include the South Kaibab trailhead, the Yaki Point overlook, two roadside pulloffs, the Grandview overlook, the Moran Point overlook, the Tusayan museum, Lipan overlook, and Navajo Point.

A 1992 study of parking lot use showed that five of the nine parking areas along East Rim Drive were over capacity during peak use periods, with parking areas at the South Kaibab trailhead, Grandview, Moran Point, and Lipan Point used well beyond their capacities. Overflow parking occurs along the shoulder of the roads in the vicinity of overlooks, contributing to traffic congestion and pedestrian conflicts in these areas.

Desert View: The one designated parking area near the visitor service facilities provides 140 spaces. The 1992 study of parking lot use showed that the use of this lot far exceeded its capacity. During periods of excess parking demand, visitors often park along the road shoulders and in disturbed areas of East Rim Drive.

IN-PARK TRANSPORTATION SERVICES ON THE SOUTH RIM

For travel along the South Rim and within Grand Canyon Village, visitors can use transportation services provided by the National Park Service and the park concessioner.

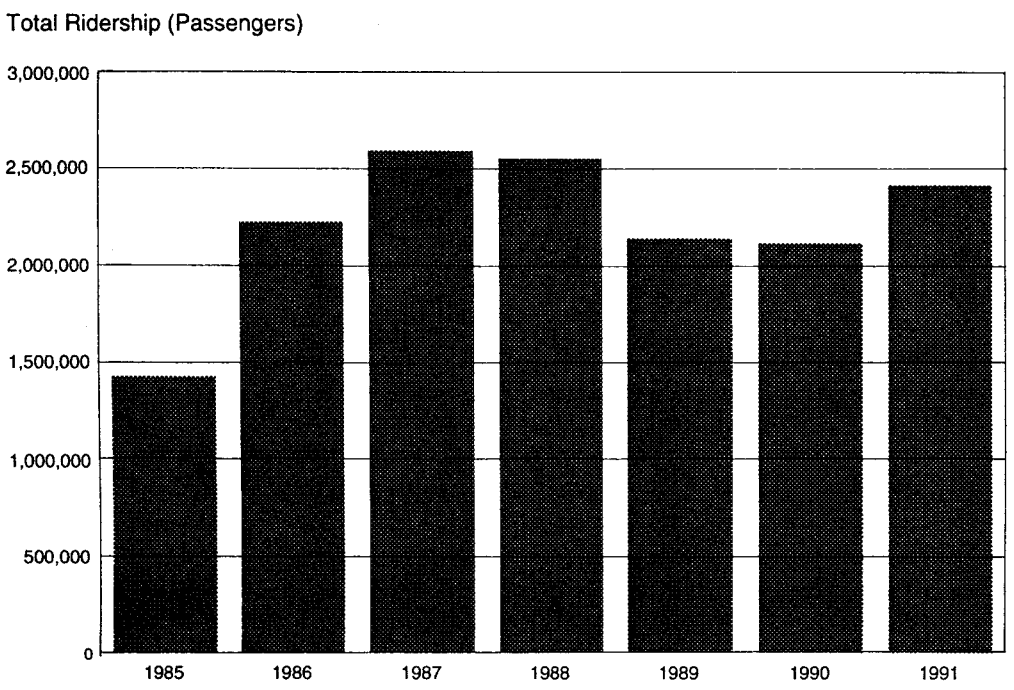
■ NPS Visitor Transportation Services

The Park Service owns a fleet of transit vehicles to transport visitors along two fixed routes on the South Rim. This service, known as the visitor transportation system (VTS), is offered free to park visitors and is managed and operated under a contract with Mayflower Contract Services. Shuttle service is not available on East Rim Drive or at Desert View because these areas are accessible to visitors in private vehicles.

Total annual ridership is shown in figure 2. The data indicate that the transportation system has provided between 2.2 and 2.6 million rides per season since 1986.

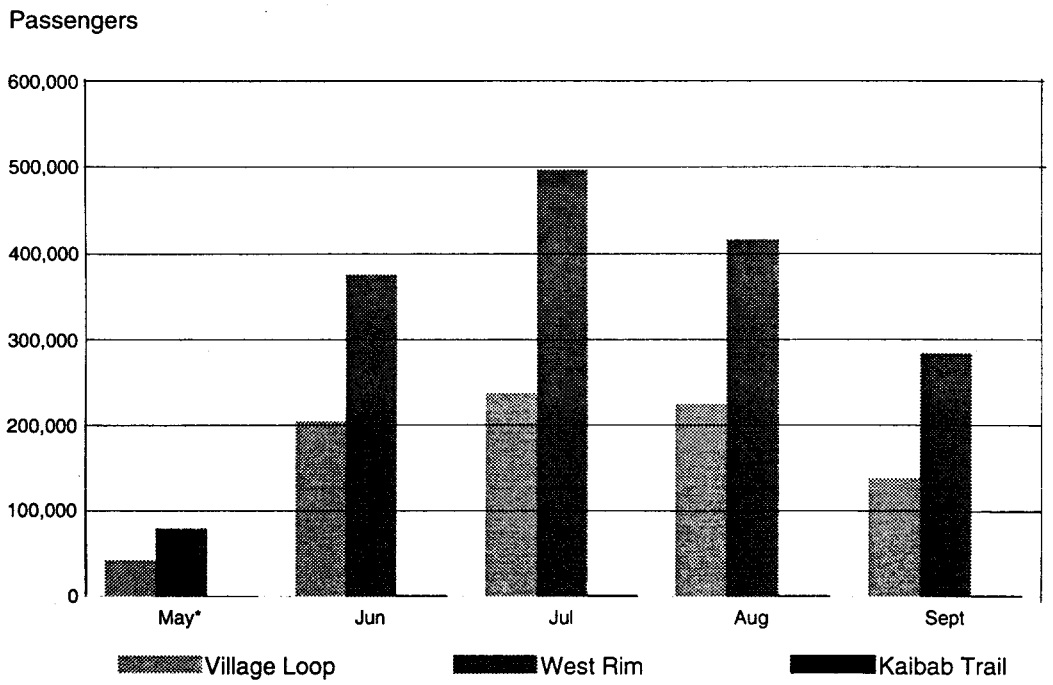
The typical transportation season is late May through the end of September. The variation in ridership throughout the season is presented in figure 3. The data show that the highest use occurs during June, July, and August and that the West Rim shuttle is the more popular service.

FIGURE 2: VISITOR TRANSPORTATION SYSTEM RIDERSHIP, 1985–1991



Source: Crawford Technical Services.

FIGURE 3: MONTHLY VARIATIONS IN TRANSPORTATION SYSTEM RIDERSHIP, 1991



Source: Crawford Technical Services.
*Transit system began operations on May 24, 1991.

The two transit routes on the South Rim are the village loop shuttle and the West Rim shuttle.

Village Loop Shuttle: The 6.4-mile village loop route connects the historic village area, the business center, the campground, trailer village, and the Yavapai observation station. The Grand Canyon Village / Loop Shuttle Route map shows the locations of the 14 bus stops on the route.

The village shuttle typically operates from 6:30 A.M. to 10:00 P.M. daily. Two buses operate until 9:40 A.M. each day, when two more buses enter into service to minimize delays for riders. Diesel-powered buses with capacities of 65-passengers each are used.

In 1991 the village shuttle carried a total of 845,971 passengers and averaged about 86 passengers per run. The managers of the system indicate that the village shuttle operates at or over capacity about 25 days each season (personal communication with Bob Oliver, Crawford Technical Services).

The demand for this shuttle service exceeds the supply of available seats for most of the time between 11 A.M. and 5 P.M. Over 25 passengers are often left waiting at the bus stop at the West Rim interchange and the visitor center as a result of the capacity problems.

West Rim Shuttle: Shuttle service is provided along the 8-mile West Rim Drive between the junction of West Rim Drive and the village loop road and Hermits Rest. The shuttle stops at eight locations, including Trailview overlook, Maricopa Point, Powell Memorial, Hopi Point, Mohave Point, the Abyss, Pima Point, and Hermits Rest. The most popular stops are Trailview overlook, Hopi Point, and Hermits Rest.

Six bus trains are used throughout the day, beginning at 7:30 A.M. and ending after sunset. The vehicles operate at 15-minute headways over the 16 mile-long round-trip route. Each bus train consists of a 30-foot-long diesel-powered motor unit and one 32-foot-long trailer unit, together capable of carrying a total of 59 seated passengers and 36 standing passengers. If passengers do not get off the shuttle, they can make the round-trip in 90 minutes.

The West Rim shuttle carried 1,562,778 passengers in 1991. The shuttle is most heavily used between 11 A.M. and 6 P.M. The shuttle operates at or over capacity about 50 days each season.

During periods of heavy use this shuttle service leaves passengers waiting at bus stops between noon and sunset. The greatest capacity problem occurs at the West Rim interchange, which is the initial loading point for the shuttle. The shuttle can leave over 150 passengers waiting at the interchange. Passengers are also left waiting at stops along the West Rim route. This has created problems for visitors, especially when weather conditions deteriorate rapidly.

Kaibab Trailhead Shuttle: In past years, the transportation service has provided shuttle service for hikers using the Kaibab Trail between mid-May and the end of September and from 7:00 A.M. to NOON. The shuttle operates between the backcountry office and the trailhead at Yaki Point on East Rim Drive, about a 13-mile round-trip. Six round trips were generally made each day, using a 65-passenger bus.

During 1991 the shuttle transported a total of 6,779 passengers. Beginning in 1993 this service was provided by the Fred Harvey Transportation Company, the transportation concessioner for the South Rim. It is anticipated that this trailhead shuttle service will be provided by the concessioner for the foreseeable future.

The South Kaibab trailhead shuttle is underutilized and does not have capacity problems. The operation of the shuttle creates some problems due to the limited schedule, and the bus may not be available when canyon hikers return to the trailhead, but a phone is there to call for taxi service.

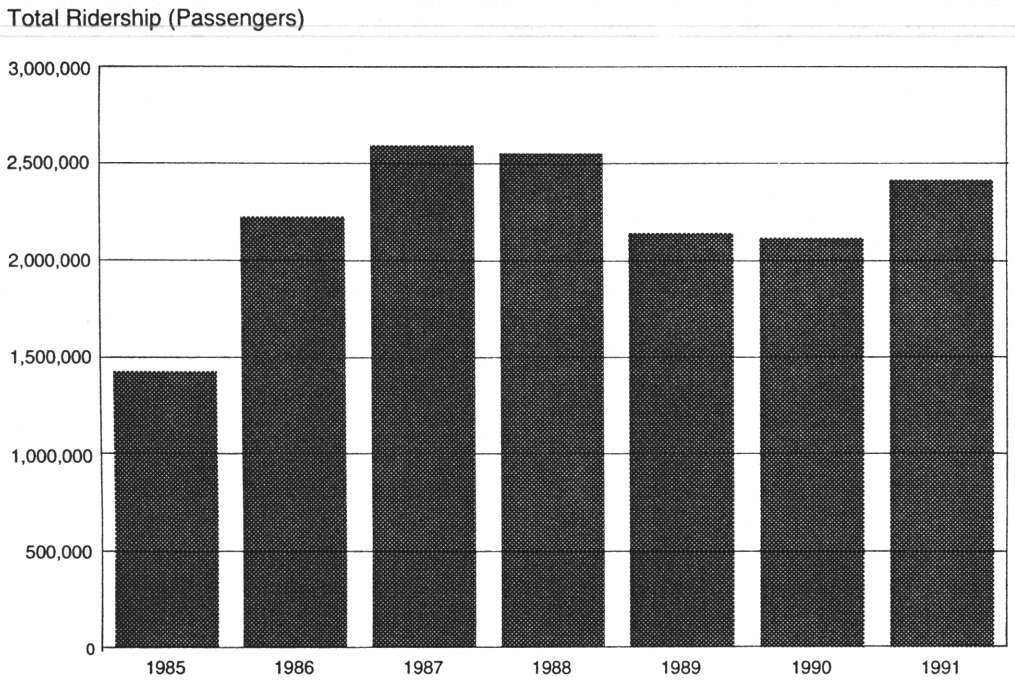
■ Concessioner Transportation Services

The transportation services provided by the Fred Harvey Transportation Company include regularly scheduled bus tours, special group tours, and a variety of guide services. The company uses large diesel buses, minibuses, and vans.

The company provides regularly scheduled tours along West Rim Drive and tours to Desert View and other locations along East Rim Drive. Upon request, they also provide specialized tours to various locations along the South Rim, as well as special bus tours for visitors arriving at the airport in Tusayan or for visitors arriving by train. The concessioner also offers taxi service 24 hours a day to and from all areas within the park, the airport, and other

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

FIGURE 2: VISITOR TRANSPORTATION SYSTEM RIDERSHIP, 1985–1991



Source: Crawford Technical Services.

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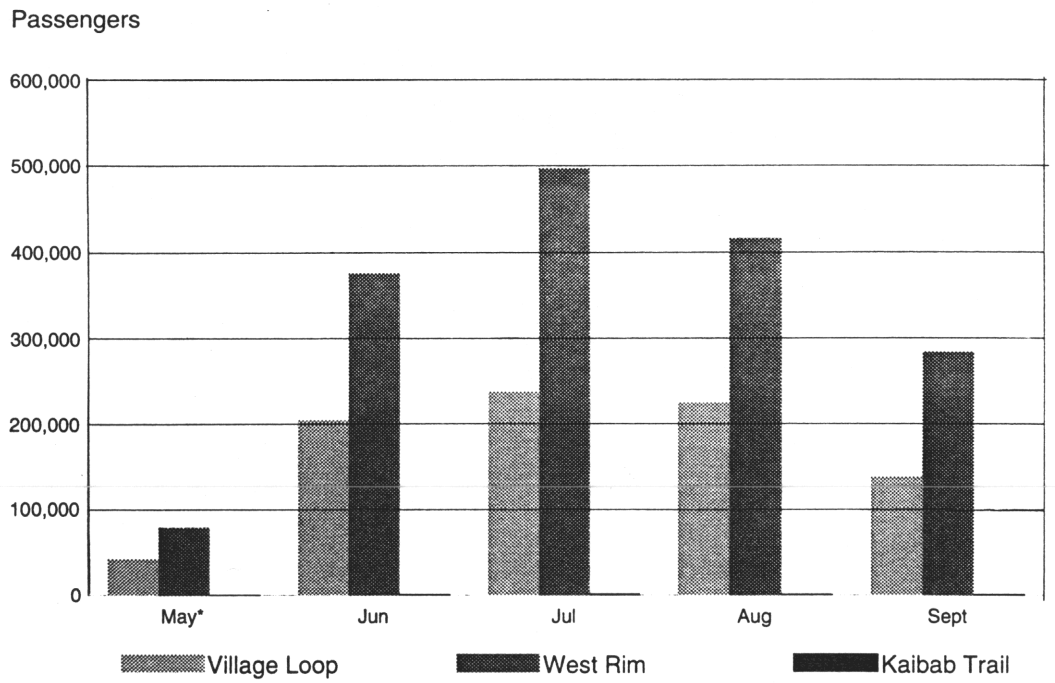

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The village shuttle typically operates from 6:30 A.M. to 10:00 P.M. daily. Two buses operate until 9:40 A.M. each day, when two more buses enter into service to minimize delays for riders. Diesel-powered buses with capacities of 65-passengers each are used.

In 1991 the village shuttle carried a total of 845,971 passengers and averaged about 86 passengers per run. The managers of the system indicate that the village shuttle operates at or over capacity about 25 days each season (personal communication with Bob Oliver, Crawford Technical Services).

The demand for this shuttle service exceeds the supply of available seats for most of the time between 11 A.M. and 5 P.M. Over 25 passengers are often left waiting at the bus stop at the West Rim interchange and the visitor center as a result of the capacity problems.

West Rim Shuttle: Shuttle service is provided along the 8-mile West Rim Drive between the junction of West Rim Drive and the village loop road and Hermits Rest. The shuttle stops at eight locations, including Trailview overlook, Maricopa Point, Powell Memorial, Hopi Point, Mohave Point, the Abyss, Pima Point, and Hermits Rest. The most popular stops are Trailview overlook, Hopi Point, and Hermits Rest.

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The West Rim shuttle carried 1,562,778 passengers in 1991. The shuttle is most heavily used between 11 A.M. and 6 P.M. The shuttle operates at or over capacity about 50 days each season.

During periods of heavy use this shuttle service leaves passengers waiting at bus stops between noon and sunset. The greatest capacity problem occurs at the West Rim interchange, which is the initial loading point for the shuttle. The shuttle can leave over 150 passengers waiting at the interchange. Passengers are also left waiting at stops along the West Rim route. This has created problems for visitors, especially when weather conditions deteriorate rapidly.

Kaibab Trailhead Shuttle: In past years, the transportation service has provided shuttle service for hikers using the Kaibab Trail between mid-May and the end of September and from 7:00 A.M. to NOON. The shuttle operates between the backcountry office and the trailhead at Yaki Point on East Rim Drive, about a 13-mile round-trip. Six round trips were generally made each day, using a 65-passenger bus.

During 1991 the shuttle transported a total of 6,779 passengers. Beginning in 1993 this service was provided by the Fred Harvey Transportation Company, the transportation concessioner for the South Rim. It is anticipated that this trailhead shuttle service will be provided by the concessioner for the foreseeable future.

The South Kaibab trailhead shuttle is underutilized and does not have capacity problems. The operation of the shuttle creates some problems due to the limited schedule, and the bus may not be available when canyon hikers return to the trailhead, but a phone is there to call for taxi service.

■ Concessioner Transportation Services

The transportation services provided by the Fred Harvey Transportation Company include regularly scheduled bus tours, special group tours, and a variety of guide services. The company uses large diesel buses, minibuses, and vans.

The company provides regularly scheduled tours along West Rim Drive and tours to Desert View and other locations along East Rim Drive. Upon request, they also provide specialized tours to various locations along the South Rim, as well as special bus tours for visitors arriving at the airport in Tusayan or for visitors arriving by train. The concessioner also offers taxi service 24 hours a day to and from all areas within the park, the airport, and other

locations in Tusayan. The company also provides transportation services and tours to areas outside the park.

During 1990 Fred Harvey provided a total of about 8,650 tours and provided transportation service to approximately 251,000 people. Peak months for in-park tours were May and June in 1990, but total ridership peaked at more than 7,500 during June and August.

Other tour buses entering the park are limited in providing transportation services unless arrangements have been made for a guide from Fred Harvey to conduct a tour. Tour buses are restricted to the major access routes in Grand Canyon Village and can stop only at major developed areas such as the Bright Angel Lodge, Maswik Lodge, and the Yavapai observation station. Most buses that enter the park at the south entrance travel directly to one of these destination points.

Access and Transportation on the North Rim

The north entrance is the primary access point for visitors to the North Rim. The North Entrance, south of Jacob Lake, can reached by way of Arizona Highway 67. The North Rim is open to motorized vehicles from early May to late October, depending on snowfall.

NPS visitation data for 1990 show that approximately 8% of the all visitors arrived in the park through the north entrance. NPS data indicate that approximately 350,000 people visited the North Rim in 1992, and on the peak day in 1992 more than 3,500 visitors came to the North Rim. According to an NPS market analysis, some 508,000 people are projected to visit the North Rim in the year 2010.

Table 18: North Rim Parking Areas

Parking Area Location	Automobile Spaces	RV/Bus Spaces	Total Spaces
Grand Canyon Lodge	250	20	270
North Kaibab Trailhead	40	3	43
Campground	33	0	33
Widforss Trailhead	10	0	10
Point Imperial	45	5	50
Vista Encantadora	22	5	27
Indian Country Overlook	6	0	6
Walhalla Overlook	41	5	46
Cape Royal	50	10	60
	497	48	545

Local Access and Transportation to the North Rim

Access to the North Rim is primarily by private vehicles and tour buses. Arizona 67 connects Jacob Lake on U.S. Highway 89 with the North Rim. This paved, two-lane road is being upgraded so it can accommodate heavier loads and be opened for traffic earlier in the spring.

Data compiled by the National Park Service in 1992 show that nearly 96% of the visitors arrived by car or RV and slightly more than 4% arrived by tour bus. NPS visitation data for the north entrance indicate that the number of tour buses serving the North Rim is increasing at an annual rate of 4%. Buses typically travel from the north entrance to the Grand Canyon Lodge or to Point Imperial and Cape Royal, the two primary canyon viewing areas.

Vehicular Circulation and Parking on the North Rim

■ Roads

The paved park roads on the North Rim include the north entrance road and roads leading to Point Imperial and Cape Royal. The north entrance road is a two-lane paved road that goes to the Grand Canyon Lodge area on Bright Angel Point. This road is about 26 feet wide and has been designed with broad sweeping curves, gentle shoulder areas, and good sight distance. The Point Imperial and Cape Royal roads are between 21′ and 22′ wide, with numerous curves, steep road shoulders, and some areas with restricted sight distance. A dirt road off the north entrance road provides access to Point Sublime.

All of these roads provide access to prime canyon viewing areas. Park roads on the North Rim are closed to motorized use during the winter.

■ Level of Service

According to machine traffic count data collected as part of the 1993 North Rim utilization study, approximately 2,200 vehicles per day used the north entrance road, and 1,070 vehicles used the Cape Royal road (Operations Research Associates 1993).

All of the roads and intersections on the North Rim currently operate at an acceptable level of service (LOS A/B). Traffic congestion on the roads and delays at major intersections is minor. The most notable traffic congestion problem occurs in the vicinity of the Grand Canyon Lodge and is attributable to poor roadway design and conflicts between parked vehicles and pedestrian traffic.

■ Parking

There are nine parking areas on the North Rim, located at the Grand Canyon Lodge, at the North Kaibab and Widforss trailheads, at the campground, and at popular canyon viewing areas on the Walhalla Plateau. Combined, these areas provide some 497 parking spaces for automobiles and about 48 spaces for RVs and buses (see table 18).

Parking areas at the Grand Canyon Lodge and at the North Kaibab and Widforss trailheads are routinely filled to capacity, with overflow parking along the roadsides adding to traffic congestion.

In-Park Transportation Services on the North Rim

The concessioner provides the only transportation services on the North Rim; no services are provided at Tuweep.

The NPS concessioner on the North Rim, TWRS/ARAMARK, provides a three-hour long interpretive bus tour of the North Rim for park visitors. The tour begins at the Grand Canyon Lodge and stops at Cape Royal, Angels Window, and Point Imperial. The bus tours are scheduled based on the daily demand. During 1991 tours were provided for 1,331 visitors. The relatively low tour bus ridership is due to a lack of demand for this service. The areas covered by the tour are all easily accessible to visitors by private vehicle.

TWRS/ARAMARK also operates a 12-passenger van to shuttle employees between the residential area and Grand Canyon Lodge from 6 A.M. to 10:30 P.M. On-call service is provided between 1 A.M. and 4 A.M. for employees working the night shift. The shuttle typically operates on 20-minute headways. Concessioner employees regularly use this shuttle system; no comparable service is provided for NPS employees.

Access and Transportation in the Tuweep Area

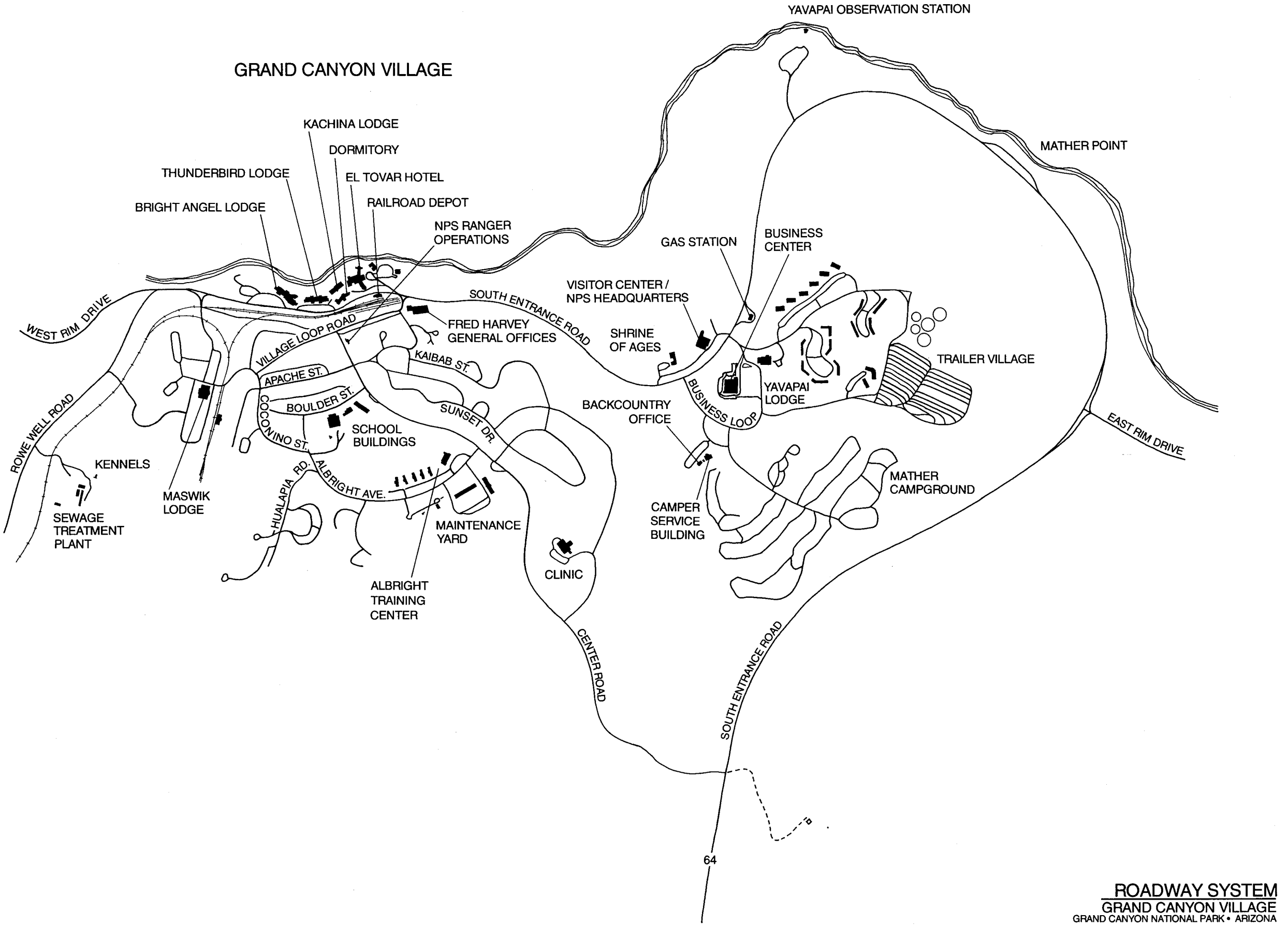
Access to the Tuweep area is almost entirely by private vehicles because of its remoteness and the absence of other transportation modes. No visitor transportation services are provided within the park.

A small, unlighted turf airstrip exists north of Tuweep on BLM land. Although the strip is owned by the Arizona Department of Transportation, the maintenance is performed by the Grand Canyon Bar 10 Ranch. This airstrip is infrequently used by the Bar 10 Ranch for ranch work activities and other small general aviation aircraft only.

Tuweep can be accessed via Mohave County Roads 5, 109, and 1069 from I-15 near St. George, Utah, and from Arizona Highway 389, which passes through Colorado City, Pipe Spring National Monument, and Fredonia. These county roads are all dirt roads that are only marginally passable during periods of rain or snow. Within the park a dirt road provides access to Toroweap overlook.

Traffic volume information for the local access roads that lead to Tuweep is not available. Due to extremely low amount of traffic on these roads, no operational problems are likely.

Parking for 10 cars is provided at vehicles for visitors at the Toroweap Overlook.



ROADWAY SYSTEM
GRAND CANYON VILLAGE
GRAND CANYON NATIONAL PARK • ARIZONA

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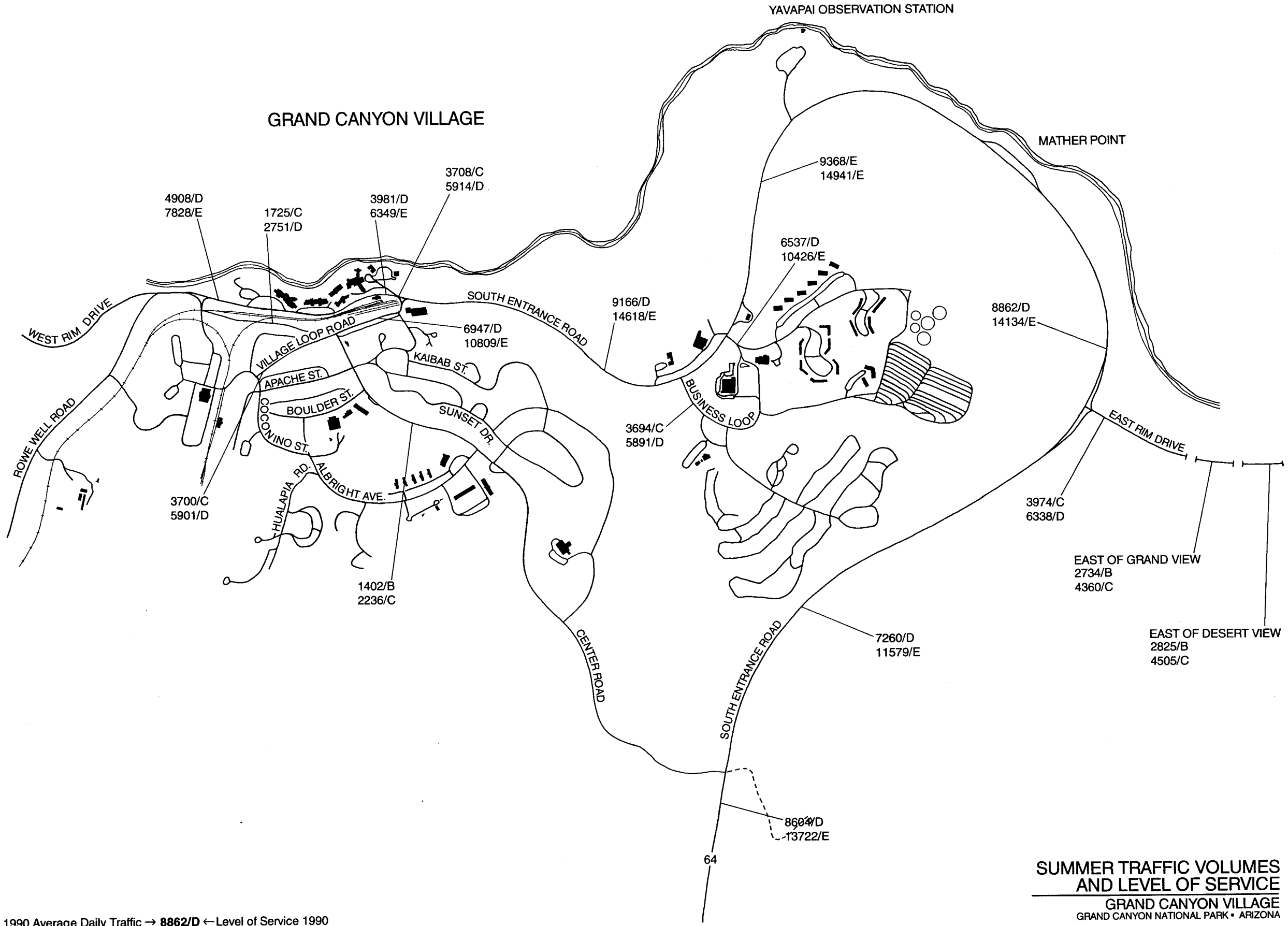

1990 Average Daily Traffic → **8862/D** ←Level of Service 1990
2010 Average Daily Traffic → **12431/E** ←Level of Service 2010

SUMMER TRAFFIC VOLUMES AND LEVEL OF SERVICE

GRAND CANYON VILLAGE

GRAND CANYON NATIONAL PARK • ARIZONA

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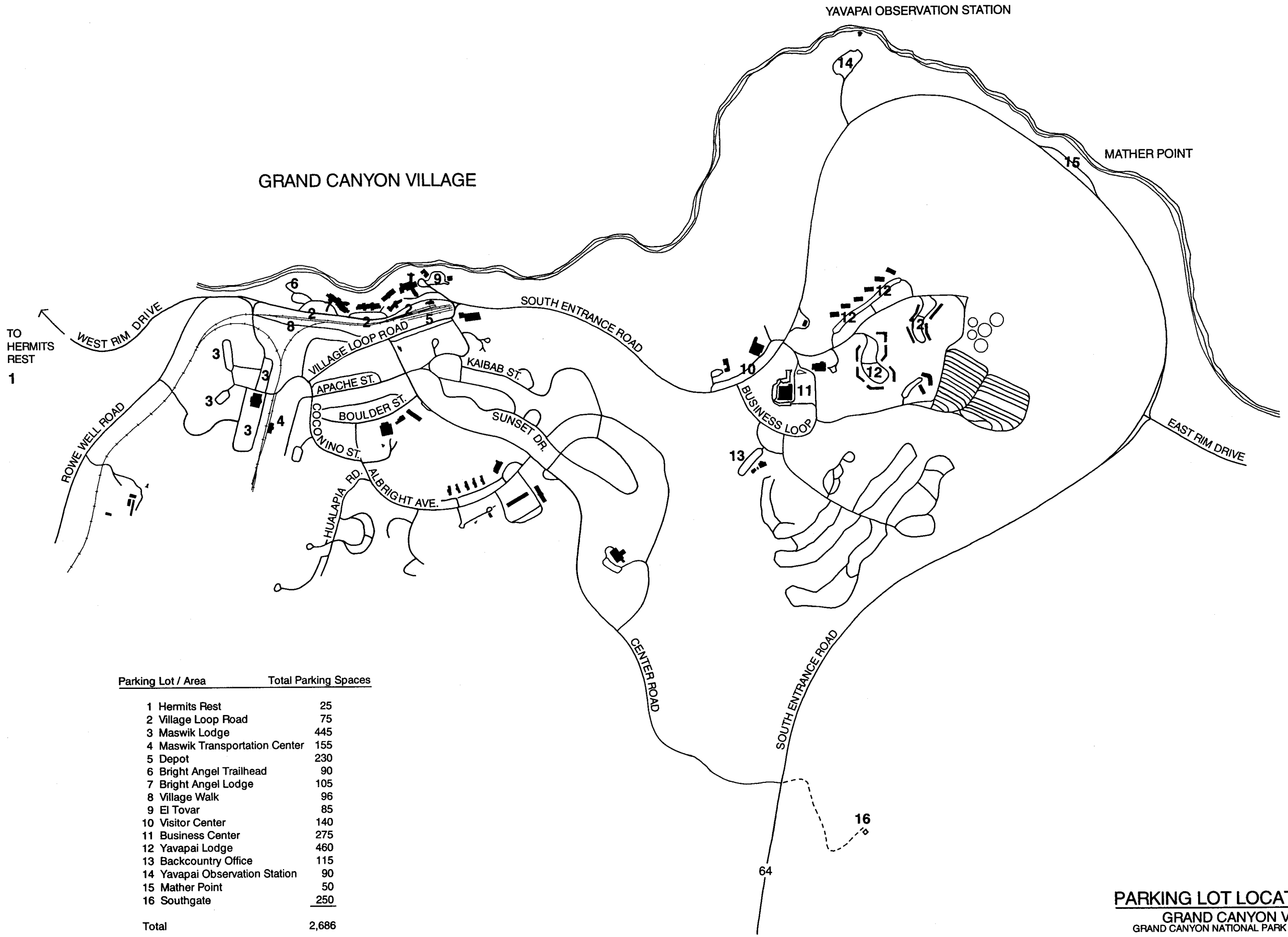

Parking Lot / Area		Total Parking Spaces
1	Hermits Rest	25
2	Village Loop Road	75
3	Maswik Lodge	445
4	Maswik Transportation Center	155
5	Depot	230
6	Bright Angel Trailhead	90
7	Bright Angel Lodge	105
8	Village Walk	96
9	El Tovar	85
10	Visitor Center	140
11	Business Center	275
12	Yavapai Lodge	460
13	Backcountry Office	115
14	Yavapai Observation Station	90
15	Mather Point	50
16	Southgate	250
Total		2,686

PARKING LOT LOCATIONS

GRAND CANYON VILLAGE

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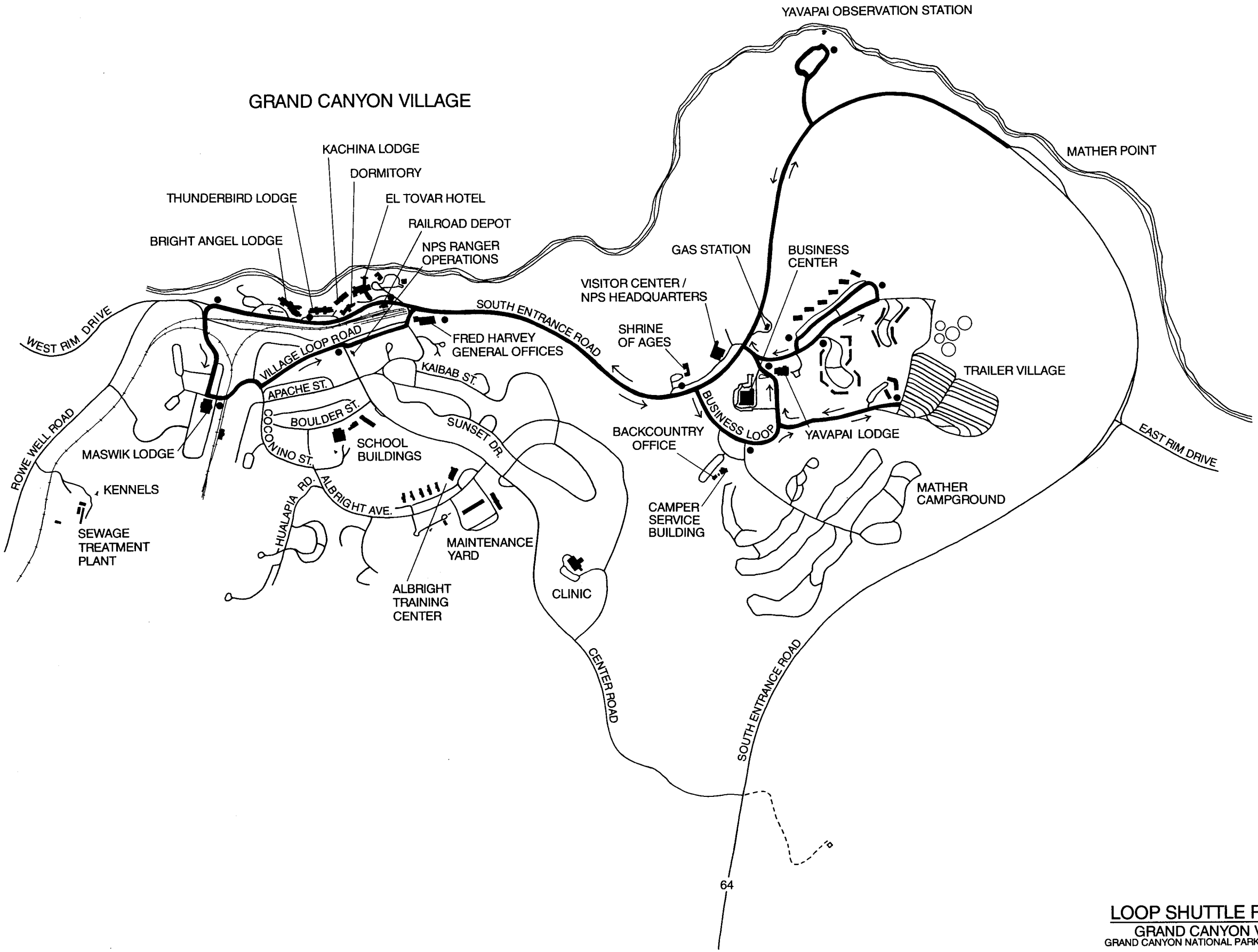

LOOP SHUTTLE ROUTE

GRAND CANYON VILLAGE

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Commercial visitor services and facilities in the park are authorized under concession contracts. These concessioners provide a variety of facilities and services, including lodging, food service, gift and merchandise stores, bus tours, river-running, mule rides, gas stations, public showers and laundry, dog and cat kennel service, and photo processing. Today they operate eight lodges with 1,131 rooms, 12 food services with 1,670 seats, 13 gift shops, 3 grocery stores, and 3 service stations.

CONCESSIONERS

At Grand Canyon Village, Grand Canyon National Park Lodges (GCNPL) operates all of the lodging facilities, food services (except the general store deli), and bars and lounges. They also operate the gift shops located in the lodging facilities, plus Hopi House, Lookout Studio, and Hermits Rest. They provide mule rides, bus tours, full-service gas stations, car repairs, public showers and laundry, dog and cat kennel, vended ice, and photo processing. Babbitt Brothers Trading Company provides a general store, including grocery and general merchandise, camping equipment, deli, and gift and souvenirs. Verkamp's, Inc. operates a gift shop specializing in American Indian handcrafts. The Grand Canyon Railway provides rail transportation from Williams to the South Rim, and is proposing a railroad spur line from just outside the park at the Grand Canyon Airport to the village.

At Desert View, Grand Canyon National Park Lodges operates a trading post which includes a small food service and a souvenir department, and a gift shop in the Watchtower. Babbitt Brother Trading Company has a general store which includes groceries and supplies, and a gift and souvenir section.

At Phantom Ranch in the inner canyon, Grand Canyon National Park Lodges provides a small cabin and food service operation. Sixteen companies provide river-running trips down the Colorado River.

On the North Rim TWRS/ ARAMARK provides lodging, food and beverage, gift and general store and service station facilities and services. Grand Canyon Trail Rides provides mule and horse rides on the rim and down the Kaibab Trail.

SOUTH RIM

The greatest concentration of hospitality service facilities are in the village on the South Rim. From Easter through October all overnight accommodations are used to capacity, and many other services are over capacity with long waits or crowding. During the peak season lodging reservations must be made three to four months in advance. There is a wide spectrum of room types and rates available with many architectural styles being represented. Food services include restaurants, cafeterias, a deli and snack bar operations. Several gift shops are available, with some specializing in American Indian handcrafts, and the Grand Canyon Association has outlets to sell books and other interpretive materials. All facilities are open year-round, except for Yavapai Lodge, Lookout Studio, Arizona Steakhouse, and the Bright Angel fountain, which are closed during portions of the winter season.

■ Rim Facilities

El Tovar Hotel, built on the rim in 1905, has 78 rooms and is a national landmark listed on the National Register of Historic Places. It was built as a first-class accommodation in a wilderness setting. In the intervening 89 years, El Tovar is still considered a deluxe facility. The views from the dining room and the rim-side rooms are spectacular. There are twelve suites, four of which have porches overlooking the rim. The elegant dining room seats 185, and its waitstaff is trained to provide high quality, attentive service to the patrons. Special meal service on the mezzanine is provided to hotel guests during peak use periods. The lounge has 49 seats and offers a piano bar and a quiet, elegant ambience. A small newsstand off the main lobby sells newspapers, cards, candy, and sundries. There is a larger gift shop which offers clothing, gifts, souvenirs, and fine American Indian handcrafts.

The Kachina Lodge (49 rooms) and the Thunderbird Lodge (55 rooms) were built in the 1968 and 1972, respectively, to try to keep pace with rising demand. They incorporated some of the amenities that were becoming popular at the time, such as meeting rooms. The buildings have a 1960s appearance with a lot of glass and concrete.

The Bright Angel Lodge was built in 1934–35 and has 89 rooms. There are 51 cabins, 15 of which are located on the rim, and 38 rooms located in the lodge, 15 having full baths. The restaurant is full-service with 165 seats and limited canyon views. It is used by families and those who want less expensive and less formal dining than the El Tovar dining room. The Arizona Steakhouse has 118 seats and is also a full-service restaurant. At lunch, this facility is open only to pre-arranged tour groups. The Bright Angel fountain offers ice cream, sandwiches and snacks at a walk-through counter service. The Bar with 61 seats has a casual atmosphere and occasionally features live western music. The gift shop sells moderately priced gifts, souvenirs, and American Indian handcrafts.

Hermits Rest is a Mary Jane Colter structure built in 1914 as a rest and refreshment place. The entire structure is now used for the sale of gifts, souvenirs, and American Indian handcrafts, and also offers limited counter service for snacks.

Lookout Studio, also a 1914 Mary Jane Colter building, originally served as a restful canyon viewing place and art sales gallery. It is currently a gift shop featuring rocks and minerals.

Construction on Kolb Studio was begun in 1904, after the Kolb brothers arrived at the canyon and began their photography business. It was finished in its present form by 1928 and offered filming services, historic slide and film shows, and book sales, and served as the Kolb brothers' residence. It is being restored by the Grand Canyon Association and has a wide variety of books available in a small portion of the building.

Hopi House was built in 1905 to serve as the main Fred Harvey sales rooms for Indian arts. It specializes in fine American Indian handcrafts and clothing.

Verkamp's is one of the park's original concessioners and is well known for high quality American Indian handcrafts. They also sell gifts and souvenirs in a building that is on the National Register of Historic Places.

■ Off-Rim Facilities

Maswik Lodge, an early 1950s development, was originally called Grand Canyon Motor Lodge. The present 250 motel units were added in two phases in the early 1960s and 1970s. In addition to the motel units there are 10 one-room "plywood" cabins and 28 pre-fabricated and stick-built quad cabins that vary in size and number of rooms. Twenty seven historical cabin units are now used for employee quarters. During the 1980s a new central building was constructed and the name of the area was changed to Maswik Lodge. The new building houses a 250-seat scatter cafeteria, a 65-seat sport bar with a big screen TV, a shop which sells gifts, souvenirs, and American Indian handcrafts, and lodge registration.

Yavapai West (160 rooms) was built away from the rim in 1958 and 1962 to relieve the growing congestion. The two-story Yavapai East units (198 rooms) were added in 1972, for a total of 358 rooms. This typical car-oriented motel facility is also heavily used by bus tour groups. The west units are one-story, outdated buildings that are outliving their usefulness. The cafeteria was remodeled in 1992 to increase efficiency, and the dining area was increased to 180 seats. The gift shop sells gifts, souvenirs, and American Indian handcrafts.

Babbitt Brothers Trading Company is a family-owned business that has operated in the park since 1921. They operated a store in the village until 1972, when they built a new building in the business center in the Yavapai area. The store is operated year-round, and provides groceries and general merchandise to visitors and residents, as well as camping & hiking equipment sales, and gifts and souvenirs. There is also a 60-seat deli in the grocery store, and a 66-seat outside picnic area which overlooks parking .

■ Transportation Services

Fred Harvey Transportation Company provides scheduled bus tours to points of interest on the South Rim as well as attractions outside the canyon, such as the Navajo and Hopi Indian

Reservations. The company also provides taxi service to the East Rim and the airport. A large number of commercial buses and shuttles originate outside the park.

Under a special contract with the National Park Service, Mayflower Contract Services operates a free seasonal shuttle around Grand Canyon Village and the West Rim (see the "Access and Transportation" section).

A steam engine train ride originates daily from Williams, and passengers are treated with western musical entertainment and snacks.

In 1903 mule rides into the Grand Canyon were the only canyon access of any note. There was foot traffic, but most people preferred to go by mule. A day trip to Plateau Point and an overnight trip to Phantom Ranch are still available on a limited basis, but reservations must be made well in advance. During peak times the concession provides 20 mules to Plateau Point and another 20 to Phantom Ranch. For Phantom Ranch the mules go down the Bright Angel Trail and return up the South Kaibab Trail. Supplies for Phantom Ranch and supplies for hikers and river runners are carried (for a fee) on supply mules using the South Kaibab Trail. The duffle service for visitors is becoming more popular.

■ Other Services

A full-service gas station offers limited repair service. Emergency passenger vehicle service can be obtained at the public garage. There are also public showers, a laundry, a dog and cat kennel, vended ice, and photo processing.

A full-service bank and post office serve the needs of visitors as well as residents

Desert View

The outstanding architectural feature at Desert View is the Watchtower, which originally served as a rest station and offered drinks and a small gift shop. It rises above the canyon floor and provides a landmark for hikers, river-rafters, mule-riders, and people driving into the park and around the rim. A large shop in the tower sells gifts, souvenirs, and American Indian handcrafts, plus pre-packaged snack items.

The trading post has gifts, souvenirs, and American Indian handcrafts in one end of the building, and the Desert View grill in the other. The grill offers a limited fast-food menu and ice cream.

Babbitt's general store has groceries, gifts, souvenirs, and clothing.

A small service station has gas and offers limited repair services. In the winter when the station is closed to visitors, the National Park Service stores a fire engine in the bay.

North Rim

The developed area on the North Rim is located in two historic districts. It is a seasonal operation, open approximately from May 15 to October 20. The nearest community is approximately 80 miles away.

The Grand Canyon Lodge, built in the late 1920s, offers a unique visitor experience. The lodge is perched on the edge of the canyon so the southern face appears to be growing out of the rock. Along with the main lodge, there are 56 cabins near the rim, 107 economy cabins, and 40 motel rooms.

Food service is provided in four locations. The Grand Canyon Lodge dining room is a full-service restaurant with 168 seats. The buffeteria has 64 seats and offers limited food service. The bar has 35 seats and serves snack food, pizza, sandwiches and alcoholic beverages. The fast-food service at the camper store has 32 seats, and primarily serves pizza.

A self-service laundry and showers are provided near the campground. A camper store sells groceries, basic camper supplies, clothing, and vended ice. The service station offers gas and limited repairs.

Mule rides on the North Kaibab Trail include a half-day trip to the Tunnel during the morning and afternoon, and an all-day trip to Roaring Springs. Horse rides on the rim are offered on an as-requested basis.

Phantom Ranch

Phantom Ranch is distinctive because of its remoteness. The buildings are old, and the infrastructure is limited. The ranch offers rustic overnight accommodations for mule riders and hikers. There are 11 cabins, seven of which have two bunkbeds, two have one queen bed each, and two cabins with five bunkbeds. Guests use a central shower facility. In addition, there are four dorms with a total of 40 beds (20 male/20 female). The cabins are primarily used by mule riders. Hikers use the dorms and another central shower facility.

The 40-seat restaurant serves meals by reservation only. When meals are not being served, the building doubles as a lounge and a limited retail sales area. Hikers can order box lunches. This facility is used to capacity from early March through early December.

Concession Facility Utilization

In 1992 and 1993 utilization studies were conducted for various Park Service and concession facilities. Results indicated some of the concession facilities were under-utilized and others over-utilized on peak days.

Even though the peak number of on-site visitors occurs during the lunchtime period, the peak demand period for food service in the park is during the dinnertime period. Although there is adequate overall food service capacity, on the South Rim the distribution of this capacity does not match the distribution of on-site visitors. Some sites have longer than acceptable waiting lines due to design inadequacies, an inability to handle sudden surges of customers, or because of the lack of the type of food service facilities desired by visitors. As indicated in the chart below, the rim table service restaurants are overloaded during peak periods (dinner time), resulting in long waiting times, while cafeterias are under-utilized. This is due to a combination of location (having dinner on the rim), and types of services offered. The popular Bright Angel Snack Bar also can have long waiting lines due to its popular location, design, and size. The North Rim food services are generally adequate at this time, but are in need of modernization, as well as the addition of additional fast-food service.

Similar distribution problems exist for gift shops at Grand Canyon Village and Desert View, as indicated below, with gift shops away from the general rim area being underutilized, a reflection of the extensive use of the rim shops by day-use visitors who seldom make use of off-rim gift shops located at lodges. The utilization percentage for Babbitt's store is influenced by the relatively large size of this shop. Gift shop utilization at Desert View is reflective of the size of facilities and the general interest in visiting the Watchtower.

Table 19 summarizes peak time capacity statistics for selected concession facilities.

Table 19: Peak Time Capacity Utilization. Selected Concession Facilities

Food and Beverage Services		Gift and Souvenir Shops	
El Tovar Restaurant	120%	Verkamp's	85%
El Tovar Lounge	81%	Hopi House	143%
Bright Angel Restaurant	180%	El Tovar Gift Shop	100%
Arizona Steakhouse	202%	Bright Angel Lodge Gift Shop	271%
		Lookout Studio Gift Shop	250%
Maswik Cafeteria	44%	Hermits Rest Gift Shop	100%
Maswik Bar	56%		
Yavapai Lodge Cafeteria*	91%	Maswik Lodge Gift Shop	32%
Babbitt's Store Deli	31%	Yavapai Lodge Gift Shop	38%
		Babbitt's Store Gift Shop	41%
Desert View Snack Bar	94%		
		Desert View Trading Post	150%
North Rim Lodge		Babbitt's Store Gift Shop	79%
Dining Room	82%**	Watchtower Gift Shop	138%
North Rim Buffeteria	63%**		
		North Rim Gift Shop	72%

* Cafeteria enlarged since study completed.
** Table utilization

HOUSING

REGIONAL HOUSING

There are few housing alternatives in the region for employees of Grand Canyon National Park. Nearly all employees reside in the park in employer subsidized housing or in their own trailers on government or concessioner trailer pads. Currently, only nine permanent employees live in regional communities and commute to work in the park. The majority of those employees live in Flagstaff. Due to the severe lack of housing in the park, regional communities will begin to appear more attractive for employee residences, particularly as employee shuttles and other alternative modes of transit are implemented to serve the park and its employees on a daily basis.

PARK HOUSING

The Grand Canyon National Park community consists of approximately 1,200 housing units distributed over seven geographic areas. Depending on the location in the park, a full range of land uses typical to many small towns can be found. Park residents have access to support facilities, including a medical clinic, post office, bank, grocery market, churches, and schools. Approximately 2,000 employees inhabit housing units in the park during the peak season, some sharing housing units with co-workers. Few of the 1,200 housing units are occupied by a single person during peak season.

Grand Canyon Village provides over 78% of the park's housing stock. The North Rim/Bright Angel Point follows with 13%, and Desert View and the corridor trails have the third largest concentration of housing at 3% each. Hermits Rest, Tuweep, and Lees Ferry round out the housing stock at approximately 1% of the total each.

A total of 153 units parkwide need to be removed in order to eliminate permanent trailers and to replace structurally substandard units. In all, approximately 385 new units are needed to replace substandard units and to achieve current housing standards by eliminating multiple bunking in dorm rooms. This breaks down to 285 needed on the South Rim, 70 on the North Rim, 1 at Hermits Rest, and 29 at Desert View.

■ Housing Characteristics

For the purposes of this plan a housing unit equals one living unit, generally defined as an abode that has access by one or more locked doors.

Most housing units are occupied by more than one person. In some cases, a married employee may share the unit with a spouse or other family members. In other cases, a single employee may share the unit with a co-worker or a person employed by another park cooperator. Few single employees occupy single living units. This sharing causes overcrowding in some instances, but it also reduces the number of housing units needed to give each employee a single unit.

The trends of employees sharing housing can be seen in the occupancy planning factor, which is used to determine future housing units needed based on employee projections. It is derived by dividing the peak occupancy number by the number of existing units (see table 20).

Other important correlations of employees to housing are found in the distribution of employee rank to housing type. Staff employees are often placed in housing such as dorm rooms, whereas upper level managers are often provided single-family houses. Variations in these trends do occur since some staff employees are married to upper level managers, and thus reside in a single-family housed. Table 21 shows general workforce characteristics (based on a survey of Grand Canyon Village and Desert View employees). Overall, 33% of the workforce are married and 67% are single. This ratio of married to single is a significant factor in providing and allocating housing.

Also, 29% of the overall workforce do not own cars, while 71% do. As table 21 shows, the majority of those without cars are staff level employees (a little less than half, 44%, are without cars). These statistics are important in locating appropriate housing for employees without transportation to and from work.

Table 22 addresses projected housing needs above and beyond those identified previously. Housing conditions at Grand Canyon are frequently substandard. According to NPS housing policies, each dorm room should house only one employee; today, there are generally two, and sometimes three, people per room. Trailers used as permanent housing are also considered substandard according to NPS policies; trailers are acceptable housing only for short-term employees or contractors. Finally, some housing structures are considered substandard due to structural considerations. In all of the table 23 housing projections, these substandard conditions

TABLE 20: OCCUPANCY PLANNING FACTOR, GRAND CANYON VILLAGE

Unit Type	No. of Units	Peak Occupancy	Planning Factor (based on existing distribution)
House	173	240	1.39
Duplex	48	59	1.22
Apartment	258	477	1.85
Dorm	301	650	1.00*
Trailers	151	253	1.68

*Future projections for dorms must use a planning factor of 1 person per unit, in conformance with NPS-76 housing standards. The actual occupancy of dorm units today is 2.16 employees per unit.

Grand Canyon Housing Categories

Housing at Grand Canyon falls into eight primary categories, as described below:

- ***Single-Family House:*** A free-standing unit, often a newer housing type (but not always), usually consisting of several separate rooms, including bedrooms, kitchen, bathroom, and living rooms.
- ***Duplex:*** A free-standing structure comprising two separate, but physically adjoined, living units. Each living unit is often similar to a house, consisting of several rooms including bedrooms, kitchen, bathroom, and living rooms. As with the house, it is often a newer housing type. In later sections of this document, the duplex is included in unit counts under the multi-family residential (MFR) category as a percentage of that category. It is included with all other similar MFR units for total unit projections only.
- ***Apartment:*** Two or more separate, but physically adjoined, living units. Each unit usually consists of several rooms, including bedrooms, living room, kitchen, and bathroom. Housing units in this category make up most of unit projections.
- ***Dorm:*** Multiple living units under one roof. Each unit is occupied by at least one person, and sometimes up to three. The units usually consist of a single room, functioning primarily as a bedroom and personal storage area. Restrooms and kitchen/dining facilities are at remote locations.
- ***Trailer:*** All premanufactured living units that are being used as permanent housing units, including mobile homes, travel trailers, and RVs. To be considered a trailer, the unit must be owned by a company or agency and used as a permanent housing unit. As employees come and go, the unit remains and is used for permanent housing.
- ***Trailer Pad:*** An improved space that can accommodate any temporary housing, including a mobile home, travel trailer, or RV. This category is different from trailers in that employees can bring their own housing with them. It is useful for short-term employees and contractors. The pad and utilities are permanent.
- ***Cabin/Lodge:*** Several similar, but slightly different, housing types. In nearly all cases, the units are old, small, free-standing structures; often, units are historic cabins once used for visitor lodging. Usually the units include a bath, kitchen, and bedroom facilities, although in a rather small space. Cabin/lodge units include frame cabins, the Maswik motor lodge, the historic frame cabins on the North Rim, and historic cabins in the inner canyon.
- ***Motel Unit:*** Essentially a dorm unit consisting of a bedroom and personal storage area with remote kitchen/dining and restroom facilities. This category applies only to the units on the North Rim in the visitor motel lodge buildings. They are different than a dorm in that they are part of a visitor lodging structure.

TABLE 21: POSITION LEVEL CHARACTERISTICS

Position Rank	No. of Employees	% of Total	% Married	% in House	% in MFR*	% in Dorm	% in Trailer	% Owning Car
Staff Level	1,071	80%	31%	15%	25%	48%	12%	56%
Low Level Managers	172	13%	54%	42%	23%	14%	21%	77%
Mid Level Managers	65	5%	69%	80%	16%	2%	2%	86%
Upper Level Managers	25	2%	72%	96%	4%	0	0	92%

* MFR = multi-family residential.

TABLE 22: PARKWIDE HOUSING NEEDS

Park Area	Existing Adequate Units	Projected 1994 Needs	Total Needs
Grand Canyon Village	930	285	1,215
North Rim	201	70	271
Desert View	29	29	58
Hermits Rest	1	1	2
Inner Canyon	18	8	26
Tuweep	1	0	1
Lees Ferry	1	1	2
Total	**1,181**	**394**	**1,575**

have been corrected by providing additional housing units.

Another factor to be considered in housing projections is the 1992 NPS "Position Management Plan," which identifies staffing deficiencies. All future housing projections are to take into account additional staff needs as well as the units required to house them. On the North Rim there is a need to add 50 concessioner employees to allow employees to work a five-day week instead of six days. This additional housing is figured into the housing needed to come to standard.

■ Employees

As the NPS 1992 "Position Management Plan" and the need for a five-day workweek on the North Rim illustrate, new employees must be hired at Grand Canyon. Park employers find it difficult to hire employees due to the shortage of adequate housing. Many times a new position has been identified and funded, but a person simply cannot be hired because housing is not available. More commonly, the best qualified applicant for a position will turn down an offer because of poor housing.

The shortage of housing in the park also creates an awkward relationship between employers and park residents. If a spouse, relative, or other non-employed roommate of a park employee can be hired for a position, then that person becomes a prime candidate simply because he or she already has housing. Again, while this situation is viable and sometimes works to the advantage of both employer and employee, it is often used as a fallback to fill a position.

SOUTH RIM

■ Grand Canyon Village

Housing Type and Extent: As shown in table 23, Grand Canyon Village contains a total of 958 existing housing units on approximately 115 acres, or an average net density of 8.5 units per acre. Housing types are dominated by dorms (33%), followed by apartments (26%), single-family units (18%), trailer pads (12%), duplexes (5%), and cabins/lodges and trailers (3%).

Table 24 provides a breakdown of the total number of units occupied in Grand Canyon Village.

Employees: Table 25 summarizes the new housing needed in the Grand Canyon Village for new employee demands and for the replacement of substandard units.

Employee Access: Employees living at Grand Canyon Village share all access routes with visitors, service traffic, and administrative traffic. Conflicts often arise between employees and these other entities, particularly during lunch hours in the peak season. Employees regularly travel park roads on their way to the post office, bank, store/deli, school, and other destinations, contributing to vehicular congestion and its associated impacts on the visitor experience, noise, pollution, and so forth. Travel from areas outside the park to residential neighborhoods in the village area also parallels visitor and service traffic routes at park entrances, where further delays and conflicts arise for both residents and visitors.

Community Structure/Social Characteristics: Housing in Grand Canyon Village is dispersed. While there is some mixing of low and upper income employees, and of NPS and cooperator housing areas, there is generally a clear distinction between housing areas.

NPS housing is generally separate from that of cooperators.

GCNPL housing is separate from other cooperators and is further segregated by income level, with managers in single-family houses away from lower level housing in dorms or apartments. The physical delineations between income and employer groups affect the cohesiveness of the community. The hierarchical nature of housing by position reinforces the hierarchical structure of the workplace and limits interaction between community members. Interviews with park personnel brought out the desire of many individuals to see a greater effort to mix income levels and employers in order to promote a more cohesive community.

In recent years there has been an emphasis to use previously disturbed land for housing. Often, disturbed areas suitable for building are scattered and away from other facilities; when these areas are used for new construction, the community is further dispersed. This trend is apparent with housing in the trailer village and the YACC camp areas, and its continuation creates the potential for a disorganized, inefficient community structure beyond what exists today.

TABLE 23: GRAND CANYON VILLAGE HOUSING SUMMARY

Housing Type	Existing	Proposed	Summer Employees	Winter Employees	Units to be Rehabbed	Units to be Replaced
Single-Family Houses	173	81	230	231	49	1
Duplexes	48	0	60	60	3	0
Apartments	258	4	471	431	0	0
Dorm Rooms	301	0	681	517	0	79
Trailers						
YACC Camp	5	0	14	14	0	5
Trailer Village	6		11	11		6
Pinyon Park	18		34	28		8
Clinic	4		6	5		4
Trailer Pads						
YACC Camp	1	0	1	0	0	0
Trailer Village	59		85	69		
Pinyon Park	57		80	53		
Clinic	1		1	1		
Motor Lodges	27	0	54	0	0	0
Total	958	85	1,607	1,426	52	113

TABLE 24: UNITS OCCUPIED IN GRAND CANYON VILLAGE

Park Employer/Cooperator	Units Occupied	Park Employer/Cooperator	Units Occupied
National Park Service	220	Unites States Postal Service	4
Fred Harvey Company	645	BANK ONE	2
Babbitt's General Store	38	Community Church	1
Grand Canyon Schools	20	Arizona Public Service	1
Grand Canyon Association	13	US West	1
Mayflower Contract Services	17	Baptist Church	1
Samaritan Health Service	11	Catholic Church	1
Verkamp's Store	9	Assembly of God Church	1

TABLE 25: PROJECTED GRAND CANYON VILLAGE HOUSING NEEDS

Housing Type	National Park Service	Grand Canyon National Park Lodges	Other Cooperators
Single-Family House	0	37	4
Duplex	2	12	0
Apartment	6	37	0
Dorm	5	139	11
Trailer Pad	5	26	1
Total	18	251	16

Many GCNPL housing units are dorms located in the heart of the village area, adjacent to hotels, restaurants, parking lots, trails, and other visitor use areas. There are frequent conflicts between employees and visitors as a result of physical proximity. Employees in these areas have little privacy during time off, remaining in the public eye and generally within earshot of visitors. Visitors often have adverse experiences as a result of off-duty employee activities, many of which are not conducive to a park-related, educational experience.

■ Desert View

Housing Type and Extent: Although Desert View has only 40 housing units, the relative number of substandard units needing replacement is very high (see table 26). Eleven of the 40 units (27.5%) are permanent trailers, which need to be replaced with acceptable housing. The housing at Desert View is divided into two primary areas. The first development is across from the primary visitor facilities and consists of historic structures, a few substandard trailers, and numerous seasonal trailers. The second area, and the largest concentration of housing, is focused around the administrative area south of the primary visitor area. This housing area contains dorms, trailers, duplexes, and a few single-family homes.

The 40 housing units at Desert View are on approximately 5.9 acres, or an average density of about 6.8 units per acre. Trailer pads dominate the housing situation, comprising 32% of the total peak housing occupancy, followed by permanent trailers (28%), dorms (25%), houses (10%), and duplexes (5%). The high occurrence of trailers and trailer pads (60% of the total housing stock) is due to the extreme fluctuation between the numbers of summer and winter personnel, and that housing demand has outpaced the supply of standard units, so trailers have been used because of their economy and ease of installation.

Of the 40 units at Desert View, the National Park Service occupies 12, Grand Canyon National Park Lodges 21, Babbitt's general store 5, and the Grand Canyon Association 2.

Employees: Table 27 illustrates the housing needed for new employees and to replace substandard units.

Community Structure/Social Characteristics: NPS, concessioner, and cooperating association employees (from management to staff) live in differing housing types in a concentrated area. This small, secluded housing area and the mix of employers contribute to a strong sense of community, resulting in frequent informal interaction between all employees. This helps to break down barriers between employers and job position. This sense of community was noted to be a valuable asset that should be preserved in future planning efforts.

GCNPL housing is adjacent to the primary visitor parking area at Desert View, resulting in conflicts between employees and visitors. When the parking lot is filled during the peak season, visitors often drive through the employee housing area to look for parking space. This causes problems for employees, who have had their vehicles blocked-in and also contributes to many distractions and a lack of privacy for their off-duty activities. Visitors become disoriented and have difficulty finding the primary visitor area and facilities.

■ Hermits Rest

Housing at Hermits Rest is comprised of an old single-family house for the GCNPL gift shop manager and a trailer for the other employees who work there. Both structures are owned by the concessioner; the house needs rehabilitation and the trailer is substandard.

Employees living at Hermits Rest are connected socially to Grand Canyon Village. All off-duty activities and services are a short drive away in the village. Employees at Hermits Rest experience much the same issues of community as their Grand Canyon Village counterparts.

NORTH RIM

■ Housing Type and Extent

The North Rim is the second-most concentrated housing area in the park. For the purposes of housing needs, the North Rim is defined as Bright Angel Point .

As an isolated unit, Bright Angel Point has its own unique community characteristics. It is similar to Desert View in the fact that there is a dramatic fluctuation between the numbers of summer and winter residents. However, the total number of employees and the seasonal fluctuation are much greater on the North Rim than at Desert View.

Housing on Bright Angel Point is dispersed in four primary

TABLE 26: DESERT VIEW HOUSING SUMMARY

Housing Type	Existing Units	Proposed Units	Summer Employees	Winter Employees	Units to be Rehabbed	Units to be Replaced
Single-Family Houses	4	0	6	6	1	0
Duplexes	2	0	3	3	0	0
Dorm Rooms	10	0	19	7	0	0
Trailers						
Ranger Station	11		23	11	0	11
Trailer Pads						
Ranger Station	3	0	5	0	0	0
GCNPL Loop	10		10	7	0	0
Total	40	0	66	34	1	11

TABLE 27: DESERT VIEW PROJECTED HOUSING NEEDS

Housing Type	National Park Service	Grand Canyon National Park Lodges	Other Cooperators
Single-Family Houses	3	2	2
Duplexes	2	0	0
Apartments	2	3	1
Dorm Rooms	7	1	3
Trailer Pad	1	1	0
Total	**15**	**7**	**6**

TABLE 28: NORTH RIM/BRIGHT ANGEL POINT HOUSING SUMMARY

Housing Type	Existing Units	Proposed Units	Summer Employees	Winter Employees	Units to be Rehabbed	Units to be Replaced
Single-Family Houses	14	0	24	8		2
Dorms	52	50	100	0		
Inn Cabins	15	0	20	0		
Mars Cabins	2	0	2	0		
Lodge Cabins	29	0	38	0	9	
Motel Units	16	0	20	0		
Trailers	17	0	33	3		16
Trailer Pads	22	0	42	0		
Bunkhouse	2	0	2	0		
Tent Spaces	4	0	16	0		4
Total	**173**	**50**	**297**	**11**	**9**	**22**

TABLE 29: NORTH RIM PROJECTED HOUSING NEEDS

Housing Type	National Park Service	TWRS/ARAMARK	Other Cooperators
Single-Family Houses	0	0	0
Duplex	8	4	0
Apartment	4	13	1
Dorm	14	0	5
Trailer Pad	3	12	6
Total	29	29	12

areas. The first is a concentrated area of NPS housing and administrative facilities on the north end of the point. The second consists of rustic, historic cabins at the historic inn area, and is comprised of NPS and cooperator employees. The third is in a concentrated area of TWRS/ARAMARK and other cooperator housing and administrative facilities about midway on the point. The fourth is in historic visitor lodging cabins at the southern end of the point near the historic Grand Canyon Lodge. Employees also occupy cabins once used as visitor lodging and the bottom floor of the motel units just north of the historic lodge. One unit near the northern park boundary adjacent to the entry station is used by a ranger.

Bright Angel Point contains a variety of housing types, ranging from tents to bunkhouses to new single-family residences (see table 28). The predominant types of housing are dorms and cabins/lodges, each comprising 30% of the total housing stock (60% combined). These types are followed by trailer pads (13%), trailers (10%), motel units (9%), and single-family houses (8%). Nearly one-third of all housing on the North Rim is of the cabin/lodge type, which were formerly visitor lodging units. The emphasis on low-end, short-term housing (such as dorms, trailers, and trailer pads) is largely due to the seasonal housing needs. Since few people are year-round residents on the North Rim, little effort has been made to create a permanent, year-round housing stock.

Perhaps the most rudimentary forms of housing on the North Rim are the tent frames and bunkhouses. These units are increasingly being used as long-term housing and are not suited for extended periods of occupancy. Most have no heat, running water, restrooms, or cooking facilities; those that do are too small for the number of people occupying them. Of all housing on the North Rim, the National Park Service occupies 37 units, TWRS/ARAMARK 124, Grand Canyon Trail Rides 9, Samaritan Health Service 2, Grand Canyon Association 1, and Mixtix 1.

■ Employees

Employers on the North Rim encounter the same difficulties in hiring practices related to housing as their South Rim counterparts. TWRS/ARAMARK, the main concessioner on the North Rim, is particularly affected by the lack of adequate housing. The fact that current employees often work six or more days between days off contributes to extreme morale problems and high employee turnover. Hiring an additional 50 employees would allow employees to work a normal five-day workweeks, improving morale and reducing turnover.

Table 29 summarizes the number of units needed for new employees and to replace substandard units.

■ Community Structure/Social Characteristics

The dispersal of employee housing on the North Rim causes problems for management in terms of assigning appropriate housing to employees. Because a sizable portion of employee accommodations are interspersed among visitor use areas and lodging, considerable care is given in assigning personnel to those units. Nevertheless, conflicts between visitors and employees do arise and contribute to a detrimental effect on the visitor experience and employees.

The NPS, TWRS/ARAMARK, and other cooperator housing areas are clearly separated, with the strongest separation between the bulk of NPS units and cooperator housing. As on the South Rim, this physical separation of agencies and employees reinforces the separation of duties and responsibilities defined by the workplace, contributing to a "divided" community. Contrary to popular opinion expressed on the South Rim, many employees prefer the separation on the North Rim and would like it to continue. All managers agree, however, that employee housing needs to be strongly separated from visitor lodging. This aspect of community on the North Rim is unique and deserves special consideration in future planning for housing.

TUWEEP

At Tuweep there is a historic ranger residence and a small trailer in poor condition. The ranger residence is occupied by the full-time ranger and the trailer is used occasionally by visiting personnel. The housing is self-sustaining, utilizing a water catchment cistern system for residential use, and solar and battery electrical power backed up by a gas generator.

No services are available to employees at Tuweep. The ranger performs information, emergency, garbage removal, maintenance, and all other functions. Everything is hauled in and out.

No adequate housing is available for new employees. The same problems for managers in Grand Canyon Village in hiring new employees and housing are apparent at Tuweep.

The remoteness of Tuweep results in infrequent contact with other park operations.

CORRIDOR TRAILS

Housing is provided at Phantom Ranch, Cottonwood, Roaring Springs, and Indian Garden (see table 30). Cabin/lodge units are the dominant housing types (39% of total housing), followed by dorms (33%), and duplexes and single-family houses (14% each). The National Park Service occupies 13 units, and Grand Canyon National Park Lodges 9.

TABLE 30: CORRIDOR TRAILS HOUSING SUMMARY

Housing Type	Existing Units	Proposed Units	Summer Employees	Winter Employees	Units to be Rehabbed	Units to be Replaced
Single-Family Houses	3	0	6	6	0	0
Duplex	3	0	1	1	0	0
Dorms	6	0	12	12	0	0
Bunkhouse	2	0	N/A	N/A	1	0
Ranger Station Rooms	7	0	8	5	3	4
Showerhouse Rooms	1	0	2	0	0	0
Total	22	0	29	24	4	4

The inner canyon is one of the few areas in the park where there is no strong need to hire new employees and provide housing for them. Most housing is for employees working in the canyon for short periods and who have long-term housing at Grand Canyon Village. This situation places the problems of hiring new employees and providing housing for them the same as on the South Rim.

Because most employees in the inner canyon are also Grand Canyon Village residents, their social alliances generally are formed with village residents. They tend to take part in those community activities and experience the same elements of community structure as full-time village residents.

Lees Ferry

Lees Ferry is part of Glen Canyon National Recreation Area and is the base of operations for Grand Canyon National Park's river operations management and monitoring; it is an operational extension of the NPS South Rim ranger division. Housing is provided through a cooperative arrangement with Glen Canyon. Housing for the rangers at Lees Ferry is provided by Glen Canyon, although the rangers are employed by Grand Canyon.

The two employees at Lees Ferry occupy one house and one trailer; the trailer is substandard.

Additional employees are needed at Lees Ferry, but housing is lacking.

Grand Canyon employees living and working at Lees Ferry tend to feel more removed from the park than most other park employees. Because they live in a remote housing area built for Glen Canyon NRA employees, they are more closely related to these employees than with most Grand Canyon employees.

Community Services

Today's community services at the Grand Canyon minimally meet the needs of a burgeoning residential population. Most primary community services, such as a bank, post office, medical clinic, worship facilities, and grocery store, are only available for Grand Canyon Village residents. Residents of remote park areas must travel to other communities or to Grand Canyon Village to use most of these services.

As the park's workforce has changed over the years, the need for expanded facilities and a wider array of community services has exceeded the construction of those facilities at or near the Grand Canyon. Most areas of the park are severely deficient in providing community services, resulting in the need to significantly expand existing facilities or construct new ones.

Regional Services

The regional communities of Tusayan, Williams, Flagstaff, Kanab, and Fredonia provide most major community services for Grand Canyon residents, including major medical, dental, car repair, grocery shopping, clothing, entertainment, and other similar purchases or services. Residents of the South Rim, including Desert View, travel to Flagstaff and Williams for major services, while residents of the North Rim rely on Kanab and Fredonia.

Tusayan is a community of approximately 500 people located 2 miles south of the main park entrance. First settled in 1936, Tusayan is a gateway community and provides many tourist services, including hotels/motels, three helicopter companies, six airlines, three ground transportation companies, two grocery/convenience stores, five restaurants (independent of hotels), two gas stations, an IMAX theater, two gift shops (independent of other facilities), and the Tusayan Ranger District office of Kaibab National Forest.

Not many community services are provided in Tusayan, and many residents use the services provided in Grand Canyon Village. Three of the hotels have meeting rooms that are occasionally used for community functions.

Coconino County provides round-the-clock law enforcement and is supported by the Arizona Highway Patrol and the National Park Service.

There are no regionwide, coordinated fire-fighting services. Moqui Lodge has its own volunteer structural fire brigade but has no responsibilities beyond that facility. The Park Service has fire-fighting capability for both structural and wildland fire but has no responsibility outside park boundaries. The U.S. Forest Service has wildland fire-fighting capability but no structural capability, and their primary responsibility is to protect forest lands. Grand Canyon National Park Airport also has fire-fighting capability but has no responsibility beyond the airport. In case of a fire in Tusayan, the community's neighbors, primarily the Park Service on a second priority basis, provide fire protection. Adequate self-protection for Tusayan remains one of the community's chief concerns.

No emergency medical service providers include Tusayan in their area of responsibility. An ambulance service based in Williams (55 miles away) includes Tusayan in its contract area for transportation services, but Tusayan must rely on the Park Service, on a second priority basis, for emergency care. Due to the liability involved in providing medical care and fire protection beyond its jurisdiction, the Park Service may one day decide to discontinue this policy, leaving Tusayan to find an alternative supplier.

All Grand Canyon Unified School District facilities (which includes Tusayan) are in the park. The recently opened day care center and the community library are also inside the park.

Tusayan has limited recreational facilities. There are two tennis courts and two swimming pools, all intended for hotel guests rather than local residents. There is a bowling alley in the basement of the Squire Inn, and leagues including Tusayan as well as park residents are active.

The school grounds in the park provide most recreational opportunities for park and Tusayan residents. There are baseball and soccer fields, a football field, a playground, a poorly maintained tennis court, and a track. Two school gymnasiums are made available on a limited schedule for pick-up basketball and volleyball. The school buildings are also used for adult education classes offered by Coconino County Community College in the evenings.

The Tusayan Planning Committee is in the process of doing a plan for the Tusayan area and has developed a draft vision statement, a portion of which states:

> The needs of the community's residents are also important. [Tusayan] should be a place where people can live a long time, raise families, and have the foundation and fabric that hold a community and neighborhoods together. Facilities such as schools, churches, parks, and a library would be readily available, as would such accepted town services as police and fire protection and emergency medical services.

Very few of these services are currently available in Tusayan.

Park Services

Existing community services at the Grand Canyon include an elementary, middle, and high school complex (serving park and local residents), a post office, branch bank, parcel package center, medical clinic, a day-care center, employee laundry facilities, informal playfields, and minimal, rustic game courts. Various offices and conference rooms in scattered buildings throughout the park often serve as impromptu, informal community meeting rooms. Most community facilities in the park are too small to meet today's needs and many of them are in substandard structures, requiring significant expansion or improvements for basic health and safety. The community recreation center in Grand Canyon Village burned in winter 1994 and has not been replaced.

Gradual shifts in community needs have occurred over the years at the Grand Canyon. Today's residents indicate needs and desires quite different from their predecessors of just 10 to 15 years ago. The average age of the park employee has risen and the season of operation has expanded, both creating new demands on community services for park residents. In interviews with over 70 park managers and personnel, most indicated a desire for expanded community services to meet their needs, which would help achieve a more stable, healthy (mentally and physically) workforce and reduce employee turnover. The greatest needs identified are for adequate recreation facilities, including outdoor game areas/fields, and indoor class and meeting rooms. Other needs are for secure storage units for personal effects and RVs, a library, and more church/worship facilities.

South Rim

■ Grand Canyon Village

Grand Canyon Village offers the greatest concentration and widest array of community services for park residents of any developed area at the Grand Canyon. The school was recently expanded to meet near-term needs for classroom space, temporarily deferring the need for a new high school complex. There are five church congregations that meet in a variety of park facilities, including garages, theaters, amphitheaters, and other open spaces.

The only employee recreation center, which recently burned, was operated by Grand Canyon National Park Lodges for their employees, contained a library, weight room, recreation room, and employee bar. Many employees seek evening recreational opportunities in the park bars, creating frequent conflicts with visitors. With the loss of the recreation center, there is little opportunity for informal social recreation beyond those visitor use facilities.

The village's business center is the primary shopping area for visitors and residents. The post office and bank are located in the heart of a heavily used visitor area, surrounded by the primary visitor center, the Yavapai lodging complex, the RV park, and Babbitt's general store. Frequent traffic conflicts occur between residents and visitors, particularly at lunchtime when residents travel to the post office for their mail and to the store for deli items.

The medical clinic in the village is the only functioning medical/dental clinic and pharmacy serving park residents, Tusayan residents, and park visitors. The clinic is capable of handling most emergency medical needs and regularly serves as a clinic for common health and medical treatments needed by community residents. It shares the building and surrounding parking area with the Resources Management Division and housing trailers, creating some conflicts between emergency operations and resource management activities.

Public safety services such as fire response, ambulances, and law enforcement are provided by the National Park Service, with additional fire response capabilities provided by Grand Canyon National Park Lodges. Separate fire stations are maintained by each entity, duplicating vehicles, staff, and support facilities and operations for structural fires. GCNPL fire crews oversee most GCNPL buildings; however, both entities often respond to common emergency situations, when warranted.

The NPS wildland fire operations do not have adequate covered storage for equipment, particularly the fire engines, which contributes significantly to equipment decay and high repair and replacement costs. The NPS structural fire and ambulance response vehicles are garaged in the NPS maintenance building, often creating potentially hazardous conflicts between responding emergency vehicles and maintenance traffic and employees in the area.

■ Desert View

Community services at Desert View are limited and inadequate. A small recreation building serves as a laundry and employee lounge. There are not enough washing machines and dryers for current employee demand; the lounge is too small and offers only limited recreational activities, including a television and a single game table. No designated outdoor game fields or facilities exist for outdoor recreation. Employees must travel to the Grand Canyon Village for more formal recreation facilities and programs.

Emergency services are provided by the Park Service. NPS fire-response vehicles are parked in makeshift areas not adequately designed for full-service emergency functions. In winter the fire engine is parked in the GCNPL service station bays since the facility is heated and closed to the public in winter.

Other emergency response vehicles such as patrol cars are often parked in private garages since those are the only available facilities offering protection from the weather. The scattered locations of emergency equipment create some difficulties and inefficiencies for emergency response.

NORTH RIM

Community services on the North Rim are somewhat limited, particularly with respect to NPS employees. The NPS housing area serves as the primary recreation and services area for NPS employees and consists of a small informal game court area suitable for volleyball and other similar activities, and a small employee laundry facility which is heavily used and often overcrowded.

Indoor recreational activities consist of very limited weight and exercise equipment located in a corner of the new generator building. That equipment is not intended for all employees; its primary use is by fire response crews and enforcement officers as part of their training equipment. Other activities such as community meetings and off-duty recreational reading or movie spaces are accommodated in a small, crowded back room of the existing headquarters building.

A new employee dining room constructed on the North Rim by TWRS/ARAMARK for its employees provides space for board games, television/movies, employee lounge, and laundry facilities. Small outdoor game courts are also located in the TWRS/ARAMARK housing area.

A small cleared area southwest of the TWRS/ARAMARK housing area serves as an informal softball field for all North Rim employees. It is away from the main visitor use areas and unimproved.

Emergency services for both visitors and employees are provided by the Park Service. Fire equipment, law enforcement, and a helipad are located in the NPS maintenance area. Since most employees are summer seasonals, no schools or other long-term community services are provided. Grocery shopping is done primarily in Kanab and Fredonia, and short-term needs are filled at the camper store near the campground and open primarily to serve visitors' needs.

TUWEEP

There are no community services at Tuweep, and the ranger and his or her family must drive to Kanab, Fredonia, or St. George. NPS staff must provide law enforcement, emergency response, recreation, and entertainment opportunities. Major emergency response is supported by either North Rim or South Rim emergency teams, depending on the type of equipment needed.

CORRIDOR TRAILS

Due to the remoteness and operational relationships with the Grand Canyon Village, the inner canyon is very limited in community services. Most employees only stay in the canyon for relatively short periods of duty. In this respect, the inner canyon is an appendage of the village. For the short stay that most employees experience in the inner canyon, several ranger stations offer limited emergency first aid, and a small employee lounge at Phantom Ranch offers an area separate from visitors for employees to informally socialize.

Major emergency services are provided from the South Rim, including emergency helicopter evacuation from the inner canyon to the medical clinic in the village.

MANAGEMENT SUPPORT

The facilities referred to as management support are generally those necessary to support park operations on a daily basis, such as maintenance buildings and yards, carpenter shops, warehouses, fleet vehicle repair, offices, and storage facilities. Substandard conditions, poor locations of facilities, and other detrimental conditions need to be addressed in the plan.

Management support facilities at the Grand Canyon date back to the 1800s. Early entrepreneurs brought supplies, stored them, quartered mules, and fed and housed tourists. With the arrival of the railroad, an influx of visitors spawned the development of hotels and restaurants, along with food preparation facilities, storage areas, a greenhouse, laundry buildings, a powerhouse, and new mule barns and stores. To support the tourist business, new housing was built close-by and maintenance requirements for the growing number of permanent structures also grew. By the early 1920s, a formal plan for the development of all visitor and

Inventory of Facilities: Definition of Terms

To determine whether existing facilities were adequate or needed to be expanded, whether new facilities were needed, or whether facilities should be relocated or removed, park managers were surveyed. The following definitions were used in the inventory:

- *Adequate* — all facilities and spaces work well in their current size and configuration. While some facilities may be adequate, relocated or new facilities in different locations could still be requested in other categories to improve future operations. This category identifies the type and size of facility that works well for each particular entity so that those attributes can be used in future planning efforts.
- *Expand* — all spaces are currently deficient in terms of space needs. Generally speaking, the location of each space is acceptable, but more space is needed at that location for offices, workspace, storage, or other needs.
- *Construct* — all new facilities desired. For each new facility requested or desired, future sizes and locations were also recorded.
- *Relocate* — facilities are in the wrong location for effective and efficient operations. These facilities and/or operations should be physically relocated to improve operational, and sometimes, space needs. Future space needs and potential relocation areas are identified and recorded.
- *Remove* — facilities are generally in a state of disrepair and are extremely inadequate. In the opinion of the respondents, the facility identified should be torn down because of safety and maintenance considerations and replaced at the same or a different location with new or rehabilitated facilities. Future space needs and locations for those facilities were recorded.

support elements at Grand Canyon Village was produced. This plan established the configuration of many elements now seen in the village.

Historically, support facilities were built near visitor use areas to reduce hauling distances and infrastructure systems. This encouraged a dense development configuration conducive to walking. Housing was also established nearby. The tight physical structure of the community formed out of necessity more than desire. Cheap, efficient, and convenient transportation did not yet exist, so facilities by necessity were located close together.

From the 1920s to the 1950s facilities at the Grand Canyon expanded at a relatively constant rate. With the widespread use of automobiles as a means of travel, more visitors began driving to the Grand Canyon, and the small, clustered facilities became rapidly out-dated and inadequate. The mid 1960s saw an era of rapid expansion and decentralization of facilities, and the separation of visitor and support facilities, made possible by cheap, efficient transportation.

The rapid expansion of park roads and facilities has had a dramatic effect on the built environment. Support facilities were put in remote locations; old structures were converted to different uses; and new facilities were built at the edges of the community. Later, houses and community services were provided, adding yet another ring of development. This type of leapfrog development has contributed to an inefficient and unorganized community structure.

FIGURE 4: PARKWIDE SUPPORT FACILITIES DISTRIBUTION

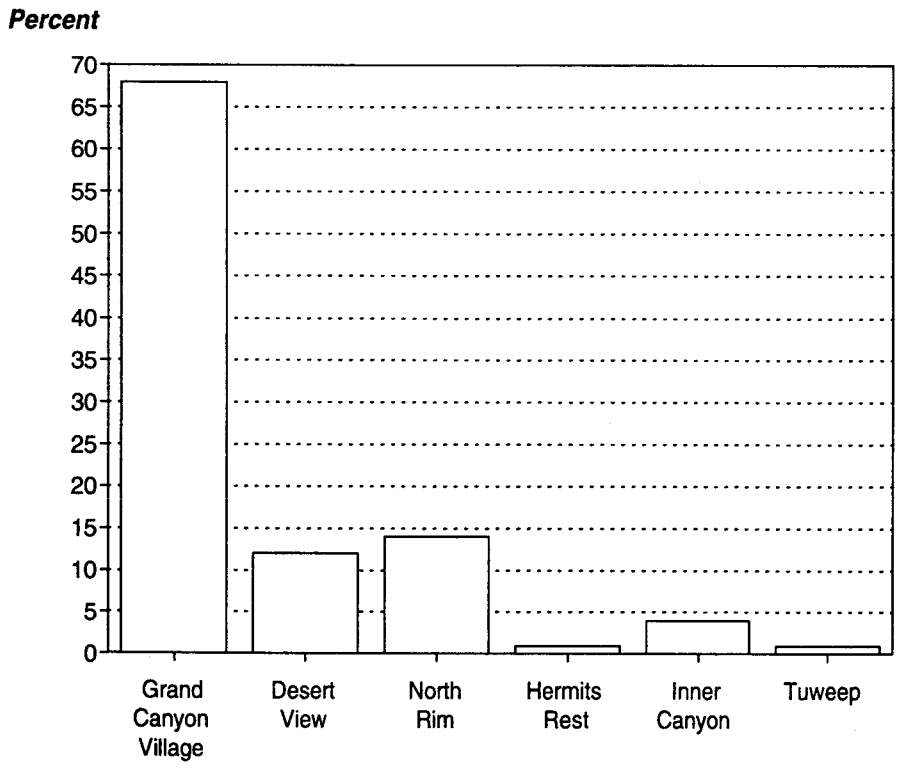


FIGURE 5: PARKWIDE MANAGEMENT SUPPORT ANALYSIS

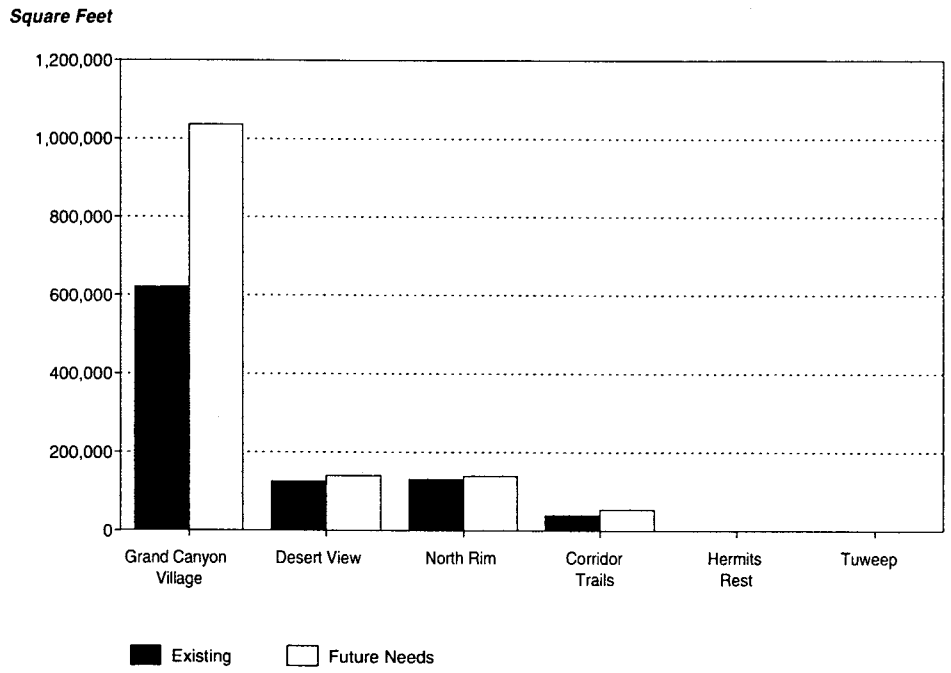


Figure 4 illustrates the general concentration of parkwide management support facilities. Grand Canyon Village contains 68% of the total square footage of support facilities in the park, followed by the North Rim (14%), Desert View (12%), the inner canyon (4%), Hermits Rest (1%), and Tuweep (1%).

Figure 5 depicts the relative space used by existing management support facilities in the park and what is needed to come to standard, as indicated by all park personnel. Besides having the highest concentration of support facilities, Grand Canyon Village also has the greatest future needs. The relative needs to existing facilities for the village show a desired increase in square footage of 58%. Much of this increase applies to large outdoor areas, such as vehicle storage, bus parking and maintenance, and sewage lagoon expansions.

In general, support facilities at the Grand Canyon are dramatically out of date and inadequate. Most park employers operate in historic structures that are limited in size and cannot be easily expanded because of their historic status. Nonhistoric structures are often decades old and can no longer efficiently serve the intended purpose.

To meet the needs of increasing visitation, expanded or new warehouses, fire stations, maintenance buildings, and public safety buildings are needed in nearly every developed area of the park. In many cases support facilities are located in prime visitor use areas, creating a conflict between service functions and the visitor experience.

SOUTH RIM

■ Grand Canyon Village

Entities with management support functions at Grand Canyon Village, in addition to the Park Service, include Grand Canyon National Park Lodges, Babbitt's general store, Grand Canyon schools, Grand Canyon Association, Arizona Public Service, Verkamp's, U.S. Postal Service, BANK ONE, US West, and Samaritan Health Services. The major deficiencies occur with the National Park Service, Grand Canyon National Park Lodges, Grand Canyon Schools, and the Grand Canyon Association. Small operations, such as the post office and bank, do not have major future needs. Arizona Public Service and Babbitt's general store have adequate facilities for the foreseeable future.

Support facilities for all operators are scattered throughout the park. GCNPL maintenance facilities are all in historic structures within visitor use areas, creating frequent and potentially dangerous conflicts. Many of these historic structures are being adaptively used in ways that were never intended; for example, the powerhouse and horse barn are used as a food warehouse and carpenter shop, respectively. Neither facility functions efficiently, and both are inadequate in terms of floor space.

Fred Harvey Transportation Company stores buses in several areas throughout the village, and bus operations, parking, and maintenance disrupt the visitor experience. The bus maintenance facility is in the general offices building at one of the busiest intersections in the park, contributing to frequent traffic congestion, noise, air pollution, and visual clutter at a primary visitor arrival point in the village. The concession buses also use the NPS maintenance area for bus cleaning, contributing to conflicts between maintenance traffic and bus activities.

The NPS maintenance area, centrally located away from visitor use functions, was built relatively recently but has quickly become too small to serve the needs of a growing maintenance operation. It houses offices for maintenance operations, workshops, warehouse, and outdoor storage, all of which are too small for today's needs. As a result, many materials are stored in garages of houses being rehabilitated, in temporary cargo containers, or left outside, which damages and often destroys good equipment and supplies.

The maintenance building also serves as a garage for emergency vehicles, occasionally creating a conflict between responding emergency vehicles and maintenance traffic and activities.

The maintenance division also oversees and operates the wet dump west of the south entrance road. The dump is being closed since the permit is about to expire and a new one will not be issued for in-park dumping. The Park Service is seeking alternative disposal sites, including developing a compacting station at the site of the current dump where refuse would be taken, compacted, then trucked out of the park to a remote dump site.

NPS visitor protection is headquartered in the historic administration building in the village. More office space, holding cells, training and meeting rooms, and other operational requirements

are needed. The building's historic status makes it difficult to expand.

The wildland fire crew has offices some distance from their response equipment, causing operational inefficiencies. The fire truck is parked outdoors in the YACC camp area, causing the equipment to deteriorate.

The backcountry offices are near the business center in a hard-to-find prefabricated structure. The building is too small to provide office space for the number of people working here and to properly instruct the numerous backcountry users getting permits every day.

Administrative space throughout the park is inadequate. The addition of staff over the years has often resulted in two or more employees sharing office space intended for one, and sometimes even sharing desk or workspace. NPS headquarters operations are in the same building as the visitor center, prohibiting expansion into visitor use areas and often creating conflicts between employee traffic and visitors walking or driving to the center. The driveway is extremely congested with visitor and administrative traffic and pedestrians, particularly during the peak season, causing minor delays for administrative traffic leaving or arriving at the building.

In general, operations in Grand Canyon Village are in great need of expansion, relocation, and consolidation. The dispersal of facilities throughout the area is largely in response to divisions simply finding any type of space in which to store things or from which to work. These conditions result in inefficient operations, damage to equipment and supplies, and sometimes endanger the safety of visitors as they get caught in the middle of service traffic, emergency operations, or other sources of conflict.

Table 31 summarizes the existing conditions and future space needs in Grand Canyon Village by park operators and their respective divisions. The three largest operators in the village (the Park Service, Grand Canyon National Park Lodges, and Grand Canyon schools) also have the greatest relative future needs, while the needs of other cooperators are relatively modest.

Table 32 summarizes the greatest facility and space needs as identified by park personnel. As shown, a number of new facilities are required to remedy substandard conditions. (The facilities and their sizes represent the manager's and park staff's best estimate of near-term required growth in manpower and support equipment, and the resultant space and facility needs based on that growth.)

TABLE 31: EXISTING AND FUTURE SPACE NEEDS, MANAGEMENT SUPPORT FACILITIES, GRAND CANYON VILLAGE

	Area in Square Feet						
	Existing	Adequate	Expand	Construct	Relocate	Remove	Future Needs
Grand Canyon National Park Lodges							
Accounting	4,750	2,650	200	0	5,000	0	7,950
Fire & Safety	2,760	1,500	0	9,260	1,260	0	9,260
Food & Beverage	63,121	52,450	0	33,880	790	0	86,330
General Management	1,594	165	441	0	0	0	2,035
Maintenance	16,101	0	5,509	10,414	10,414	0	15,923
Personnel	8,576	3,347	0	0	0	0	8,576
Purchasing	12,210	0	0	0	23,170	0	23,170
Retail	23,087	17,127	145	5,000	5,200	0	23,300
Rooms	14,029	11,044	840	0	695	500	15,569
Sales	4,475	318	1,773	0	0	0	6,248
Training	4,436	2,880	131	0	387	0	4,567
Transportation	127,067	60,623	928	165,888	142,588	0	227,439
Subtotal	**282,206**	**152,104**	**9,967**	**224,442**	**189,504**	**500**	**430,367**
Arizona Public Service	**544**	**544**	**0**	**0**	**0**	**0**	**544**
Grand Canyon Schools	**27,953**	**0**	**4,446**	**63,000**	**1,450**	**0**	**95,399**
Grand Canyon Association	**5,451**	**4,111**	**966**	**0**	**0**	**0**	**6,417**
National Park Service							
Administration	32,354	0	31,702	0	0	0	64,056
Concessions	576	0	224	0	0	0	800
Interpretation	20,743	7,317	9,632	0	400	0	30,375
Maintenance	233,266	194,403	4,530	148,452	34,725	7,590	366,796
Professional Services	1,344	0	0	0	2,000	0	2,000
Visitor Protection	10,043	0	645	16,410	8,938	1,728	24,855
Resource Management	5,794	2,343	0	7,000	3,451	0	12,794
Superintendent	898	684	144	0	0	0	1,042
Subtotal	**305,018**	**204,747**	**46,877**	**171,862**	**49,514**	**9,318**	**502,718**
Total	**621,172**	**361,506**	**62,256**	**459,304**	**240,468**	**9,818**	**1,035,445**

■ Desert View

Operations at Desert View, in addition to the Park Service, include Grand Canyon National Park Lodges, Babbitt's, and the Grand Canyon Association. All but Babbitt's have a shortage of space and/or inadequate facilities to support their operations.

Most management support facilities are located away from visitor use areas in the area to the south of the major visitor parking lot. The NPS maintenance and ranger divisions are located there in trailers and storage units which are poorly insulated and too small to adequately provide office and work space for peak season personnel. During the winter, storage of emergency vehicles occurs in facilities such as private residence garages and GCNPL service station bays, which are closed to the public in winter. Other emergency response equipment is located in a small, unheated, rustic shed behind the Babbitt's store, away from the center of operations for other equipment and personnel. The scattered facilities and equipment contribute to inefficient operations, and the poor quality of the structures result in equipment decay and damage.

TABLE 32: GRAND CANYON VILLAGE FACILITY AND SPACE NEEDS

Cooperator/Park Division	Facility Needs	Space Requirements (S.F.)
Grand Canyon National Park Lodges		
Maintenance	New maintenance facilities	13,944
Accounting	Relocated records storage	5,000
Food and Beverage	New central kitchen facility	13,880
Retail	New retail warehouse	5,000
Transportation	Relocated public garage	21,300
	Relocated service station	108,000
	Relocated bus garage	33,000
Fire and Safety	New fire and safety building	9,260
Purchasing	Relocated warehouse/offices	15,050
Grand Canyon Schools	New high school buildings	63,000
National Park Service		
Administration	Relocated admin. offices	8,000
Maintenance	New covered storage facilities	18,456
	New/expanded workshops	7,640
	New solid waste compacting station	90,000
	Relocated trail operations facility	20,000
	New road crew operations facility	17,400
Interpretation	Visitor center expansion	9,632
Visitor Protection	New public safety building	16,410
	Relocated backcountry offices	1,218
	Relocated river operations	7,600
Resources Management.	Relocated offices	3,451
	New archives building	7,000

The only employee recreation center, which recently burned, was operated by Grand Canyon National Park Lodges for their employees, contained a library, weight room, recreation room, and employee bar. Many employees seek evening recreational opportunities in the park bars, creating frequent conflicts with visitors. With the loss of the recreation center, there is little opportunity for informal social recreation beyond those visitor use facilities.

The village's business center is the primary shopping area for visitors and residents. The post office and bank are located in the heart of a heavily used visitor area, surrounded by the primary visitor center, the Yavapai lodging complex, the RV park, and Babbitt's general store. Frequent traffic conflicts occur between residents and visitors, particularly at lunchtime when residents travel to the post office for their mail and to the store for deli items.

The medical clinic in the village is the only functioning medical/dental clinic and pharmacy serving park residents, Tusayan residents, and park visitors. The clinic is capable of handling most emergency medical needs and regularly serves as a clinic for common health and medical treatments needed by community residents. It shares the building and surrounding parking area with the Resources Management Division and housing trailers, creating some conflicts between emergency operations and resource management activities.

Public safety services such as fire response, ambulances, and law enforcement are provided by the National Park Service, with additional fire response capabilities provided by Grand Canyon National Park Lodges. Separate fire stations are maintained by each entity, duplicating vehicles, staff, and support facilities and operations for structural fires. GCNPL fire crews oversee most GCNPL buildings; however, both entities often respond to common emergency situations, when warranted.

The NPS wildland fire operations do not have adequate covered storage for equipment, particularly the fire engines, which contributes significantly to equipment decay and high repair and replacement costs. The NPS structural fire and ambulance response vehicles are garaged in the NPS maintenance building, often creating potentially hazardous conflicts between responding emergency vehicles and maintenance traffic and employees in the area.

■ Desert View

Community services at Desert View are limited and inadequate. A small recreation building serves as a laundry and employee lounge. There are not enough washing machines and dryers for current employee demand; the lounge is too small and offers only limited recreational activities, including a television and a single game table. No designated outdoor game fields or facilities exist for outdoor recreation. Employees must travel to the Grand Canyon Village for more formal recreation facilities and programs.

Emergency services are provided by the Park Service. NPS fire-response vehicles are parked in makeshift areas not adequately designed for full-service emergency functions. In winter the fire engine is parked in the GCNPL service station bays since the facility is heated and closed to the public in winter.

Other emergency response vehicles such as patrol cars are often parked in private garages since those are the only available facilities offering protection from the weather. The scattered locations of emergency equipment create some difficulties and inefficiencies for emergency response.

NORTH RIM

Community services on the North Rim are somewhat limited, particularly with respect to NPS employees. The NPS housing area serves as the primary recreation and services area for NPS employees and consists of a small informal game court area suitable for volleyball and other similar activities, and a small employee laundry facility which is heavily used and often overcrowded.

Indoor recreational activities consist of very limited weight and exercise equipment located in a corner of the new generator building. That equipment is not intended for all employees; its primary use is by fire response crews and enforcement officers as part of their training equipment. Other activities such as community meetings and off-duty recreational reading or movie spaces are accommodated in a small, crowded back room of the existing headquarters building.

A new employee dining room constructed on the North Rim by TWRS/ARAMARK for its employees provides space for board games, television/movies, employee lounge, and laundry facilities. Small outdoor game courts are also located in the TWRS/ARAMARK housing area.

A small cleared area southwest of the TWRS/ARAMARK housing area serves as an informal softball field for all North Rim employees. It is away from the main visitor use areas and unimproved.

Emergency services for both visitors and employees are provided by the Park Service. Fire equipment, law enforcement, and a helipad are located in the NPS maintenance area. Since most employees are summer seasonals, no schools or other long-term community services are provided. Grocery shopping is done primarily in Kanab and Fredonia, and short-term needs are filled at the camper store near the campground and open primarily to serve visitors' needs.

TUWEEP

There are no community services at Tuweep, and the ranger and his or her family must drive to Kanab, Fredonia, or St. George. NPS staff must provide law enforcement, emergency response, recreation, and entertainment opportunities. Major emergency response is supported by either North Rim or South Rim emergency teams, depending on the type of equipment needed.

CORRIDOR TRAILS

Due to the remoteness and operational relationships with the Grand Canyon Village, the inner canyon is very limited in community services. Most employees only stay in the canyon for relatively short periods of duty. In this respect, the inner canyon is an appendage of the village. For the short stay that most employees experience in the inner canyon, several ranger stations offer limited emergency first aid, and a small employee lounge at Phantom Ranch offers an area separate from visitors for employees to informally socialize.

Major emergency services are provided from the South Rim, including emergency helicopter evacuation from the inner canyon to the medical clinic in the village.

MANAGEMENT SUPPORT

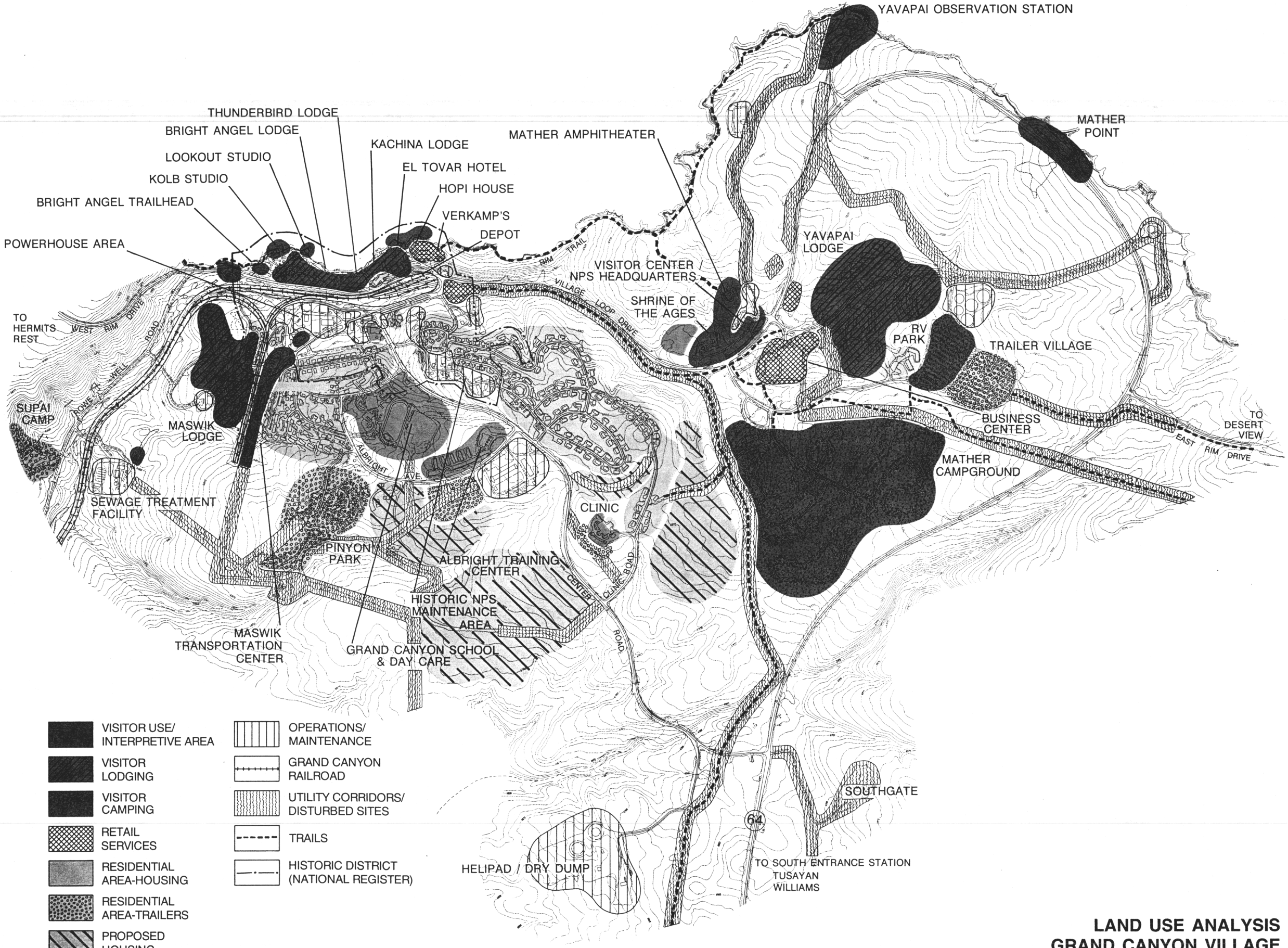
The facilities referred to as management support are generally those necessary to support park operations on a daily basis, such as maintenance buildings and yards, carpenter shops, warehouses, fleet vehicle repair, offices, and storage facilities. Substandard conditions, poor locations of facilities, and other detrimental conditions need to be addressed in the plan.

Management support facilities at the Grand Canyon date back to the 1800s. Early entrepreneurs brought supplies, stored them, quartered mules, and fed and housed tourists. With the arrival of the railroad, an influx of visitors spawned the development of hotels and restaurants, along with food preparation facilities, storage areas, a greenhouse, laundry buildings, a powerhouse, and new mule barns and stores. To support the tourist business, new housing was built close-by and maintenance requirements for the growing number of permanent structures also grew. By the early 1920s, a formal plan for the development of all visitor and

Inventory of Facilities: Definition of Terms

To determine whether existing facilities were adequate or needed to be expanded, whether new facilities were needed, or whether facilities should be relocated or removed, park managers were surveyed. The following definitions were used in the inventory:

- *Adequate* — all facilities and spaces work well in their current size and configuration. While some facilities may be adequate, relocated or new facilities in different locations could still be requested in other categories to improve future operations. This category identifies the type and size of facility that works well for each particular entity so that those attributes can be used in future planning efforts.
- *Expand* — all spaces are currently deficient in terms of space needs. Generally speaking, the location of each space is acceptable, but more space is needed at that location for offices, workspace, storage, or other needs.
- *Construct* — all new facilities desired. For each new facility requested or desired, future sizes and locations were also recorded.
- *Relocate* — facilities are in the wrong location for effective and efficient operations. These facilities and/or operations should be physically relocated to improve operational, and sometimes, space needs. Future space needs and potential relocation areas are identified and recorded.
- *Remove* — facilities are generally in a state of disrepair and are extremely inadequate. In the opinion of the respondents, the facility identified should be torn down because of safety and maintenance considerations and replaced at the same or a different location with new or rehabilitated facilities. Future space needs and locations for those facilities were recorded.



LAND USE ANALYSIS
GRAND CANYON VILLAGE

GRAND CANYON NATIONAL PARK

U.S. DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE
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TABLE 33: EXISTING AND FUTURE SPACE NEEDS, MANAGEMENT SUPPORT FACILITIES, DESERT VIEW

	Area in Square Feet						
	Existing	Adequate	Expand	Construct	Relocate	Remove	Future Needs
Babbitt's	**6,700**	**0**	**0**	**0**	**0**	**0**	**6,700**
Grand Canyon National Park Lodges							
Maintenance	585	0	775	2,400	1,800	0	2,400
Retail	5,023	0	0	0	0	0	5,023
Transportation	22,237	0	27,400	0	0	0	27,400
Subtotal	**27,845**	**0**	**28,175**	**2,400**	**1,800**	**0**	**34,823**
Grand Canyon Association	**284**	**0**	**0**	**0**	**400**	**0**	**400**
National Park Service							
Interpretation	2,078	0	0	1,850	2,663	0	3,928
Maintenance	86,740	83,770	240	8,409	0	1,898	92,419
Visitor Protection	2,273	292	0	2,116	437	720	2,408
Subtotal	**91,091**	**84,062**	**240**	**12,375**	**3,100**	**2,618**	**98,755**
Total	**125,920**	**84,062**	**28,415**	**14,775**	**5,300**	**2,618**	**140,678**

TABLE 34: DESERT VIEW FACILITY AND SPACE NEEDS

Park Agency/Division	Facility Needs	Space Requirements (S.F.)
Grand Canyon National Park Lodges		
Transportation	Expanded service station	49,200
Maintenance	New maintenance building	1,000
	New employees' laundry/rec. bldg.	1,800
National Park Service		
Interpretation	Relocated contact station	983
	New Tusayan interpretive facility	1,850
Maintenance	New public restrooms	1,712
	New district operations facility	7,329
	Expanded sewage lagoons	Undetermined
Visitor Protection	New district operations facility	2,116

The visitor contact station is in a converted historic restroom. This small structure is shared with the Grand Canyon Association book sales outlet. The building is too small to accommodate both of these functions, often resulting in large crowds inside the building and congestion.

GCNPL operations, particularly housing and administrative areas, are experiencing some growth and increased need for routine maintenance. Currently, the company's maintenance operation in Grand Canyon Village services the major needs of the Desert View facilities, but some sort of satellite facility and personnel are needed at Desert View, as indicated by the frequency of repairs and maintenance.

Table 33 summarizes existing and future space needs at Desert View.

Table 34 shows the relative existing and future square foot needs for each park operator at Desert View, as well as major facility needs identified by park personnel.

■ Hermits Rest

Hermits Rest consists of a gift shop, snack bar, and public restrooms. The area, approximately 8 miles west of Grand Canyon Village, is served only by transit during the peak season, and is considered to be an operational attached to the village. The public restrooms are too small and not designed to handle the current levels of use.

NORTH RIM

Bright Angel Point operations are conducted by TWRS/ARAMARK, the Grand Canyon Association, Grand Canyon Trail Rides, and Samaritan Health Services, in addition to the Park Service. TWRS/ARAMARK has just completed construction of an employee dining room. This new facility, located in the company's housing and operations area, serves TWRS/ARAMARK employees as a recreation center, laundry, employee lounge, and administrative service center. TWRS/ARAMARK offices are also located in this structure. The area is separated from primary visitor use areas and from NPS operations, creating little conflict with those other uses.

The NPS automotive repair garage is in an old concrete building in the TWRS/ARAMARK administrative area, resulting in some NPS traffic into the area for repair and service. The building is in generally poor condition and is too small for the growing fleet of vehicles; its remote location from other NPS operations results in inefficient communications and longer travel times between facilities.

The primary NPS operations and housing area is on the extreme north end of Bright Angel Point. A complex of historic structures house the maintenance facilities, emergency vehicles and equipment, and some office and storage areas. All of the historic facilities are too small to meet today's needs. New emergency vehicles are too big to fit into the structures, requiring a new emergency operations facility (currently being designed).

The backcountry offices are in the NPS headquarters building at the entrance to the housing and administrative area. That location creates frequent conflict between backcountry users who are getting permits and orientation and administrative functions in the headquarters building. Because the lobby is too small, often people have to wait outside in the parking lot for orientation procedures.

The administrative headquarters building is near the historic maintenance complex and housed in a modular trailer-type structure. This space is too small for current operations, and more offices and training/meeting rooms are needed.

NPS maintenance operations are housed in various small historic structures adjacent to the NPS housing area. Many of the structures are too small to adequately house workshops, offices, and storage space. The unheated and uninsulated structures make it difficult to work in the buildings in the winter. The maintenance road operations dry dump is north of Bright Angel Point, off the park road at Lindbergh Hill. This remote location requires frequent travel between operations at Bright Angel Point, contributing to inefficient operations and increased energy expenditures. However, there is nearly no conflict between road maintenance operations, materials storage, and visitor use.

The interpretive division is scattered in several facilities. The chief's office is in the headquarters building and, while adequate in size, it is affected by

TABLE 35: EXISTING AND FUTURE SPACE NEEDS, MANAGEMENT SUPPORT FACILITIES, NORTH RIM

	Area in Square Feet						
	Existing	Adequate	Expand	Construct	Relocate	Remove	Future Needs
Grand Canyon Trail Rides	**17,780**	**60**	**0**	**0**	**0**	**0**	**17,780**
National Park Service							
Interpretation	458	187	0	824	189	135	824
Maintenance	64,123	54,046	0	6,577	6,816	217	70,700
Visitor Protection	5,917	1,130	0	4,891	3,913	1,266	6,021
Subtotal	**70,498**	**55,363**	**0**	**12,292**	**10,918**	**1,618**	**77,545**
TWRS/ARAMARK	**43,696**	**23,743**	**0**	**0**	**1,225**	**1,800**	**43,696**
Grand Canyon Association	**100**	**0**	**0**	**0**	**100**	**0**	**150**
Total	**132,074**	**79,166**	**0**	**12,292**	**12,243**	**3,418**	**139,171**

TABLE 36: EXISTING AND FUTURE SPACE NEEDS, MANAGEMENT SUPPORT FACILITIES, CORRIDOR TRAILS

	Area in Square Feet						
	Existing	Adequate	Expand	Construct	Relocate	Remove	Future Needs
Grand Canyon National Park Lodges	**17,981**	**17,351**	**420**	**150**	**150**	**0**	**18,551**
National Park Service							
Maintenance	18,494	15,079	2,364	1,500	0	0	22,358
Visitor Protection	4,245	1,564	1,067	8,998	2,098	250	14,310
Subtotal	**22,739**	**16,643**	**3,431**	**10,498**	**2,098**	**250**	**36,668**
Total	**40,720**	**33,994**	**3,851**	**10,648**	**2,248**	**250**	**55,219**

the noise and distractions associated with backcountry users waiting in the lobby. Interpretive aids and slide files are stored in a small room in a building in the maintenance area; this room is too small to store all equipment properly, and the lack of working space make it difficult for interpretive staff to prepare programs.

Most of Grand Canyon Trail Rides operations are centered at the corrals on CC Hill. These facilities are adequate for the foreseeable future. Their mess hall is located in a trailer near the TWRS/ARAMARK housing and administration area and functions adequately for current operations.

The Grand Canyon Association operates a small book sales outlet in the corner of the lobby of the Grand Canyon Lodge. This sales area is too small and not well located for optimal exposure to visitors; storage is limited as well. The association is scheduled to relocate to the new visitor contact station approved to be built in the grassy area between the lodge cabins and the parking lot. This building will provide adequate sales, storage, and office space for the North Rim.

Table 35 summarizes existing and future space needs for operations on Bright Angel Point. As the table shows, the Park Service is the only entity needing expanded support facilities.

The most severe facility deficiencies on Bright Angel Point are experienced by the Park Service. The maintenance division is housed in scattered historic buildings that cannot easily be expanded without altering the historic fabric. More workshop space, storage space, and offices are needed in a consolidated, updated facility (6,816 sq. ft. total). The visitor protection division, also housed in various small, historic structures, needs a new consolidated emergency operations facility (4,891 sq. ft. total).

TUWEEP

Support facilities at Tuweep are minimal, consisting of a workshop/warehouse, storage shed, generator shed, and chlorine building for the ranger residence water supply. The workshop/warehouse and storage facilities are too small and poorly insulated. Expansion potential is complicated by the historic status of the structures.

CORRIDOR TRAILS

Both the National Park Service and Grand Canyon National Park Lodges conduct operations in the inner canyon area. Most of their operations are housed in old ranger cabins and historic cabins at Phantom Ranch. As in other areas of the park, most of the facilities are too small, and their historic status creates some difficulties for expansion.

Storage and kitchen facilities at Phantom Ranch only need to be minimally expanded because of the lack of space in the current configuration.

Other problems in the inner canyon are the lack of adequate operational space in several historic ranger residences. The storage areas for equipment, including first aid and office space, are too small, and the structures are dilapidated.

Table 36 shows the existing and desired square footages for the various operations in the inner canyon, and it identifies facilities to meet today's needs. Grand Canyon National Park Lodges requires a total of 1,000 square feet at Phantom Ranch (500 square feet for an expanded maintenance shop and 500 square feet for an expanded kitchen); the Park Service needs a new mule corral at Cottonwood (1,500 square feet) and a new Phantom Ranch ranger station (1,440 square feet).

LEES FERRY

Lees Ferry operations are an extension of the park's visitor protection division. The subdistrict offices and boat shop are located in Grand Canyon Village, requiring frequent trips between the two sites for equipment and management purposes. The separation of the primary boat repair facilities from the point of operation creates logistic problems and inefficient retrieval of equipment in day-to-day operations.

UTILITIES

WATER AND WASTEWATER

■ Regional Perspective

Tusayan and Local Developments: The water infrastructure for Tusayan is not adequate to support continued growth of the community, particularly with respect to water source development. This has resulted in past and present pressures for the park to sell water to the community.

Tusayan has no municipal water system. Two of the four water storage and distribution systems are privately owned and operated by Southwest Groundwater, Inc and Red Feather Properties, Inc.. The publicly owned water systems are those serving Moqui Lodge and USFS complexes north of town, and the Grand Canyon National Park Airport system south of town.

Until recently, all domestic water for the community of Tusayan was hauled in from other sources. This is still true for most of the water consumed in the community; however, a well source was successfully developed in 1989 by Southwest Groundwater under the auspices of the Grand Canyon Squire Inn and provides most of the water for that particular facility and system. A second well was drilled behind the Quality Inn in 1994.

Water from another well owned by Southwest Groundwater at Fort Valley near Flagstaff is hauled in to supply the Grand Canyon Squire Inn system. During periods when the total output of the two wells exceeds the domestic water needs of the Grand Canyon Squire Inn system, Southwest Groundwater sells water to local users.

Water is also purchased from Williams and is hauled from a well at Belmont and from Grand Canyon National Park to Tusayan.

The Tusayan community has purchased water from the park since 1980 under Public Law 95-586, which specifically authorized the sale with stipulated conditions. The three major conditions are (1) water rights are to remain with the United States Government, (2) the water must be sold to a nonprofit entity authorized by the State to receive and distribute it, and (3) the secretary of the interior must determine "that such sale is not detrimental to the protection of resources of Grand Canyon National Park or its visitors and that appropriate measures to provide for such protection, including a right of immediate termination, are included in the transaction."

The sales have taken place through an annually renewed memorandum of agreement between the park and the Tusayan Water Improvement District.

The park issued an environmental assessment covering the water sales to Tusayan in November 1986, and has operated under its preferred alternative, which allows the sales only when the park's storage tanks are full. There is no expressed limit on the amount of water that Tusayan may purchase.

Flagstaff: The city of Flagstaff relies on water from the Lake Mary reservoir system and on groundwater from the Woody Mountain well-field to the west, the Inner Basin well-field in San Francisco Peaks to the north, and the Lake Mary well-field to the southeast. Water is also obtained from springs in the Inner Basin well-field.

The amount of groundwater withdrawn depends on the amount needed to supplement water available from the Lake Mary reservoir system (which provides 10%–60% of total supply).

Groundwater in the Flagstaff area is from the Coconino/Supai aquifer and various shallow volcanic aquifers. Water is provided by a city utility, several private water companies, and to a minor degree by private domestic wells. Water use has declined significantly since Flagstaff implemented a conservation program. In 1992 yearly consumption was 2.6 billion gallons, down from 3 billion gallons in 1990. Water demand in the Flagstaff area is projected to increase to 6.5 billion gallons by 2040.

Williams: The city of Williams uses surface water from six reservoirs that have a combined storage capacity of 900 million gallons. The Dogtown and Cataract reservoirs and Kaibab Lake comprise about 85% of the storage capacity. The water is distributed by a city utility. Water use in 1989 was 130 million gallons. Despite this relatively low consumption, reservoir storage is often insufficient to meet demand because of high seepage losses from the reservoir. The Dogtown reservoir was lined in 1971, and efforts were made to line Kaibab Lake a few years later.

Williams water consumption is expected to increase by 260 million gallons per year by 2040.

Valle: The community of Valle consists a gas station, curio shops, and hotel, plus undeveloped private land. All water is hauled from Williams. The city recently constructed a 10,000-gallon storage tank. Two wells were recently drilled, and another is proposed

Cameron: Cameron consists of three motels, two restaurants, a butcher shop and approximately 20 residences. The community obtains water from two 100-gpm wells near the Little Colorado River.

Before a recent 100-year flood, the wells were approximately 50-feet from the riverbank. The stream channel was altered during the flood, leaving the wells inside the channel. Water pumped from the 50-foot-deep wells is chlorinated prior to storage in two 80,000- gallon tanks. Stand-pipes adjacent to the storage tanks allow for local residents and businesses to connect and purchase water. The exact amount of water consumed by the community is unknown. About half of the water sold is used for irrigation.

Kaibab Lodge and DeMott Campground: The USFS facilities at the Kaibab Lodge complex and DeMott campground are served by shallow wells. These wells are not totally reliable, and water must be hauled in during periods of extended drought.

The Kaibab Lodge complex obtains water from a well about 0.5 mile north of the lodge. This well is approximately 50 feet deep, with a static water level of less than 25 feet below the ground surface. It has a 6-inch casing and discharges into a 50,000-gallon storage tank, with only chlorination for treatment. Daily use can reach levels as high as 7,000 to 8,000 gallons.

The DeMott campground is served by a similar well approximately 200 yards to the north. It discharges into a 30,000-gallon storage tank. Daily use in the campground never exceeds 3,000 gallons. Recharge of the well is a problem at times. Recently, the Arizona Department of Environmental Quality began testing the well for turbidity and indications of surface water influence. The state is considering reclassifying this well to "groundwater under the influence of surface water."

The Forest Service owns another well approximately 3 miles south of Kaibab Lodge (2 miles north of the entrance station). Called the Mason well, this well has been used during recent droughts to supplement water from the two primary wells; however, its production characteristics are similar and do not preclude the need for hauling.

The water systems near the North Rim are already inadequate for serving visitor needs during periods of extended dry weather; hence any increased visitation or development outside the park will have to be accompanied by new infrastructure or contingency planning to provide potable water.

Big Springs: Similar to Roaring Springs in the park, Big Springs in the Kaibab National Forest is in a crevice in the canyon wall. Water is collected and piped to a storage tank that feeds the distribution system. The tank overflows into a spring created by the crevice overflow. This source serves the Big Springs work center. The Arizona Department of Environmental Quality considers this a groundwater source and does not require disinfection. While actual consumption is unknown, this source meets the needs of the Big Springs work center. A roadside hose bib allows casual users to obtain water. This source also supplements Kaibab Lodge water needs.

■ Park Water Supply

The Grand Canyon potable water supply is taken from the Roaring Springs cave north of Bright Angel Point and below the North Rim. Water flow varies throughout the year. The normal cycle includes high flows during spring that taper off in late May and remain fairly constant until the following spring. Minimum flows typically occur in September and early October. During the minimum discharge period Roaring Springs produces' 1,500 gpm. Approximately 900 gpm are diverted for potable water consumption. Prior to consumption, the water is minimally treated through a desander unit and disinfected.

The Roaring Springs source has been classified by the state as a surface water source because of unrestricted atmospheric influences. Consequently, current water treatment provisions, as mandated by Congress in the 1986 amendments to the Safe Drinking Water Act, are not being met. Most significantly, compliance with the surface water treatment rule is not taking place.

Rapid shifts in turbidity during spring runoff may indicate a direct influence by surface water, which definitely violates the state maximum turbidity standards for potable water. The Arizona Department of Health has indicated that for a classification of the water source to groundwater (which does not require full conventional treatment to produce potable water), physical changes must be made to the intake to eliminate atmospheric influences. If satisfactory source modifications are made, the state will then reclassify the source as "groundwater under the direct influence of surface water," which still requires compliance with provisions of the surface water treatment rule.

In order for the state to consider further reclassification as groundwater not under the direct influence of surface water, testing for viruses is required. If viruses are undetected during the test period, the state will consider reclassification.

Regardless of the state's classification of the source, treatment will be required to comply with the turbidity standards. As a minimum, treatment facilities will be required to service all park developments and potentially the North Rim. Because of the North Rim's seasonal operation and water storage capacity, the turbidity standard can be met without treatment.

High sediment levels in the water have required intense maintenance of the transcanyon waterline. Pressure-reducing valves must be replaced or rebuilt frequently, and pump impellers must be replaced routinely. Pipeline scouring leads to erosion and contributes to pipeline failure,

Monthly potable water consumption on the North Rim for 1992 ranged from 1.3 million gallons in May to 2.9 million gallons in August. Monthly potable water consumption for the South Rim and Desert View for 1992 ranged from 12.3 million gallons in December to 18.5 million gallons in July.

■ Water Transmission

Water is collected through a series of pipes and dams and travels to the Roaring Springs pumphouse. From here it is either pumped to the North Rim or delivered into the transcanyon waterline, which serves South Rim and inner canyon developments. The pumphouse can be isolated from the transcanyon waterline while flow to the South Rim is maintained by closing and opening valves.

In normal operation the transcanyon flow proceeds into the pumphouse to the desander, which is designed to remove suspended sediment from the raw water. After the water is chlorinated, the flow splits, with a portion of the flow going to the North Rim and the remainder into the transcanyon waterline.

South Rim Transmission and Distribution Lines: The transcanyon waterline consists of 8-inch ductile iron pipe and predominantly 6-inch seamless aluminum pipe of varying alloys and pressure ratings. Water flows by gravity from the Roaring Springs pumphouse to the Indian Garden pumphouse, where it is pumped to the South Rim for distribution. Along the way to Indian Garden the waterline supplies domestic water to the Roaring Springs quarters area, Cottonwood campground, and Phantom Ranch.

Operating pressures in the line can vary from as low as 30–40 pounds per square inch (psi) at the Indian Garden pumphouse to 400 psi along the Colorado River. Static pressure varies from 620 psi at Indian Garden to 1,200 psi along the Colorado River, and surge pressure reaches as high as 2,000 psi. To minimize static pressures in portions of the line in lower elevations (such as Phantom Ranch), water is allowed to flow continuously through the pipeline and overflow at the Indian Garden pumphouse. During periods when Indian Garden pumps are not operating, the transcanyon flow discharges into Garden Creek.

There are indications that portions of the transcanyon waterline are nearing their useful service life. The 12-mile section between Roaring Springs and the Colorado River has been subject to more and more frequent breaks, particularly the 3 to 4

mile section north of Phantom Ranch. The extremely high pressures, in combination with corrosion and pipe stress, are the predominant causes of failures.

The percentage of down time due to waterline failures has been steadily increasing. Because of the very difficult logistics associated with construction and maintenance activities in the inner canyon, repairs are extremely costly. This is compounded by the use of welded seamless aluminum piping in the original construction, which requires special equipment and specially trained, skilled welders for repairs.

On the South Rim water is stored in five welded-steel, abovegrade water storage tanks near the trailer village, with a total capacity of 13 million gallons. The South Rim distribution system consists of two pressure zones, necessitated by topography. The upper zone serves everything east of the visitor center, including Babbitt's store, the Yavapai Lodge, the campground, and the trailer village. The lower zone serves everything from the headquarters building west, and extends as far as the wastewater treatment plant.

The coverage of the South Rim distribution system includes an area bounded by the canyon rim on the north, the wastewater treatment plant on the west, the clinic on the south, and the trailer village on the east. Most of the distribution system is in good to excellent condition, as a result of major rehabilitation, replacement, and upgrading from 1986 through 1988. The majority of the older mains that are still in use are cast iron, and a significant percentage of these are cement lined. Ductile iron pipe with cement mortar lining has been used for all new mains since the early 1980s. System leakage is well within normal range for a system of its size.

The volume of water storage provided by the tank farm is fully adequate to meet the Insurance Services Office (ISO) criteria for fire protection, while allowing appropriate equalizing storage in the tank farm for present conditions.

The South Rim distribution systems meets ISO ratings of 3,000 gpm in commercial districts and 1,000 gpm for residential districts with any main out of service. The ISO rating assigned to the South Rim is 6. (ISO ratings are between 1 and 10, with 1 as the best. The rating takes into account not only infrastructure, but the capabilities of the fire department itself, including equipment. A rating of 6 is above average for a community the size of Grand Canyon Village.)

There are between 50 and 60 fire hydrants on the South Rim that are fairly old and lack a steamer connection.

Desert View Distribution Lines: Potable water is pumped to Desert View through a 22-mile pipeline extending from the Grand Canyon Village tank farm at a rate of 125 gpm. Water is stored in a 150,000-gallon storage tank; booster pumps provide pressure for distribution. The transmission line was constructed in two phases, the first phase in 1966, and the second phase in 1988. The pipeline is in relatively good condition.

Development at Desert View is not adequately protected from structural fires by the existing infrastructure. The life safety risk is minimal, due to the nature of the buildings in the area. However, there is considerable risk of loss of property, including much that is privately owned.

North Rim Transmission and Distribution Lines: Water is transported from the Roaring Springs pump station to the North Rim through a 12,500-foot line constructed in 1928 of 3.5-inch steel pipe. The line is structurally sound; however, the pipe supports are susceptible to damage from erosion, washouts, freeze/thaw cycles and rock slides. This constant assault necessitates numerous annual repairs. The condition of the North Rim line is such that its ability to withstand the higher pressures associated with an increased flow rate is very questionable.

Water is pumped through the transmission line by a pair of pumps that are nominally rated at 97 gpm. Actual flows normally measure in the range of 93–96 gpm. The pump capacity can be increased beyond its current rating to 150 gpm by replacing the pulley.

Water on the North Rim is stored in two 2-million-gallon, aboveground, steel tanks. Both tanks are in good condition. The lack of level controls to prevent tank overflow is a potential source of water loss.

North Rim water distribution pipes are predominantly small diameter (4 inches and smaller) cast-iron, galvanized steel, and polyethylene pipes. A substantial portion of the system dates back to 1928. The system is confined to Bright Angel Point, extending as far north as the wastewater treatment plant and as far south as the Grand Canyon Lodge. Historically, water loss through leaky pipes in the distribution system has been problem. A concentrated effort by park staff identified areas of significant water loss. By abandoning lines no longer used and replacing cabin waterlines near the main lodge, water loss was reduced from 23,000 to approximately 10,000 gallon per day.

Reclaimed water from the wastewater treatment plant is used for fire fighting. The 1-million-gallon aboveground steel storage tank and 8-inch mains throughout the development are adequate for all existing circumstances during summer months. The shallow burial of the distribution piping requires the system to be drained at the end of each summer operating season to prevent freezing. This factor, as well as potential freezing problems with the storage tanks, would have to be addressed for year-round operation at the North Rim.

Tuweep: A rain catchment and cistern system date back to original construction in 1934. The catchment feeds a 9,000-gallon cistern. The limited water storage capacity must be supplemented with hauled water a few times a year to meed the demands of a ranger and family living at the site. Both the catchment and cistern need to be rehabilitated and cleaned.

Phantom Ranch Distribution Lines: Water is delivered to Phantom Ranch by the transcanyon waterline with two 2-inch taps serving the entire development. Pressure regulating valves are installed at each tap to reduce the system pressure from nearly 1,000 psi in the transcanyon waterline to 40–60 psi in the two minor distribution systems served. Fire protection is afforded by standpipes located among the concession buildings.

No water storage tank has been used for Phantom Ranch since the construction of the transcanyon waterline. When the waterline is out of service, operations at Phantom Ranch must be adjusted accordingly. Depending on where the break is, there may be sufficient water in the line to allow continued water delivery for a period of hours up to a couple of days. Of course, when the pipeline breaks at some locations in or near Phantom Ranch, there is no water for operations until the break is repaired.

Fire protection limitations at Phantom Ranch are a matter of some concern. Local staff have refurbished and filled an old 5,000-gallon storage tank with water for emergency use. This volume is inadequate by typical standards even for active storage volume, much less fire fighting.

The adequacy of standpipes in the concession cabin area is somewhat controversial, since there is no fire truck or crew to fight a structural fire, and therefore there is no need for typical municipal hydrants and 500-gpm nozzle flows. The risk of fire spreading between structures is also minimal due to their spacing; however, this is not true of the new dormitory-style cabins at the upper end of the development.

It appears that, as a minimum, firefighting deficiencies that should be corrected at Phantom Ranch include water storage for times when the transcanyon waterline is out of service, additional standpipes at the upper end of the development, and standpipes on the delta.

Indian Garden Distribution Lines: The pump station constructed as part of the transcanyon waterline provides increased capacity to the original facility designed to pump water from a local creek. The Indian Garden pumphouse provides 300,000 gallons of water storage and has two 550-gpm pumps and one 650-gpm pump.

Due to a deteriorated state, the original discharge line (constructed in 1932) was replaced in 1986 with 6-inch steel pipe placed in a directional drill hole. This line is the primary transmission line from Indian Garden to the South Rim and is in excellent condition.

The largest of the Indian Garden pumps is operated solely during off-peak electrical demand periods to reduce electrical costs. This 11-hour period provides adequate pumping service to meet present demands.

Water is distributed to the residences, campground, and other uses at Indian Garden through a network of small-diameter piping served by a 3-inch diameter main. Pressure in the main is 30–40 psi.

Fire protection at Indian Garden is provided by standpipes located near the buildings. Deficiencies and degree of risk are low at Indian Garden because there are few structures, none for public lodging or dining, and the

storage afforded by the pipe between Indian Garden and the South Rim makes water virtually always available.

■ Wastewater Treatment

Tusayan and Local Developments: The Tusayan community, under the auspices of the Tusayan Sanitary District, completed construction of a new wastewater reclamation facility in 1992. The new plant consists of extended aeration secondary treatment facilities followed by a multimedia filter and ultraviolet disinfection system.

The plant is designed to process up to 150,000 gallons per day of domestic wastewater into high-quality reclaimed effluent, which will be used for toilets and other facilities that have traditionally been served by purchased reclaimed effluent from the park. Effluent is stored in a 1.5-million gallon, non-discharging lagoon, from which it can be withdrawn for reuse, and which will serve as a feature of a community park.

The plant currently receives 100,000–150,000 gallons per day of wastewater from the community. It has been designed to be expanded to a capacity of 300,000 gallons with relatively little additional capital investment.

There are still numerous individual septic tank and drainfield installations in operation in the Tusayan community.

All wastewater generated at the Moqui Lodge and USFS compound is treated in a four-cell lagoon system. The system is non- overflowing; all effluent disposal is by evaporation. The system currently operates at or above capacity, and excess wastewater is hauled to the park for disposal at the South Rim plant.

Flagstaff: The city of Flagstaff has a 6-million-gallon per day wastewater treatment plant and recently constructed a 4-million-gallon per day reclamation plant. Water from the reclamation plant is to be used for irrigation of city parks.

Cameron: Cameron maintains a sophisticated wastewater treatment plant for such a small community. The activated sludge extended aeration plant was constructed in the 1960s by the Standard Oil Company. The 68,000 gpd facility receives 13,000–20,000 gpd during winter months and up to 40,000 gpd per day during summer months. On one occasion in the summer of 1993 (during a trade show at the local trading post) wastewater flow went as high as 72,000 gpd, exceeding plant capacity.

A high-quality effluent is achieved with 95% BOD removal and 99% suspended solids removal. The effluent is discharged into the Little Colorado River just downstream of the potable water wells.

Kaibab Lodge and DeMott Campground: Wastewater from the DeMott campground is treated by septic tank and leachfield. A separate septic tank and leachfield is provided for the USFS trailer site.

Jacob Lake: Wastewater treatment for Jacob Lake consists of a lagoon system. The capacity is unknown; however, flows in the range of 20,000 gpd are received.

South Rim: The South Rim sewage treatment plant/water reclamation plant, with a capacity of 750,000 gpd, treats all wastewater generated by the South Rim development. The treatment process includes pretreatment, secondary treatment, water reclamation, and sludge treatment facilities. These treatment facilities, resulting from the most recent improvements in 1988, are in relatively good condition and effectively treat wastewater.

All secondary effluent is treated for reclamation and is then distributed or discharged into Bright Angel Wash. Although the quantity of reclaimed water available for use increased substantially when the new reclamation plant was completed, much of it is still released into Bright Angel Wash for disposal. The existing storage and distribution systems for reclaimed water are inadequate to handle the available quantity; consequently potable water is often used for purposes that could be served by water of lesser quality.

Sludge treatment facilities include an aerobic digester, sludge pumps and sludge drying beds. These facilities were designed using the same flow criteria as the rest of the plant. The dried sludge can ultimately be buried in a sanitary landfill or used as a soil conditioner in many instances.

In summer 1991 wastewater flows for the South Rim peaked at approximately 600,000 gpd, roughly 80% of the plant's design capacity. Based on this 1991 data, the plant can receive and successfully treat approximately 150,000 gallons per day more wastewater before it reaches theoretical capacity.

Desert View: Wastewater generated in the Desert View area flows by gravity to a series of three facultative lagoons for treatment and disposal. Most effluent disposal is by evaporation; however, there is some percolation from the secondary and tertiary cells.

Two cells of these lagoons were originally constructed in the early 1960s. The third cell was added in 1989 to handle a gradual increase in flows in the area. Flows average 8,000 gpd and 5,000 gpd during low visitation periods. The total surface area of the three lagoons is 74,800 square feet. The lagoons are undersized for the quantity of wastewater received.

The Arizona Department of Health in 1991 cited the park for failure to obtain an aquifer protection permit for these facilities. In response to this citation, liners were installed in 1992 and a permit application was filed.

North Rim: At the North Rim, wastewater treatment and disposal was accomplished using a septic tank and drainfield system until 1976, when a new treatment plant went on line. This plant produces a high quality effluent during the summer operating season.

The treatment plant was not designed for winter operation, and features open concrete basins. These tanks are all completely drained for the transition to winter operation of septic tanks. The facility was originally designed to operate as an extended aeration plant, although it has successfully operated in the conventional activated sludge mode since 1984. Advanced treatment is used for final polishing. Reclaimed wastewater is stored and used for fire protection at the North Rim and the remainder discharged into Transept Canyon.

Flows into the North Rim facility average approximately 76,000 gpd through the summer season. Peak daily flows have reached 112,000 gallons. This volume of wastewater exceeds the designed plant flow of 100,000 gpd; however plant and process modifications made in recent years have allowed the plant to operate successfully.

Tuweep: A small septic tank and drainfield is employed to treat and dispose of wastewater generated in the Tuweep area. This system dates back to the original construction in 1934. There have been some recent indications of drainfield failure, such as surfacing of effluent.

The addition of a seasonal ranger and a new residence would require a septic system.

Phantom Ranch: The existing wastewater treatment plant and collection system came on line in 1982. The collection system, consisting of 4-inch laterals and 6-inch mains, conveys wastewater generated throughout the area to the plant entirely by gravity.

This plant employs an extended aeration activated sludge process, with a capacity of 12,000 gpd. Flows reaching the plant have averaged 8,000–9,000 gpd during the summer season, and peak days are very close to the 12,000 gpd capacity.

Sludge treatment with aerobic digestion and sludge drying beds are provided, similar to the plants on the rims.

All wastewater treated at Phantom Ranch is used for irrigation of the cottonwood trees in the delta area adjacent to the treatment plant. In recent years there has been a noticeable decline in the general health of these trees, which may be attributable to this practice. The area being irrigated may be inadequate for the volume received. A potential solution could be to expand the irrigation system and use reclaimed effluent for other purposes, such as toilet flushing.

TELEPHONE SYSTEM

■ South Rim

US West provides phone service to all of the Grand Canyon Village and Tusayan. Service is microwaved in from Flagstaff and then microwaved from the South Rim powerhouse to inner canyon developments. All cabling for NPS facilities is owned by US West. Grand Canyon National Park Lodges owns some cabling but the exact amount is unknown. Most telephone cables are in poor condition.

Grand Canyon National Park Lodges uses a Hitachi HCX 5000 Phone system, a two-year old, state-of-the-art system. A portion of the phone lines are owned and maintained by the concessioner.

Desert View recently had a "Slick 96" phone system installed, which provides service to approximately 48 phones. This system has been in service approximately two years and provides off-proximity extension, FTS, and electronic mail capabilities.

The historic line to the inner canyon was taken out of service in October 1992, and phone service for emergency phones at Phantom Ranch and Roaring Springs is provided through radio transmission. Four solar panels provide electricity to power the phones, requiring nighttime phone calls be held to a minimum to reduce battery drainage. The four solar panels are at Roaring Springs, Cottonwood, Tip Off, and the river rest house.

Service to Indian Garden is a combination of both commercial lines and a Basic Exchange Telephone and Radio (BETR) system. Two commercial lines serve the maintenance facility and the ranger stations. The emergency phone system at the 3-mile and 1.5-mile houses along the Bright Angel Trail are through radio transmission. In an emergency situation, the user picks up the phone and the through light indication identifies where the call is being generated.

No telephone service is now provided at Tuweep. Plans are underway to obtain cellular phone service.

■ North Rim

North Rim telephone service — both NPS and concessioner — is by microwave signal from the South Rim. Kaibab Lodge is on the same system.

Electrical Power Supply and Distribution

■ South Rim

The South Rim first had electricity in the 1920s when the Santa Fe Railroad constructed the powerhouse, which used fuel oil to generate electricity. The powerhouse was transferred to the Park Service in the late 1950s.

Arizona Public Service (APS) provides power for all of Grand Canyon National Park except for the North Rim, where power is provided by Garkane Power Association. APS power is generated at the Cholla power plant about 75 miles east of Flagstaff on I-40 and transmitted through overhead 69,000-volt power lines to Williams and then to Grand Canyon Village. Alternate power required during emergencies is provided from various power sources on the APS system.

The substation, where the 69,000 volts is transformed to 12,470 volts and regulated for a constant voltage for primary use, is in relatively good condition. All power lines (up to metering points) and the substation are owned and operated by Arizona Public Service.

The excellent power line maintenance provided by Arizona Public Service has allowed continuous service for several years. Only one power outage (due to a broken insulator) has been recorded on the 69,000-volt line during the past six years.

A 12,000-volt power line from the Grand Canyon substation serves Desert View. This line is constructed on overhead power cables through a narrow corridor of trees, and power outages occur when trees fall onto the lines.

■ North Rim

Electrical power on the North Rim dates to the 1920s, when Utah Parks Company (owned by the Union Pacific Railroad) constructed a hydroelectric plant at Roaring Springs to provide power to a pump station and the North Rim development.

In the 1960s an electric power line was constructed to the North Rim from the north by the local rural electric association utility, Garkane Power Association,.

In the late 1970s a new overhead, 15,000-volt insulated line was constructed from the North Rim near the concessioner motel units to Roaring Springs. This project was in conjunction with the demolition of the Roaring Springs powerhouse, the pumphouse, and the electrical transmission line to the North Rim, and the construction of a new pumphouse.

The current power distribution system is the result of construction projects from 1987 to 1990. The overhead 24,900-volt Garkane line was replaced from the park's north boundary to the developed area with an underground 24,900-volt system. The new transmission line is owned by the National Park Service. New standby diesel generators were installed. The existing overhead telephone lines were replaced with underground lines in conjunction with the electrical system work.

In the event of a commercial power outage, emergency standby power is provided by diesel generators.

■ Tuweep

Power is only provided for the ranger residence and consists of 16 solar panels. Auxiliary power is provided by a propane-fueled generator.

■ Corridor Trails

Power to Indian Garden and Phantom Ranch is provided through an overhead 12,470-volt three-phase line from Orphan Mine. At Indian Garden the line changes to 7,200-volt single-phase power line to Phantom Ranch. The line terminates at Phantom Ranch.

All facilities at the Cottonwood campground are powered by batteries. A small hydro-generator in the creek at the northern end of the facility generates power to charge the batteries used at the ranger station and bunkhouse.

ENVIRONMENTAL CONSEQUENCES

NATURAL RESOURCES

The analysis was conducted in accordance with the direction in a number of documents, including: *NPS-77, Natural Resources Management Guideline, NPS Management Policies, NPS-2, NPS Planning Process Guideline,* and *NPS-12, NPS Environmental Compliance Guideline.* These documents provide general guidance for compliance with various laws, executive orders, and other regulations, including the National Environmental Policy Act (NEPA); Endangered Species Act; Clean Air Act; Clean Water Act; Wilderness Act; Wild and Scenic Rivers Act; Executive Order 11988 (Floodplain Management); Executive Order 11990 (Protection of Wetlands).

First, the best available information regarding the various natural resource subject areas was compiled as part of the description and analysis phase of planning, before any alternatives were developed. This information was augmented and refined based on data gaps identified by the planning team, or on input received during the scoping phase of planning. This information is summarized in the "Affected Environment" section of this document.

Second, the level of analysis and scope of the environmental impact statement were determined. Impacts are evaluated in this document at a level that decisions about major actions within alternatives can be made, but in most cases not at a level that actions can be implemented without additional site-specific environmental assessment in compliance with NEPA and other applicable laws and policies. Except where site-specific designs for actions are included in this document, an environmental assessment could not be conducted at the level necessary to allow immediate implementation of an action. Within that framework, environmental consequences are evaluated in the most specific manner possible. In all cases, the best available information indicates that the actions evaluated are feasible as presented and that the analysis of consequences is accurate. The planning team has no reason or information to indicate that consequences will be other than described when more site-specific design and analysis is conducted to implement this plan.

Third, the location and nature of specific actions in each alternative were evaluated to determine their potential to affect natural resources. Locations were compared to known sensitive areas for the various natural resource topics. The extent and type of impacts were then evaluated for their potential to affect the known resources. Subject matter experts outside the planning team and park staff were consulted as appropriate.

Because site-specific designs have not been completed for most actions, it is not possible at this time to determine the exact acreage that will be affected by alternative actions. Therefore, the given acreages for vegetation or soil disturbance are the maximum that could be affected. The acreage that would actually be affected should be smaller in all cases, especially as site-specific design seeks to minimize impacts to park resources by using already-disturbed areas as much as possible, by avoiding sensitive areas, and by following other sustainable design techniques.

CULTURAL RESOURCES

SUMMARY OF REGULATIONS, POLICIES, AND PAST PLANNING OBJECTIVES

The treatment of archeological resources and traditional cultural properties is governed by the National Historic Preservation Act of 1966 and its subsequent amendments. Section 106 of the act specifies that all government agencies must take archeological and traditional cultural properties into consideration before implementing any federal action. Section 110 specifies that government agencies inventory all of their historic properties (including archeological sites and traditional cultural properties) and evaluate them according to the criteria of the National Register of Historic Places.

The Native American Grave Protection and Repatriation Act of 1990 governs the treatment and ultimate disposition of human burials and grave goods. The American Indian Religious Freedom Act of 1978 protects American Indians' rights to continue traditional religious practices at sacred places.

The National Park Service's *Cultural Resources Management Guideline* (NPS 28) dictates NPS policy to preserve all archeological resources and traditional cultural properties through active protection and preservation.

ARCHEOLOGICAL RESOURCES

Archeological base maps were compared with the development concept plan maps for each alternative. In areas where development was proposed on or near archeological sites, it was assumed that impacts would occur.

With 2,700 known archeological sites in the park and an estimated 61,000 total, it would seem that the loss of a few small sites would not constitute a major impact to the cumulative resources of the park. However, archeological sites are nonrenewable resources. Many of the places modern peoples use for living and the enjoyment of the resources coincide with places ancient peoples used. In many cases, these areas are the only ones that have the potential to answer important questions in prehistory. For instance, the Grand Canyon Village area appears to have been on a boundary between two major cultural groups. The sites there can answer a number of questions about how the two groups interacted. During all consultations, the confidentiality of information will be fully protected.

Because all archeological sites in the park are assumed to be significant in the absence of formal determinations of eligibility, any effects on archeological sites are considered to be adverse unless otherwise mitigated. The National Park Service will mitigate adverse effects to archeological resources. If effects cannot be avoided during the specific design of facilities, mitigation will consist of data recovery as developed in consultation with the state historic preservation officer, the Advisory Council on Historic Preservation, and American Indian tribes as appropriate.

TRADITIONAL CULTURAL PROPERTIES

Personal visits were made to six American Indian tribal offices, as well as to two chapter houses of the Navajo Nation, to gather data on traditional cultural properties. In addition, representatives of each of the tribes participated in workshops to determine issues and to develop interpretive themes. Existing ethnographic documents and archeological studies were scrutinized for information on traditional cultural properties.

Most American Indian groups regard archeological sites as sacred, especially the ones connected directly to their groups. The effects on archeological sites have been evaluated separately, but it is understood that any archeological site associated with either prehistoric or historic American Indians may also have traditional cultural values.

For the most part, American Indians were reluctant to reveal the precise location of traditional cultural properties other than archeological sites. Especially in the case of sites associated with religious activities or of special spirituality, revealing their locations could compromise the sacredness of the site. They prefer to remain reactive to our proposal and alternatives. All groups saw the alternatives as outlined in the workbook, and a special workshop was held to obtain their comments on the alternatives. All interested Indians were given opportunities to comment at those stages. Special efforts will be made to contact cultural liaison officials for the tribes and designated religious personages during the public review period.

The methodology for analyzing impacts is to assume no traditional cultural properties are within an impact area unless otherwise informed by interested American Indians. Even if the Park Service knew the locations of the properties, until exact locations are selected and preliminary designs are available, it is not possible to project all direct effects on these properties. Once informed that a specific proposal may affect a property, every effort will be made to avoid the property at the design stage through consultation between planners, designers, and the interested American Indians. If sites could not be avoided, mitigating measures would be developed in consultation with the interested tribe, the state historic preservation officer, and the Advisory Council on Historic Preservation, as stipulated in the *Code of Federal Regulations,* title 36, part 800 (36 CFR 800).

HISTORIC STRUCTURES AND LANDSCAPES

The historic properties listed on, or determined eligible for listing on, the National Register of Historic Places provide the basic inventory of historic resources for this plan.

An effect on a significant historic property occurs if an action has the potential to change the characteristics that qualify that property for listing on the national register. If the action diminishes the integrity of those characteristics, it is considered to have an adverse effect. Effects that may occur later than, or at a distance from the location of the undertaking, are considered to be potential impacts of the action and may be called indirect effects.

The revised regulations of the Advisory Council on Historic Preservation (36 CFR 800.8) provide the methodology for assessing impacts on historic resources. In assessing the impacts of this plan, the following steps were taken:

(1) the location of a proposed action was identified
(2) that location was compared with the location of resources listed on or eligible for listing on the National Register of Historic Places
(3) the extent and type of impact of the proposed action on the national register properties was determined
(4) those effects were assessed according to procedures established in the regulations.

In those instances when alternatives state that previously disturbed areas would be used for development, for example a parking lot or an orientation center, the potential effects are addressed. Some disturbed areas may be older than 50 years, therefore making it necessary to assess effects under section 106 of the National Historic Preservation Act.

VISITOR EXPERIENCE

Impacts on the visitor experience were examined based on information gathered from a 1991 visitor use survey entitled "A Study of the Perceptions, Expectations, and Satisfaction Levels of Visitors to Grand Canyon National Park" (T&M University) and visitor utilization studies conducted for the South and North Rims in 1991 and 1992 respectively (Walt Disney World 1992 and Operations Research Consulting Associates 1993). In addition to visitor use patterns, preferences, and problems, the utilization studies also looked at all visitor services, including traffic, parking, transit, trails, lodging, eating facilities, orientation and interpretive facilities, gift shops, restrooms, overlooks, and other areas used by visitors. Exit and overlook surveys were also conducted, and monthly and yearly traffic count data were used.

SOCIOECONOMIC ENVIRONMENT

Impacts on concession services provided to the public were examined in light of the current capability to provide acceptable levels of service as well as anticipated needs under the various alternatives. Potential concession revenues from lodging, food and beverage, merchandise and other services, along with operating expenses and capital expenditures, were analyzed to determine if the proposed actions provided the concessioners with a reasonable opportunity to make a profit, as required by law.

TRANSPORTATION, PARKING, AND TRANSIT

SOUTH RIM

■ Design Days

Instead of planning and designing a road system or other transportation facilities and services to accommodate the demands of visitors on peak days of the year, appropriate design days were selected in order to balance providing an adequate level of service for every (or almost every) day of the visitor season and economic efficiency. For the Grand Canyon design days were selected to size transportation facilities and services for both summer and winter use.

Summer Design Day: Traffic counts for 1990 at the south entrance station were used to select the design day. Total traffic volumes for each day of the year at this location were arrayed from highest to lowest to produce a volume curve, providing an accurate means of estimating both traffic and visitation for a single day as well as other days. Where the slope of the curve changes from sharp to flat indicates a break between the very highest traffic and visitation days from the rest of the days in the year. The initial flattening of the curve appears to occur on the day representing the 10th highest traffic volume total at the south entrance, so this day was selected as the summer design day.

On this day an estimated 5,588 vehicles entered the South Rim (4,470 vehicles through the south entrance and 1,118 vehicles through the east entrance), consisting of 5,124 cars, 327 RVs, and 137 buses. Using an average vehicle occupancy of 3.1 visitors per car and RV and 31 passengers per bus, the estimated visitation on the 1990 summer design day was 21,145.

Winter Design Day: Park visitation varies throughout the year, as shown in figure 7. Peak visitation occurs during July and August, and the lowest visitation occurs during December, January, and February. Because park visitation varies substantially during the summer and winter, winter visitation characteristics were further examined.

Visitation declines steadily through October and November before reaching a low in December and January. Well-defined peaks in visitation are apparent during the Thanksgiving weekend and the week between Christmas and New Year's Day. The low visitation period begins December 1 and runs through the end of February each year.

Traffic volume information from the south entrance station was analyzed, and the day with the 10th highest traffic volume total of the 1992 winter season was selected as the appropriate winter design day.

Based on vehicle entrance and classification data, an estimated 2,543 total vehicles entered the South Rim on the 1992 design day, consisting of 3,177 cars, 203 RVs, and 123 buses. Data show that 80% of the traffic enters through the south entrance (amounting to 2,034 vehicles in 1992) and 20% through the east entrance (509 vehicles).

■ Mode of Arrival

Data on how visitors arrived at the south and east entrances was compiled in 1992 and show that 78.6% of the visitors arrived by car, 11.5% by tour bus, 7.1% by airport shuttle bus, and 2.8% on the Grand Canyon Railroad. Tour bus travel, as well as the number of passengers using the airport bus, has been increasing for the past decade and is expected to continue to do so. The Grand Canyon Railroad operates one train per day from Williams, carrying up to 400 passengers. The company plans to add new rail service between Grand Canyon Village and the Grand Canyon National Park Airport. It is anticipated that there would be eight round-trips per day year-round if this service was expanded.

The mode of arrival during the winter is not expected to be significantly different than what occurs during the rest of the year.

■ Parking

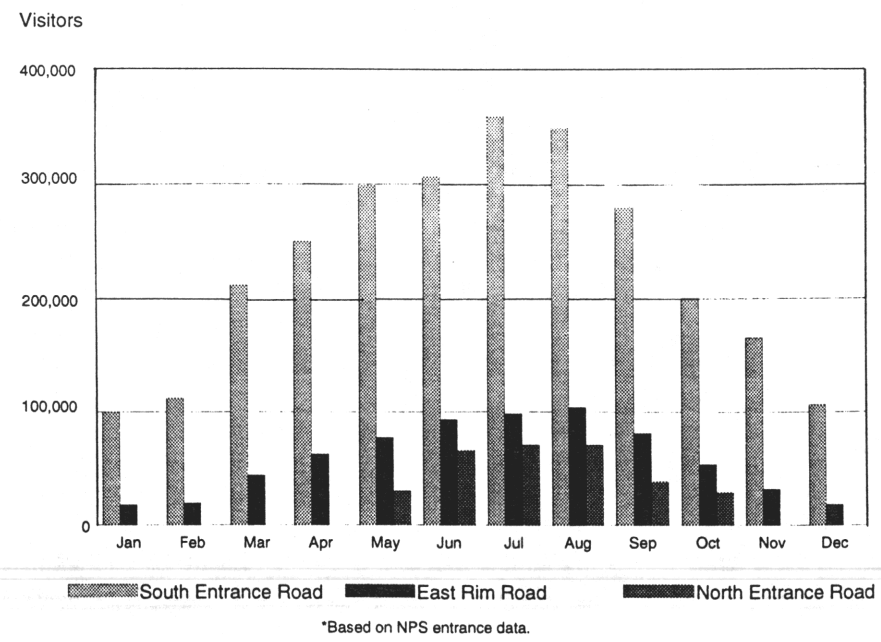
Current parking trends, based on surveys completed during the summer of 1992, were analyzed to determine how parking demand would change under each alternative. There are currently 3,320 parking spaces on the South Rim, including about 2,686 spaces in the village, 494 spaces along East Rim Drive, and 140 spaces at Desert View.

NORTH RIM

■ Design Day

To select the design day for the North Rim, traffic volumes at the north entrance station during 1992 were arrayed in a graph representing a volume curve. The day with the 10th highest traffic volume of the season was selected as the design day. Because the

FIGURE 6: VARIATIONS IN SEASONAL VISITATION



*Based on NPS entrance data.

North Rim is closed to vehicles during winter, only one design day was chosen.

On the 1992 design day there were 1,016 vehicles, consisting of 968 cars, 43 RVs, and 5 buses. Applying vehicle occupancy factors of 3.3 people per vehicle for cars and RVs and 31 passengers per bus (which were established through detailed study), this traffic volume represented about 3,490 visitors.

■ Mode of Arrival

NPS visitation data indicate that in 1992 nearly 96% of the visitors arrived by car or RV and slightly more than 4% by tour bus. The mode of arrival on the North Rim is expected to change slightly because the number of visitors arriving by bus in recent years has increased.

Other Projection Methodologies

■ Projected Traffic Volumes and Levels of Service for Park Roads

Information on current traffic and capacity and levels of service for park roads was obtained from the *Traffic Engineering Operations / Safety Study for Grand Canyon National Park* (Traffic Engineers 1991). This document summarizes 1990 traffic count data from 41 locations on the North and South Rims. The study also projects traffic volumes for major park roads for the years 2000 and 2010.

The level of service analysis was based on 1990 traffic volume data. Future levels of service were estimated based on projected traffic volumes and flow rates established by the 1991 traffic study.

Manual distribution of traffic on the park road system was performed as needed to analyze predicted changes in traffic patterns under each alternative.

■ Transit Projections

Transit demand projections were developed based on current visitation patterns, which were established using data from the "Visitor Use Study" (Operations Research Consulting Associates 1993). Future demand levels were estimated using the anticipated future visitation and mode of arrival to develop factors that were applied to the current demand patterns.

■ Parking Projections

Projections of future parking were determined based on increases in traffic volumes and current parking demands. Information in the "North Rim Visitor Utilization Study" (Operations Research Consulting Associates 1993) was used to predict future parking demands. Manual redistribution of parking was done as required to evaluate the alternatives.

Area Operations

Housing

The most recent planning for housing at the Grand Canyon has focused primarily on Grand Canyon Village. A 1991 housing report for the village identified future needs in a series of alternative plans (NPS 1991a). Subsequent efforts have initiated the construction of 85 single-family homes on Havasupai Street and planning for 200 apartments off Albright Avenue. In all projections for this plan, only the construction of the 85 units on Havasupai Street are considered a given.

■ Housing Characteristics

There are 11 general categories of housing at the Grand Canyon today, ranging from rudimentary tent cabins for part-time workers to single-family homes with two-car garages. As figure 7 illustrates, the predominant housing accommodations are dormitories, followed by apartments, houses, trailer pads, trailers, cabins, duplexes, and former visitor lodging units that have been converted to housing. The parkwide average net density is 8.9 units per acre. By generalizing the housing types into simple categories of single-family house, duplex, apartment, dorm, and trailer pad, future projections for housing were made relative to existing distribution patterns and densities.

■ Substandard Conditions

According to *NPS-76, National Park Service Housing Design and Rehabilitation Guideline,* all trailers used as permanent housing, double- and triple-bunking in dorm rooms or single rooms not designed for more than one occupant, and dilapidated, structurally unsound units are considered substandard housing. All areas of the park currently contain substandard housing that needs to be corrected.

■ Grand Canyon Position Management Plan

The park's "Position Management Plan" identifies current and near-term projected staffing needs for each division in each area of the park. Increased visitation in recent years has created a constant need for additional staff to adequately take care of park resources, facilities, and visitor needs. The increased staff needs have been met in all housing projections because no alternative reduces the need for additional staff.

■ Housing Projection Methodology

Housing Occupancy Planning Factor: Because many Grand Canyon housing units are occupied by more than one park employee, either a spouse and family or roommates, the need to account for multiple occupancy has been addressed. The occupancy planning factor was developed by dividing the peak number of employees residing in each housing type by the total number of units of that particular housing type.

By using the peak number of employees, the projections account for the real needs of the park at critical points in time. If the plans address total numbers of units needed for each alternative during the peak season, then the off-peak season could easily be achieved by redistributing employees in units, eliminating roommates in most instances, and reducing some unit occupancies to single occupancy. The overall effect of the occupancy planning factor is a reduction in the total number of units needed relative to the number of employees to be housed.

Future Employee Projections: New employees would be required under all alternatives as a result of needs identified in the park's "Position Management Plan," the need for new facilities, or the presence of more visitors. Because nearly all park employers currently have the maximum number of employees that they can handle (primarily due to housing shortages), the addition of any new visitor services will require more employees.

New employee projections are based on three assumptions:

(1) If a new facility such as a cafeteria is added, and if the proposed facility is approximately the same size as an existing operation, then the projection for employees is based on the same number of employees required to operate the existing facility.

(2) If visitation is allowed to continue at a relatively constant annual rate, then projections for future employees needed to meet operational requirements related to increased visitation (other than visitor services), such as rangers and maintenance staff, are based on a percentage increase relative to visitation. While projected staff increases are not directly correlated to visitation increases, they have been projected based on a general relationship of staff to visitors.

(3) In all cases, staff increases have been projected according to the existing distribution of personnel across the four following position categories:
- staff level positions
- low-level management (shift supervisor/crew leader)
- mid-level management (foreman/store manager)
- upper-level management (division chief/unit manager)

Housing Type, Distribution, and Density: The projected housing types have been simplified to five general categories: single-family house, duplex, apartment, dorm, trailer pad.

An overall analysis of the South Rim and Desert View housing defined general distribution patterns that have been used in all housing projections as a standard. Table 37 illustrates the general statistics regarding the number of employees in each po-

FIGURE 7: PARKWIDE HOUSING TYPES

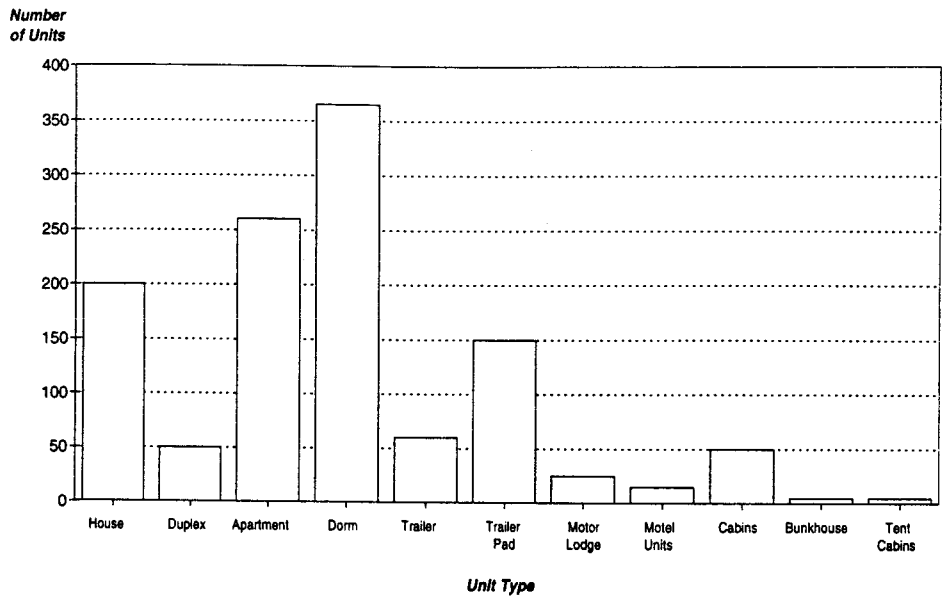


TABLE 37: EXISTING DISTRIBUTION OF HOUSING TYPES

		Existing Housing Types Occupied by Park Residents			
	Percentage of Total Workforce	House	Multi-Family Housing	Dorm	Trailer
Staff	80%	15%	25%	48%	12%
Low Management	13%	42%	23%	14%	21%
Mid Management	5%	80%	16%	2%	2%
Upper Management	2%	96%	4%	0%	0%

sition level and respective housing type that have been used in developing housing projections (multi-family residence includes apartments and duplexes).

Future housing needs have been developed assuming an increase in overall density from about 8.9 units per acre at present to 15 units per acre. The increased density adheres to environmentally sound planning principles, maximizes the use of disturbed land, and causes as little new disturbance as possible. The higher density projections are based on fewer single-family units, trailers, and other low-density units and utilizing more high-density apartment units and dorms. Table 38 outlines the density figures used for future housing projections.

TABLE 38: HOUSING UNIT DENSITY

Housing Type	Average Density
Single-family houses	4 units/ac
Duplexes	7 units/ac
Apartments	16 units/ac
Dorm rooms	40 units/ac
Trailer pads	9 units/ac

COMMUNITY SERVICES

As described in the "Affected Environment," the condition of existing community facilities, and new facilities desired by park residents, were analyzed.

Each alternative addresses where community services would be provided differently, depending largely on where residential development takes place. Under all alternatives existing facilities would be used when appropriate; new facilities would be in locations that best serve the community residents and preserve park resources. In alternatives where new communities are proposed outside park boundaries, final locations for community services are deferred to final plans for those communities.

MANAGEMENT SUPPORT FACILITIES

As described in the "Affected Environment," management support facilities include all those necessary to support park operations on a daily basis (such as maintenance buildings and yards, carpenter shops, warehouses, fleet vehicle repair, offices, and storage facilities). Existing and future needs are presented in the "Affected Environment."

UTILITIES

■ Water

In 1992 water consumption within Grand Canyon National Park was approximately 200 million gallons per day (mgd) — South Rim 180 mgd, Desert View 4.6 mgd, and North Rim 14.6 mgd. To determine the increase in future demand, water use was calculated by assigning specific consumption values to each type of user. For estimating purposes a day user is considered to consume 10 gallons per day (gpd), a lodge guest 65 gpd, a camper 35 gpd, a resident 90 gpd, and a restaurant seat 30 gpd.

The degree of water conservation varies by alternative. For the purposes of analysis, water conservation includes the use of low-flow fixtures and the use of reclaimed water for toilet flush and irrigation. As a minimum, low-flow plumbing fixtures would be installed in all new facilities, and reclaimed water would be used in all facilities where reclaimed water service mains were available.

■ Wastewater

Approximately 90% of all water consumed results in wastewater. It is assumed that the generated wastewater will be primarily domestic. Treatment plant effluent will meet all state and federal code requirements for disposal and all requirements for reclaimed use.

■ Electrical Power

It is assumed that Arizona Public Service will continue to provide power to Grand Canyon Village, Desert View, and Indian Garden. The South Rim power supply system is operating at approximately half of its capacity; the power required for proposed facilities would not impose enough load to jeopardize the capacity of the system. However, line extensions to the new facilities are accounted for under each alternative.

It is assumed that the power system for the North Rim will remain as it is today, with powerlines owned by the Park Service, and electrical power purchased from Garkane Power Association. Again, the power required by new facilities proposed under each alternative will not exceed the power supply capacity.

IMPACTS ON NATURAL RESOURCES

GEOLOGIC RESOURCES, SOILS, VEGETATION, AND WILDLIFE

Long-term effects on the environment can be caused by physically damaging or removing vegetation, and by compacting or otherwise disturbing soils. These impacts can increase soil erosion and dust, destroy wildlife habitat, increase the susceptibility of plants and animals to disease, and generally reduce biotic productivity. The Grand Canyon's arid climate, poor soils, and other factors severely limit the recovery potential for most lands in the park, and it may be impossible for some lands to return to a "natural" condition after disturbance. In certain cases, vegetation disturbance can have positive effects, such as increasing the edge effect for wildlife, and opening up senescent or unhealthy stands to provide an environment for new growth.

Impacts related to any new disturbance of lands as part of construction or other activities would be negative, even with subsequent rehabilitation and revegetation. Past revegetation efforts in the park have shown limited success, with a high degree of maintenance required because conditions favorable to revegetation rarely occur. Even though some disturbed lands through rehabilitation and revegetation may be returned to a semi-natural state, this land is not as valuable as undisturbed land.

The greater the size and intensity of the developed areas in the park, the less valuable the natural or semi-natural areas within the development become as wildlife habitat. Many animals are not able to live in areas where intensive development and human activity predominate. Wide corridors of natural or semi-natural vegetation are required in developed areas to allow for wildlife movement and habitat.

Vehicles and increased numbers of humans along dirt roads could displace or affect reproduction of animals and physically damage plants.

Any required trenching for utility lines, cuts for roads, or building foundations — whether inside or outside the park — could unearth or destroy paleontological resources. Blasting could affect subsurface cave resources and cause landslides at the rim. Site-specific environmental assessments would be required for any trenching or blasting, and the potential to affect paleontological and cave resources would be evaluated and mitigated at that time.

Restoring the natural role of fire in park ecosystems within the constraints of the park's fire management plan would help restore ecological processes and reduce the danger of catastrophic fire.

The use, enlargement, or creation of new borrow pits along corridor trails could also adversely affect vegetation, soils, and paleontological resources and would continue to be a visual intrusion. Hardening the trails to reduce dust and erosion would reduce the need for borrow material. However, native material must be used in the hardening, for example cobbling with native rock. Otherwise, the use of chemicals or cement or other nonnative materials could create more impacts than the problems they addressed. .

Impacts related to stock use and stock trails on the South Rim, North Rim and Corridor Trails include soil compaction, erosion, dust, possible introduction of nonnative plant seeds from feces, the potential for urine and feces to provide a breeding ground for insects and cause changes in soil chemistry and biota near trails and corrals, and changes in wildlife distribution and behavior as a result of interaction with stock. Use conflicts with hikers sometimes result in a gradual widening of the trail to allow hikers and livestock to pass each other.

Roads in general form barriers for wildlife. Some disruption of wildlife habitat and road kills can be expected with the construction of new roads or the realignment of existing roads, depending on design and vehicle speeds. The slower the speed allowed, the less potential for road kills, but steady traffic would displace some species.

Paved trails would increase runoff (with the possible addition of nonnative surfacing materials or chemicals into the environment) and impede drainage in some areas; these impacts would be mitigated through design techniques. Unsurfaced trails would probably have fewer direct impacts, but they could result in more erosion (especially if mud pools occurred), and visitors might be more likely to stray off the treadway and cause impacts on adjacent soils and vegetation. Formalizing some paths would reduce the number of informal trails and allow trampled areas to be revegetated, eventually decreasing runoff and erosion. Constructing new trails in previously undisturbed areas would increase human presence, as well as trash or human waste, and reduce the value of wildlife habitat.

Adding toilets would generally reduce human waste and trash impacts.

WATER RESOURCES

Any increase in groundwater use in the vicinity of the park would probably impact water resources in the canyon because it is the ultimate drain for virtually all water in the area. Well drilling in communities or developed areas near the park, like Tusayan, Valle or Kaibab Lodge, could reduce or eliminate the flow of springs in the park. Information gained through expanded water monitoring would improve the park's ability to protect water rights and water resources. The National Park Service would seek to limit any potential adverse effects by working with the state of Arizona and other entities outside the park, and by monitoring water resources.

Impacts from the park water withdrawals for administrative purposes to Roaring Springs, and to Bright Angel and Garden Creeks would be no greater than current impacts, and might be reduced if modifications to the transcanyon waterline or alternative water sources were successfully implemented.

Because there are no viable alternatives for moving many existing inner canyon structures out of floodplains, a floodplain statement of findings for existing facilities at Phantom Ranch, Indian Garden, and Cottonwood will be prepared and included in the final general management / environmental impact statement.

Adding toilets or replacing existing toilets with water-conserving models would reduce impacts on water resources from human waste.

AIR QUALITY

Dust raised by vehicle traffic on dirt roads would adversely affect local air quality and could reduce productivity of plants along roads. The magnitude of the effect would depend on the road substrate, the amount of vehicle traffic, and climatic conditions that cause dust generation and movement. Because some dust suppression techniques can cause environmental impacts of more concern than the dust, site-specific environmental studies would be needed before such techniques were used.

The bulk of air pollution in the Grand Canyon area is transported into the region from major industrial areas; ongoing programs would continue to try to protect park and regional air quality from these distant sources.

Selecting new NPS and concession vehicles that meet strict air pollution standards would improve local air quality over the long term. Requiring buses to turn off their engines while parked or loading/unloading passengers would reduce local emissions.

NATURAL QUIET AND SOLITUDE

No motorized winter use would be allowed within the park on the North Rim, allowing continued winter opportunities for natural quiet and solitude.

Selecting new NPS and concession vehicles that meet strict noise pollution standards would reduce vehicle noise intrusions locally. Requiring buses to turn off their engines while parked or loading/unloading passengers would reduce local emissions.

VISUAL RESOURCES

The Park Service would maintain visitor safety with adequate lighting in developed areas. All new lighting would meet Coconino County exterior lighting standards for shielding to reduce effects on night sky and visibility from other park areas.

IMPACTS ON CULTURAL RESOURCES

ARCHEOLOGICAL RESOURCES

Direct impacts on archeological sites would be variable and closely related to specific kinds of proposed actions. Construction activities would affect the uppermost strata because vehicles would compact the soils and alter distribution and stratification of artifacts. If all materials were on the surface, the site's value would be destroyed. Excavation for new development would alter the position of artifacts and other cultural materials at a greater depth. Paving would temporarily seal archeological resources and protect them from additional damage; however, construction activities that precede paving and the weight of paving materials would alter original site conditions. Removing structures or roads from the top of sites would result in additional disturbance beyond the effects of original construction.

Changed drainage patterns can change soil moisture, adversely affecting the natural preservation of fragile archeological materials. Increased visitation in areas with previously low visitation could have an indirect effect on nearby sites through illegal collection activities.

Until exact locations were selected and preliminary designs were available for new construction, it is not possible to project all direct effects on archeological resources. Direct impacts on archeological resources would be avoided to the extent possible through consultation at the design stage between planners, designers, and the park's archeological office. If sites could not be avoided, mitigating measures, including excavating and recording sites, would be carried out in consultation with the state historic preservation officer and the Advisory Council on Historic Preservation.

If previously unknown archeological resources were uncovered during construction, work would be stopped in the discovery area, and the National Park Service would comply with 36 CFR 800.11 and applicable provisions of the Native American Graves Protection and Repatriation Act of 1990.

ETHNOGRAPHIC RESOURCES

Because American Indian tribes are reluctant to divulge the location of sacred sites and other ethnographic resources for the purposes of this plan, project-specific consultation would be undertaken during implementation phases. If during those consultations ethnographic resources were found to be affected by the project, every effort would be made to avoid that resource. If sites could not be avoided, mitigating measures would be developed in consultation with the interested tribe, the state historic preservation officer, and the Advisory Council on Historic Preservation, as stipulated in 36 CFR 800. Under all circumstances, the locations of sacred sites and other important ethnographic resources would be maintained as fully confidential.

HISTORIC STRUCTURES AND LANDSCAPES

The Tuweep ranger station should be evaluated to determine its eligibility for listing in the National Register of Historic Places since it is more than 50 years old. If the station was determined to be eligible for listing, its rehabilitation and the expansion of its water system could constitute an adverse impact on a historic property.

IMPACTS ON THE VISITOR EXPERIENCE

Dust and odors caused by stock use on the corridor trails would be an adverse effect on the experience of some hikers.

IMPACTS ON AREA OPERATIONS

UTILITIES

■ Water

For this analysis it is assumed that Roaring Springs would remain the sole source of water for park developed areas except Tuweep, and that the water is of reasonable quality, with disinfection, for potable consumption. However, this source has not met all requirements for safe drinking water under all conditions. The Park Service is working with appropriate agencies to consider alternative methods of meeting the requirements. The most feasible approach to meeting drinking water standards would be implemented and would occur under each alternative considered in this document.

Portions of the transcanyon waterline may be nearing their useful service life. Plans are underway to replace the troubled portions of line between Phantom Ranch and Cottonwood Camp. The replacement or repair of the waterline is considered as a common action under all alternatives as being necessary to provide water service to all park developments except the North Rim. However, the park could consider other water supply options in environmental compliance and planning documents subsequent to this plan.

The existing fire protection system at Desert View requires upgrading. Additional water storage and booster pumping capability are required and are included in all alternatives.

The North Rim transmission line supplying water from the Roaring Springs pumphouse to the North Rim needs repair. The transmission line will either be replaced or repaired under all alternatives.

At Tuweep the existing water cistern (rain catchment) system is undersized for the needs of the ranger residence. Also, a residence for the proposed seasonal ranger does not have water service. All alternatives include provisions for expanding water catchment to supply the needs of both residences.

■ Wastewater Treatment

The Desert View wastewater lagoons are currently undersized to meet present demands. Expansion is required under all alternatives; however, the extent of expansion would vary by alternative.

The existing septic system on the North Rim would remain the sole wastewater treatment system during winter months. The activated sludge wastewater treatment facilities used during summer would need to be expanded under all alternatives to meet the peak daily flows.

Effluent at the septic system for the Tuweep ranger residence surfaces, required repair. Also, a septic system must be provided for the proposed seasonal ranger residence. These septic system improvements at Tuweep would be required under all alternatives.

■ Electrical Power

It is assumed that power to the Tuweep ranger residence would continue to be provided through solar panels, with auxiliary power provided by a propane-fueled generator. The power supply would require expansion to support the needs of the seasonal ranger residence.

■ Telephone Service

It is assumed that telephone systems throughout the park would remain the same during the life of the general management plan, with ownership by the Park Service, U.S. West, and Grand Canyon National Park Lodges. The NPS system requires expansion and telephone line upgrades to handle the number of phone calls received. It is assumed that repair of the existing phone lines would be made under all alternatives.

The park is investigating cellular phone service for Tuweep. Once a solution has been identified, phone service would be provided under all alternatives.

Impacts on Natural Resources

In addition to the impacts that would be common to all alternatives, the no-action alternative would have the following effects.

Regional Effects

■ **Species of Special Management Concern**

Outside the South Rim: Due to unlimited visitation, longer lines at entrance stations could cause some visitors and residents to seek alternative ways to enter the park, specifically by using USFS Roads 302/307, and 328. Increased use of these road corridors could adversely affect the species listed in table 9 in the "Affected Environment." Impacts would be similar to those described for dirt roads under "Impacts Common to All Alternatives."

Outside the North Rim: Increased visitation to lands north of the park could also result from unlimited park visitation, with potential to indirectly affect species listed for outside the North Rim in table 9. Impacts to these species would be similar to those described for dirt roads under "Impacts Common to All Alternatives."

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Outside the South Rim: Increased vehicle use on USFS Roads 302/307 and 328 would have effects as described for dirt roads under "Impacts Common to All Alternatives." Greater recreational use of lands south of the park could increase impacts to other ecosystem components.

Outside the North Rim: Increased visitation on lands north of the park could result from unlimited park visitation. increasing use of access roads to Tuweep would increase dust along the roads, which even at current use levels can often be seen for several miles. Impacts would be as described for dirt roads under "Impacts Common to All Alternatives."

Crowded conditions at Tuweep and Bright Angel Point would probably increase pressures for camping and recreation on public lands outside the park managed by the Forest Service and Bureau of Land Management.

■ **Water Resources**

Outside the South Rim: Excess potable water could continue to be sold to Tusayan as long as park resources or visitors were not adversely affected; therefore, there would be no adverse impacts.

Reclaimed water would continue to be used by the Forest Service south of the park for livestock or wildlife consumption. This would tend to increase grazing impacts near water sources and would probably change wildlife species composition and density on both sides of the park boundary.

Outside the North Rim: Unlimited visitation could increase pressure to develop additional water sources, such as wells, north of the park boundary. Such development could indirectly affect park water resources.

■ **Air Quality**

Outside the South Rim: Air pollution would increase locally due to more vehicles and the lack of enforcement of emission standards for commercial vehicles. Limited use of public transit would have no appreciable effect in reducing pollution. Smoke from campfires and wood stoves could also create localized pollution problems under certain atmospheric conditions.

Airborne dust from increased use on USFS Roads 302/307 and 328 would reduce local air quality. Even at current levels of use, these roads often generate considerable dust from motorized use.

Outside the North Rim: Effects on air quality would be similar to those discussed for outside the South Rim.

■ **Natural Quiet and Solitude**

Outside the South Rim: The Park Service would continue to address aircraft overflight issues, which could affect expansion of the airport in Tusayan. Unlimited park visitation could increase pressures for expansion, which could increase noise levels near and possibly in the park.

Noise from vehicles would increase with unlimited visitation, and vehicle noise would dominate the audible environment in many areas. While enforcement actions might be taken in response to complaints, these would likely be limited.

Outside the North Rim: Noise from vehicles would increase with unlimited visitation as described for outside the South Rim.

■ **Visual Resources**

Outside the South Rim: The visual aspects of park entrance corridors would depend on the efforts of outside entities. Unrestricted development outside the park could adversely affect the visual quality along entrance roads.

Outside the North Rim: Effects would be similar to those described for outside the South Rim.

Parkwide Effects

■ **Species of Special Management Concern**

These species would continue to be protected on a case-by-case basis, with limited research or recovery programs. The success of such programs would depend primarily on the level of effort of persons and agencies outside the Park Service, as well as the particular circumstances of each species. Ensuring the long-term viability of certain populations would be more difficult with a case-by-case, species-specific program than with an ecosystem approach.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Fishery management programs would maintain the current mix of fish species, including the perpetuation of nonnative species and the resulting changes to the park's aquatic ecosystems.

The Park Service would continue to manage ecosystem components primarily to address immediate problems, with little direction, inconsistent funding, and limited research. Generally, only acute or high profile problems would be addressed, usually on a case-by-case basis or in response to a crisis. The lack of a coordinated plan and approach would hinder efforts to protect park ecosystems over the long term.

Periodic surveys to identify and remove hazardous trees would control the most serious hazards, but they would not address the causes of the problem. Disturbed areas would be revegetated or rehabilitated as funds became available.

Without a program to propagate native and self-sustaining plants from local genetic material, nonlocal plant stock would probably have to be used in revegetation efforts, which could adversely affect the genetic integrity of park ecosystems.

Nonnative species would proliferate in the absence of a management program to remove or replace them. The long-term effect would be to displace native species.

Existing impacts on vegetation, wildlife, and soils would continue. To the extent that existing uses are degrading soils and vegetation, or disrupting wildlife, long-term loss of habitat would result.

■ **Water Resources**

Impacts are described for specific areas or under "Impacts Common to All Alternatives."

■ **Air Quality**

Air pollution would increase locally due to increasing vehicle numbers and the lack of enforcement of emission standards for commercial vehicles. Limited use of public transit would have no appreciable effect in reducing pollution. Smoke from campfires and wood stoves would also continue to create localized pollution problems under certain atmospheric conditions.

Localized pollution problems in parking lots and along roadsides would continue to worsen under the no-action alternative as visitor use increased. Diesel buses often create exhaust problems for people standing beside park roads, particularly as they begin to accelerate up grades. Also, vehicles idling or driving slowly through congested areas and parking lots have higher emission levels than those running at 35 to 55 miles per hour. Local air pollution problems would also be affected by employees driving to work.

■ **Natural Quiet and Solitude**

The Park Service would continue to address aircraft overflight issues, but other noise sources would be addressed on a case-by-case basis, generally in response to complaints.

Train whistles would continue to be heard in the wilderness and other areas of the park outside Grand Canyon Village, including Indian Garden and Phantom Ranch, detracting from a sense of solitude for backcountry visitors.

Because noise standards for commercial vehicles would be enforced only in response to complaints, only the worst vehicle noise problems would be addressed. Noise from vehicles would continue to intrude on natural quiet and solitude throughout most developed areas.

Reflections from vehicles in rim parking lots would continue to be visible in park wilderness areas, intruding on a sense of solitude.

■ **Visual Resources**

In addition to impacts that would be common to all alternatives, limited maintenance and vista clearing at overlooks would correct only the worst adverse impacts from overuse and disturbance, leaving some view obstructions and an impacted appearance in many locations. Also, disturbed areas would not be revegetated or rehabilitated in any systematic manner, which would continue to intrude upon visual quality. Private vehicles would continue to dominate the views of high use areas, detracting from views of park resources.

SOUTH RIM

■ **Species of Special Management Concern**

In addition to the parkwide effects, while the endangered sentry milkvetch would continue to be protected by fencing, substantial numbers of visitors and vehicles would remain adjacent to the fence. Some visitors would continue to climb the fence and impact the milkvetch.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Increased visitation would result in more roadside parking near the rim, increasing resource damage there as visitors venture off designated trails and gradually create more and more informal trails. As a consequence, damage to plants, erosion, soil compaction, and disturbance to wildlife habitats would all increase.

The construction of approximately 200 housing units between Pinyon Park and the current NPS maintenance area would disturb up to 30 acres of vegetation, soils, and wildlife habitat. This would increase the footprint of Grand Canyon Village and decrease the natural habitat within the village area. This would also require trenching or blasting for utilities and building foundations, which could impact paleontological or cave resources as discussed under "Impacts Common to All Alternatives."

Road construction and trenching or blasting for utility lines would be limited, except in the area where the 200 additional housing units would be constructed, so impacts to paleontological and cave resources would be limited.

With the exception of the paved trail between the Yavapai observation station and Maricopa Point, all rim trails and most forest trails would remain unpaved and often poorly defined. The creation of multiple, informal trails would continue throughout all South Rim developed areas. Virtually all of the forest within developed areas would continue to be further impacted by humans, reducing its value as wildlife habitat.

■ **Water Resources**

Although potable water use in the park would increase, no additional storage would be needed. Existing storage tank and water distribution system acreages would remain impacted, but no additional impacts would occur on the South Rim. The increased demand would be met by increased pumping from Indian Garden, increased water conservation measures, and limited water system improvements. This would reduce overflow at Indian Garden, resulting in positive impacts there, but could result in trenching and other impacts that would be evaluated in site-specific environmental compliance documents.

The absence of baseline data for water resources would make it difficult to make informed management decisions, or to assess the effects of management actions on water resources.

Reclaimed water would continue to be used in the park for landscape irrigation and vehicle washing, supplied to the U.S. Forest Service, or released into Bright Angel Wash. It is possible that reclaimed water released into Bright Angel Wash percolates into groundwater feeding springs in the canyon between Indian Garden and Hermit Basin. The amount that does not percolate downward creates a riparian wetland along the wash.

Providing additional toilets in high use areas would reduce negative impacts resulting from human waste.

The addition of approximately 200 housing units along Albright Avenue and 85 units near the clinic would increase runoff from hard surfaces and alter drainage patterns in areas where stormwater drainage is not now a concern.

■ **Air Quality**

In addition to parkwide effects described above, the use of trains for transportation into Grand Canyon Village would continue to contribute localized emissions. These emissions would be less for some pollutants and greater for others if train passengers had used private vehicles in lieu of the train (depending on the type of locomotive and types of other vehicles visitors might have otherwise used; USDA et al. 1993).

■ **Natural Quiet and Solitude**

Unlimited visitation would likely increase noise levels in developed areas as people, vehicles, and congestion increased. Train whistles and bells would continue to be heard in Grand Canyon Village, which some people view as a positive effect and others negative.

■ **Visual Resources**

The current mix of historic and nonhistoric structures and landscapes would be retained, resulting in inconsistent and often conflicting visual perceptions. The deterioration of many structures, human disturbance, clutter, and automobiles would continue to dominate the visual landscape in many developed areas.

Shielding new outdoor lighting would ensure that light intrusions on the night sky did not worsen. However, existing lighting would not be shielded, detracting from night sky viewing opportunities in many developed areas. Unshielded lights close to the rim would also be visible from within wilderness areas of the park or from the opposite rim of the canyon.

Disturbed areas would not be revegetated in any systematic manner. Vehicles would continue to dominate much of the scenery of the village, the East Rim overlooks, the Tusayan museum, Desert View, and, during the off-season, the West Rim overlooks. In the village the power substation, overhead lines, exposed trash dumpsters, and warehouse/maintenance/service activities in the old powerhouse area would continue to be negative visual intrusions. The character of the village historic district would continue to be compromised by noncontributing structures and nonhistoric landscaping.

NORTH RIM

■ **Species of Special Management Concern**

Effects would be similar to those described under parkwide effects.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

In addition to parkwide effects discussed above, increased day visitation and overflow parking along roadsides would result in more trampling of vegetation and compacting of soils, especially in high use areas like the Grand Canyon Lodge. Social trails and trash would also increase near high use areas.

Constructing a gravel parking lot in a previously disturbed area on CC Hill, and grading the access road, would cause minimal new impacts.

Retaining the unpaved pedestrian trail system would continue minor soil compaction, erosion, trash, and disruption of wildlife due to human presence.

Upgrading and using the existing housing at the entrance station would increase human presence in that area, with a minimal effect on wildlife. Replacing substandard housing units on Bright Angel Point would be limited to already disturbed areas, but there may be minimal additional disturbance of vegetation and soils. Sewage treatment plant expansion would require about an acre of already disturbed land.

■ **Water Resources**

In addition to parkwide effects, runoff would increase from the CC Hill parking area and housing areas. Measures would be taken to retain this runoff to prevent any additional erosion to surrounding areas.

While additional water would be needed to serve more visitors, no new water facilities would be needed, so there would be no additional impacts. Additional water demand would be met by increased water conservation measures and limited water system improvements.

■ **Air Quality**

Effects on the North Rim would be the same as described under parkwide effects above.

■ **Natural Quiet and Solitude**

In addition to the parkwide effects described above, the North Rim would continue to offer more opportunities for natural quiet and solitude than the South Rim, with only localized noise sources near developed areas and roads. Access to wilderness, where natu-

ral quiet and solitude are important components, would also continue to be readily available on the North Rim. However, increasing numbers of vehicles and people would result in more noise and less solitude, especially on Bright Angel Point. Enforcing noise standards only in response to complaints would deal only with the most serious noise intrusions.

■ **Visual Resources**

In addition to parkwide effects described above, increasing numbers of vehicles would increasingly dominate the visual aspects of all the high use areas, especially around the Grand Canyon Lodge.

TUWEEP

■ **Species of Special Management Concern**

The species listed in table 9 for Tuweep (see the "Affected Environment" section) occur outside major visitor areas. While unlimited visitation could increase pressure for hikers to start visiting new locations, impacts radiating out from existing visitor attractions would become severe before hikers began to impact these species. The Park Service would take action before such impacts occurred.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

A large increase in day visitation would result in increased parking along roadsides, especially near the Toroweap overlook. Impacts would be similar to those described for the South Rim above, however more severe because there are few existing road shoulders and environmental conditions preclude a rapid recovery. Although no road improvements would be undertaken, roadside parking would gradually widen the roadways.

The number of backcountry permits issued for the Tuweep area would also probably increase, with accompanying impacts on vegetation, soils and wildlife in the backcountry areas.

Enlarging the septic and water catchment systems would disturb alluvial deposits and vegetation near the ranger station; however, most of this area has been previously disturbed.

■ **Water Resources**

In addition to those impacts common to all alternatives, some of the slickrock in the campground and the Toroweap overlook areas support ephemeral pools after rainstorms or snowmelt. A small number of these pools could be adversely affected by roadside parking and increased human activity, especially with unlimited day visitation.

Converting pit toilets to composting models would mitigate any existing impacts to groundwater. Enlarging the septic and water catchment systems for the ranger station would not affect runoff or groundwater.

■ **Air Quality**

Dust effects from access roads would be the same as regional effects above. Smoke from campfires dissipates over the nearby canyon rim and is no more than a very localized air pollution concern.

■ **Natural Quiet and Solitude**

Increased noise from vehicles and humans would adversely affect natural quiet and solitude, especially during congested times. During peak times over 40 cars (130 visitors) have been counted at the Toroweap overlook. All these people at this one overlook creates a highly social rather than solitary experience which is likely to worsen with increased visitation in the future.

■ **Visual Resources**

Outside the park the adjacent airstrip detracts from the area's natural character. Private vehicle parking at the Toroweap overlook, along roadsides, and in the campground would continue to intrude on the views of arriving visitors within the park. The scars created by roadside parking would be essentially permanent, and would continue to detract from the area's natural character. Disturbed areas at both the overlook and the campground would continue to need rehabilitation and revegetation. Old irrigation scars across from the ranger station also detract from the natural landscape.

CORRIDOR TRAILS

■ **Species of Special Management Concern**

Human presence and disturbance on the corridor trails would increase due to unlimited visitation, but the species listed in table 9 are not expected to receive any additional impacts as impacts would continue to be confined close to the trails.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Impacts of mule use would continue as discussed under "Impacts Common to All Alternatives." The North Rim stock concessioner is implementing measures to harden trails and construct bypasses that would reduce impacts from current levels on the North Kaibab Trail. These actions would be evaluated in a separate environmental compliance document, as appropriate; however bypasses would require widening the trail, resulting in impacts on soil and vegetation.

Mule use on the North Rim could be expanded if warranted by visitor demand, which could negate many of the gains made by mitigation. The upper section of the North Kaibab Trail is the most heavily impacted in the park now, with extensive dust, pools of mule urine, and difficult areas for passing. This section is expected to continue to be the most impacted, even if impacts were reduced by mitigation measures and use did not increase.

Mule use, with accompanying impacts, could also increase on the South Kaibab Trail if more pack mules were used to carry visitors' packs. Mule use and impacts on the Bright Angel Trail are expected to remain relatively constant, although day hiker numbers are expected to increase dramatically on these South Rim trails.

The need for borrow material used to maintain the corridor trails, primarily to repair damage caused by mules, would increase, resulting in the enlargement of existing borrow pits and the creation of new ones as existing material was used up. Some parts of the corridor trails already have extensive borrow pit impacts, and it is becoming increasingly difficult to find new borrow sources that do not seriously affect park resources or the visitor experience on the trails. Paleontological resources could be impacted, as well as vegetation and soils, due to borrow pits.

Impacts related to camping and lodging at Indian Garden, Cottonwood campground, and Phantom Ranch would be confined to currently disturbed areas with current use levels continuing. All visitor service facilities and employee housing would also be retained in their current locations, with the only changes being replacement of four substandard concession housing units in their existing locations.

Unlimited day hiker use could affect vegetation and soils as hikers stray away from the trail to bypass other hikers and mules. It could also increase trash and human interaction with wildlife. Increased use could also be extended to the Hermit and Grandview trails, increasing human waste, trash, interactions with wildlife, and human-caused erosion.

■ **Water Resources.**

The park's domestic water system would continue to draw approximately 800 mgd from Roaring Springs (or about 20% of the base flow). No minimum flows would be established for Bright Angel Creek, so during drought years withdrawals could bring streamflows well below historic low levels, with significant impacts to the creek ecosystem.

The transcanyon waterline would remain the primary distribution line and would be upgraded as needed, depending on the results of planning and environmental analysis conducted subsequent to the general management plan. Treated water would continue to overflow into Garden Creek, increasing its volume and changing its chemistry and biota. To meet expected demands for water on the South Rim, the pumps at Indian Garden would operate longer, so water would overflow less often than current conditions. However, this would make stream fluctuations even more dramatic, and probably even more damaging to the ecosystem of Garden Creek.

The use, enlargement, or creation of new borrow pits along corridor trails could change drainage and erosion patterns.

Converting all toilets to composting toilets and adding toilets in areas along the trail and at major trailheads would decrease human waste impacts to water and other resources.

Private and concession mules would continue to cross and contaminate Garden Creek, Pipe Creek, Bright Angel Creek, and the area below Roaring Springs.

■ **Air Quality**

Dust from mule-caused erosion and the odor of mule waste on trails would continue to degrade air quality for trail users. Smoke from wood fires at Phantom Ranch and Indian Garden in the winter would continue to affect air quality under some climatic conditions.

■ **Natural Quiet and Solitude**

More day hikers would increase noise levels along corridor trails, trail congestion, and reduce opportunities for solitude.

■ **Visual Resources**

More and larger borrow pits along trails would detract from their natural character. In some areas borrow pits already dominate the scene along the side of the trails.

Conclusion

Existing impacts on natural resources related to visitor use would continue and would increase with greater visitor use. Impacts on vegetation and soils would be most severe in developed areas and along roads and trails. Environmental conditions in most places in the park make it very difficult to rehabilitate and revegetate disturbed areas, resulting in an environment that would become more and more degraded over the long term.

Cumulative Effects

The larger the overall footprint of development and the smaller the natural habitat within that footprint, the greater would be the contrast between the natural environment outside developed area and the species and ecology inside and on its edges. The cumulative trend for the South Rim and North Rim developed areas as well as the roads leading to those areas is for increasing development to serve increasing numbers of visitors. These areas will continue to be increasingly influenced by humans and less and less natural due to the effects of unlimited visitation and the impacts and pressures for development it causes.

Impacts on Cultural Resources

Archeological Resources and Traditional Cultural Properties

■ Regional Effects

Archeological and traditional cultural properties would continue to be researched and preserved following state and other relevant regulations by each independent management entity. There would continue to be limited collaboration with the Park Service.

Archeological sites and traditional cultural properties would continue to receive impacts along USFS Roads 302/307 and 328 as use in those areas continued to increase.

■ Parkwide Effects

The approach to data collection on archeological sites and traditional cultural properties would be on a case-by-case basis in response to project needs. There would be limited context in which to evaluate resources. There would be no concerted effort to nominate properties to the National Register of Historic Places, except as needed for specific projects. Therefore, all archeological resources and traditional cultural properties would be considered significant unless proven otherwise. It would not be possible to plan holistic approaches to the preservation of sites, especially in mitigation efforts, which rarely can directly address pertinent research questions. The park would continue to add to its collections without the ability to synthesize data.

Because the approach to data collection for traditional cultural properties would be on a case-by-case basis in response to project needs, there would be a continuing need to consult frequently with all American Indian groups on every project that arises. Some sites could be disturbed or their sacred or traditional values compromised because planning would be reactive to immediate problems. Preproject planning could be so site-specific that it might not be possible to completely avoid the traditional cultural properties. Adverse effects could become apparent only over the long term, and after the effects had occurred, due to an inability to predict impacts through long-term, holistic planning.

Illegal collection would continue to be a major problem in backcountry areas of the park due to a lack of a systematic inventory and monitoring program.

Impacts to resources throughout the park are difficult to predict as development continues in response to visitor demands. Archeological mitigation would proceed without the benefit of a broader research framework.

■ South Rim

As visitation increased, indirect impacts to archeological sites and traditional cultural properties would increase. The lack of formal trails in areas of high visitation will cause indirect impacts to an undetermined number of sites and properties along the rim.

Grand Canyon Village: Proposed housing south of Albright Circle would cause direct or indirect impacts to four known archeological sites. Additional toilets in the Tusayan Ruins area could potentially affect archeological sites. There would be no other planned impacts to archeological sites along the South Rim, although impacts could occur in the future as the Park Service implemented unplanned development in response to specific problems. The village area is an area that the Havasupai traditionally used for subsistence, residential and religious purposes. There are probably a number of significant traditional cultural properties within the area that could be affected by unplanned development.

Desert View: There would be no effects on archeological sites or traditional cultural properties in the Desert View area, although impacts may occur in the future as NPS implements unplanned development in response to specific problems.

■ North Rim

The lack of planned trail systems on the Walhalla Plateau may pose indirect impacts to the plentiful archeological sites and potential traditional cultural properties in the area. There would be no other planned impacts to archeological sites or traditional cultural properties on the North Rim, although effects could occur in the future as the Park Service implemented unplanned development in response to specific problems.

■ Tuweep

Archeological sites in the campground would continue to receive indirect impacts. There would be no known affects to traditional cultural properties at Tuweep.

■ Corridor Trails

Archeological sites and traditional cultural properties along the corridor trails would continue to receive indirect impacts from illegal collection and erosion. A potentially sacred area near Cottonwood campground would continue to receive uncontrolled visitation. The replacement or upgrading of a water main from Roaring Springs to the South Rim could affect at least one archeological site containing human remains.

■ Conclusion

At least four archeological sites would receive adverse effects from planned housing development south of Albright Circle. Facilities development on an as-needed basis would continue to cause direct and indirect impacts to an unknown number of archeological sites and traditional cultural properties. The lack of a systematic research plan and ethnographic surveys would result in the failure of archeologists to place mitigative actions within an appropriate research context, with a resultant loss in information. The lack of monitoring and preservation programs would make it difficult to determine the nature of cumulative impacts, and loss of resources would not be understood until a specific action is planned that may affect it.

■ Cumulative Effects

Cumulative impacts of the no-action alternative on archeological sites and traditional cultural properties are difficult to analyze, as no long-term monitoring program has occurred in the developed areas at the park. It is presumed that the closer large groups of people are to a given archeological site, the more likely the possibility of degradation caused by erosion, casual collection, and deterioration to features such as rock walls.

Repair and maintenance of proposed facilities near archeological sites would increase the likelihood of inadvertent, eventual damage to the sites. Facilities such as utility lines or roads could clip the edges of sites, resulting in a slow "whittling-away" of resources over time as broken lines are repaired and road alignments changed to accommodate differing sized vehicles. Even controlled excavation of sites damages them as current methods, technologies, and research emphases cannot anticipate the needs of future researchers. Therefore, data recovery is usually regarded as only a last-resort option to preservation in place.

The more people there are near sacred sites, the less suitable the site becomes for sacred uses. An occasional non-Indian visitor might not affect a site's sacred values, but repeated visitation over time, even of limited numbers, could eventually make the site unsuitable for any traditional activity. The inability to identify and protect those sites through long range planning and consultation with American Indians could result in cumulative impacts that would ultimately destroy the value of the properties.

Historic Structures and Landscapes

■ Regional Effects

Historic structures and cultural landscapes would be inventoried, evaluated, and preserved by each separate land management entity, following the national register regulations and guidelines, with little or no support from the Na-

tional Park Service either for preservation or interpretive endeavors.

■ **Parkwide Effects**

At the present time Grand Canyon National Park has no comprehensive program for cultural resource preservation. Hence, the limited and piecemeal approach to cultural resource research and preservation would continue, and historic structures and cultural landscapes would continue to deteriorate. Small changes, undertaken without reference to an overall program, would continue to accumulate and in some cases would damage the integrity of some resources. Cultural landscapes would continue to deteriorate as a result of continuing efforts to manage ever-increasing numbers of visitors. This deterioration is particularly evident at Desert View where fencing has been used extensively around significant historic structures to control crowd movement.

As budgets permit and needs arise, national register evaluation work would continue, and planning would be conducted on a case-by-case basis, but such efforts would not enable the Park Service to preserve cultural resources in a manner consistent with its *Management Policies.*

■ **South Rim**

One historic district and four individual buildings on the South Rim are designated national historic landmarks. In addition, two historic districts and two individual properties are listed in the National Register of Historic Places, and one historic district has been determined eligible for listing. Each of these properties, with the exception of the Grandview Mine and Orphan Mine historic districts, would continue to be used for park administration or operations purposes, or for concessioner services. Routine maintenance of these properties would continue, as would monitoring for structural deterioration. Structures that do not contribute to the significance of the historic landscape (e.g., Kachina and Thunderbird Lodges, several buildings in the powerhouse area, and the gift shop/deli at Desert View) would continue to compromise resource values. Nonhistoric uses of national historic landmark properties, such as Hermits Rest, Lookout Studio, and the Watchtower, would continue.

At the present time most village historic structures possess a high degree of integrity. However, some structures are deteriorating, and their integrity is becoming increasingly compromised. This deterioration would be expected to continue.

The cultural landscape is deteriorating on a continuing basis. Nonhistoric plant species and expanding irrigation systems continue to alter the cultural landscape.

Although a new storage facility is proposed, the park archival and museum collections would continue to be housed in dispersed and inadequate facilities.

■ **North Rim**

Properties listed on the National Register of Historic Places would continue to be used for park and concessioner operations. Routine maintenance of these properties would be conducted, except for the exterior of the frame cabins, which would be boarded up and allowed to deteriorate naturally (an adverse effect). Selective monitoring of the historic buildings for structural deterioration would continue. Planning efforts would be undertaken on an ad hoc basis.

■ **Tuweep**

The cluster of buildings comprising the ranger station at this remote site along the North Rim would continue in its present use. Routine maintenance would be performed on the structures on an as needed basis. As time and budget permitted, the ranger station would be evaluated to determine its eligibility for listing in the National Register of Historic Places.

■ **Corridor Trails**

The corridor trails are included in the Cross Canyon Corridor Historic District listed on the National Register of Historic Places. Structures along the trails, including those at Indian Garden and Phantom Ranch, would continue to be used for park and concessioner operations. Maintenance would occur as needed on trails and structures along the corridor. Trail maintenance activities and heavy trail use, especially by mules, would continue. The landscapes at Indian Garden and Phantom Ranch would continue their cluttered appearance, resulting from random piles of rocks, attempts to channelize watercourses, and erosion control efforts consisting of gabions and mesh.

Impacts on the Visitor Experience

Regional Information and Services

Regional, national, and international information about planning a trip to the park would continue to be limited.

Flagstaff and Kanab would continue to provide regional information to visitors, however, NPS personnel would not be present at these information facilities. The two joint information centers at Jacob Lake and Williams, which currently have an NPS presence, would continue helping visitors with trip planning and encouraging use patterns that better distribute visitors to attractions both in the park and on U.S. Forest Service lands. Without NPS funding to expand the Jacob Lake information center, the facility would become overcrowded and not all visitors requesting assistance could be helped.

More and more visitors would be disappointed to find out after they arrived on either the South Rim or North Rim that lodging was not available or that dining in the park could entail long waits. Visitors would continue to be frustrated by not being able to get park trip planning information by phone and by the inadequate phone system for making lodging reservations, with visitors getting continuous busy signals during most of the year when calling the park's lodging reservation office.

Increasing park visitation would result in more pressure outside the park for accommodations, gifts, and food services.

South Rim

Private vehicles would continue to be the primary means for visitors to get around the South Rim, and visitors could drive directly to rim overlooks. The poor distribution of visitor information results in visitors not knowing where to go, not being well distributed throughout the park, and not being well informed about park themes, programs, and visitor options. Visitors would continue to get lost as they tried to find various points of interest.

Private automobiles would dominate visitors' initial perceptions of Grand Canyon Village and most canyon overlooks, reducing the quality of the experience for people viewing the canyon and relaxing along the rim.

Because of the difficulty in getting orientation and information, visitors would continue to ask questions of any NPS or concession employee they see; many of these employees do not have the necessary training or time to assume these responsibilities.

■ **Visitor Access and Convenience**

The visitor transportation system would continue to be inadequate. Long lines of visitors would have to wait to ride the shuttle, and on the West Rim many people would be stranded at various overlooks because the present system cannot carry all visitors, especially during thunderstorms when people are seeking shelter. On the East Rim Drive year-round, and on the West Rim Drive during the off-season when shuttle service is not provided, visitors would have no options except to drive to South Rim overlooks. Therefore, visitors arriving by train or shuttle would have to take concessioner bus tours to see most of the South Rim.

Biking would continue to be extremely dangerous throughout the South Rim since no bike system would exist and bicyclists would have to share narrow roadways with traffic.

Parking: A total of 3,320 parking spaces in current locations along the South Rim are inadequate to meet demand during peak periods, forcing a large percentage of visitors to spend their time hunting for parking space rather than enjoying the park. Many visitors would continue to park along roadsides and walk along the roadway in order to reach their destinations. This situation is dangerous, unpleasant, and frustrating.

Visitor Services: Existing visitor services would remain the same except for the addition of some chemical toilets in high use areas; food carts would also be added during peak times near existing restaurants. Waiting times for food service along the rim in the village would increase. On peak summer evenings visitors can now wait up to three hours to eat at a restaurant along the rim. These lengthy waits would gradually force visitors to eat in less desirable places or at less preferable times.

The food service at Desert View is expected to be fully utilized, and waiting times would continue to grow during lunch hours.

Visitor accommodations would remain at existing levels, and visitors would need to plan far in advance in order to obtain in-park lodging. The limited number of lower-priced rooms could cause

economic hardship and inconvenience for people wanting to stay in this price of units, but could not obtain them.

The demand for campsites would continue to far exceed supply, causing some people to try to camp illegally both inside and outside the park. Heavy pressure would be placed particularly on Kaibab National Forest.

The business center would continue to look more like a major parking facility than a center for visitor services. The character of this area would continue to be much like a shopping center, with little connection to the unique character of the Grand Canyon. This area would provide little educational value or a quality experience for visitors.

The capacity of the existing village gift shops would be exceeded by the projected attendance, resulting in high congestion within the shops and a resulting high visitor turn-away rate. All existing gift shops would remain and would be highly convenient for visitors along the rim. At Hermits Rest, Lookout Studio, and the lower level of the Watchtower — structures designed by Mary Jane Colter that are on the National Register of Historic Places — the entire interior space would be used for gift displays, and many of the windows, which were designed to provide excellent views of the canyon, would be filled.

The service station and public garage would remain the same and would provide convenient service to visitors.

■ **Orientation and Interpretation**

The existing visitor center is not conveniently located and does not offer any views of the canyon, so visitors are not inclined to go there before they see the canyon. Currently only 10% of the visitors use the visitor center; consequently, most visitors never encounter any orientation or interpretation before leaving the park. The present visitor center is also inadequate in terms of space, with the primary exhibit areas over capacity during peak times from opening until closing.

For many visitors the Yavapai observation station would continue to function as a first-stop orientation center, a function this small building was not designed to perform. The building is currently far over capacity from the time it opens until closing. Many short-term visitors would stop first at Mather point to see the canyon, and may never encounter any interpretation or orientation facility before leaving the park.

The orientation center at Desert View would remain. Because of the building's low visibility, poor location, and limited available services, it currently is poorly utilized during peak times. Although this limited utilization is expected to continue, the facility would exceed capacity during peak times by the year 2010.

As interpretive facilities, the Tusayan museum and the Yavapai observation station would continue to be inadequate for accommodating present uses or visitation levels. Like the observation station, during the peak season the Tusayan museum is over capacity from the moment it opens until it closes. Insufficient space would continue to prevent any in-depth interpretation of key park themes. Visitors would benefit from the planned rehabilitation of the Kolb Studio, which is to include some interpretive media and meeting rooms.

For evening programs the location of the amphitheater near the visitor center would continue to be inconvenient for many visitors because many people would need to drive to it or use some other means of transportation to reach it. Interpretive programs in the Shrine of Ages would continue to be provided, as well as privately sponsored religious functions.

NORTH RIM

■ **Visitor Access and Convenience**

Unlimited day visitation would continue. Visitors would continue to be able to drive any size private vehicle to all developed areas on the North Rim. Private vehicles would remain the primary means of transportation since no public transportation system would be available. Visitor distribution could be slightly improved through information provided at the regional centers.

Bike riding would remain dangerous since bikers would have to ride the relatively narrow roadways with vehicular traffic (except on the Arizona Trail). Because there are few trails along the rim, visitors would continue to crowd onto the trail to Bright Angel Point. The Ken Patrick Trail, in the area near the North Kaibab trailhead, would continue to be used primarily by mule riders, making it unpleasant for hikers because of mule droppings.

On the Walhalla Plateau the visitor experience would continue to be primarily a car experience, with visitors driving from one overlook to another and spending little time away from the overlooks. At times, drivers would be inconvenienced by oversized vehicles, which must climb and descend steep grades and travel around tight curves at slow speeds.

Parking: Parking demand on Bright Angel Point would exceed the supply in high use areas. Visitors in the Grand Canyon Lodge area in particular would have trouble finding parking during peak times, with roadside parking occurring up to 1/3 to 1/2 mile away from the lodge. Overnight visitors would continue to compete with day visitors for parking at the lodge. Buses and oversized vehicles would continue to park at the amphitheater parking area near the campground, reducing the secluded and natural visual quality of that area. Due to the danger of roadside parking at the North Kaibab trailhead, a new gravel lot would be developed at CC Hill which, although it would not be very attractive, would provide safe parking.

Visitor Services: The number of lodging units would remain the same, and accommodations would continue to be full most of the time. Food service, especially in the lodge area, would continue to be crowded during peak periods. The number of campsites would remain the same, and many visitors would have to camp outside the park. All sizes of vehicles would continue to be allowed in the park campground. Because there are so many group sites, several of these sites would often remain open while individual parties were turned away.

■ **Orientation and Interpretation**

The Jacob Lake visitor center, which is operated by the U.S. Forest Service, would continue to help visitors plan their trips to the North Rim and would orient visitors to regional themes.

The small contact station near Grand Canyon Lodge would continue to benefit visitors on Bright Angel Point; however, its location increases congestion in an already crowded area.

Visitors would continue to benefit from the park's emphasis on a wide variety of personal service interpretive programs on the North Rim. These programs, including the evening talks at the lodge and amphitheater and programs on the Walhalla Plateau, would continue to expose visitors to the North Rim's diverse resources and help to provide information and distribute visitors.

TUWEEP

■ **Visitor Access and Convenience**

Because unlimited day visitation would continue, at times crowds could be well over 100 at Toroweap Overlook. The campground would continue to be first-come first-served with no reservations. People wishing to camp could be disappointed, especially after driving about 60 miles of dirt road, if all sites were filled.

■ **Orientation and Interpretation**

Visitors would have limited access to information concerning Tuweep. No signs, other than the one sign on Mohave County Road 5, would be provided. The bulletin board at the ranger station would continue to provide some information on the site, and brochures would continue to be available. Because of inadequate information, some visitors would not understand the primitive nature of the area and would come unprepared; they would also not know if they could stay and camp. Increased camping demand in the park would increase camping demand in surrounding areas.

CORRIDOR TRAILS

■ **Visitor Access and Convenience**

The number of hikers on the main corridor trails would continue to increase. The heaviest hiker impacts would be on the Bright Angel and North Kaibab Trails.

Hiker/mule conflicts would continue to worsen on the corridor trails as more hikers use the trails and mule use remains the same. Complaints from hikers about mules, especially on the North Rim, would continue.

Many visitors would continue to be disappointed at not being able to take a mule ride into the canyon because of having to make reservations well in advance.

Camping would remain the same; therefore, during most seasons visitors would need to make reservations well in advance or would not be able to stay in the corridor. Phantom Ranch would continue to be used at capacity from early March to early December.

■ **Orientation and Interpretation**

Other than the North and South Rim interpretive walks that could lead people a short distance below the canyon rim,

visitors would have few opportunities to experience interpretive programs or media along the corridor trails. The occasional wayside exhibit or NPS employee would provide the only interpretive encounters along the trails.

Most interpretive media in the canyon would remain concentrated at Phantom Ranch, including wayside exhibits and ranger-led talks at the amphitheater. In the evenings the amphitheater would continue to have inadequate seating for the large audiences that attend the programs.

For most visitors safety information on hiking below the rim would be presented primarily through signs and bulletin cases at or near the major corridor trailheads. Many visitors would continue to ignore these safety precautions, resulting in no reduction of visitor assists and rescues.

Information about backcountry and overnight hiking would continue to be provided at the existing backcountry reservations office near the business center. Many visitors would continue to have difficulty finding this office.

Conclusion

The no-action alternative would provide fewer opportunities than any of the other alternatives for visitors outside the park on a national, regional, and local level to get information about the Grand Canyon and other tourist attractions in the area to assist visitors in making their travel plans.

More than the other alternatives, once visitors arrived in the park, they would continue to have difficulty getting timely and accurate orientation to park resources, programs, and facilities. Visitors would find that the sequence of how information was presented would not fit with their needs or the desired visitor experience. In addition many visitor facilities would be inadequate for handling even moderate levels of visitation, or for providing in-depth interpretation of primary park themes.

Cumulative Effects

The information facilities and systems provided would contribute to regional and national efforts to expand information opportunities for the public less than any of the other alternatives. Any orientation and interpretive activities provided under this alternative, when combined with other similar activities in adjacent parks and other federal and state areas, would have a positive cumulative effect on visitor orientation and interpretation in the region.

Impacts on the Socio-economic Environment

Regional Effects

Employment and wages attributable to NPS operations, and jobs and earnings generated by the expenditures of park visitors, contribute to the local economies in the Grand Canyon area. The average number of NPS workers and tourist industry jobs directly supported by park visitor expenditures is projected to increase from about 4,180 in 1993 to nearly 7,108 in 2010 (an increase of 69.9%). The personal earnings of these workers would increase from $75 million to $128 million. A negative aspect of growth in the area's tourism economy is that many of the new jobs would be seasonal or part-time (although seasonality has been reducing over the years), and most would be low paying. It would be commonplace for workers to hold more than one of these jobs.

In addition to direct employment and earning effects, local purchases by the Park Service, tourism businesses, and park tourist sector workers would cause indirect and secondary economic effects in the region's economies, creating additional jobs and income for area residents.

■ Short-Term Effects

All NPS jobs and most park-related tourist expenditures would be located in Coconino County, Arizona. Total park-related employment in Coconino County, including NPS employees, tourism sector workers, and persons employed as a result of indirect and secondary economic effects of the park, was estimated to average about 6,900 workers in 1993 and is projected to average about 11,800 workers in 2010 (+70%).

■ Long-Term Effects

An economic model developed by the Bureau of Economic Analysis was used to estimate the employment and earnings effects of Grand Canyon National Park on the Coconino County economy (Bureau of Economic Analysis, U.S. Department of Commerce, 1992). Annual park-related earnings in Coconino County were approximately $117 million in 1993 and are predicted to increase to about $198 million in 2010. From 1993 through 2000 the total earnings resulting from the direct, induced, and secondary economic effects of the park are estimated to be $2.8 billion (see table 39).

The economies of Utah's Washington and Kane Counties, along with the economies of communities located along travel corridors to and from the park, will also benefit from an increase in park visitation. From 1993 through 2010, the growth in park visitation is predicted to add 320 tourist-oriented jobs and trigger indirect and secondary economic effects in these areas.

Economic growth related to increasing park visitation is one of several factors contributing to Coconino County's rapid population growth. Increasing enrollment and staff expansion at Northern Arizona University, growth in manufacturing, expanding regional trade, growth in other aspects of the region's tourism industry, inter-regional migration patterns, second home development, and natural population increases are all making important contributions to the area's increasing population.

■ Coconino County Population Effects

Coconino County's population is projected to reach 141,353 in 2010 (an increase of 37,683 above its 1993 estimated population). Based on assumptions of 1.5 persons per NPS and tourism job, and 2 persons per derivative job (the 1990 ratio of employment to county population), the economic growth attributable to increased Grand Canyon visitation would support 8,214 additional county residents in 2010. Increased park visitation would account for about 22% of the county's projected increase in population (103,670 to 141,353).

Population growth would produce demand for expanded and additional public and private services. Of particular concern are the adequacy of water supplies in rural communities and the availability of affordable housing for workers in low-paying tourism jobs. Park-related population growth is projected to create a demand for 3,800 additional housing units by 2010.

■ Communities East of the Park

Economic and population effects attributable to expanded NPS employment and growth in visitor expenditures would continue to be less substantial in communities east of the park. Cameron, Gray Mountain, and Tuba City would benefit from any growth in park-related tourist traffic on Arizona 64 east of the park and U.S. 89. In 2010 an estimated 576,000 vehicles would enter the park from the south and exit through the east. However, communities in this area have little community and commercial infrastructure to attract and care for tourists. An exception is the Lake Powell area, and the city of Page in particular, which has evolved into a substantial resort area.

Table 39: Projected Parkwide Visitation, Expenditures, and Employment - No-Action Alternative

	Predicted Visitation (in thousands)	Annual Visitor Expenditures (in millions)
1993	4,355	$402.6
2010	6,865	697.5
Net Change	+ 2,510	+ $294.9
Percentage Change	+ 57.6%	+ 73.3%
Total 1993–2010	101,000	$9,901.4

	Average Park-Related Jobs			Annual Park-Related Earnings (in millions)		
	Direct	Indirect/Induced	Total	Direct	Indirect/Induced	Total
1993	4,180	2,743	6,923	$68.1	$49.4	$117.6
2010	7,108	4,654	11,762	114.2	83.9	198.0
Net Change	2,928	1,911	4,839	46.0	34.4	$ 80.5
Percentage Change			69.9%			68.4%
Total 1993–2010			168,030*			$2,837.1

NOTE: Park-related jobs and earnings are projected for Coconino County.
* Total employment in person-years.

The Navajo Nation is considering economic development projects on reservation lands east of the park. One proposal under consideration is to develop a major Navajo cultural center near where the Little Colorado River meets Arizona 64. The center would provide information about Indian history and culture, as well as an arts and crafts market. Other projects under consideration include establishing gambling casinos in Cameron and Page, and restaurants, craft sales, and lodging in Cameron. If any or all of these projects were successfully developed, they could increase the proportion of visitors entering the park from the east, and also increase the numbers of people using East Rim Drive who enter the park at the south entrance.

The successful development of Navajo tourist attractions would benefit businesses along east entrance travel corridors and disadvantage businesses along south entrance corridors. Improved economic opportunities for Navajos may encourage tribal members to migrate from elsewhere on the reservation to nearer the park area. Economic growth would also stimulate in-migration of non-Indians to the area.

■ **Regional Concession Effects**

Concessioners would continue to provide little regional information or communication, with the exception of the Grand Canyon Railroad, which distributes a brochure related to the train trip from Williams and helps visitors plan their trip in connection with train rides.

Other concessions would continue to answer phone calls for information, although phone lines would continue to be busy, and callers could have a difficult time getting through. On the South Rim very limited information would be provided since the reservation phone lines are almost always busy.

PARKWIDE EFFECTS

The number of yearly visitors to Grand Canyon National Park is projected to increase from 4,355,000 in 1993 to 6,865,000 in 2010 (a 57.6% increase). Most of this increase would occur along the South Rim, and by 2010 the South Rim is predicted to attract 92% of the total park visitation. From 1993 through 2010, about 101 million people would visit the park. From 1993 through 2010, visitor expenditures in the Grand Canyon area are projected to grow by 73%, from $403 million to $698 million (in constant 1993 dollars). From 1993 through 2010, visitors would spend an estimated $9.9 billion in the park area (see table 39).

Although data are limited, it appears that approximately one in four visitors to Grand Canyon is from a foreign country. This is the fastest growing group of users and is expected to continue increasing. In 2010 international visitors are projected to make up 40% of the park's visitation. Foreign visitors tend to spend more during their park visits than domestic visitors.

No permanent changes would be made to concession facilities or programs. The only addition would be food carts added during peak times on the South Rim. Due to overcrowded eating facilities, especially on the South Rim, concessioners would have difficulty providing quality service. They would have to turn away many visitors and could not be expected to make up this lost income through food carts.

Since gift shops are projected to become increasingly overcrowded, the concessioners would be likely to lose customers and would probably not experience significant increases during peak times compared to present sales volumes.

Increased employee housing proposed to reduce existing substandard conditions would be the major expense for the primary concessioners on the South and North Rims. Project funding for this housing would come from funds provided through concession contract provisions, such as investment requirements and funds set aside by concessioners in capital improvement accounts. Set-aside funds would be based on a percentage of the concessioner's gross receipts, to be determined in the concession contracting process. The proposed housing units were requested by the concessioners on both the North and South Rims, and each concessioner has indicated these changes are economically feasible.

SOUTH RIM

From 1993 to 2010 the annual number of people visiting the South Rim is expected to grow from 3.9 million to over 6.3 million visitors (a net increase of 2.4 million persons or about 60%). In 2010 an estimated 5,115,000 visitors (an increase of 67%) would enter the park from the south (including train arrivals) and about 1,230,000 from the east (an increase of 45%). The more rapid growth in visitation from the south is due to rising visitation by train and by airplane/bus shuttle services, which are only available to visitors entering the park from the south.

■ **Distribution of Economic and Population Effects**

The majority of additional expenditures by South Rim visitors would occur outside park boundaries. Increases in South Rim visitation would most benefit community economies in southern Coconino County. In 2010 South Rim visitors would spend an estimated $590 million, a 78% increase over the 1993 expenditures. Over the 18-year period (1993–2010) visitors would spend an estimated $8.3 billion at businesses in the southern and eastern sections of the county. During this period the average number of park-related jobs would grow by 4,839 full-time equivalent jobs (a 75% increase) to 11,762 jobs. These figures include NPS employees at the South Rim (including the Desert View area) and persons working for private businesses serving Grand Canyon visitors. Earnings would grow by $79.2 million (+74%) to %186.3 million.

The existing shortage of affordable housing would be made worse by growth in the number of low-paid tourism industry workers. Business and population growth would also increase demand for public and private infrastructure. In some small rural communities and most previously undeveloped areas, water supply would constrain business and residential growth.

The impacts of increased expenditures by South Rim visitors would be greatest in communities along Arizona 64 (serving the south entrance to the park) and in Flagstaff. Tusayan, Williams, Valle, and Flagstaff already capture the majority of South Rim visitor expenditures. Their market shares would grow as a result of increased automobile and tour bus visitation. Tusayan and Williams would specifically benefit from increasing visitation by airplane, shuttle bus and train. The Flagstaff economy is likely to capture most of the indirect and secondary employment and population increases attributable to increases in NPS employment and countywide tourism. Williams businesses would also benefit from purchases made by households living in the park area. The number of people living in Williams and commuting to jobs in the park and in Tusayan would also increase.

Economic Effects with the Expansion of Tusayan: The distribution of jobs and population impacts on the South Rim would be markedly influenced by any expansion of the community of Tusayan. Tusayan is well positioned to serve the unmet market for visitor services inside the park and to cater to auto, plane, and tour bus visitors going to and from the park. For Tusayan to achieve its potential for business, employment growth, and population growth, it must increase the land available for commercial development, develop satisfactory water supplies, and substantially expand other community facilities and services. Providing satisfactory housing for tourist-sector workers also looms as an obstacle to commercial expansion. The Coconino County Planning and Zoning Commission recently conditioned approval of a new hotel in Tusayan on providing housing for hotel workers.

The Tusayan townsite is surrounded by USFS lands, and further business growth in Tusayan is constrained by limited amounts of undeveloped private land along Arizona 64. There are two separate proposals to expand Tusayan, each of which would enlarge the town's size by over 400% and greatly increase the land available for business development. With townsite expansion, Tusayan would have sufficient highway frontage and adjoining property to accommodate much of the growing demand that is expected for lodging, eating and drinking, retail, short-range transportation, and personal services. Both expansion proposals would provide substantial land for residential and community facility development.

One proposal would exchange USFS lands adjacent to Tusayan for private inholdings elsewhere in the Kaibab National Forest, a proposal being analyzed in a separate environmental impact statement being prepared by the U.S. Forest Service. The land exchange area would be planned for mixed use development, with designated areas for commercial, residential, and community land uses and a strategy for providing water and other public infrastructure.

An alternative proposal would involve a land grant from the Forest Service to the town of Tusayan, which would be contingent on the incorporation of Tusayan and USFS approval of the land grant. This proposal would also provide for a mix of commercial, residential, and community service development.

The addition of affordable housing would not be guaranteed with expansion of the Tusayan town-

site. The existing community contains about 50 undeveloped acres offset from Arizona 64. In the past, high development costs and the low wages earned by Tusayan-area workers resulted in insufficient incentive for private residential development on this land.

If ample affordable housing development did not occur in collaboration with new commercial development, the numbers of Tusayan residents living in substandard housing would increase. A lack of affordable housing would also increase the number of workers commuting to Tusayan from Williams, Flagstaff, Valle, and small residential areas. Increased commuting would benefit the economies of the communities where Tusayan workers chose to live. Some workers already commute from Williams and Flagstaff to jobs in Tusayan, even though commuting takes an hour or more.

Economic Effects without the Expansion of Tusayan: If the Tusayan townsite was not expanded, new business development and population growth would gradually shift to other communities. The Flagstaff and Williams economies are most able to serve unmet demand for park-related tourist services. Both communities have land area, community infrastructure, and housing to accommodate growth in the tourist industry. Flagstaff already captures the greatest portion of overnight park visitors not staying in the park or in Tusayan. The presence of Northern Arizona University in Flagstaff provides a flexible and inexpensive workforce for providing tourist services. Williams is closer to the park and also for parties traveling to and from California and Nevada via I-40.

Both Flagstaff and Williams are long driving distances from the park. The unincorporated community of Valle is more favorably located to provide for the unmet demand for visitor services inside the park and in Tusayan. The Valle area has substantial land area available for commercial development; the major obstacle to commercial and residential development is the absence of community infrastructure, in particular, the lack of public water supply. If acceptable water service could be developed, Valle could grow significantly either as a commercial node catering to park visitors, or as a bedroom community for people working in the park and Tusayan.

Even without a planned expansion as described above, some additional commercial development would occur in Tusayan. New development would be limited to infilling the small amount of vacant highway frontage, expanding and redeveloping existing commercial properties, and constructing new development back from the highway. Land back from Arizona 64 could also be used for housing development.

North Rim and Tuweep

Increases in park visitation would be less on the North Rim than on the South Rim. From 1993 to 2010, annual visitation to the North Rim and Tuweep is expected to grow by an estimated 77,000 visitors to 508,000 in 2010 (16.5% growth). Visitation to Tuweep is expected to grow by 44% (16,000 in 2010), but it would still account for only about 0.2% of total park visits. Expenditures by North Rim and Tuweep visitors are projected to increase by $6.7 million to $37.7 million (a 21.6% increase).

The economies of communities in Coconino County, and Utah's Washington and Kane Counties, would benefit the most from increased tourism at the North Rim. No commercial services are available inside the park at Tuweep. Communities in Coconino and Mohave Counties in Arizona, and in Washington County, Utah, as well as communities along other travel routes in Nevada and Utah, would provide services to Tuweep visitors. Some expenditures in Mohave County would occur on the Kaibab Paiute Indian Reservation.

From 1993 through 2010 the number of jobs attributable to the direct, indirect, and secondary effects of North Rim and Tuweep operations and visitor expenditures are projected to increase by 24% and personal earnings by 25%. The park's North Rim would continue to be open only during warm weather months, and nearly all North Rim-related jobs would continue to be seasonal.

Outside the park, economic and population effects would be distributed between Arizona's Coconino County, and Utah's Washington and Kane Counties. Fredonia and Page are the Arizona communities likely to benefit most from growing expenditures by North Rim visitors, but development proposals near Jacob Lake and Marble Canyon and elsewhere might influence future patterns of tourist expenditures. St. George and Kanab would also serve as major overnight lodging and traveler service communities in southwestern Utah. Most of the indirect and secondary economic effects of increased North Rim visits would occur in Flagstaff and St. George. Many North Rim visitors would also be visiting Zion, Bryce, and Canyonlands National Parks, and they could choose to stay in other Utah communities on their way to or from these parks.

Additional jobs in northern Coconino County, Arizona, and Kane County, Utah, would help reduce the adverse effects of declining employment in this area's natural resource extraction industries. Tourist sector jobs are seasonal and are generally low paying and would not fully offset the economic effects of the area's declining employment in forest products, mining, and agriculture.

Conclusion

The no-action alternative would allow current park visitation trends to continue into the future. In 2010 an estimated 6,865,000 people would visit the park. These tourists are predicted to spend $697.5 million in the region. Most visitors would tour the park in personal vehicles.

By fully accommodating demand to visit the park, this alternative would not limit the growth in earnings or employment by businesses catering to Grand Canyon tourists, and it would result in expanded NPS employment. Growth in the region's tourist economy and increases in NPS jobs would have positive effects on area economies and would support additional population growth. This alternative would allow for less long-term economic growth in the Grand Canyon region than that fostered by alternatives 2, 3, and 4.

Most economic, population, and land use impacts attributable to Grand Canyon tourism and park operations would occur in Coconino County, Arizona. From 1993 through 2010 the direct, indirect, and induced economic effects attributable to the park would cause the county's average annual employment to grow by an estimated 4,839 jobs, and countywide personal earnings to grow by $80.4 million. Total employment and earnings growth would support an additional 8,214 persons in 2010. Park economic effects would be responsible for 22% of the county's projected population growth between 1993 and 2010.

The no-action alternative would result in the expansion and upgrading of in-park roads, parking areas, and community infrastructure, as well as larger NPS and concessioner services and facilities over the long term. Expanded concession facilities would reduce potential tourist business expansion outside the park and would constrain economic and population growth in small towns catering to park visitors. Additional employment and population growth inside the park would exacerbate existing shortages of affordable housing in the Grand Canyon area. Over the long term more and more lands both inside and outside the park would have to be developed to accommodate visitor-related services.

Cumulative Effects

■ Regional Population Growth

The Grand Canyon area is one of the fastest growing regions in the country, with the park only one of several factors contributing to its dynamic growth. From 1970 through 1993 the population of Coconino County, Arizona, grew at an average rate of about 5% a year. The combined populations of Kane and Washington Counties in southern Utah averaged about 12% annual growth. Population projections developed by Arizona and Utah state agencies predict continued ongoing economic and population growth trends through 2010. The alternatives considered in this document would cause relatively minor variation on the population growth in Coconino County, and they would have even less effect on population growth in the southern Utah counties.

■ Tusayan Expansion

Expansion of the Tusayan townsite could notably affect business development and population patterns associated with Grand Canyon tourism. With an enlarged land area and upgraded infrastructure, Tusayan could accommodate much of the demand for commercial services attributed to increases in park visitation. Townsite expansion also would provide land area for construction of housing for NPS and tourist industry workers. To the extent that Tusayan would attract new tourism business investment and population settlement from other communities, it would inhibit employment and settlement growth in these other communities. Tusayan expansion would have minimal effects on overall economic and population growth in Coconino County.

■ **Navajo Economic Development Projects**

The Navajo Nation is proposing to develop an Indian cultural center on Arizona 64, between the park's east entrance and Cameron. In addition, the Navajo are considering development of gambling casinos at Cameron and Page. The tribal cultural center and casinos would benefit from regional tourism attracted by Grand Canyon National Park. If the Navajo economic development projects were successful, they would also attract additional tourists to the region and increase park visitation.

By allowing for the free flow of drive-through traffic between the south and east entrances, the no-action alternative and alternative 4 would best facilitate Grand Canyon visitor access to the Navajo economic development projects.

■ **Sleepy Hollow Mine**

A major coal mine is being proposed for southeastern Kane County. The Sleepy Hollow Mine would directly employ about 600 workers. The economic effects of such a large mining project would notably expand the Kane County economic base. The impacts of the mining project would have much greater employment and population effects in Kane County than any of the general management plan alternatives. The mining project could also employ residents of northern Coconino County. Areas of Kane and northern Coconino Counties have been adversely affected by declining employment in the forest products industry and agriculture. A large-scale mining project could serve to offset these impacts. Businesses in St. George, Page, and Flagstaff would capture much of the secondary economic effects of the major coal mining project.

IMPACTS ON TRANSPORTATION, PARKING, AND TRANSIT

SOUTH RIM

The NPS market analysis estimated that 6,341,000 people would visit the South Rim in the year 2010. Based on current distribution patterns, approximately 80% (5,073,000) would arrive through the south entrance and 20% (1,268,000) through the east entrance.

To project traffic volumes in the year 2010, the 1990 traffic volume on the summer design day (5,588 vehicles) was compared to total visitation on the South Rim. This ratio was then applied to projected South Rim visitation for the year 2010 of 6,341,000 people. It was determined there would be 8,780 vehicles on the summer design day in the year 2010, consisting of 7,965 cars, 508 RVs, and 307 buses. (The mix of vehicle types was based on 1992 vehicle classification data from the south and east entrance stations.) Based on the average vehicle occupancy rates for the park, some 39,203 people would be present on the South Rim during the 2010 summer design day.

On the winter design day in 2010 there would be 3,503 vehicles, consisting of 3,177 passenger cars, 203 RVs, and 123 buses. Based on the average vehicle occupancy rates for the park, 15,639 people would be present on the South Rim on that day.

■ **Access and Circulation**

Outside the Park: More vehicles would use the regional roads in the vicinity of the park; however, there would be no shifts in regional traffic patterns. All major access routes leading to the South Rim are expected to provide satisfactory service through the year 2010.

Traffic on USFS Road 302/307 would continue to increase, causing airborne dust and safety hazards in several areas along the corridor. The Coconino Rim slope would become increasingly dangerous due to volume of traffic, resulting in more accidents.

South Rim: Figure 8 shows how the mode of arrival on the South Rim is anticipated to change between the present time and the year 2010 because more park visitors would arrive by bus and by train. Consequently, the percentage of visitors that would arrive by car would decrease from 78% to 67% by the year 2010.

Because of increasing tour bus travel, it is expected that about 15% of all visitor arrivals to the South Rim by the year 2010 would tour bus. Likewise, the number of passengers using the airport bus is forecast to account for 9.3% of all South Rim visitor arrivals by 2010. This increase is due to the expected expansion of operations at the Tusayan airport.

Expanded rail service between Grand Canyon Village and the Tusayan airport (eight round-trips per day throughout the year) would provide access for an estimated 8.7% of the visitors in the year 2010.

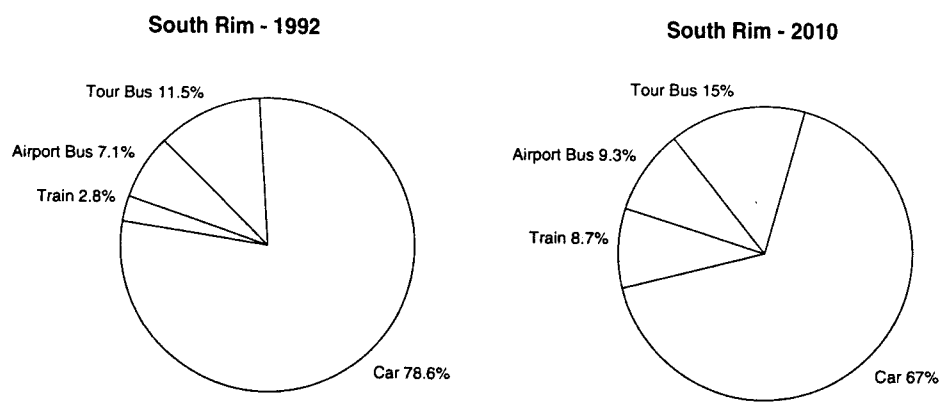
The quality of access and traffic circulation is evaluated by performing a level of service (LOS) analysis, which determines the carrying capacity of each particular road section. The traffic volume data indicates that many of the roads in the village are currently operating at LOS D, with visitors in vehicles experiencing slow travel times, bumper to bumper traffic, and long delays. East Rim Drive and Center Road are the only roads that are below capacity and operating with a desirable LOS B or C.

Most of the roads currently operate at LOS D and most of the major intersections in the village operate at LOS D/E. Based on year 2010 traffic volumes, main roads in the village and the south entrance road would exceed their operating capacity, with the level of service deteriorating to E and gridlock resulting. Center Road and East Rim Drive are expected to continue to operate satisfactorily as long as the traffic distribution remains similar to what occurs now. It is likely that when the village road system failed, traffic would be redistributed as visitors sought out less traveled roads. When this happened, the level of service on Center Road is expected to drop to the D/E range. The western section of East Rim Drive would be expected to operate at LOS D in the year 2010, while the rest of the road would operate at LOS C.

During winter 1992 most roads on the South Rim operated at LOS C or better; East Rim Drive and Center Road were well below capacity and operated at LOS B. West Rim Drive operated at LOS D, as did sections of the village loop road and the south entrance road. None of the roads on the South Rim operated at LOS E or F during this period.

During the winter season in the year 2010 most sections of the main roads in the village and the south entrance road would operate at LOS C. Center Road and East Rim Drive are expected to continue to operate satisfactorily at LOS B; West Rim Drive, the north half of the village loop road, and the south entrance road between the visitor center and the Yavapai observation station are expected to operate at LOS D.

FIGURE 8: MODE OF ARRIVAL, SOUTH RIM



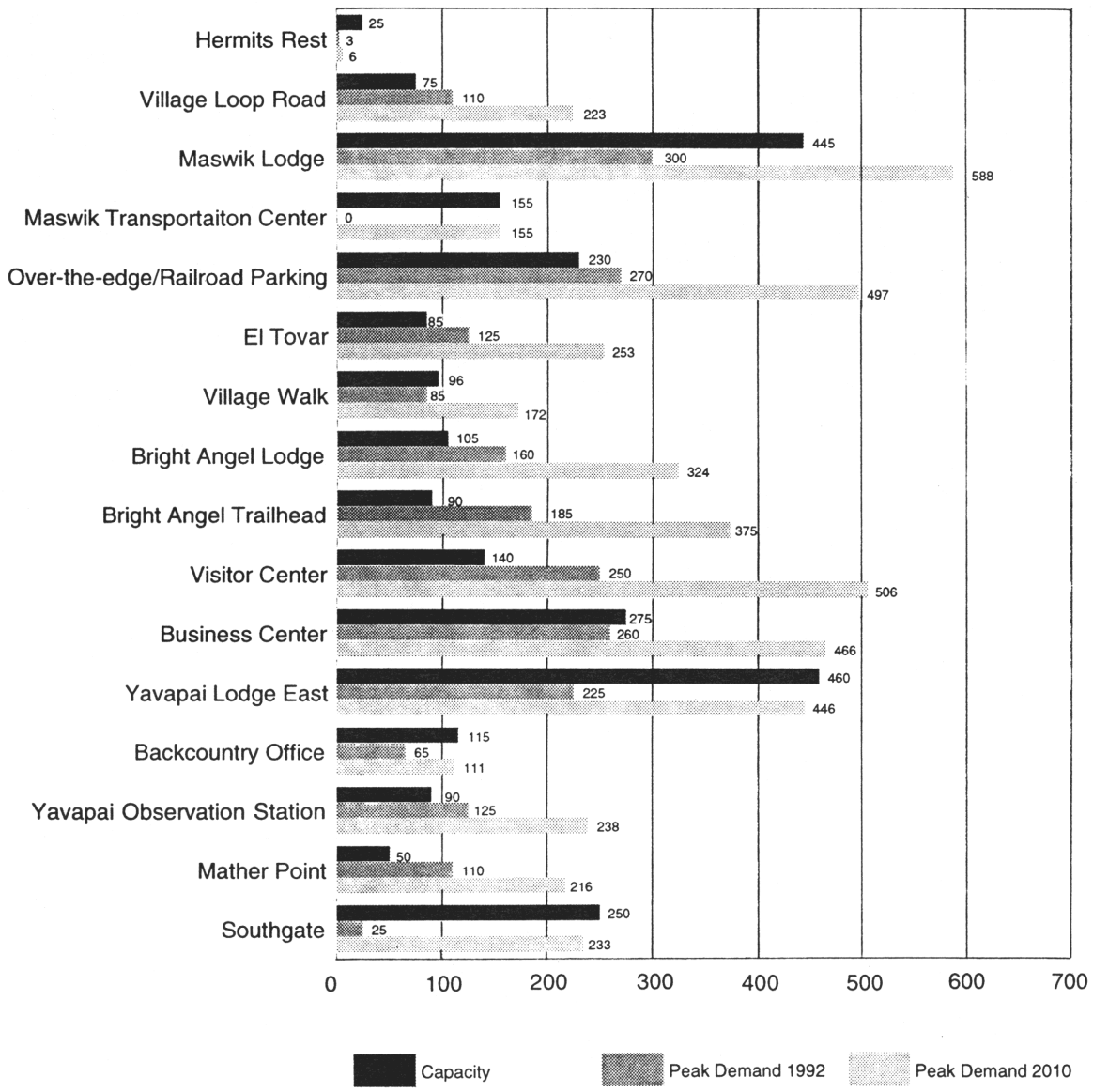
Based on 1992 visitation claim collected at the south and east entrance stations

■ **Parking**

Grand Canyon Village: Figure 9 shows the 1992 parking demand for the village and projected parking demand in the year 2010. A July 1992 survey (Operations Research Associates) established the demand for parking in the village at 2,298 vehicles, representing 86% of the total parking supply in the village (2,686 spaces). However, the parking areas at Hermits Rest, Yavapai East, and Southgate were included in the village parking areas. Parking demand at eight of the 16 parking areas, including parking areas around the lodges nearest the rim, the visitor center, Yavapai observation station, and Mather Point, were over capacity.

By the year 2010, the demand for parking in the village is forecast to increase to 4,809 vehicles, resulting in a parking shortage of 2,123 spaces. Twelve of the 16 parking areas in the village are predicted to be at capacity or have parking shortages. This demand for parking would result in massive amounts of parking along roads and illegal parking wherever vehicles could park. Parking along roadsides would compound traffic circulation problems by restricting the width of the road. Pedestrians walking to and from parked vehicles would also disturb traffic flow and increase the potential for pedestrian/vehicle conflicts. The existing disturbed area at Southgate can only accommodate about 130 oversized vehicles; therefore, about 100 oversized vehicles would have to find parking elsewhere.

FIGURE 9: VILLAGE PARKING DEMAND



On the winter design day in 1992, eight of the 16 parking areas in the village, primarily those along the rim, were over capacity. By 2010, 11 of the existing 16 parking areas would be over capacity, and in the heart of the village the parking demand would be at 90% capacity. The only parking area in the village that would have capacity is the Maswik Lodge parking area.

By the year 2010, parking demand is expected to increase to 1,288 vehicles.

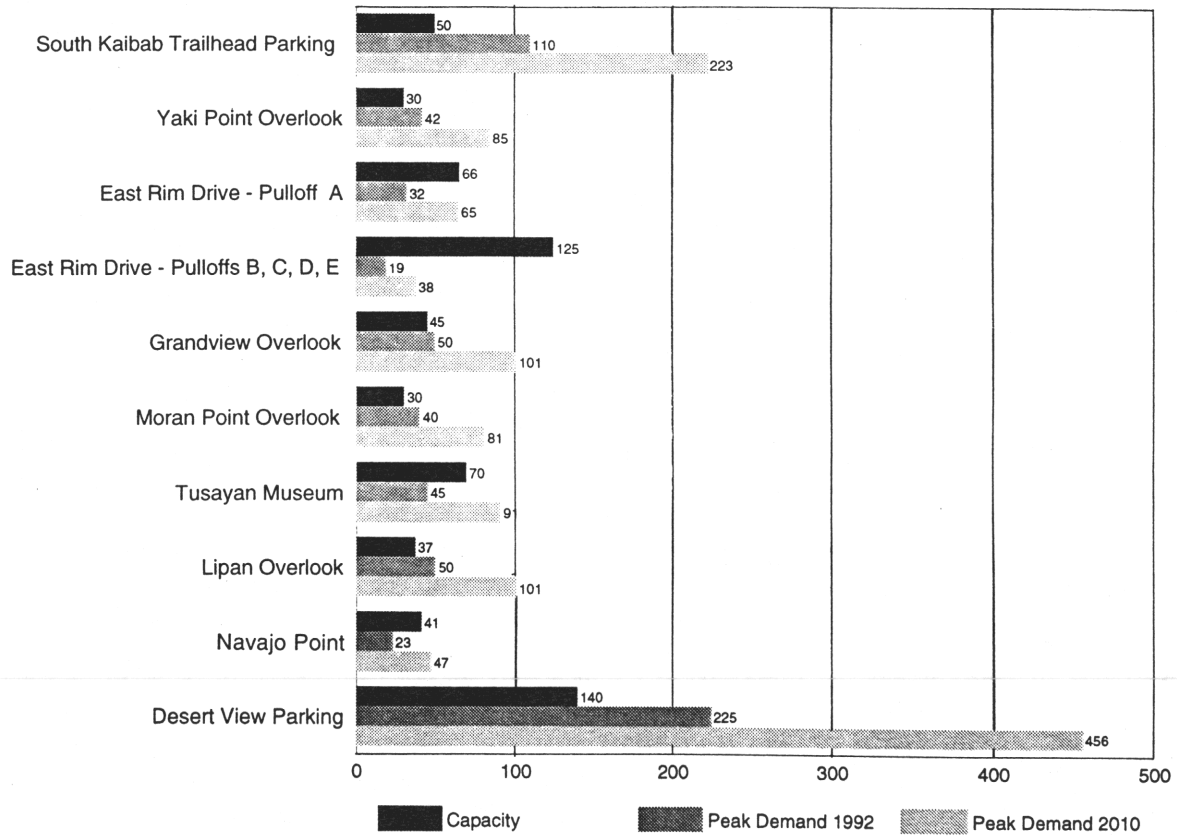
East Rim: Figure 10 shows current and projected parking demand on East Rim Drive. The data indicate that total parking demand in 1992 was 411 vehicles, with the demand exceeding the parking supply at five of the nine parking areas. By 2010 parking demand would increase to approximately 656 vehicles, and seven of the nine parking areas would be over capacity. The worst case would be the South Kaibab trailhead, with a demand for 223 spaces and a supply of 50. Vehicle numbers would depend on daily variations in park visitation.

Desert View: In 1992 there was parking demand for 225 vehicles at Desert View, which has 140 parking spaces. The demand for parking at Desert View is projected to be 456 vehicles by the year 2010, assuming that parking distribution remained relatively constant. This would amount to a shortage of 316 spaces. Severe overflow parking would occur along the roads and at Desert View in some nearby disturbed areas. It was assumed that parking distribution trends indicated by data compiled in 1992 would remain relatively constant throughout the year 2010; however, the number of vehicles would depend on daily variations in park visitation.

Winter Parking Demands: During winter 1992 the nine parking areas on East Rim Drive plus Desert View were able to handle the total winter parking demand of about 370 vehicles, which is 58% of the available supply. By the year 2010 the parking demand would increase to 504 vehicles, or about 79% of the supply. Four of the parking areas would be overcapacity in 2010, including Yaki Point, Grandview, Moran Point, and Lipan Point, as well as Desert View. The worst case would be Desert View (demand of 184, supply 140). All overflow parking would occur along the roadside.

It was assumed that the 1992 parking distribution data would remain relatively constant through the year 2010, however, the number of vehicles would depend on daily variations in visitation. The only exception to this assumption is expected to occur at the parking area for the South Kaibab trailhead on East

FIGURE 10: EAST RIM PARKING DEMAND



Rim Drive. The demand for parking during the winter is expected to be only about half of the corresponding demand in the summer. Fewer hikers are likely to use this trail during the months when snow or ice may be present on the trail.

■ Transit

Outside the Park: Private tour bus, shuttle, and train service would continue. Due to parking problems along the South Rim, private bus companies would likely expand and provide parking outside the park and offer transit service to the park. Such service would be likely in Tusayan because of its proximity to Grand Canyon Village, but it could also be offered in communities such as Valle, Williams, Flagstaff, and Cameron. Train service would likely gain in popularity, especially with the railroad spur, even though it would be competing with other transit service. The Park Service would not provide any transit service outside the park.

Grand Canyon Village: The visitor transportation system would continue in the village and along the West Rim from May through September. The vehicle fleet would be increased slightly based on available funding. The village loop shuttle would continue to provide poor service, with capacity problems anticipated on a regular basis throughout much of the transit season. The shuttle to the South Kaibab trailhead would provide acceptable service through the year 2010, but it would still have low ridership since it provides service away from the main visitor use areas at the backcountry office. Private vehicles on the park roads would create increasingly worse traffic problems and cause delays in transit service.

The West Rim shuttle would continue to provide very poor service. Capacity problems would occur on a regular basis during summer, with long lines of visitors waiting to ride the shuttle at the West Rim interchange. Many visitors would be stranded at the various overlooks due to inadequate transit service. Concession tours would probably increase so visitors would have a dependable service.

No public transit service would be available on the East Rim or to Desert View. Concession tours and private tour buses would continue to operate on the East Rim.

NORTH RIM

Under the no-action alternative, some 508,000 people are projected to visit the North Rim in the year 2010, all of whom would enter on Arizona 67.

Using the proportional relationship between the traffic volume at the north entrance on the 1992 design day and annual North Rim visitation for that year, an estimated 1,443 vehicles (comprised of 1,374 cars, 58 RVs, and 11 buses) would be present on the 2010 design day. Assuming vehicle occupancies remained constant, this traffic volume would represent about 5,080 visitors.

The mode of arrival for visitors to the North Rim is expected to change slightly by the year 2010. NPS visitation data show that the number of visitors arriving by bus in recent years has increased. Based on this trend, it is estimated that 7% of the visitors (compared to 4% currently) would arrive by tour bus and 93% (compared to 96% currently) would arrive by private automobiles or RVs in 2010.

■ Access and Circulation

Outside the Park: More vehicles would use regional roads near the park, however, there would be no shifts in regional traffic patterns. All major access routes leading to the North Rim are expected to provide satisfactory service through the year 2010, especially with the completion of improvements to Arizona Highway 67 from Jacob Lake to the park. No NPS-provided transit would be available; however, tour buses are expected to continue and expand service to the park.

Bright Angel Point and Walhalla Plateau: All roads on the North Rim would operate at LOS B, and traffic congestion would not be a problem. Even though the level of service would be satisfactory, some road sections along the Cape Royal Road would have to be widened to accommodate oversized vehicles. Visitors along this road could experience delays and excessively slow traffic caused by oversized vehicles moving slowly up steep grades and around sharp curves.

■ Parking

The nine parking areas on the North Rim would fill to capacity in the following order: Grand Canyon Lodge, the North Kaibab trailhead, and the Widforss trailhead. The other lots do not currently fill to capacity.

Existing parking lots would remain the same in this alternative except that a gravel overflow lot would be provided on CC Hill in order to remove the dangerous situation caused by vehicles parking along the roadside at the North Kaibab trailhead. The CC Hill lot would have about 30 regular vehicle spaces and one oversized vehicle space (0.25 acre). The amphitheater parking lot would be used for oversized vehicles.

Localized parking problems would occur, primarily at the Grand Canyon Lodge where long lines of cars park along the roadsides, causing restricted traffic movements and a dangerous situation for visitors walking to and from their cars. On a peak day roadside parking in this area would occur for about 800 feet on either side of the road or for over 1,600 along one roadside. Other overflow parking would occur regularly at the North Kaibab trailhead lot, at the Widforss trailhead, and occasionally at Point Imperial. Overflow parking at the North Kaibab trailhead would use the new gravel lot on CC Hill.

■ Transit

No public transit would be available. However, the small concession tour bus service to the Walhalla Plateau would continue. In most cases visitors would continue to drive and park at each area they wish to visit.

■ Bike and Pedestrian Trails

Outside the Park: The unpaved Arizona Trail would continue to provide direct hiking and biking access to the North Rim. In addition, the U. S. Forest Service would continue to close certain logging roads for nonmotorized use and would develop more trails with views and access to Grand Canyon. Specific trails would also be provided to ensure accessibility for visitors with disabilities in Grand Canyon view areas.

North Rim: The only offroad trail for bikers would be the Arizona Trail. In all other cases bikers would ride on roads with motorized vehicles; no bike lanes would be provided. This situation would become more and more dangerous for motorists and bikers as the number of vehicles increased.

Hikers would have access to two track areas now closed to vehicles in the wilderness areas along Bright Angel Point and the Walhalla Plateau. However, most of these trails have limited views of the canyon. These trails would continue to have limited signs so that few visitors would know they exist.

TUWEEP

Access to Tuweep would remain unchanged. The three primary access roads would continue to be maintained as dirt roads whose accessibility would depend on the weather. Because of Tuweep's remote location, these roads are not expected to experience capacity future problems. Bike riders could continue to use the dirt roads on adjacent BLM lands. Since traffic is very low, these roads should continue to provide a safe, somewhat solitary experience.

The narrow dirt roads inside the park would continue to receive very limited maintenance. Traffic problems would occur occasionally during peak times when vehicles are passing on the narrow road. Current problems that oversized vehicles have maneuvering on these narrow, rutted roads would continue.

Parking problems would occasionally occur at the Toroweap overlook, where parking is limited to about 10 cars. The current parking demand during peak times is for 40 vehicles. This situation would continue to worsen, and more than 30 cars at any one time would result in parking along the road in the area of the overlook.

No public or private transit service would be provided except perhaps private bus service to the rim as part of an adjacent lands tour package.

CONCLUSION

Regional roads would be able to handle the increase in traffic; however, many park roads would deteriorate and operate below acceptable levels. Road sections in Grand Canyon Village would experience gridlock, and traffic congestion would increase in all park developed areas. Parking shortages would become severe in all high use areas, and roadside parking would continue to worsen. Private parking areas outside the park, with shuttle systems to the park, would likely develop due to the severity of traffic and parking problems on the South Rim.

Visitors would have almost no access to alternative means of transportation. The existing village transit service would become even more ineffective, handling a very low percentage of visitors on West Rim Drive; no transit service would be provided on the North Rim. Biking would be allowed on roadways, but would be

extremely dangerous because of the high traffic volumes. Rim pedestrian trails would become even more overcrowded.

Cumulative Effects

Roads, parking, and transit along the South Rim, and sections of the North Rim, would deteriorate far below acceptable levels. On the South Rim all visitor use roads would continue to deteriorate and operate at a level of service D or worse. Visitors would experience long traffic delays, bumper-to-bumper traffic, and gridlock. Most parking lots would be over capacity, and severe parking congestion would occur in all use areas. Public transit service would continue to worsen to the point that private contractors could find it profitable to provide their own transit systems. Any expansion of transportation-related services outside the park, such as fee parking lots with shuttle service into the park, could reduce impacts within the park. Ultimately the transportation situation could become so severe that the South Rim would have a reduction in visitation.

The level of service on the North Rim would be acceptable; however, congestion would worsen in high use areas and bumper-to-bumper traffic would occur on sections of the Walhalla Plateau. Parking would become a severe problem on Bright Angel Point, which could encourage more visitors to take private bus tours to avoid traffic and parking problems.

Impacts on Area Operations

Housing

There are 1,208 housing units for NPS and concession employees within the park and outside (see table 40). To meet projected housing needs by 2010 — including replacing all substandard units, providing housing for approximately 200 required new employees, and eliminating double and triple bunking — an additional 595 units would be needed. However, present approved plans call for the addition of only 326 units in the park, resulting in a shortage of 269 units. As a result, park employees would continue to occupy substandard housing and to live two and three per dorm room. Employees who could not be housed within the park would have to find housing on their own in outside communities.

■ Regional Effects

Employees: Little impact on regional communities would occur under the no-action alternative since nearly all employees would continue to live in the park, with many living in substandard units, being double or triple bunked, or living in permanent trailers. Due to the housing shortage near the park, some employees would choose to live in Williams or Flagstaff and commute up to an hour and half each day. Housing options near the park could be developed when the USFS land exchange was completed.

Housing Needs: A total of 148 housing units would not be provided in the park under this alternative. The housing type needed would depend entirely on the individual employee's circumstances. There would be negligible impacts on the region in providing a few housing units.

Community Structure/Social Characteristics: Park employees living in remote communities and commuting to work could feel disconnected with the park community, possibly affecting their job performance. Park employees living outside the park could benefit from the opportunity to buy their own homes, yet there would be the potential for increased tardiness or absenteeism because of lengthy commutes.

■ South Rim

Grand Canyon Village:

• *Employees* — Approximately 130 new employees would be required to meet park operational needs related to increased visitation by the year 2010 (see table 41). Constructing the 285 units that have been approved would benefit some employees, but would not meet existing housing needs. Some 250 employees would have to continue living in substandard housing or find their own housing outside the park. High employee turnover would continue, and the ability to hire the most qualified personnel would remain low.

• *Housing Needs* — A total of 285 new units would be built in Grand Canyon Village, and 113 of the worst substandard units would be removed. The net density for this new housing would be approximately six units per acre. (This represents the current housing trend occurring in Grand Canyon now.) Therefore, village housing units would increase from 958 units to 1,130 units. All of Pinyon Park and the trailer village would remain as substan-

TABLE 40: HOUSING SUMMARY, 2010 - NO-ACTION ALTERNATIVE

Area	Existing Units	Substandard Units to be Replaced	Standard Units to be Converted or Replaced	Total Remaining Standard Units	New Units Needed to Meet Standards*				Additional Units Needed for New Employees		Total New Units Needed		Total Units Needed under this Alternative	Total New Units Built under this Alternative		Projected Housing Unit Shortage	Actual Net Change over Existing	
					NPS		Concessioner											
					Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.		Units	Ac.		Units	Ac.
South Rim Region																		
• Tusayan	0	0	0	0	0				0		0		0				0	
• Flagstaff, Valle, or Williams	9	0	0	9	0		0		0		0		85				85	
• East Rim/Outside Park	0	0	0	0	0				0		0		0				0	
Subtotal	9	0	0	9	0	0	0	0	0	0	0		85				85	
South Rim																		
• Grand Canyon Village	958	113	0	845	68	8.5	263	32.9	102	11.8	433	53.2	1,278	285	54.4	-148	172	30
• Hermits Rest	2	1	0	1	0		0		0		0		1			0	-1	0
• Desert View	40	11	0	29	15	1.4	13	1.5	4	0.4	32	3.3	61	0		-32	-11	0
Subtotal	1,000	125	0	875	83	9.9	276	34.4	106	12.2	465	56.5	1,340	285	54.4	-180	160	30
North Rim																		
• Jacob Lake	0	0	0	0	0		0		0		0		0	0			0	
• North Rim	173	22	0	151	29	3.5	51	11.9	44	5.2	124	20.6	275	37	4.4	-87	15	4.4
• Tuweep	2	0	0	1	0		0		0		1		2	0	0.0	-1	0	0
Subtotal	175	22	0	152	29	3.5	51	11.9	44	5.2	125	20.6	277	607	4.4	-88	15	4.4
Other Park Areas																		
• Corridor Trails	22	4	0	18	4		0		0		4		22	4			0	
• Lees Ferry	2	1	0	1	1		0		0		1		2	0		-1	0	
Total	1,208	153	0	1,055	224	27.1	369	46.3	106	12.2	595	75.6	1,726	326	59.2	-269	260	35

* Includes replacement of substandard units and additional units to eliminate double and triple bunking.

TABLE 41: PROJECTED PEAK SEASON EMPLOYEES, 2010 - NO-ACTION ALTERNATIVE

Area	Park Employees							
	National Park Service			Concessioner			Total	Net Change
	Existing	New	Total	Existing	New	Total		
South Rim								
• Tusayan	0	0	0	0	0	0	0	0
• Flagstaff, Valle, or Williams	3	0	3	0	0	0	3	0
• Grand Canyon Village	286	110	396	1,318	20	1,338	1,734	130
• Hermits Rest	0	0	0	3	0	3	3	0
• Desert View	22	5	27	44	0	44	71	5
• East Rim/Outside Park	0	0	0	0	0	0	0	0
Subtotal	311	115	426	1,365	20	1,385	1,811	135
North Rim								
• Jacob Lake	0	0	0	0	0	0	0	0
• North Rim	67	12	79	230	44	274	353	56
• Tuweep	1	0	1	0	0	0	1	0
Subtotal	68	12	80	230	44	274	354	56
Other Park Areas								
• Corridor Trails	12	0	12	17	0	17	29	0
• Lees Ferry	2	0	2				2	0
Subtotal	14	0	14	17	0	17	31	0
Total	**393**	**127**	**520**	**1,612**	**64**	**1,676**	**2,196**	**191**

dard trailer housing, and many of the units would continue to have double or triple bunking.

• *Community Structure/Social Characteristics:* Providing some new housing inside of park boundaries would contribute to employee satisfaction because most employees drawn to work at the park prefer to live in the park. However, because of continued overcrowded living conditions, substandard units, or the need to commute long distances for housing, employee turnover at the park would likely remain high.

Most housing would continue to be dispersed across several areas within Grand Canyon Village. Managers would continue to be housed separate from lower level employees, and NPS housing would continue to be separate from concessioner housing, with little integration of these groups.

Approximately 270 dorm units would continue to be mixed with visitor use areas. Conflicts between residential and visitor activities would continue to occur.

Hermits Rest. No new employees would be added, and the existing standard housing unit would remain.

Desert View:

• *Employees* — Three new employees would be needed at Desert View. With existing housing conditions, approximately 42 employees would continue to live in substandard conditions. The addition of a few trailers in disturbed areas would help reduce crowded conditions slightly, but would be substandard housing. New employees hired to work at Desert View would experience poor housing conditions and overcrowding, exacerbating existing housing problems. The poor standard of living would result in continued high turnover and employee dissatisfaction.

• *Housing Needs* — A total of 32 new units would be needed under this alternative; however, none of these units would be built. Only a few new trailers would be permitted to help reduce severe overcrowding.

• *Community Structure/Social Characteristics* — The current mix and integration of employers and employee level housing unique to Desert View would continue, as would the sense of community found among residents due to the remoteness of Desert View. Some residents would continue to be frustrated by the poor living conditions.

Most housing would continue to be located away from visitor areas. However, the concession housing area next to the parking lot would continue to contribute on a minor level to some conflicts between visitors and employees, especially concerning visitors parking in the employee housing area.

■ North Rim

Employees: Approximately 55 new employees would be needed because of increased visitation on the North Rim. Providing 37 housing units would allow the concessioner to convert from a six-day workweek to a five-day week. It is anticipated this change would significantly reduce employee turnover, making the entire operation more efficient and enjoyable for employees and visitors alike.

Approximately 100 employees would continue to live in substandard housing. Approximately 78 employees would continue to live in visitor use areas, with continued conflicts between visitors and employees.

Housing Needs: Approximately 125 housing units would be required by 2010 to meet housing needs and to replace substandard units. However, only 37 units for concession employees would be constructed. The housing shortage would be 87 units. To somewhat relieve crowding, a few trailers would be added in existing disturbed areas.

Community Structure/Social Characteristics: The separation of NPS and concession employees would continue, with new NPS trailers provided adjacent to existing NPS housing, and new concessioner housing provided adjacent to existing concessioner housing. This separation of housing is generally viewed as a positive element on the North Rim.

Concessioner and NPS housing adjacent to visitor lodging and camping areas would continue, with periodic conflicts between and complaints by both groups.

■ Tuweep

No new employees would be added at Tuweep. Short-term employees would have to stay at remote lodging and commute to the area or stay in the visitor camping area. The existing substandard ranger trailer would be removed.

■ Corridor Trails

No new employees would be required; approximately 10 NPS employees would continue to live in substandard conditions. Inner canyon housing would continue to function as backcountry, remote housing.

■ Lees Ferry

No changes would be made to employee housing, and one employee would remain in a substandard trailer.

The Grand Canyon employees living at Lees Ferry would continue to be part of the community in that area, which consists of Glen Canyon National Recreation Area employees and people living in nearby communities.

■ Conclusion

Housing conditions at Grand Canyon would continue to be poor, even with the addition of 285 units in Grand Canyon Village. Approximately 150 employees would have to find their own housing outside the park, and almost 350 would be living in substandard and overcrowded conditions within the park. Commuting time for employees living outside the park would often be an hour or more each way, which would be detrimental to maintaining an efficient, productive, and responsive workforce. The overcrowded and substandard housing conditions would continue to worsen, contributing to high employee turnover.

■ **Cumulative Effects**

Substandard and overcrowded housing conditions on the North and South Rims would continue to worsen, leading to a large number of dissatisfied employees, high employee turnover, and poor living conditions. The number of employees required to find their own housing outside the park would continue to increase, leading to long drives and lowered work efficiency and dedication.

COMMUNITY SERVICES

■ **Region**

Facility and Space Needs: The regional communities of Flagstaff, Williams, and Page, Arizona and Kanab, Utah would continue to serve as primary regional community centers for park residents. These communities would continue to offer services not found in the park such as major auto repair/sales, appliance and clothing sales, major medical and dental care, urban forms of recreation such as movies, and primary grocery shopping. Park residents would continue to travel from the park to those communities on a regular basis to meet their needs for those services. There is no significant impact on those communities in continuing to meet those needs for park residents.

Conflicts with Visitors: Conflicts with visitors would continue to be minimal in traveling through park entrances as park residents travel from the park to the regional communities and back again. There would be some delay and inconvenience to both park residents and visitors as a result of traffic congestion at park entrances, particularly during peak periods of visitation.

Community Characteristics: This alternative would have no impact to current regional community characteristics.

■ **South Rim**

Grand Canyon Village:

• *Facility and Space Needs* — Many community service needs for residents of Grand Canyon Village would continue to not be met. There would continue to be a shortage of community meeting space for groups or special occasions, church facilities would continue to be inadequate and impromptu areas around the park would continue to be used for those functions, the school would still need expansion and school activities would still require commutes from outside the park to inside the park for many regional residents. Recreation facilities in the park would continue to be badly needed with the school continuing to offer only limited opportunities at the play fields and in the gym on an infrequent basis. Personal storage facilities, outdoor game courts, and a new or expanded recreation center with meeting rooms and opportunities for crafts and hobbies would still be needed.

• *Conflicts with Visitors* — Church facilities would continue to be shared between park residents, regional residents, and visitors, for church functions and for visitor programs. The Shrine of the Ages building would still serve these groups as a multifunctional facility, and conflicts between the uses and parking for the adjacent visitor center would continue to occur.

The lack of dedicated recreation facilities for off-hour employee use would continue to force employees into visitor pubs for off-duty recreation. Employees would continue to use visitor recreation facilities, retaining many of the current conflicts between the two groups that often result in visitor complaints and employee reprimands.

Employee trips to the post office and bank, particularly during lunch hours, would continue to create conflicts with visitors. Employees would continue to travel to the post office and bank in the business center, parking in visitor parking areas and competing with visitors for those spaces and time in line.

• *Community Characteristics* — Grand Canyon Village would continue to have the residential population of many small towns in the country, but without many typical community services. There would continue to be employee turnover associated with desire for, and the lack of, recreation facilities. Employee morale would continue to be a source of problems for park management, particularly related to the lack of off-hour activities available to park staff. There would continue to be a segregation of employee activities and facilities by employer. Limited facilities provided by respective employers would continue to serve primarily their own employees, discouraging use and subsequent employee interaction between employers.

Desert View:

• *Facility and Space Needs* — The existing employee recreation facility would continue to be too small and would not provide adequate off-hour recreational activities desired by park staff. Limited movie watching, indoor game space, and inadequate laundry facilities would continue to be a source of complaints for employees. There would continue to be a shortage of personal storage facilities for residents at Desert View. No formal outdoor recreation areas would be provided for softball or other field games. Travel to the Grand Canyon Village would still be required for employee participation in formal recreation leagues, school, church, or other organized activities.

• *Conflicts with Visitors* — Minimal conflict with visitors would be experienced. Visitors would still be able to see and hear employee recreational activities in the GCNPL housing area, but there would be minimal disruption to visitors. Other employee recreation areas would continue to be provided in the NPS housing area and from visitor view and access routes.

• *Community Characteristics* — The tight-knit social structure of Desert View would continue. Although housing and some off-hour activities would still occur in separate geographical areas, the sense of community would be preserved. Employee morale would continue to be affected by the lack of adequate recreational facilities such as outdoor game courts and areas, indoor facilities and activities (particularly in winter), and the long travel distances required to access such facilities and activities.

■ **North Rim**

Facility and Space Needs: Most recreational needs for concession employees would be met by existing outdoor facilities and the employee dining room.

NPS and other cooperator employees would still require expanded recreation facilities. The NPS employees would continue to use the North Rim administration building for limited meeting and training space, and the generator building would continue to be used for weight training. All indoor recreation activities would continue to occur in buildings not intended for those activities, resulting in inadequate space and competition with intended uses. Outdoor recreation areas would continue to be limited to dilapidated basketball courts and a small cleared area for volleyball or other impromptu games.

The clearing in the forest to the southwest of the TWRS/ARAMARK housing area would continue to serve as an informal softball field for employees.

The existing laundry facilities in the NPS housing area would continue to be too small and crowding will continue to be a problem for NPS employees.

Conflicts with Visitors: Few conflicts with visitors with regard to community facilities would occur in this alternative. Most employee activities would be limited to TWRS/ARAMARK and NPS housing and administration areas, keeping visitor/employee recreational conflicts to a minimum.

Community Characteristics: The highly segregated social community on the North Rim would continue under this alternative. NPS and other concession employees would have little access to TWRS/ARAMARK activities and facilities, continuing the split social character of employee activities. Limited activities and facilities would be provided which would break down that social structure.

■ **Tuweep**

There are no community services in this secluded area and none would be identified under this alternative.

■ **Corridor Trails**

Due to the scale of the inner canyon communities there are no formal inner canyon community services. This situation would continue.

■ **Lees Ferry**

There is a very small community of Glen Canyon National Recreation and Grand Canyon employees. No community services exist and none would be identified under this alternative.

MANAGEMENT SUPPORT FACILITIES

Baseline needs and shortages are discussed in the "Affected Environment" and summarized in table 4.

■ **Region**

Facility and Space Needs: Regional communities other than the town of Tusayan would experience little change under this no action. However, due to liability concerns for the Park Service and the lack of jurisdictional agreements, the town of Tusayan would likely lose its occasional

emergency services support from NPS response crews, leaving the town with the closest emergency service based in Williams, or requiring new agreements with new providers or the Park Service.

Operational Relationships: Ongoing efforts to clarify jurisdictions and responsibilities would continue, but significant changes from the present situation are not expected.

Conflicts with Visitors: Regional service traffic entering the park to provide materials and supplies to park operations would continue to experience delays and congestion at major park entrances. Conflicts with visitor traffic at these points and on park roads would continue to occur, causing frequent disruptions to the visitor experience and to service deliveries.

■ South Rim

Grand Canyon Village:

• *Facility and Space Needs* — Deficits in space and facilities currently exist in every NPS division. Each division would experience increasing space shortages since visitation would continue to increase without any addition in space. The biggest space and facility problems would be in maintenance and visitor protection. Maintenance facilities would continue to be too small to adequately serve park operations, requiring temporary storage areas in makeshift facilities such as mobile storage units, trailers, uncovered yards, and residential garages. A continued loss and deterioration of equipment and supplies would occur as a result of inadequate covered storage and the associated exposure to the elements on a year-round basis.

Visitor protection would need to spread out into disconnected and inadequate spaces. The backcountry offices would continue to operated out of a substandard premanufactured structure that is too small and poorly located, making it difficult for staff to properly provide services to visitors.

The scattered, inefficient organization of support facilities would continue to create management problems throughout the park. Due to the shortage of storage areas, new storage would continue to be sought in every abandoned structure in virtually any place in the park, reducing operational efficiencies and contributing to the continued dilapidated and unsatisfactory storage of materials. Some hazardous materials such as paint storage would continue to be stored in temporary structures not suited for those materials, creating potential hazardous situations for park operations.

Park employees at Lees Ferry would continue to travel back and forth to the South Rim for supplies and equipment storage.

Grand Canyon National Park Lodges would have many functions in inadequate or inappropriate spaces. Historic structures such as the old powerhouse, horse barn, old laundry building, and other similar structures would continue to house operations that are thoroughly unsuited to the existing structure. Makeshift improvements to the interiors of those buildings would continue to occur in an effort to adapt an unsatisfactory physical layout to an incompatible use. Operations in those facilities would continue to be inefficient and constrained due to poor physical layout and too little space.

• *Operational Relationships* — Difficult physical relationships between uses would continue to occur for many park functions. Interpretive staff offices would continue to be dispersed throughout the South Rim in substandard spaces in the old railroad station, Yavapai observation station, and the park headquarters building. Maintenance storage areas would still be located at various scattered locations. Critical records storage for accounting and other functions would continue to occur in remote substandard structures, increasing the potential for damaged documents and creating inefficient means of document access.

The relatively compact nature of Grand Canyon Village would still allow many park staff to walk to work or walk from one division to another for business activities. Emergency response to facilities in the village would still be relatively easy due to the central location of the emergency operations and short distances required for emergency response. Personnel offices for park and concession operations would still be easily accessible to employees from work and/or residential locations.

• *Conflicts with Visitors* — Many management support operations would continue to experience conflicts with visitor use. GCNPL administration, maintenance, purchasing, accounting, personnel, warehouse, commissary, and transportation operations would continue to function in the midst of primary visitor use areas. Bus and vehicle fleet maintenance and parking functions would continue to be in the public eye, diminishing the visitor experience visually and through traffic congestion. The maintenance and other functions in the historic powerhouse area would continue to intrude on the visitors experience, and employees and service vehicles would continue to compete with visitors for parking and road access. The location of the mule barn would continue to attract visitors to this area, further contributing to the conflicts between visitors and service functions.

Desert View:

• *Facility and Space Needs* — Nearly all operations at Desert View would continue to function with severe shortages of space and in substandard facilities. The NPS visitor protection and maintenance divisions would continue to have offices that are too small in substandard trailers. The visitor protection division would continue to use private garages and the gas station repair bays for emergency equipment and vehicle storage in the winter, dispersing equipment required for emergencies. GCNPL maintenance operations would continue to operate out of substandard facilities, too small for required operations.

The NPS interpretation division's offices and storage space in historic structures at the Tusayan museum would continue to be too small and the buildings substandard in their physical structure and layout for long-term use.

• *Operational Relationships* — Most operations would continue to function with relatively adequate relationships between uses. The small physical development at Desert View allows easy access to all facilities.

The only distant operations would be at the Tusayan museum. Service deliveries and other business traffic would continue to use East Rim Drive as a primary vehicular route.

Conflicts with Visitors — Minor conflicts between operational activities and visitors would occur. Service traffic entering the park from the east would continue to use the east visitor entrance station, contributing to congestion and delays at the entry gate. The areas of overflow visitor parking would continue to encroach upon the GCNPL residential and support service area. The negative visual character of facilities in that area would continue to be visible to visitors.

Service traffic to the NPS support services area, sewage lagoons, and Babbitt's and GCNPL's gift shop would continue to be separate from visitor use patterns, creating minimal to no conflict with visitors. A little conflict would continue to occur with service trucks and hand carts delivering to the Watchtower.

■ North Rim

Facility and Space Needs: Most NPS management support facilities would continue to function with space deficits and in substandard structures. The historic structures where most divisions are located would continue to provide inadequate work space. Maintenance would continue to operate out of historic structures that are too small, uninsulated, and scattered throughout the administrative area. The visitor protection division would continue to park emergency vehicles outside since no adequate facility would exist. NPS administrative offices would continue out of a substandard premanufactured structure that serves as a backcountry office, employee library, and meeting facility.

TWRS/ARAMARK employees would continue to enjoy adequate support facilities provided by the employee dining room facility, which offers laundry, meeting rooms, and offices for personnel and other administrative functions.

Grand Canyon Trail Rides would continue to operate out of substandard trailers. Continual repair and adaptation of those trailers would occur as a result of weather damage and the age of the units.

Operational Relationships: NPS management operations would experience minor inconveniences due to the scattered location of support facilities. The remote location of maintenance dry storage at Lindbergh Hill would continue to be inconvenient for roads and trail crews.

Most other management support operations would continue to operate adequately because of the relatively compact location of f management support areas on the North Rim.

Conflicts with Visitors: Few operational conflicts with visitors would occur as a result of this alternative. Adequate separation between visitor use areas and management support areas would continue.

■ **Tuweep**

Facility and Space Needs. The ranger at Tuweep would continue to experience problems from a lack of storage, workshop, and office space. Operations would function out of substandard historic structures that are uninsulated and too small. No suitable facility would be provided to store hazardous materials (such as paints, paint thinners, and gasoline), continuing potentially hazardous situations for the ranger and facilities at Tuweep.

Operational Relationships: All operational relationships at Tuweep would continue to adequately serve management needs.

Conflicts with Visitors: There would be no conflicts between management functions and visitors.

■ **Corridor Trails**

Facility and Space Needs: NPS operations at Indian Garden would be adequate since facilities were recently constructed in this area. Other operation areas along the corridor trails would continue to suffer from lack of space, particularly at the historic ranger stations. Some ranger functions, particularly at Phantom Ranch, would continue to operate in cramped or substandard structures, making it difficult to store emergency and operational supplies and to adequately serve visitor needs.

Most other support facilities would function adequately given the continued limits on visitor use in the inner canyon.

Operational Relationships: No changes in operational relationships would occur. Most locations for support facilities would continue to function well. All operations would continue to be supplied from remote locations, primarily Grand Canyon Village.

Conflicts with Visitors: Minor conflicts with visitors would continue as a result of administrative mule traffic on the South Kaibab Trail. Mules would continue to create some undesirable circumstances for hikers.

There would be few conflicts with visitors in other operations because of separation of use areas.

UTILITIES

■ **Water Supply**

Parkwide: The park would probably continue to withdraw, transport, and use water from Roaring Springs similar to today and rehabilitate the transcanyon waterline. However, the Park Service would explore alternative water sources and change to a different source if legally and technically feasible, and if the costs and environmental impacts were superior to the continued use of the transcanyon waterline. Site-specific environmental compliance would be necessary for such actions following further study and site-specific design.

South Rim: The construction of 285 new housing units in the village and increased visitation are the major factors contributing to increased water consumption under the no-action alternative. All these units would include the use of low-flow plumbing fixtures and dual plumbing to use reclaimed water. As a result of these changes, potable water use would increase approximately 18%, and the Indian Garden pump station would operate approximately 19 hours per day during peak months. No additional water storage on the South Rim would be required. Reclaimed water use in new facilities would increase by 4.5 million gallons per year.

Visitation at Desert View would increase, but no new housing or other facilities would be constructed. Water use would increase by approximately 10%, imposing no impact to water supply facilities other than increased pumping from the South Rim tank farm.

North Rim: Increased visitation and the construction of 44 housing units would contribute to increased water consumption. The use of reclaimed water would be implemented in the new housing. The use of potable water would increase by approximately 19.5% by the year 2010, imposing no impact to the water supply system. No additional water storage would be required.

Tuweep. Same as "Impacts Common to All Alternatives."

Corridor Trails: The limited changes proposed under this alternative would not affect the water supply.

■ **Wastewater**

South Rim: Wastewater would be generated by the use of both reclaimed water and potable water associated with increased visitation and new housing. No sewer extensions to outlying communities are considered in this alternative.

The treatment plant would not need to be expanded to treat additional wastewater flows. The treatment plant would operate at approximately 85% capacity during peak months. Peak-day hourly flows would exceed the secondary capacity, but could be handled by pretreatment facilities.

Desert View. Increased wastewater generation would result from increased water use. Currently, the Desert View lagoons are too small for current usage. Approximately double the wastewater treatment capacity would be required to meet projected wastewater demands through the planning period. Alternate wastewater treatment facilities could be considered to minimize impacts on natural resources. If the existing lagoons were expanded, approximately 1 to 2 additional acres of land would be required.

North Rim: Housing and more visitation would increase wastewater generation on the North Rim. Peak month wastewater flows would reach 86,000 gallons per day, exceeding the existing plant capacity and requiring expansion. Approximately 1 additional acre would be affected by plant expansion. No additional reclaimed water for fire protection would be required.

Tuweep. The existing system at the ranger station currently experiences surfacing of effluent, requiring rehabilitation or replacement. The proposed seasonal ranger residence does not have wastewater treatment facilities. The ranger residence septic system would be rehabilitated, and no impact to undisturbed land is anticipated. A new septic system for the seasonal ranger residence would be constructed, with minimal impact to land.

Corridor Trails. No impacts.

Conclusion. Treatment plant expansion on the South Rim would not be required to treat the additional wastewater flows under this alternative. Approximately double the wastewater treatment capacity would be required at Desert View. Peak month wastewater flows on the North Rim would exceed the existing plant capacity and require expansion. At Tuweep the ranger residence septic system would be rehabilitated, and a new septic system would be constructed for the seasonal ranger residence.

■ **Power Supply and Distribution**

Visitor and employee facilities would remain the same under this alternative, imposing no additional load on the electrical supply system at South Rim, Desert View, North Rim, or the corridor trails.

At Tuweep solar power, with a propane-fueled auxiliary generator, is used at the ranger residence. A new seasonal ranger residence would be provided, requiring new power supply.

■ **Telephone System**

Under the no-action alternative very few new facilities requiring phone service would be constructed, except for new housing on the North and South Rims.

No major changes in the telephone system are anticipated beyond the repair and rehabilitation of the current systems. Lines would be extended to appropriate new housing units. Depending on the results of the reservation system study, the telephone system could require major expansion or replacement to handle the increased number of calls resulting from increased visitation.

IMPACTS ON NATURAL RESOURCES

REGIONAL EFFECTS

- **Species of Special Management Concern**

Outside the South Rim: Due to the reservation system and limits on visitation, some visitors and residents may seek alternative ways to enter the park, specifically by using USFS Roads 302/307, and 328, possibly indirectly affecting species listed for outside the South Rim in table 9 (see "Affected Environment"). Impacts to these species would be the same as described for dirt road use under "Impacts Common to All Alternatives."

The gateway information center proposed for Tusayan would require site-specific environmental compliance to assess its effects on sensitive species. Also, depending upon how the reservation system was implemented, there may be increasing numbers of people outside the park waiting to get in who would potentially cause greater impacts south of the park while they waited.

Outside the North Rim: Potential park visitors without reservations during peak use periods could dramatically increase visitation on USFS dirt roads, especially to canyon viewpoints on national forest lands, and viewpoints just inside the park at Indian Hollow, Monument Point, and Fire Point. This could indirectly affect species listed for outside the North Rim in table 9. Impacts to these species would be the same as described for dirt road use under "Impacts Common to All Alternatives."

- **Geologic Resources, Soils, Vegetation, and Wildlife**

Outside the South Rim: Effects would be similar to the No Action alternative, but under this alternative would probably be more likely and of greater magnitude due to people trying to get around the reservation system.

Outside the North Rim: Effects would be similar to the no-action alternative, except there would not be unlimited visitation to Bright Angel Point so there would be fewer impacts there.

- **Water Resources**

Effects would be the same as the no-action alternative.

- **Air Quality**

Effects would be the same as the no-action alternative, except that local air pollution in the region may be reduced to the extent that park day use restrictions also limit the number of people coming into the region.

- **Natural Quiet and Solitude**

The effects would be the same as the no-action alternative, except that restricting the number of day visitors could also limit the number of people coming into the region, reducing human-related noise in the region. However, if people stayed longer waiting to get in the park and engaged in noise-producing activities, then noise levels could increase in local areas.

- **Visual Resources**

Effects would be the same as the no-action alternative.

PARKWIDE EFFECTS

- **Species of Special Management Concern**

Effects would be the same as the no-action alternative.

- **Geologic Resources, Soils, Vegetation, and Wildlife**

Effects would be the same as the no-action alternative.

- **Water Resources**

Effects are described for specific areas or as "Impacts Common to All Alternatives."

- **Air Quality**

Effects would be the same as the no-action alternative except the number of vehicles would be reduced by the reservation system, so local pollution would be less.

- **Natural Quiet and Solitude**

Effects would be the same as the no-action alternative except the number of vehicles would be reduced by the reservation system so local noise pollution would be less.

- **Visual Resources**

Effects would be the same as the no-action alternative except the number of vehicles would be reduced by the reservation system, so the negative effects of vehicles on visual resources would be less.

SOUTH RIM

- **Species of Special Management Concern**

Effects would be the same as the no-action alternative.

- **Geologic Resources, Soils, Vegetation, and Wildlife**

Effects would be the same as the no-action alternative, except for the following:

A day reservation system based on parking and facility carrying capacities and prohibiting roadside parking outside designated areas would eliminate resource damage caused by indiscriminate parking along roadsides. Because the number of visitors would be limited through a reservation system, visitors would have less need to go off trails to avoid crowds and congestion, thus reducing soil compaction, vegetation disturbance, and trash. Day visitor limitations would also reduce the number of interactions between visitors and wildlife, which disrupt wildlife behavior and habitat.

Formalizing the overflow parking area at Desert View would confine parking impacts within the disturbed area, thus reducing trails and other impacts caused by visitors parking indiscriminately throughout the area.

- **Water Resources**

Effects would be the same as the no-action alternative.

- **Air Quality**

Effects would be the same as the no-action alternative except that there would be fewer vehicles in the park due to the reservation system, so fewer localized air pollution concerns.

- **Natural Quiet and Solitude**

Effects would be the same as the no-action alternative except there would be fewer vehicles due to the reservation system, resulting in less vehicle noise compared to no-action.

- **Visual Resources**

Effects would be the same as the no-action alternative except there would be fewer vehicles due to the reservation system and no roadside parking, resulting in less visual intrusion from vehicles compared to no action.

NORTH RIM

- **Species of Special Management Concern**

Effects would be the same as discussed for parkwide effects under the no-action alternative.

- **Geologic Resources, Soils, Vegetation, and Wildlife**

Effects would be the same as the no-action alternative except for the following:

Effects in road corridors would be greatly reduced compared to the no-action alternative because roadside parking would be prohibited.

Constructing approximately 120 new and 20 replacement housing units would occur within already disturbed areas, thus minimizing new impacts on vegetation and soils. Expanding the sewage treatment plant would affect about an acre of already disturbed land. Trenching for utilities would have potential effects as described under "Impacts Common to All Alternatives."

- **Water Resources**

Effects would be the same as the no-action alternative.

- **Air Quality**

Effects would be the same as the no-action alternative except that the day use reservation system would reduce the number of vehicles compared to the no-action alternative, which would help limit air pollution impacts from vehicles within the park.

- **Natural Quiet and Solitude**

Effects would be the same as the no-action alternative except that the day use reservation system would reduce the number of vehicles compared to no-action, which would help limit vehicle noise impacts within the park.

- **Visual Resources**

Effects would be the same as the no-action alternative.

TUWEEP

All effects on natural resources would be the same as the no-action alternative.

Corridor Trails

All effects on natural resources would be the same as the no-action alternative.

Conclusion

The impacts to park natural resources under alternative 1 would be less than under no action due to visitation limits and prohibiting roadside parking. They would also be slightly less in most cases than under alternative 4, but would be much greater than under alternative 2 or 3. This is primarily due to a lack of coordinated programs to protect sensitive species, to revegetate and rehabilitate disturbed areas, to provide data about resource impacts, or to deal with noise and air emissions. The approach to solving problems is primarily to limit visitation, but considerable employee housing would still be built in the park on the South Rim. Alternative 1 would also allow new borrow pits inside the park, provide for only minimal conservation programs, and allow greater fluctuations in treated water overflows at Indian Garden.

Cumulative Effects

A gateway information center would be built outside the park under alternative 1, so cumulative effects would be added to the effects of the proposed railroad spur and land exchange in Tusayan. It is likely that sensitive species will be at least indirectly affected by this cumulative development, even though each individual project will attempt to avoid direct effects. The details of design and location for the gateway information center and land exchange have yet to be defined, and will be evaluated in subsequent environmental compliance documents.

The primary cumulative effect of alternative 1 would probably not be additional effects, but would be a failure to address existing and projected impacts in any systematic or coordinated way. Limits on park visitation would have ripple effects outside the park, but these could not be quantified in any meaningful way without many assumptions and data that are impossible to project at this time.

Impacts on Cultural Resources

Archeological Resources and Traditional Cultural Properties

- **Parkwide Effects**

The effects would be the same as in the no-action alternative, except that the presence of a reservation system could affect American Indian access to ethnographic resources. This effect would be partially mitigated by issuing special permits for American Indians to enter the park to conduct traditional activities. No restrictions would be placed on the issuance of those permits, and they would be given precedence over other visitors.

- **South Rim**

The effects would be the same as in the no-action alternative.

- **North Rim**

The effects would be the same as in the no-action alternative, except that, in addition, a new parking area on CC Hill might affect potential historical archeological sites associated with the CCC camp that was originally in the area (the area has not been surveyed for archeological resources).

- **Tuweep**

The effects would be the same as in the no-action alternative.

- **Corridor Trails**

The effects would be the same as in the no-action alternative.

- **Conclusion**

The effects would be the same as in the no-action alternative.

- **Cumulative Effects**

The effects would be the same as in the no-action alternative.

Historic Structures and Landscapes

- **South Rim**

One historic district and four individual buildings on the South Rim are designated national historic landmarks. In addition, two historic districts and two individual properties are listed in the National Register of Historic Places, and one historic district has been determined eligible for listing. Each of these properties, with the exception of the Grandview Mine and Orphan Mine historic districts, would continue to be used for park administration/operations purposes or concessioner services. Routine maintenance would be conducted, and monitoring of the structures for deterioration would be continued. Noncontributing structures in the historic landscape, primarily in the Grand Canyon Village (Kachina and Thunderbird Lodges, several structures in the powerhouse area, and the gift shop and deli at Desert View) would compromise resources. Likewise, nonhistoric uses of national historic landmark properties such as Hermits Rest, Lookout Studio, and the Watchtower would continue to compromise historic resources. Only small remnants of historic landscapes may be found at Grand Canyon Village and Desert View.

The park archival and museum collections, despite a new storage facility, would continue to be housed in dispersed and inadequate facilities. As budgets permit and needs arise, national register work would continue and planning conducted on a case by case basis.

- **North Rim**

One historic district on the North Rim has been designated a national historic landmark, and two additional historic districts have been listed on the National Register of Historic Places. These properties would continue to be used for park and concessions operations. Routine maintenance of these properties would be conducted, except for the exterior frame cabins, which would be boarded up and allowed to deteriorate naturally (an adverse effect). Selective monitoring of the structures for deterioration would be continued. Planning would be conducted on an ad hoc basis.

- **Tuweep**

In this remote area along the North Rim, the cluster of buildings making up the ranger station at Tuweep would continue in its present use. Routine maintenance would be performed for the structures as needed.

- **Corridor Trails**

The corridor trails are included in the Cross Canyon Corridor Historic District, listed on the National Register of Historic Places. Structures along the trails, including those at Indian Garden and Phantom Ranch, would continue to be used for park operations and concession operators. Maintenance would occur as needed on the trails and structures along the corridor. Trail maintenance activities and heavy trail use, especially by mules, would continue. The landscapes at Indian Garden and Phantom Ranch would continue to have a cluttered appearance due to random piles of rocks, attempts to channelize the creek, and erosion controls of gabions and mesh. It presents a setting not in keeping with the historic landscape.

- **Conclusion**

Historic properties listed on the National Register of Historic Places would continue to be protected as required by historic preservation law and NPS *Management Policies.* Lack of appropriate maintenance and heavy usage of some resources, however, could result in some deterioration. The historic landscapes, particularly on the South Rim, would continue to be compromised by nonhistoric, noncontributory structures, and landscaping at variance with the historic landscape. Additional properties meeting national register criteria would be determined eligible, and budget permitting, be nominated. Planning would be instituted on a case-by-case basis as needs became critical.

- **Cumulative Effects**

No additional significant impacts would result from this alternative. A lack of long-range planning, except as critical needs arose, would lead to intermittent and reactive management actions to the historic resources in the park. This lack of an integrated approach could result in deterioration of the resources.

Impacts on the Visitor Experience

Regional Information and Services

Potential park visitors would benefit from being able to consult multiple media sources to obtain accurate, up-to-date information about Grand Canyon from their homes, local travel agencies, and several regional centers. In addition, existing phone centers would make it easier for people to call for park information, helping potential visitors better understand the need to plan their trip and make necessary reservations long before they reach the park. Many visitors would continue to be disappointed at not being able to stay inside the park, but because of advance planning opportunities, they would have had a greater opportunity to take advantage of other options available, either just outside the park or in other nearby communities such as Flagstaff.

Visitors traveling by air would benefit from park information placed at all airports with service to Grand Canyon (including the Phoenix, Las Vegas, Los Angeles, Flagstaff, and Grand Canyon airports).

Staff personnel at existing regional information centers and visitors to these centers would benefit from closer interactions with park and concession personnel regarding the daily status of the park reservation system and the availability of lodging. Visitors approaching the existing regional centers would benefit from additional highway signs and radio broadcasts alerting visitors to the park entrance reservation system. However, since many park visitors would not stop at these regional centers, some visitors could drive all the way to Tusayan or the park entrance only to discover that they could not get in. On the other hand, the additional signing and radio broadcasts could encourage many more visitors to stop at regional centers, some of which have limited parking and inadequate space to handle large increases in visitation.

Establishing a gateway information center in the town of Tusayan would allow visitors to obtain park entrance reservations and other advance information. Depending on the size, design, and location of the existing structure chosen for the center, some visitors could bypass the facility in their haste to get to the park. On the other hand, good signing and a prominent location would help attract a large number of visitors, which in turn could place greater demands on parking and interior spaces.

Providing NPS staff at the existing USFS visitor center at Jacob Lake would help visitors with trip planning and encourage use patterns to better distribute visitors to attractions both in the park and on USFS lands. The small building and limited parking could be inadequate to meet demands of additional visitor use.

SOUTH RIM

The establishment of a reservation system for the South Rim would require visitors to plan ahead in order to gain entry into the park during peak times. The reservation system would allow visitors to make reservations at regional and gateway centers and possibly even at home, so they would know long before reaching the park about where to go. Visitors who did have reservations would be assured of being able to find parking spaces, and facilities would not be overcrowded. Visitors who did not have reservations would likely be greatly inconvenienced by not being able to visit the park.

During a peak period approximately 4,000 visitors would not be able to drive their vehicles into the park. It is assumed that about half of these people would leave or would learn about the reservation system outside the park and turn around before reaching the park boundary; the other half would enter by alternate transportation modes, such as buses or trains.

During the off-season all visitors would be able to enter the park with their private vehicles.

■ Visitor Access and Convenience

Implementing day use and vehicular reservation systems would ensure that visitors did not have to experience highly crowded roads, parking areas, and restaurants. However, visitors would have to enter at designated times, which may not fit with their travel plans, or they could be scheduled for another day. About 670 private vehicles would be allowed to enter into the park each hour, and an additional 550 people could arrive by means other than private vehicles (e.g., train or shuttle bus) through the south entrance only.

West Rim Drive and East Rim Drive would be the same as the no-action alternative. The Tusayan museum would continue to be overcapacity but would have a few less people since roadside parking would not be allowed.

Travelers wanting to drive through the park to get to areas east of Desert View or south of Tusayan might be forced to drive back to Williams, Flagstaff, or Cameron and proceed from those points.

The same as the no-action alternative, biking would continue to be extremely dangerous throughout the South Rim since no bike system would exist and bikers would have to share the narrow roadways with vehicular traffic.

■ Parking

No additional parking would be provided in Grand Canyon Village; however, limiting the number of vehicles allowed in the park to the existing parking capacity would eliminate current parking problems and demands for more parking. Because all parking could be accommodated in existing lots, the need to park along roadsides would be reduced. Providing parking attendants in Grand Canyon Village would help visitors find available spaces. Once lots were full, visitors would be directed by attendants to areas farther away. Providing parking attendants would relieve frustration for visitors because they would not have to drive around looking for vacant space on their own. However, in some areas, attendants would be forced to act more like police to ensure that visitors did not park illegally in order to be closer to their destinations.

Alternative transportation modes would be very poor, so many visitors would have to walk long distances after parking (for example, from Yavapai Lodge East to Mather Point). Many visitors would have to bypass some areas due the lack of immediate parking.

At certain overlooks on East Rim Drive parking demand would exceed the supply, and visitors would have to park farther from the overlook. The presence of automobiles would dominate many of the overlooks and reduce the quality of the visitor experience for people viewing the canyon and relaxing along the rim.

The existing road and parking lot at Desert View would continue to dominate much of the rim area, causing noise and safety problems; however, this area would be convenient for visitors wanting to drive to the rim. A gravel overflow lot at the quarry, about a mile from the rim, would provide a place for visitors to wait but would not be attractive or particularly pleasant since no trails or other amenities would be provided.

■ Visitor Services

No visitor services would be expanded, except that a couple of existing gravel areas would be used for additional parking. Roads, parking areas, lodging, restaurants, gift shops, visitor centers, and interpretive facilities would be crowded.

Because food service facilities have a higher capacity during the day than parking areas, visitors would be able to be accommodated for daytime food service, as long as more visitors used cafeterias, which provide faster service. Supplementary food service, such as food carts, would be added to help reduce visitor inconvenience. The reservation system would help prevent eating facilities from being severely overcrowded. During evening hours, long waits, sometimes up to 90 minutes, would by the norm at sit-down restaurants.

Visitors would need to plan far in advance to obtain in-park lodging. The limited number of lower priced rooms could cause economic hardship and inconvenience for people who could not afford more expensive accommodations. The demand for camping would far exceed supply, causing some people to try to camp illegally both inside and outside the park. Heavy pressure would be placed on facilities in Kaibab National Forest.

Gift shops would remain the same as the no-action alternative.

Additional chemical toilets would be added to alleviate restroom overcrowding, which may be less than satisfactory for many visitors.

The service station and public garage would remain the same as the no-action alternative.

Desert View would remain the same as the no-action alternative.

■ Orientation and Interpretation

Grand Canyon Village: The visitor center, Yavapai observation station, the Tusayan museum, amphitheaters, and the Kolb Studio would be the same as the no-action alternative.

Desert View: The orientation center at Desert View would remain in its present location and continue to look like a converted restroom building. Because of the building's low visibility and poor location it would continue to receive limited use by visitors to the site.

NORTH RIM

■ Visitor Access and Convenience

Private vehicles would remain the primary means of transportation and circulation within the park since no public bus system would be available, and visitors would continue to be allowed to drive any size private vehicle into the park.

Visitors would be required to obtain a reservation to visit the North Rim during peak periods starting about 2004. The reservation system would limit the number of visitors to an estimated 1,744 visitors at any one time or 495 vehicles. An estimated 749 visitors (227 vehicles) would be turned away on peak days or assigned different entry times. The months during which the reservation system would be needed would gradually be lengthened over the years to meet demand. However, no reservations are expected to be needed during May or the end of August.

Implementing a reservation system would help ensure that the North Rim retained a low-key, uncrowded atmosphere. Visitors who did not get entry passes would still be able to visit adjacent Kaibab National Forest

lands, which offer beautiful canyon views, meadows, and forests.

Visitor distribution could improve slightly with regional information centers; however, visitors would probably still concentrate at Grand Canyon Lodge.

Bike riding, rim trails, the Walhalla Plateau, and the Ken Patrick Trail would remain the same as the no-action alternative.

■ Parking

Visitors concentrating at the Grand Canyon Lodge area would cause parking problems, and rangers would have to continuously enforce parking regulations, with people having to park away from their destination. Overnight visitors would continue to compete with day visitors for parking at the lodge, and some overnight guests would have to park a mile or more from their lodge unit when the lodge lot was full. This would be a major inconvenience for visitors.

■ Visitor Services

Lodging would continue to be full most of the time. Food service and gift shop outlets would remain crowded during peak periods, but with limitations on visitation, this situation would not worsen. The number of camping facilities would remain the same; therefore, those campers who could not be accommodated in the park would have to use other areas outside the park.

■ Orientation and Interpretation.

The orientation center near the Grand Canyon Lodge would continue to benefit visitors on Bright Angel Point. Having a separate facility adjacent to the lodge would relieve congestion in the lobby and foster a clearer identity for the National Park Service. However, this location is not convenient for visitors traveling first to Cape Royal, and those visitors wanting to stop at the center would add to the parking and congestion problems in the lodge area.

Visitors would continue to benefit from the park's emphasis on a wide variety of personal services interpretive programs the same as the no-action alternative.

Tuweep

■ Visitor Access and Convenience.

The effects would be the same as in the no-action alternative.

■ Orientation and Interpretation

Under this alternative most park and regional visitors would continue to know nothing of the existence of the Tuweep unit. Visitors who did discover the unit would continue to benefit from the information provided in the bulletin case near the ranger station.

In keeping with the vision of maintaining the primitive nature of Tuweep, visitors would be encouraged through brochures and minimal wayside exhibits to learn about the significance of this portion of the park and to explore its resources.

Corridor Trails

■ Visitor Access and Convenience

The number of hikers on the main corridor trails would increase somewhat. However, because the number of visitors allowed on the South and North Rims would be limited at any one time, the increase in trail use would be indirectly controlled. The heaviest hiker and mule impacts would continue to be on the Bright Angel and North Kaibab Trails, but would be somewhat reduced compared to the no-action alternative due to day visitor limitations.

Many visitors would continue to be disappointed at not being able to take a mule ride into the canyon without a reservation made well in advance. Providing better information beforehand would help alleviate this disappointment.

The number of inner canyon campsites would remain the same, with visitors having to make reservations well in advance during most seasons or not being able to stay in the inner canyon. Phantom Ranch lodging would continue to be full from March through December.

■ Orientation and Interpretation

The effects would be the same as in the no-action alternative.

Conclusions

Alternative 1 would provide more opportunities outside the park on a national, regional, and local level for visitors get information about the Grand Canyon and other tourist attractions in the area to assist visitors in making their travel plans.

Once visitors arrived in the park, they would continue to have difficulty getting timely and accurate orientation to park resources, programs, and facilities. Visitors would find that the sequence of how information was presented would not fit with visitor needs or the desired visitor experience. In addition many visitor facilities would be inadequate for handling even moderate levels of visitation, or for providing in-depth interpretation of primary park themes.

Cumulative Effects

The information facilities and systems provided would contribute to regional and national efforts to expand information opportunities for the public. Any orientation and interpretive activities provided under this alternative, when combined with other similar activities in adjacent parks and other federal and state areas, would have a positive cumulative effect on visitor orientation and interpretation in the region. This effect would be less than under alternatives 2, 3 or 4.

By restricting visitor access and vehicular use, this alternative would set a precedent for limiting visitor-related development in the future.

Impacts on the Socio-economic Environment

Limiting the number of park visitors during peak use periods would minimize increases in the number of persons working and living inside the park. No major changes would be made in the park's internal infrastructure or visitor transportation services. Alternative 1 would not establish external information facilities or relocate NPS operations and jobs out of the park.

Establishing a visitor reservation system would restrict entry into the park once the number of visitors or the number of vehicles had reached the park's carrying capacity. In doing so, the reservation system would also constrain the growth of regional and local economic benefits derived from expenditures by park visitors.

Regional Effects

Northern Arizona and southwestern Utah are anticipated to experience robust economic growth regardless of the effects of alternative 1. Grand Canyon tourism would continue to be a major contributor to the regional economy. However, the reservation system would slightly reduce growth in expenditures by park tourists, thus modestly restraining regional economic expansion.

The adverse economic impacts of this alternative would occur mainly in Coconino County and to a much lesser extent Utah's Washington and Kane Counties and other economies along travel routes to and from the park. It is possible that southern Utah economies could actually benefit from the reservation system because some tourists could choose to spend more time (and money) at Utah attractions in lieu of adapting their travel schedules to fit a reservation at the Grand Canyon.

■ Short-Term Effects

All construction activities would occur in Coconino County. The county has a large and versatile workforce, and most in-park construction jobs would be filled by area residents. The number of construction workers and construction worker earnings would vary from year-to-year; the peak year of construction is anticipated to be 1996 (see table 43). Workers could be expected to commute to construction sites from homes located elsewhere in the county.

■ Long-Term Effects

The long-term economic impacts of alternative 1 would primarily occur in Coconino County. Increases in Grand Canyon visitation would cause overall growth in countywide employment and personal earnings; however, by limiting the number of people visiting the canyon, the reservation system would result in less long-term economic growth than if all potential visitors were allowed into the park.

Park-related employment in Coconino County would increase by 64% (+4,420 jobs to 11,343 total) and earnings would increase by 62% (+$72.5 million to $190 million). As previously indicated, employment and earnings would be higher from 1996 to 2000 due to construction projects inside the park. However, there would be about 419 fewer jobs and $10.8 million less in countywide earnings in 2010 under alternative 1 than under the no-action alternative (see table 42).

■ Coconino County Population Effects

Coconino County would grow rapidly regardless of which alternative was implemented. Alternative 1 would slightly reduce the capability of Coconino County's economy to support population growth, with a predicted reduction in Coconino's 2010 population from 141,353 to 140,475 (about 715 fewer residents). Park-related population effects would still account for 20% of the county's projected growth between 1993 and 2010.

TABLE 42: PROJECTED PARKWIDE VISITATION, EXPENDITURES, AND EMPLOYMENT - ALTERNATIVE 1

	Predicted Visitation (in thousands)	Annual Visitor Expenditures (in millions)
1993	4,355	$402.6
2010	6,696	678.4
Net Change	+ 2,341	+ $275.8
Percentage Change	+ 53.7%	+ 68.5%
Total 1993–2010	99,568	$9,743.1
Compared to No-Action Alternative		
Net Change	- 169,000	- $19.1
Percentage Change	- 2.5%	- 2.7%
Total 1993–2010	- 1,395,000	- $158.3
Percentage Change	- 1.4%	- 1.6%

	Average Park-Related Jobs			Annual Park-Related Earnings (in millions)		
	Direct	Indirect/Induced	Total	Direct	Indirect/Induced	Total
1993	4,180	2,743	6,923	$ 68.1	$ 49.4	$117.6
2010	6,864	4,479	11,343	109.3	80.8	190.1
Net Change	+ 2,684	+ 1,736	+ 4,420	+ $ 41.2	+ $ 31.4	+ $ 72.5
Percentage Change			+ 63.8%			+ 61.7%
Total 1993–2010			165,174*			$2,785.5
Compared to No-Action Alternative						
Net Change			- 419			- 8.0
Percentage Change			- 3.5%			- 4.0%
Total 1993–2010			- 2,856*			- $ 51.6
Percentage Change			- 1.7%			- 1.8%

NOTE: Park-related jobs and earnings are projected for Coconino County.
* Total employment in person-years.

TABLE 43: ESTIMATED CONSTRUCTION EMPLOYMENT AND EARNINGS - ALTERNATIVE 1

	Construction Employment	Earnings
1996	152	$4.2
1997	11	0.3
1998	54	1.5
1999	11	0.3
2000	33	0.9
Total	**261**	**7.2**

NOTE: Construction employment is presented as full-time equivalent jobs. Earnings are in millions of dollars (1993).

Although slightly lower than baseline projections, park-related population growth would still contribute to substantial increases in the demand for public and private facilities and services. Under alternative 1 park-related population growth is projected to create a demand for 3,400 additional housing units.

PARKWIDE EFFECTS

The reservation system is expected to be initiated in 1995 on the South Rim, and be in place from during June through early September. On the North Rim a reservation system would not be needed until 2004 and would be in use during July and August. On both rims reservations would only be needed during peak-use times (for example, mid-day or during the evening dining period). People without reservations would still be able enter the park earlier in the morning or later in the afternoon or evening. During the non-peak season, people will be able enter the park at any time.

The reservation system would have no meaningful effect on overall visitation to the United States by international tourists, or visits to the Southwest by foreign and U.S. citizens.

Most persons precluded from visiting the park by a reservation system would be those people making loosely scheduled or spontaneous decisions to visit the canyon. These people would already be touring Arizona, Nevada, Utah, New Mexico, or California and would likely visit the region's other tourist attractions instead. A limit on park visitors would result in a slight shift in the economic benefits of tourism from the immediate Grand Canyon area to other areas in the Southwest. Most trade lost to the Grand Canyon area would be recouped by economies elsewhere in Arizona, Nevada, Utah, New Mexico, or California.

The reservation requirement would have greatest impact on persons arriving at the park in private vehicles, but limits could also be imposed on persons entering by bus or train. It is assumed that half of the visitors turned away during the peak use periods would be able to adjust their schedules and enter the park at less congested times.

Alternative 1 would still allow for major increases in overall park visitation. From 1993 through 2010, total park visitation would increase to 6,696,000 (an increase of about 54%). However, this would be 2.5% fewer visitors than under the no-action alternative. Between 1993 and 2010, 99.6 million people would visit the park, 1.4 million fewer visitors than predicted under the no-action alternative (see table 42).

With a reservation system, visitor expenditures are still projected to be 69% greater in 2010 than in 1993, growing to $678.4 million, which would be $19.1 million less than under the no-action alternative. During the 18-year study period visitors would spend a total of $9.7 billion, $158.3 million less than under the no-action alternative.

SOUTH RIM

Under alternative 1 annual visitation to the South Rim between 1993 and 2010 is projected to grow by 2.3 million visitors to 6.2 million visitors (a net increase of 58%). This is about 160,000 fewer visitors (-2.5%) than under the no-action alternative. Fewer people would visit the South Rim under this alternative than under the other alternatives.

Both the south and east entrances to the park would still experience substantial increases in visitor use. Visitation by train, tour bus, and airplane/bus shuttle services would grow more rapidly than visitation by private automobile and would cause a slightly greater portion of visitors to enter through the south entrance. Entries from the south would increase by 63.1% and from the east by 40.3%. The share of visitors using the east entrance would decrease from 21.6% to 19.2%.

Under alternative 1 South Rim visitor expenditures would increase by $242.3 million to $574 million in 2010, an increase of 73%, but $16.3 million less than what is predicted under the no-action alternative. From 1993 through 2010 South Rim visitors would spend a total $8.2 billion dollars in the county, which would be 1.7% less than predicted under the no-action alternative.

By 2010 in Coconino County the average number of jobs attributable to park operations and visitor expenditures would grow by 69%, but there would 406 fewer jobs and $50.3 million less in personal earnings than under the no-action alternative.

■ Distribution of Economic and Population Effects

Alternative 1 would increase tourism's direct employment and population impacts in individual South Rim communities, but it would result in less overall economic and population growth than under the other alternatives. By restricting expansion of in-park concessions, alternative 1 would encourage additional development of park visitor services in nearby communities. However, alternative 1 would also constrain growth in the number of NPS employees, whose earnings and expenditures also contribute importantly to the overall county economy. In addition, alternative 1 would not establish major in-park transit service, which would also contribute positively to local and regional economies.

Communities like Tusayan, Williams, Valle, Cameron, and Page would experience net increases in tourist-oriented business investment and employment as a result of the unmet demand for services inside the park. The populations of these communities are predicted to grow more under this than they would under the no-action alternative. Even though tourism investment and Grand Canyon visitor expenditures would also increase in Flagstaff, this community would experience less overall economic and

population growth. Flagstaff is the major beneficiary of the indirect and secondary economic effects of park employment and visitor expenditures. Flagstaff's diminished economic growth results from the limiting effect that alternative 1 would have on NPS employment and overall tourist expenditures.

Economic Effects with the Expansion of Tusayan: The expansion of Tusayan would noticeably affect distribution of economic and population impacts outside the park, since this community is ideally situated to benefit from unmet demand for concession services inside the park. If the townsite was expanded, Tusayan is predicted to capture the majority of park-related business development. Valle, Williams, and Flagstaff would experience additional investment and tourism sector job growth, but it would be less than if Tusayan was not enlarged.

Even with Tusayan expansion, there would be no assurances that an adequate supply of affordable housing would be developed in this townsite. A shortage of affordable housing would force Tusayan workers to commute to their jobs from homes located in Valle, Williams, Flagstaff, and rural subdivisions. This commuting pattern would shift population impacts and much of the economic impact of tourism employment to these other communities.

Economic Effects without the Expansion of Tusayan: If Tusayan was not enlarged, much of the employment and population effects attributable to increasing park visitation would shift to other communities south of the park. Flagstaff's economy would benefit the most from the shift of employment impacts, and it would also experience the greatest share of park-related population growth. Valle and Williams would also experience net increases in employment and population if the Tusayan was not enlarged.

Tusayan would still experience business expansion, and increases in employment and population, but the growth would be constrained by the absence of private land with commercial development potential. The small amount of undeveloped highway frontage would be developed, and some existing commercial properties would be enlarged and redeveloped into more intensive uses. It is also likely that some commercial development would occur farther back from Arizona 64.

■ Communities East of the Park

Alternative 1 would cause less overall economic and population growth in communities east of the park than under the no-action alternative. Communities nearest the park to the east lack the commercial development and community infrastructure to markedly benefit from unmet demand for in-park visitor services. Some individual businesses could experience increases in sales and employment. In general business would be disadvantaged by decreases in drive-by traffic.

Alternative 1 would result in fewer park visitors traveling on Arizona 64 and U.S. 89 to the east entrance of the park. This alternative would reduce the economic viability of the Navajo economic development projects that are being considered. By limiting the growth in park visitors, alternative 1 would also limit the potential market available to a Navajo cultural center, or gambling casinos at Cameron or Page.

North Rim and Tuweep

Alternative 1 would not affect visitation or visitor expenditure patterns until 2004. Implementing a reservation system at that time would reduce overall growth in North Rim visitation and associated economic and population impacts. In 2010 there would be about 9,000 fewer visitors on the North Rim than under the no-action alternative (67,000 under alternative 1 compared to 76,000 under the no-action alternative). Alternative 1 would not affect visitation patterns at Tuweep.

Under alternative 1 area expenditures by North Rim and Tuweep visitors would increase from $31 million in 1993 to $37 million in 2010. In 2010 visitor expenditures would be about $800,000 less than under the no-action alternative. Between 1993 and 2010 park visitors would spend an estimated $615.8 million in Coconino, Mohave, Washington, and Kane Counties, $3 million less than under no action.

Under alternative 1 the total number of jobs created on the North Rim would increase by 18% to 712 in the year 2010, with total earnings of $12.2 million. This would be 22 fewer jobs than under the no-action alternative and a decrease in total earnings of $500,000.

Alternative 1 would allow for substantial increases in employment by in-park concessioners and would allow in-park business operations to expand their shares of the market created by North Rim tourist expenditures. Business expansion inside the park would limit business growth in other northern Arizona and southwestern Utah communities. Areas outside the park would still experience net increases in jobs and population growth attributable to park visitation, but growth would be less than if all potential visitors were allowed to enter the North Rim and the market share for in-park concessioners remained at its current level. Alternative 1 would cause less indirect and secondary economic effects in Flagstaff and St. George, Utah.

Utah's Washington County economy could actually benefit from the reservation system. Tourists deterred from visiting the Grand Canyon could substitute visits to Zion National Park, Bryce Canyon National Park, or other nearby Utah attractions and spend more money in this economy. Utah's Kane County (Kanab) could experience some minor adverse economic effects as a result of tourists changing their travel and overnight lodging itineraries. It is also possible that Kane County would benefit from substitution of visits to Utah and other northern Arizona attractions.

Conclusion

Alternative 1 would limit the number of park visitors during peak use periods. This alternative would also limit the number of persons living and working inside the park. No major improvements would be made in the park's internal infrastructure or visitor transportation services. Most visitors would tour the park in personal vehicles.

There would be less economic and population growth in the Grand Canyon area under this alternative than what is predicted to occur under the other alternatives. However, even under constraints on visitation, the growth in the number of park visitors would contribute to substantial economic expansion and population increases.

In 2010 an estimated 6,696,000 people would visit the park, 169,000 fewer visitors (-2.5%) than predicted under the no-action alternative. Under alternative 1 park visitors would spend $678.4 million in the Grand Canyon region in 2010, $19.1 million less (-2.7%). To the extent that a day visitor reservation system would constrain the growth in expenditures by tourists, the growth in employment and earnings in tourist-oriented businesses would be constrained. This alternative would increase NPS and transit service employment inside the park by an estimated 57 jobs, which is less job growth than under the other alternatives.

Most economic, population, and land use impacts attributable this alterative would occur in Coconino County, Arizona. From 1993 through 2010 the direct, indirect, and induced economic effects attributable to the national park would cause the county's average annual employment to grow by 4,420 jobs, and countywide personal earnings to grow by $72.5 million. Total employment and earnings growth attributable to this alternative would support about 7,500 additional persons in 2010. Park economic effects would be responsible for 20% of the county's projected population growth between 1993 and 2010. Under this alternative Coconino County employment would grow by 419 fewer jobs and support 715 fewer people than predicted under the no-action alternative.

This alternative would restrict the expansion of in-park concession services and would minimally affect in-park land uses. An indirect effect of restricting the growth of in-park concessions and services would be to transfer the growth in tourist-oriented commercial land uses to small communities outside the park's entrances. Resulting employment and population growth would add to exiting shortfalls in affordable housing and require improvements to community infrastructures and services in nearby communities.

Under this alternative concession services would continue to be inadequate for dealing with visitor needs and demands, particularly in the areas of food service and overcrowded rim facilities. There would be no new impacts on park concessioners.

Cumulative Effects

The effects would be the same as the no-action alternative except that by restricting the number of South Rim visitors, alternative 1 would limit the growth in customer market available to all Grand Canyon area tourism businesses. Also, not addressing the ability to accommodate current and expected increased growth in park use would have a negative cumulative effect on the effective use of concession facilities and adequate service to visitors.

IMPACTS ON TRANSPORTATION, PARKING, AND TRANSIT

SOUTH RIM

■ Access and Circulation

Outside the Park: This alternative would not cause any major shifts in regional traffic patterns. All major access routes leading to the South Rim are expected to provide satisfactory service through the year 2010.

A vehicle reservation system under this alternative would limit the number of vehicles on the South Rim at any one time. This limit would initially be established at 2,686 total vehicles (2,475 cars, 158 RVs, and 53 buses).

It is estimated that on the 2010 design day (10th highest day in the year 2010) approximately 1,704 vehicles would not be able to enter the South Rim between 11 A.M. and 3 P.M., amounting to 5,282 people. Based on present use patterns, 80% of these vehicles (1,363) would be turned away at the south entrance, and 20% (341) at the east entrance. Some of these visitors could be rescheduled for non-peak hours or a different day. Some visitors would choose not to visit the park as a result of the reservation system.

It is estimated that 90% of the visitors initially turned away from the South Entrance would enter the park on a private transit bus or train. It is estimated that only 50% of the visitors initially turned away from the East Entrance would drive to the South Entrance and enter the park on private transit bus or train. Of all the visitors turned away at the entrance gates, approximately 2,900 visitors would choose to enter the park via private shuttle bus and approximately 1,430 would choose to enter the park by train.

Traffic circulation patterns would be likely to change within the community of Tusayan as a result of this alternative. The reservation system would tend to regulate the number of visitors in personal vehicles that enter the area and would also help to distribute the visitor demand throughout the year.

Although all visitors would know their assigned entrance time in advance, early arrivals would be likely. These people would circulate within the community of Tusayan while waiting to enter the park. It is assumed that this parking demand in communities outside the park would be accommodated by the private sector.

A similar condition would exist at the east entrance. The reservation system would result in the rescheduling of approximately 341 vehicles that would typically enter the east entrance of the park during the middle of the 2010 design day.

USFS Road 302/307 would remain a dirt road that would be closed to through traffic. The use of this road is not expected to change as a result of this alternative.

Grand Canyon Village: As previously described, many of the roads in Grand Canyon Village are now operating at LOS D, with slow travel times, bumper to bumper traffic, and long delays. East Rim Drive and Center Road are the only roads that are well below capacity and operating at a desirable LOS B/C.

Limiting the number of motorized vehicles would mean that in the year 2010 main roads in the village and the south entrance road would not exceed their operating capacity and would function at LOS D. Center Road would continue to operate at LOS C.

West Rim: West Rim Drive would be restricted to NPS-provided transit and concession tour buses during the peak visitor season. During this time, West Rim Drive would operate at LOS A/B. Transit service would be discontinued during the shoulder months, and West Rim Drive would be open to private vehicle traffic. The road would operate at LOS D during these times.

East Rim: East Rim Drive would operate at LOS B through the year 2010. No operational problems with respect to traffic access or circulation are anticipated on this route.

Desert View: Access to Desert View would remain unchanged under this alternative, and no vehicle circulation changes would be made within the developed area at Desert View.

■ Parking

Outside the Park: Alternative 1 would create additional parking demand within the community of Tusayan. Approximately 936 parking spaces (6.5 acres) would be needed to accommodate the visitors choosing to take a private shuttle service into the park. Approximately 461 parking spaces (3.2 acres) would be needed to accommodate the visitors choosing to ride the train into the park.

The vehicle registration system would result in visitors who were waiting for their park entrance time to recirculate through the community. It is anticipated that these visitors would create a parking demand of about 250 vehicles in Tusayan, requiring about 1.75 acres of paved area.

Formalized parking areas would not be provided by the National Park Service in Tusayan. Since roadside parking is prohibited, additional parking demand would have to be accommodated by the businesses in the community. It is anticipated that minor problems would occur in a few private parking lots as parking demands exceeded the supply of parking spaces.

A parking area would also be required near the east entrance to accommodate the visitors choosing to wait in that area for their park entrance times. A gravel-surfaced parking area 1 mile east of the entrance at the Desert View quarry site would be provided to help meet this parking demand. The parking area would be about 0.5 acre in size and could accommodate 50 cars, 3 RVs, and 1 bus .

Grand Canyon Village: The day visitor reservation system would limit the demand for parking in the village. Parking demands on the East Rim and within the village would generally be equal to the total number of parking spaces now in this area. No on-street parking would be allowed under this alternative.

The current supply of parking spaces (2,686 spaces) within the village was used to determine the carrying capacity for the South Rim. Under this alternative the East Rim would have a parking demand that is at or near the parking capacity, while the village would have a parking demand that is 76% of capacity. This means that 2,052 of the parking spaces in the village would be used on a peak day.

The areas that are most likely to experience parking capacity problems are the parking lots closest to the rim, which are most in demand. The presence of parking attendants to direct vehicles to the parking areas with available spaces would minimize any parking capacity problems in these areas and prevent overflow conditions. The parking provisions for overnight guests would remain essentially unchanged, with guests parking at lots near their lodging sites.

West Rim: Some parking problems are expected to continue during the peak season when the West Rim is restricted to transit vehicles only. These parking problems are typically created by concession tour buses and vehicles for visitors with disabilities.

Even greater parking problems are anticipated during the shoulder seasons when the West Rim is accessible to all visitor vehicles. Parking demands would exceed available parking supply in several parking areas. The presence of RVs and buses at the West Rim overlooks would create special problems since no oversized vehicle parking spaces have been designated at any of these parking areas.

East Rim: The carrying capacity limit for the South Rim was based on the East Rim having a parking demand that is equal to the available parking supply. Parking demand is expected to exceed the supply of parking spaces at some overlooks because of occasional imbalances in the distribution of the visitors along East Rim Drive. The popular overlooks at the South Kaibab trailhead and Grandview would most likely be full on a regular basis. The restriction of roadside parking would theoretically force visitors to move on to other overlooks on East Rim Drive.

Parking demand at the South Kaibab trailhead is expected to exceed the supply by about 60 vehicles on a peak day. Without adequate enforcement of the roadside parking restriction, roadside parking would occur at this site.

A similar situation is expected at Grandview, where the parking demand would exceed the supply by about 35 vehicles on a peak day.

Desert View: The existing 140-space paved parking area would remain. An additional 85-space gravel-surfaced parking area would be provided to accommodate the anticipated overflow parking demand (this area is currently used for overflow parking). Both the existing parking area and the overflow parking areas would be full on a regular basis.

Problems relating to overflow parking along East Rim Drive near Desert View could be a problem. Even though roadside parking would be prohibited along East Rim Drive, it is believed that overflow parking would still occur unless parking restrictions were actively enforced. Enforcing roadside parking restrictions would force additional overflow vehicles to go to other overlooks.

■ **Transit Service**

Outside the Park: No NPS transit service would be provided outside the park. Private transit operators would probably continue to offer public transit service between Tusayan and the park. Private transit services between other gateway communities and the park would likely become established and sufficiently equipped to meet any anticipated park-related transit demand.

Visitors without a vehicle reservation could take either a private shuttle bus or the train into the park. The train would have to compete with the shuttle bus for this business. It is estimated that most visitors would choose the shuttle bus because it would probably be less expensive and faster than the train.

Grand Canyon Village: A visitor transportation system would be provided by the National Park Service within the village area, similar to what is currently provided. The vehicle fleet would be increased slightly in response to additional demand. The number of stops, the estimated peak-hour demand in the year 2010, the number and size of vehicles required to operate the service, and the time between buses on the route (headways) are shown below.

Village Loop Shuttle

Stops:	Same as existing service, with additional stops at Mather Point and Southgate
Demand:	500 rides/hour
Vehicles:	Five 65-passenger buses
Headway:	15 minutes

South Kaibab Trailhead Shuttle

Stops:	Backcountry office, South Kaibab trailhead
Demand:	20 rides/hour
Vehicles:	One 65-passenger bus
Headway:	45 minutes

The operation of the village loop shuttle would continue to provide poor service. Capacity problems are anticipated to occur on a regular basis during the peak season. It is expected that the South Kaibab trailhead shuttle would continue to provide acceptable service through the year 2010. Private vehicles operating on park roads could create traffic congestion, affecting the efficiency of the transit system by creating delays in the bus schedule.

Concession tours and private tour bus service to the village would continue similar to the present.

West Rim: The Park Service would continue to provide transit service on West Rim Drive during the peak visitor season.

West Rim Shuttle

Stops:	Trailview, Maricopa, Powell, Hopi, Mohave, Abyss, Pima, Hermits
Demand:	450 rides/hour
Vehicles:	Six 100-passenger bus trains
Headway:	15 minutes

The West Rim shuttle is expected to continue to provide very poor service. Capacity problems are expected to occur on a regular basis during the summer months. Long lines of visitors waiting to ride the shuttle would form at the interchange. Numerous visitors would be stranded at various overlooks on the West Rim due to the inadequate service. Major capacity problems would likely occur on days when the weather changes rapidly, causing large numbers of visitors wanting to leave the West Rim as fast as possible. The transit system would not be capable of handling this anticipated demand.

East Rim: No NPS-provided transit would be available on the East Rim. Concession tours and private tour buses would continue to operate on the East Rim.

Desert View: No NPS transit service would be provided in the Desert View area. Concession tours and private tour bus service would continue on the East Rim similar to present operations.

■ **Winter Use**

Access and Circulation: Estimates of traffic volumes and visitor access demands for peak days in the winter season were developed from actual traffic count data collected in 1990 and 1992, which indicate that during the 1992 winter season most South Rim roads operated at LOS C or better. East Rim Drive and Center Road were well below capacity and operated at LOS B. West Rim Drive, sections of the village loop road, and the south entrance road operated at LOS D. No South Rim roads operated at undesirable levels of service (LOS E or F) during the 1992 winter season.

It is estimated that during the winter season in the year 2010 most sections of the main roads in the village and the south entrance road would likely operate at LOS C. Center Road and East Rim Drive would continue to operate at LOS B. West Rim Drive, the north half of the village loop road, and the south entrance road between the visitor center and the Yavapai observation station would be expected to operate at LOS D.

Parking: Parking in the village during the winter is expected to be near capacity in some locations. Parking problems would be expected to occur at all parking areas near the rim.

Parking problems on West Rim Drive are also expected during the winter season, especially during the shoulder months of October and November, March and April.

Parking demand on East Rim Drive during a peak winter day was estimated to be about 67% of the summer carrying capacity limit. On most winter days the parking demand on the East Rim is expected to be much less than the total parking capacity of the developed areas on the East Rim.

Transit: No NPS-provided transit services would be provided during the winter months. Concession tours and private tour buses would continue to operate on the East Rim.

North Rim

■ **Access and Circulation**

Outside the Park: Regional traffic patterns would not change as a result of implementing this alternative. Access to the park would be allowed to increase until visitation reached the established carrying capacity for the North Rim. When this limit was met (estimated to occur around the year 2004), the proposed reservation system would control and limit additional visitor access.

Bright Angel Point: The reservation system would limit the number of vehicles on the North Rim to 495 vehicles, assuming that 80% of the vehicles would go to Bright Angel Point, where 386 parking spaces are available, and 20% would go to Walhalla Plateau, creating a demand for 109 parking spaces (58% of capacity). This number of vehicles represents 1,744 visitors. All roads in this area would provide LOS B through the year 2010.

The carrying capacity limits established for the park would require rescheduling the arrival of 227 vehicles on the North Rim, or 749 visitors. Most of these vehicles could be accommodated during the off-peak hours on the same day.

Walhalla Plateau: Access to Walhalla Plateau would not be changed under this alternative. All roads in this area would operate at LOS B in the year 2010.

■ **Parking**

Outside the Park: Implementing a reservation system would cause minor increases in parking demands in the gateway communities and at nearby commercial establishments. The increased parking demand would be created by visitors waiting for their scheduled time to enter the park. It is likely that the majority of the increased parking demand would occur at Kaibab Lodge.

Bright Angel Point: Allowing 495 vehicles onto the North Rim, and assuming that 80% would go first to Bright Angel Point, would produce a parking demand about equal to the current parking capacity of the point. Parking capacity problems would still occur at the lodge parking area since higher visitation to this area is probable. Because roadside parking would be prohibited under this alternative, all overflow vehicles from the lodge parking area would have to park at the camper store, amphitheater, or laundry.

A new gravel-surfaced parking area on CC Hill would accommodate overflow parking demand from the North Kaibab trailhead parking area for about 40 cars. The access road from the existing trailhead parking area to CC Hill would be widened for two-way traffic. Much of this road is steep and would have to be paved to ensure safe vehicle use. RVs and other oversized vehicles would be required to park in the existing parking lot.

All other parking areas on Bright Angel Point would remain unchanged.

Walhalla Plateau: No changes to parking areas along the scenic roads would be made. The reservation system would create a parking demand on Walhalla Plateau that is about 50% of the parking capacity for this area of the park. Some local parking capacity problems could result from the unbalanced distribution of visitors on the North Rim.

■ **Transit**

No NPS transit service would be provided outside or within the park. Private bus tours to the North Rim are expected to continue to grow in response to the demand for such service.

TUWEEP

Access to the Tuweep area would remain unchanged. The quality of travel on the dirt access roads would depend on weather and the condition of the road. Although unlimited vehicle access would be allowed, the traffic volumes on the access roads are not expected to substantially increase in the future due to the remote location of this area, consequently no capacity problems are expected.

The 10 parking spaces at Tuweep would fill to capacity on most peak visitation days. Roadside parking would be allowed for overflow parking. It is estimated that as many as 40 vehicles would park at Tuweep on a peak day, with 30 vehicles being forced to park along the road. The current parking supply would meet the parking demand on most days.

No transit service of any kind would be provided for the Tuweep area.

CONCLUSIONS

The carrying capacity limits established for the park would require rescheduling the arrival of about 1,704 vehicles on the South Rim and 217 vehicles on the North Rim. It is unlikely that all of the 1,704 vehicles on the South Rim could be rescheduled for off-peak times on the same day, forcing some visitors to reschedule their visit for another day or to come during the off-season. On the North Rim, most of the 217 vehicles that would need to be rescheduled could be accommodated during the off-peak hours on the same day.

Establishing carrying capacity limits would not cause visitors to drive to the other rim in order to circumvent the vehicle entrance limits. It is unlikely that many visitors would drive from the South Rim to the North Rim because of the reservation system.

The carrying capacity limit would control parking demand throughout the Park. This would minimize the number of parking problems that occur on both rims, without constructing large amounts of new parking.

CUMULATIVE EFFECTS

Establishing carrying capacity limits for the park would better distribute the daily visitor demand, and would reduce the peak loads that would occur in the middle of the day. Visitor demand would tend to increase during the off-peak hours of the day. The limit would cause a shift in the seasonal distribution of visitors. The limits would tend to shift some visitor trips from the peak season to the shoulder season.

These anticipated changes in the visitor use patterns would affect the tour bus and air tour industries. The tour companies that serve the Grand Canyon would have to modify their operations to meet the new demand patterns.

The anticipated changes in visitor patterns would have a positive impact on the operations at the Grand Canyon Airport.

The NPS transit service proposed in this alternative would produce an energy benefit by trading private vehicle miles for transit miles. The transit service would reduce private vehicle travel each year within the park by 6.1 million miles. Taking into account the fuel used in the transit vehicles, the net fuel savings would be approximately 200,000 gallons of gasoline each year.

The transit service would also produce an air quality benefit, trading 6.1 million private vehicle miles/year in gasoline burning cars for 245,000 transit miles/year driven in clean natural gas burning buses. This trade-off would produce a net reduction in vehicle generated pollutants and have a positive impact on the air quality of the park.

IMPACTS ON AREA OPERATIONS

HOUSING

No employees would be added under this alternative, other than employees filling those positions identified in the park's position management plan; growth in park employment would be limited by a day visitor reservation system that would limit increases in visitation. To replace substandard housing units and to provide housing for additional required employees, a total of 520 units would be provided — 370 on the South Rim (85 units outside the park), 117 on the North Rim, 4 in the inner canyon, and 1 at Lees Ferry (see table 44).

■ Regional Effects

Employees: Because housing would be provided by the private sector, prices for renting or buying could be higher than what some employees could afford, particularly lower paid personnel. The restriction on the number of housing units to be constructed in the park under this alternative would force some employees to relocate from Grand Canyon Village to Valle, Williams, or Flagstaff.

The location of housing in Valle, Williams, and Flagstaff would require a commute from 25 minutes up to an hour and a half each way. Commuting times could be increased with regular waits in visitor traffic at the park entrance station during times of high visitation. Studies have shown that long commutes for resort-type employees negatively affects employee attendance and productivity, and increases turnover.

Housing Needs: Of the 370 new housing units needed under this alternative to meet projected housing needs, only 285 units would be built in Grand Canyon Village, leaving approximately 85 housing units to be provided outside the park. Many of these units would be for employees newly arrived at the park since most longer-term park employees would already have status for in-park housing. There would be negligible regional impact in meeting the needs for 85 housing units, although there are no current options for housing in Tusayan (unless the USFS land trade is completed) or other closeby areas.

Community Structure/Social Characteristics: Those employees living in remote communities and commuting to work could experience a sense of disconnection with the park community, possibly affecting their job performance and sense of belonging to the park community.

■ South Rim

Grand Canyon Village:

• *Employees* — With new park housing available for some new employees under this alternative, both the Park Service and concessioners would benefit slightly by being able to hire the highest qualified employees for a few of the new positions available. Most new employees, however, would find housing conditions to be substandard, and additional employees would tend to exacerbate the housing problems now apparent within or near the park.

Replacing substandard housing would significantly improve living conditions for approximately 150 employees, helping to reduce employee turnover and general dissatisfaction with living conditions at the Grand Canyon.

• *Housing Needs* — A total of 285 new housing units, which have already been approved, would be built on 43.1 acres in Grand Canyon Village; these units would replace 113 substandard units and provide 172 additional units (see table 44). By removing substandard units and utilizing that disturbed area, this alternative would affect an additional 29.7 acres over existing conditions. This is an overall net density for the new units of approximately 5.8 units per acre. This density is substantially lower than desired, but it represents the current trend of housing development at the Grand Canyon, based on recent park housing plans, and best illustrates a continuation of present course of action.

• *Community Structure/Social Characteristics* — Providing housing inside park boundaries would contribute to park employee satisfaction. Most employees drawn to work at the park prefer to live in the park, and park housing would continue to meet most employee expectations. Those employees not wishing to live in the park could still reside in remote communities and commute to the park.

Most housing would continue to be dispersed across several areas within Grand Canyon Village. Managers would continue to be housed separate from lower level employees, and NPS housing would continue to be separate from concessioner housing.

Employee housing in prime visitor areas along the rim and near hotels would continue, with continued conflicts between residential and visitor activities.

Most employees could still walk or bike to work, as well as drive. Employee parking adjacent to hotels, offices, and other park structures would continue to conflict with visitor parking and would continue to be an enforcement problem. Employee traffic would continue to contribute to overall congestion on park roads, particularly during peak season and during lunch hours.

Hermits Rest: No new housing would be added at Hermits Rest under this alternative. Replacement housing for one trailer would be provided in Grand Canyon Village, improving living conditions for this employee but requiring a daily commute.

Removing the substandard trailer would result in an overall net reduction in units and land disturbance. A total of 0.1 acre of disturbed land could be restored under of this alternative.

TABLE 44: HOUSING SUMMARY, 2010 - ALTERNATIVE 1

Area	Existing Units	Substandard Units to be Replaced	Standard Units to be Converted or Replaced	Total Remaining Standard Units	New Units Needed to Meet Standards*				Additional Units Needed for New Employees		Total New Units Needed		Total Units Needed This Alternative	Net Change over Existing		Projected Housing Unit Shortage
					NPS		Concessioner									
					Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.		Units	Ac.	
South Rim Region																
• Tusayan	0	0	0	0	0				0		0		0	0		
• Flagstaff, Valle, or Williams	9	0	0	9	18		67		0		85		85	85		
• East Rim/Outside Park	0	0	0	0	0				0		0		0	0		
	9	0	0	9	18	0	67	0	0	0	85		85	85		
South Rim																
• Grand Canyon Village	958	113	0	845	59	17.8	226	25.3	0		285	43.1	1,130	172	29.7	
• Hermits Rest	2	1	0	1	0				0		0		1	-1	-0.1	
• Desert View	40	11	0	29	15	1.4	13	1.5	0		28	2.9	57	17	0.6	
	1,000	125	0	875	74	19.2	239	26.8	0		313	46	1,188	188		
North Rim																
• Jacob Lake	0	0	0	0	0				0		0		0	0		
• North Rim	173	22	0	151	29	3.5	88	6.2	0		117	9.7	268	95	6.6	
• Tuweep	2	0	0	1	0				0		0		1	-1	0.1	
Other Park Areas																
• Inner Canyon	22	4	0	18	4				0		4		22	0		
• Lees Ferry	2	1	0	1	1				0		1		2	0		
Total:	**1,208**	**152**	**0**	**1,055**	**126**	**22.7**	**394**	**33**	**0**		**520**	**55.7**	**1,566**	**367**	**36.7**	

* Includes replacement of substandard units and additional units to eliminate double and triple bunking.

Desert View:

• *Employees* — Providing replacement housing for substandard units as well as new housing for two new employees, would provide adequate housing for employees. Eliminating double- and triple-bunking in dorm rooms, as well as trailers and other substandard living conditions, would improve employee morale and help reduce employee turnover and general dissatisfaction with living conditions at Desert View.

Most housing would continue to be provided in the employee area southeast of the visitor use area. This location, along with limited housing close to the visitor parking area, would allow nearly all employees to walk to work, minimizing traffic conflicts with visitors. Service deliveries to the gift shop and store would continue along a service road at the back of these facilities and separate from visitor traffic areas.

• *Housing Needs* — A total of 28 new units on 2.9 acres would be constructed under this alternative, including the replacement of 11 substandard units. By using existing disturbed areas, the net increase of newly disturbed land would be 0.6 acre. Since most existing substandard units are trailers, most previously disturbed land can be reused for housing, requiring minimal new disturbance.

• *Community Structure* — Because most new housing would be built in previously disturbed areas, the current mix and integration of employers and employee level housing unique to Desert View would continue, including the strong sense of community found among residents due to the area's remoteness.

Most housing at Desert View would continue to be provided out of sight of visitor activities except for a few units near the existing visitor parking lot. Little conflict would occur between residential and visitor activities other than the negative visual appearance of the small housing area near visitor parking.

■ North Rim

Employees: New employees would benefit from new housing provided within the park. Employers would benefit from being able to provide adequate housing for the best employees that can be hired. The hiring of 44 new concession employees would enable the concessioner to reduce its workweek to five days from six days, helping reduce employee turnover (the same as the no-action alternative). It is anticipated this change would significantly making the entire operation more efficient and enjoyable for employees and visitors alike.

Only three new NPS employees would be added under this alternative. This modest increase in employment would have minimal effect on new housing needs on the North Rim.

Only employees residing in substandard housing would be relocated to new or improved housing. Eliminating double- and triple-bunking in dorm rooms, as well as trailers and other substandard living conditions, would help improve employee morale and reduce employee turnover.

Housing Needs: A total of 117 new housing units on 9.7 acres would be constructed under this alternative, including the replacement of 22 substandard units, for a net increase of 95 units. By utilizing existing disturbed areas, 6.6 acres of new land disturbance would occur. New disturbance would be limited to areas adjacent to existing housing, reducing the need for infrastructure extensions and reducing visibility by visitors.

Community Structure/Social Characteristics: The separation of NPS and concessioner housing would continue under this alternative, with new housing adjacent to each existing housing area. This separation of housing is generally viewed by employees and employers as a positive element on the North Rim.

Most park employees would still be able to walk to work. Employee housing adjacent to visitor cabins would continue to promote informal visitor/employee interactions. Periodic conflicts and complaints by visitors and residents would also continue.

Some employees would continue to drive to work and park in visitor parking areas, competing with visitors for parking in a few areas, particularly near the Grand Canyon Lodge.

■ Tuweep

No new employees would be required under this alternative. A substandard trailer would be removed and 0.1 acre of disturbed land would be restored. Short-term employees would be required to stay at remote lodging

and commute to Tuweep or stay in the visitor camping area.

■ **Corridor Trails**

No new employees would be required under this alternative. Inner canyon housing would continue to function as backcountry, remote housing. However, housing conditions would be improved by replacing four substandard units at Phantom Ranch. Since the improvements would occur in previously disturbed areas, no new land would be disturbed. Eliminating double-bunking in dorm rooms would help reduce employee turnover caused by housing problems in the inner canyon.

■ **Lees Ferry**

No new employees are required under this alternative. One new housing unit would be provided to replace a substandard unit. The new structure would be in a previously disturbed area, resulting in no new disturbance. The relocated employee would benefit from better living conditions.

■ **Conclusion**

Providing 285 housing units in Grand Canyon Village and 28 units at Desert View would substantially improve overall housing availability in the park and eliminate substandard conditions. Better housing would help improve employee morale and reduce employee turnover. There would be a minimal impact on surrounding South Rim communities, where there would be a demand for 85 housing units for park employees.

Park employees who had to live in remote communities and commute over a half an hour to work would be more difficult to keep as long-term employees. Studies have shown that long commutes for resort-type employees negatively affects attendance, productivity, and turnover. Car-pooling programs and employee shuttles could reduce the negative effects but would not eliminate the problem.

Establishing a visitor carrying capacity would directly affect the need for park housing. Without a significant increase in visitation during peak use periods, no facility or workforce expansion, or associated housing, would be required. Limiting park visitation would essentially freeze the need for more park housing.

TABLE 45: PROJECTED EMPLOYEES, 2010 - ALTERNATIVE 1

Area	Park Employees							
	National Park Service			Concessioner			Total	Net Change
	Existing	New	Total	Existing	New	Total		
South Rim								
• Flagstaff, Valle, or Williams	3	0	3	0	0	0	3	0
• Grand Canyon Village	286	50	336	1,318	0	1,318	1,654	50
• Hermits Rest	0	0	0	3	0	3	3	0
• Desert View	22	2	24	44	0	44	68	2
• East Rim/Outside Park	0	0	0	0	0	0	0	0
Subtotal	311	52	363	1,365	0	1,365	1,728	52
North Rim								
• Jacob Lake	0	0	0	0	0	0	0	0
• North Rim	67	3	70	230	44	274	344	47
• Tuweep	1	0	1	0	0	0	1	0
Subtotal	68	3	71	230	44	274	345	47
Other Park Areas								
• Corridor Trails	12	0	12	17	0	17	29	0
• Lees Ferry	2	0	2	0	0	0	2	0
Subtotal	14	0	14	17	0	17	31	0
Total	**393**	**55**	**448**	**1,612**	**44**	**1,656**	**2,104**	**99**

COMMUNITY SERVICES

■ **Region**

Facility and Space Needs: Flagstaff, Williams, and Page, Arizona and Kanab, Utah would continue to serve as primary regional centers for park residents. These communities would continue to offer services not found in the park, such as major auto repair/sales, appliance and clothing sales, major medical and dental care, and primary grocery shopping. Park residents would continue to travel to these communities regularly. There would be no significant impact on those communities in continuing to meet needs of park residents.

The potential land exchange in Tusayan could provide an array of nearby community services for park and regional residents. Such a development would reduce the time and financial commitment of traveling to towns such as Flagstaff or Williams for many common items and services.

Conflicts with Visitors: Conflicts between park residents and visitors would continue to be minimal. There would be some delay and inconvenience to both park residents and visitors as a result of traffic congestion at park entrances, particularly during peak periods of visitation.

Community Characteristics: This alternative would have minimal impacts on current regional community characteristics.

■ **South Rim**

Grand Canyon Village:

• *Facility and Space Needs* — Many community service needs for residents of Grand Canyon Village would not be met. There would continue to be a shortage of community meeting space and church facilities, and areas around the park would continue to be used for such functions. The school would still need to be expanded, and school activities would still require commutes for many regional residents. Recreation facilities in the park would be needed, with the school and GCNPL recreation center offering only limited opportunities. Personal storage facilities would also still be needed.

• *Conflicts with Visitors* — The Shrine of the Ages building would serve both visitors and residents as a multi-functional facility, and conflicts between the uses and parking for the nearby visitor center would continue.

Because of the lack of recreation facilities for off-hour employee use, employees would continue to seek out visitor recreation facilities. Many of the current conflicts between the two groups that often result in visitor complaints and employee reprimands would continue.

Employee trips to the post office and bank, particularly during lunch hours, would continue to create conflicts with visitors because of having to compete with visitors for parking spaces.

• *Community Characteristics* — The effects would be the same as for the no-action alternative.

Desert View: Effects related to facility and space needs, conflicts with visitors, community characteristics would be the same as for the no-action alternative.

■ **North Rim**

Effects related to facility and space needs, conflicts with visitors, community characteristics would be the same as in the no-action alternative.

■ **Tuweep**

No changes to the Tuweep community services would occur under this alternative.

■ **Corridor Trails**

No changes to the inner canyon community services would occur under this alternative.

■ **Lees Ferry**

No changes to community services at Lees Ferry would occur under this alternative.

■ **Conclusion**

This alternative would perpetuate the lack of community services, particularly in Grand Canyon Village, Desert View, and the North Rim. No new facilities would be provided, and existing facilities would continue to be used for other needs. Employee morale would continue to be affected because of a lack of community facilities and activities. Employee turnover would continue to be higher, with employees searching for a more complete social environment in which to work and live.

■ **Cumulative Effects**

As the surrounding communities continue to grow around the Grand Canyon, more pressure to provide community services would be placed upon those communities. Grand Canyon residents would likely become more reliant on those remote communities and the Tusayan land trade development for services, increasing the number and frequency of trips between the park and those communities/development areas. The remoteness of those communities would continue to make many Grand Canyon residents feel isolated and eventually seek to relocate to new communities and jobs that can fulfill their social needs. The Grand Canyon would continue to be an outpost of short-term employees with few alternatives or conveniences available to them outside of their workplace.

Management Support Facilities

Please refer to table 4 at the end of the "Alternatives, Including the Proposed Action" section for a summary of needed management support facilities.

■ **Region**

Effects on regional communities as a result of park-related facility and space needs would be minimal under this alternative. Due to the implementation of a reservation system, few new facilities would be required in the park and very little expansion or relocation of facilities outside of the park would take place. If the official jurisdiction of emergency response and care providers does not change, the town of Tusayan could lose some of its occasional support from NPS response crews the same as in the no-action alternative.

Effects on operational relationships and conflicts with visitors would be the same as in the no-action alternative.

■ **South Rim**

Effects related to facility and space needs, operational relationships, and conflicts with visitors would be the same as in the no-action alternative.

■ **North Rim**

Effects related to facility and space needs and operational relationships would be the same as in the no-action alternative. Few operational conflicts with visitors would occur as a result of this alternative because visitor use areas and management support areas would be adequately separated.

■ **Tuweep**

Effects related to facility and space needs would be the same as in the no-action alternative. All existing operational relationships at Tuweep would be adequate for management needs. There would be no conflicts between management functions and visitors under this alternative.

■ **Corridor Trails**

Effects related to facility and space needs would be the same as in the no-action alternative. No changes in operational relationships would occur as a result of this alternative. Most locations for support facilities would continue to function well and provide adequate coverage of service. All operations would continue to be supplied from remote locations, primarily Grand Canyon Village.

Minor conflicts with visitors would continue to occur as a result of administrative mule traffic on the South Kaibab Trail. There would continue to be frequent contacts between mules and hikers on this trail, creating some undesirable circumstances due to mule waste and minor interruptions/delays for hikers.

There would be very few points of conflict with visitors in all other operations, maintaining an adequate separation of those entities.

■ **Conclusion**

The effects would be the same as in the no-action alternative.

■ **Cumulative Effects**

Maintenance operations in the park would tend to suffer the greatest impacts as a result of this alternative. The persistent workload of projects needing to be addressed by inadequate staff levels working from substandard, small, inefficient facilities would contribute significantly to the further decay and dilapidation of many park structures. Heavy visitor use would continue to extend priorities to visitor areas, outpacing the ability of maintenance crews to keep up with other non-visitor maintenance needs in the park.

Other NPS operations such as the ranger division would also continue to suffer inefficiencies of operations due to lack of adequate work space and equipment storage. The interpretive and administrative divisions would continue to suffer inefficiencies and conflicts with visitors on an increasing basis due to their primary offices located in the overcrowded visitor center.

Some of the most severe impacts as a result of this alternative would be the constant employee turnover due to stress and problems associated with inadequate working conditions and facilities. The Grand Canyon could become a park to be avoided simply due to severe lack of space and equipment to perform quality work in a timely and enjoyable manner.

Utilities

■ **Water Supply**

South Rim: The construction of new housing and increased visitation are the major factors contributing to increased water consumption under this alternative. Limited employee housing would be provided, requiring some employees to obtain housing outside the park.

As a result of implementing the proposed changes, potable water use would increase approximately 15% during peak visitation months. To meet this increased demand, the Indian Garden pump station would operate approximately 18 hours per day. No additional water storage on the South Rim would be required. Reclaimed water use in new facilities would increase by 6 million gallons per year.

Water service for employees obtaining lodging outside of the park would be provided locally.

At Desert View increased visitation and construction of new housing would be the primary changes affecting increased water consumption at Desert View. Water use would increase by approximately 13%, imposing no impact to water supply facilities other than increased pumping from the South Rim tank farm.

North Rim: Increased visitation and replacement of housing are the primary factors contributing to increased water consumption. The use of reclaimed water would be implemented in the new housing.

The use of potable water would increase by approximately 10% by the year 2010, imposing no impact to the water supply system. No additional water storage would be required.

Tuweep: Effects would be the same as described under "Impacts Common to All Alternatives."

Corridor Trails: Proposed plans to be implemented under this alternative would not affect water supply.

Conclusion: While water consumption would increase under the alternative 1, this increase would not result in any need for additional water supply or water storage beyond the capacity of the existing system.

■ **Wastewater**

The South Rim treatment plant would operate at approximately 85% capacity during peak months; peak-day hourly flows could be handled by pretreatment facilities. At Desert View approximately double the wastewater treatment capacity might require alternate wastewater treatment facilities or the expansion of existing lagoons.

On the North Rim peak month wastewater flows would exceed the existing plant capacity, requiring expansion; no additional reclaimed water for fire protection would be required.

■ **Power Supply and Distribution**

Visitor and employee facilities would remain the same under this alternative, imposing no additional load on the electrical supply system at any park developed areas. At Tuweep increased power supply for the seasonal ranger residence would be required.

■ **Telephone System**

Very few new facilities requiring phone service would be constructed under alternative 1 except for new housing. A visitor reservation system for the South and North Rims would require a detailed study to determine the most appropriate system. Otherwise, no major changes in the telephone system are anticipated beyond the repair and rehabilitation of current deficiencies.

IMPACTS ON NATURAL RESOURCES

In addition to impacts common to all alternatives, alternative 2 would have the following effects.

REGIONAL EFFECTS

- **Species of Special Management Concern**

Outside the South Rim: The general area north of Tusayan considered for the gateway information/transit center and the federal housing area contains species listed for outside the park in table 9 (see the "Affected Environment" section). While facilities would be located to avoid any direct effect on known populations, more human presence in the area could result in increased indirect impacts to the species (e.g., trampling) and in the loss of potential habitat. The impacts of these facilities would be analyzed in a separate environmental compliance document after site-specific design.

Impacts on species near USFS Road 302/307 would be similar in type but less in magnitude than under either the no-action alternative or alternative 1. Because visitors would be substantially limited in where they could drive and park their vehicles within the park, there would be less reason to use Forest Service roads to try to get around the park entrance gates.

USFS Road 328, which connects to Rowe Well Road in the park, would be upgraded to gravel, and would receive increased use primarily by local residents seeking to avoid congestion at the gateway information/transit center or south entrance station. Impacts to the species listed in table 9 would be as described in "Impacts Common to All Alternatives." Compared to the no-action alternative and alternative 1, the number of vehicles on Road 328 would be reduced due to vehicle restrictions inside the park, and dust would be reduced by graveling the road. The impacts of improving this road would be analyzed in a separate environmental compliance document after site-specific design.

Outside the North Rim: No sensitive species are known from the Jacob Lake area where a joint orientation center would be constructed.

Species near Forest Service roads north of the park could be affected by increased traffic if visitors sought to bypass the entrance station or spend more time on forest lands due to park visitation limits. Impacts would be the same as described for alternative 1 and would include dust and possible displacement of wildlife.

- **Geologic Resources, Soils, Vegetation, and Wildlife**

Outside the South Rim: Moving park jobs and related housing to Flagstaff, Williams, or more distant locations would create insignificant impacts in those urban areas.

Constructing a gateway information/transit center and a new federal housing area in or adjacent to Tusayan would affect considerable acreage as described in table 3. Impacts would be evaluated in detail in a separate environmental compliance document at a later date after site-specific planning and design. Attempts would be made to minimize the impacted acreages, to use existing disturbed areas as much as possible, and to maintain as much of the natural environment as possible when siting development. Nevertheless, the natural character and ecological integrity of the impacted area could be adversely affected.

Site-specific environmental compliance would be conducted, as appropriate, for any new buildings required to establish regional information centers in Cameron, Flagstaff, or Williams.

Impacts on resources near USFS Road 302/307 would be similar in type but less in magnitude than under either the no-action alternative or alternative 1. Because visitors would be substantially limited in where they could drive and park their vehicles within the park, there would be less reason to use Forest Service roads to try to get around the park entrance gates.

USFS Road 328 would be upgraded to gravel and would receive increased use primarily by local residents seeking to avoid congestion at the gateway information/transit center or south entrance station. Impacts would be as described in "Impacts Common to All Alternatives." Compared to the no-action alternative and alternative 1, the number of vehicles on Road 328 would be reduced due to vehicle restrictions inside the park, and dust would be reduced by graveling the road. The impacts of improving this road would be analyzed in a separate environmental compliance document after site-specific design.

Cooperative planning with outside entities, focusing on preservation, ecosystems, education and information, and the development of a unified management plan for the region, would benefit regional resources. Providing NPS assistance in developing a growth management plan for Tusayan that reflected the vision for the park would help to avoid uncontrolled growth immediately outside the park boundary which is one of the biggest threats to regional ecosystem integrity.

Using borrow pits outside the park would impact regional geologic resources, rather than park resources.

Clustering facilities in Tusayan in disturbed areas and linking them to existing utility systems wherever possible would help reduce impacts on the regional ecosystem. However, facilities located just outside the park boundary would have about the same ecosystem impacts as if development occurred inside the park.

Locating major orientation/information facilities outside the park would help reduce visitor impacts on park resources by providing information for visitors and informing them of appropriate behavior before they entered the park, by helping them find the places and experiences they wanted more efficiently (thus reducing travel time and fuel), and by eliminating the need to devote park lands for this purpose.

Outside the North Rim: Site-specific environmental compliance would be conducted, as appropriate, for any new buildings required to establish a regional information center in Kanab. Site-specific impacts related to a joint information center at Jacob Lake would be minimal because either the existing center would be expanded or a new structure built nearby.

Soils and vegetation could be disturbed in limited areas by posting informational signs along the three access roads to Tuweep; any required road widening for a pullout would increase the disturbed area. Day use and camping limits at Tuweep could increase use and impacts on adjacent lands and facilities. The use of existing access roads to Tuweep would continue to cause dust which can often be seen for several miles, with impacts as described for "Actions Common to All Alternatives."

- **Water Resources**

Outside the South Rim: Constructing park-related facilities (including housing, community facilities, and paved roads and parking areas in the community of Tusayan and other areas outside the park) would change local runoff patterns and the amount of runoff during storms. This runoff could contain hydrocarbons and metals from automobiles which could adversely affect surface and groundwater quality.

Selling water outside the park, as permitted by legislation, would not have any adverse effects because water would only be sold if there were no adverse effects on park resources. However, the amount of excess park water available for sale to Tusayan would decrease as park visitation increases and the park provides water for federal housing and the gateway information/transit center south of the park.

Outside the North Rim: Increased water demand could result from increased overnight accommodations adjacent to the park (e.g., in the Kaibab Lodge area or Jacob Lake), which may result in resource impacts depending upon how that demand is satisfied.

- **Air Quality**

Outside the South Rim: Increased transit use by people entering the Grand Canyon region would reduce local emissions of some types of pollutants along roadsides. However, while commercial vehicles entering the park would have to meet air emissions standards, these standards would not necessarily apply to vehicles outside the park. Also, vehicles in parking and transit staging areas outside the park could increase local emissions in those areas. Such changes in vehicle emissions would have an insignificant effect on regional air quality, which is primarily influenced by the long-distance transport of pollutants from major industrial centers. Smoke from campfires and wood burning stoves may increase, increasing local pollution problems under certain atmospheric conditions.

Encouraging the use of clean fuels such as natural gas in Tusayan would reduce local emissions from vehicles and heating systems. Locating housing and community service facilities outside the park would increase pol-

lutant emissions there, rather than in the park.

Outside the North Rim: Similar to "Outside the South Rim," but there would be fewer vehicles on the North Rim so less vehicle pollution. However, options for using clean fuels are fewer on the North Rim, and they would probably not be available by 2010.

■ Natural Quiet and Solitude

Outside the South Rim: Increased visitation, which would require additional employees to serve visitor needs, would affect natural quiet and solitude regionally as well as inside the park. Increased transit use would reduce overall vehicle noise emissions, depending on the frequency and noise levels associated with the transit vehicles. Locating housing and facilities outside the park would increase human-related noise in that area, rather than in the park.

Encouraging airport expansion farther to the south of the park than Tusayan would limit noise related to aircraft numbers in the Tusayan area. Any increase in aircraft overflights within the region could affect natural quiet and solitude.

Outside the North Rim: Similar to "Outside the South Rim," increased visitation would affect natural quiet and solitude, while increased transit use would reduce vehicle noise emissions.

The purchase of the state-owned airstrip outside the park boundary at Tuweep would allow more control of adjacent land uses and noise from aircraft using the strip. Planning efforts subsequent to this plan would determine what would be done with the airstrip and would evaluate the impacts of various alternatives. Noise from aircraft overflights is being addressed in other planning efforts.

■ Visual Resources

Outside the South Rim and North Rim: Sustainable design and environmentally sensitive planning on a regional basis could help improve the visual character along access routes to the park, including compatible architecture and advertising. Coordination between the Park Service and the Bureau of Land Management at Tuweep would help to retain the natural visual quality of the Tuweep region.

PARKWIDE EFFECTS

■ Species of Special Management Concern

An ecosystemwide management approach for sensitive species, along with active research and recovery programs, would meet all mandates for management of these species and would greatly aid their recovery.

■ Geologic Resources, Soils, Vegetation, and Wildlife

Developing an active research program for ecosystems and species would improve baseline data, identify problems, and help direct mitigation efforts for maximum effectiveness. A vegetation management plan would facilitate restoring the natural environment to the maximum extent possible, including maintaining park genetic integrity, restoring natural or historic landscapes, reducing underlying causes of hazardous trees, and managing vistas and overlooks.

Rehabilitating and revegetating many park lands that are currently disturbed by trampling, multiple informal trails, and parking lots would help restore natural conditions for soils, vegetation, and wildlife. This would allow many parts of developed areas to begin to support a more natural ecosystem. Additional habitat would be restored or protected by eliminating roadside parking.

Emphasizing native fish species over nonnative fish species parkwide would help to restore natural aquatic ecosystems. However, some of these ecosystems have been altered by external forces, and it is doubtful whether they could ever return to their condition before interference.

The Park Service would actively seek assistance in removing hazardous materials and conditions at abandoned mine sites below the rim, including the Orphan Mine openings.

Using trail surface materials that minimize the need to use borrow pits would help improve the sustainability of park roads and trails, while minimizing the need for constructing and maintaining borrow pits that impact park resources. Using pits outside the park if possible would further reduce direct impacts on park resources, but would shift the impacts to regional resources.

Moving positions outside the park to Flagstaff and Williams would result in fewer housing needs and impacts to the park and adjacent areas.

■ Water Resources

The addition of paved roads and parking surfaces would change local runoff patterns and the amount of runoff during storms. The runoff could contain petroleum products, heavy metals, and other automotive-related substances. Toxic substances washing off the paved surfaces could accumulate locally in the soils.

Because there would be no limits on the number of people entering the park (only on the number of vehicles), demands for potable water would increase, as would sewage. Existing water and sewer systems would be minimally expanded to accommodate proposed facility and visitor use needs. The increased demand would be met primarily by emphasizing water conservation and maximum use of reclaimed water at all park facilities. Measures would also be implemented to decrease per capita water use. Reducing per capita water consumption will allow the park to meet increased demand without increasing withdrawals. Consequently, the amount of water withdrawn from Roaring Springs for domestic use would not increase from current levels.

■ Air Quality

The following actions would reduce local air pollution in the park:

- an increased emphasis on transit, hiking, and biking, and designating many areas as transit only during peak season periods
- requiring commercial vehicles to meet air emissions standards to enter the park
- prohibiting new wood burning stoves and fireplaces in the park, and requiring replacements to meet EPA standards
- limiting the number of private vehicles that can park inside the park
- expanding bicycle and pedestrian trail systems
- providing employee shuttles and mail delivery
- requiring buses to turn off their engines while parked or while loading/unloading passengers
- encouraging the use of clean fuels such as natural gas

■ Natural Quiet and Solitude

Impacts on natural quiet and solitude on the rim would be reduced by requiring all commercial vehicles entering the park and all NPS and concession vehicles to meet noise emission standards. An increase in the number of visitors would result in more visitor-related noise. However, an increased emphasis on transit, hiking and biking would help reduce the noise and sense of crowding caused by large numbers of private vehicles, improving natural quiet and solitude in developed areas.

Reflections from vehicles on the rims would be reduced with limitations on vehicle parking, reducing effects on solitude in park wilderness areas.

Minimizing the use of train whistles and bells, as safety allowed, would reduce the intrusion of these sounds into park wilderness areas where they impact the sense of solitude.

■ Visual Resources

An increased emphasis on transit, hiking and biking would help reduce the sense of clutter caused by large numbers of private vehicles, especially when parking is inadequate. The carrying capacities and parking limits would keep visitor numbers manageable within the ability of the facilities and resources to handle them, which would help maintain or enhance visual integrity. Park areas would be heavily landscaped to reduce signs of human impact.

Actively maintaining overlooks for resource protection and scenic quality would enhance visual quality.

In addition to new lighting, retrofitting existing lights to meet Coconino County exterior light standards, (unless cultural resource considerations made that impossible) would help reduce the effects of lighting on night sky, as well as reduce the visibility of developed area lights from wilderness areas and long distance locations.

Identifying and reducing the number of human-made elements that impact scenic resources (e.g., roofs, lights, and trash bins) would enhance the scenic quality of visitor use areas in the park.

SOUTH RIM

■ Species of Special Management Concern

Removing the parking lot and rerouting the trail at Maricopa Point would provide considerably more protection for the endangered sentry milkvetch and would allow recovery activities to proceed out of public view.

■ Geologic Resources, Soils, Vegetation, and Wildlife

Roads and Trails: The following areas on the South Rim would receive disturbance to relatively undisturbed areas, with acreages shown in table 3. While they would be designed to minimize disturbance, and a detailed impact analysis and mitigation would be conducted in a separate environmental compliance docu-

ment for each project, each of the following could involve substantial impacts to the affected area:

- a new access road from the employee housing area to the business center, which would probably require road cuts
- a new road between Maswik Lodge and Center Road, which would follow a utility alignment as much as possible, but which would require widening and alignment changes
- a new shuttle bus turnaround near Hopi Point
- bicycle and pedestrian trails in Grand Canyon Village, West Rim Drive, and East Rim Drive, primarily off roads. Well-defined trails would reduce the impacts caused by multiple trails created by visitor use
- parking lots and access roads to the visitor orientation/transit center at Mather Point
- a new road alignment, entrance station, and parking lot at Desert View.

Removing parking lots in Grand Canyon Village, at Maricopa Point, and at Hopi Point would allow semi-natural habitat to be restored in these areas.

Impacts related to stock use and stock trails on the South Rim — including NPS and concession corrals in Grand Canyon Village and Yaki Point, trails between Yaki Point and the village, and a trail between Moqui Lodge and East Rim Drive — would continue as generally described under "Impacts Common to All Alternatives."

Grand Canyon Village/ Mather Point: Redesigning the current trailer village for visitor RV use only would increase the amount of vegetation within the affected area due to landscaping, with an increase in RV campsites but no change in the overall affected acreage.

Removing the Kachina and Thunderbird Lodges would allow semi-natural habitat to be restored along the rim of the canyon in their location. Providing replacement units in existing disturbed areas at Yavapai West Lodge would result in no additional impacts on soils or vegetation.

Constructing the visitor orientation/transit center at Mather Point would require substantial impacts to park resources in the acreages shown in table 3, including access roads and parking. Blasting could be required, with potential effects on geologic and paleontological resources as discussed in "Impacts Common to All Alternatives." Site-specific environmental compliance would be required for this facility, and design would try to minimize impacts within the affected acreage.

Changes at the business center would involve no new disturbance; new landscaping there would increase semi-natural habitat in that area.

Relocating the existing amphitheater at the visitor center, and landscaping currently impacted areas in the historic Grand Canyon Village would allow semi-natural habitat to be restored in these areas. Removing housing at Hermits Rest would allow up to 0.1 acre of semi-natural habitat to be restored.

The 200 housing units already approved between Pinyon Park and the current NPS maintenance area would not be built, preserving the acreage shown in table 3 in its natural condition.

Up to 500 housing units would be developed in existing disturbed areas. The construction of dorms and apartments in Pinyon Park and the YACC camp area could result in a net loss of vegetation, but the overall size of the impacted area would not change. Increased human presence could reduce the value of these areas for wildlife habitat, independent of any net loss of vegetation. Because housing has been provided in these areas for many years, especially when new landscaping is considered, there would be no net change in impacts on soils, vegetation, and wildlife. However, there would be considerable trenching for utilities which could impact paleontological or cave resources as discussed in "Impacts Common to All Alternatives."

Moving the concession mule barn and associated facilities to the West Rim interchange area would disturb soils and vegetation on a bench next to Bright Angel Wash. Several large ponderosa pine trees may have to be removed to accommodate these facilities, but this cannot be quantified pending site-specific design and environmental compliance.

Moving the park's main helibase from the dry dump to the area of the sewage lagoons would not require any vegetation clearing at the lagoons, but it would require major access road improvements and trenching for utility lines. Also, it would require major changes to the lagoons which serve as a major water source for birds, insects, and large mammals. Operating the helibase in this habitat could adversely affect wildlife use of the water. Major changes in the lagoons might also have adverse effects on wildlife. However, if the lagoons continue to serve as a major water source after the changes, as expected, these animals could interfere with the safe operation of the helibase, or, especially in the case of insects, create nuisance or health concerns for helibase personnel.

All structures and contaminated soil at the Orphan Mine site would be removed, new soil brought in, and the area revegetated. All mine openings on the rim would also be sealed. These measures would increase the semi-natural habitat of the area and reduce radiation hazards to wildlife and people. Because it is not feasible to close all openings to the mine below the rim, radon gas would still escape, and the openings would continue to pose hazards for both wildlife and visitors.

Changes to camper services and relocating the backcountry reservations office would have no effect.

East Rim: Expanding exhibits and walks at the Tusayan museum, providing restrooms, and trenching for utility lines would disturb acreage shown in table 3, with the detailed impacts evaluated in site-specific environmental compliance after design. Allowing parking at East Rim overlooks during the peak visitor season only by transit vehicles would concentrate people in areas designed to handle the impacts rather than spread them out due to overcrowded parking lots as occurs now.

Desert View: In addition to roads and trails, digging trenches for utilities, and constructing new buildings would affect a maximum of the acreage shown in table 3. The actual amount of disturbance would depend on later site-specific designs and environmental compliance.

Providing 50 new campsites and constructing approximately 70 housing units in areas where utility lines already exist would minimize new disturbance. However, considerable vegetation in those areas would still have to be removed.

■ Water Resources

It is expected that little excess water would be available for sales to Tusayan under this alternative, due to increased demand inside the park, and the need to supply park water to the gateway information/transit center and federal housing area adjacent to Tusayan. The commitment under this alternative not to withdraw additional park water for domestic use would ensure that this action does not impact park water resources. The Park Service would evaluate options for supplying water to these facilities outside the park in a separate environmental compliance document.

The removal of parking lots in the park would reduce runoff and related contaminants. Increased housing densities in some areas would probably increase runoff in those areas.

Most of Grand Canyon Village drains into Bright Angel Wash which flows directly through the historic district and occasionally causes flooding problems at the general offices/public garage building and railroad yard. Some of the problems will be addressed by improving the culverting system around the general offices building, but the problem could be aggravated by increased runoff from facilities constructed in the watershed under this alternative. To avoid this, all new construction will incorporate design features to retain stormwater that will, at a minimum, comply with state stormwater regulations. The same measures will be applied to new facilities at Desert View, the Tusayan museum, and any facilities constructed outside the park.

Solid and liquid mule waste will be prevented from entering Bright Angel Wash with proper berming and stormwater retention, and proper manure management and disposal.

■ Air Quality

In addition to the impacts described under "Parkwide Effects" and "Impacts Common to All Alternatives," smoke from campfires at Desert View may increase with doubling the number of campsites, which may create local pollution problems under certain atmospheric conditions.

■ Natural Quiet and Solitude

Minimizing the use of train whistles and bells, as safety allows, would reduce the intrusion of these sounds into backcountry and wilderness areas, as well as in the vicinity of Grand Canyon Village. In addition, the transit system would reduce the number of privately-owned vehicles on South Rim roads, thus reducing noise levels along road corridors. Discouraging changes at the airport in Tusayan that would increase noise in the park, and encouraging any needed airport expansion further away from the park would help reduce impacts on natural quiet and solitude in the park.

■ **Visual Resources**

Identifying and reducing the number of human-made elements that impact scenic resources (e.g., roofs, lights, airport beacon, trash bins) would enhance the scenic quality of visitor use areas. The character of the Grand Canyon Village Historic District would be enhanced by removing many noncontributing structures (including the Thunderbird and Kachina Lodges), and designing new facilities so they do not detract from scenic views or the character of historic districts and buildings. To reduce the possible visibility of the Mather Point orientation/transit center from the North Rim (Grand Canyon Lodge, Cape Royal) and from Yaki Point, the facility design would take into account the need for a low-profile structure.

The visual scene in the village would be improved by restricting the use of vehicles, removing and revegetating parking areas, extensively rehabilitating and revegetating impacted areas, landscaping, and reducing clutter.

Converting the buildings designed by Mary Jane Colter back to historic uses would also improve the internal visual aspects of these important cultural landmarks.

Removing cars and nonhistoric buildings from the Watchtower area at Desert View, as well as the housing and clutter across the road from the Watchtower, would improve the visual quality of this area. Also, moving the gift shop and parking area away from the Watchtower would greatly improve the views of this national landmark. A new Desert View entrance station would also improve the sense of entrance to the park.

North Rim

■ **Species of Special Management Concern**

There are 16 species listed in table 9 that could be affected by proposed actions on the North Rim. As described under "Parkwide Effects," adopting an ecosystem approach with active research and recovery programs would tend to mitigate any potential adverse effects from actions proposed in this alternative.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Roads and Trails: A new access road to the CC Hill orientation center would involve substantial road cutting, possibly with blasting, with potential effects on paleontological resources and subsurface cave resources as discussed under "Impacts Common to All Alternatives." Drainage patterns may also be altered. Site-specific environmental compliance would be required, and design would try to minimize impacts.

Additional trail segments for mules and pedestrians in the CC Hill and Bright Angel Point areas would be routed and constructed to minimize impacts to soils and vegetation. Adding a mule trail parallel to the Ken Patrick Trail to reduce conflicts with hikers would enlarge the area with impacts for trails as discussed under "Impacts Common to All Alternatives."

Constructing an off-road bicycle and pedestrian path system would disturb vegetation and soil on the Walhalla Plateau, Bright Angel Point, and between CC Hill and the Walhalla Plateau with acreages shown in table 3.

Constructing a transit maintenance facility at a previously disturbed site on Lindbergh Hill would involve no direct effects to soils and vegetation. Utility trenching would occur in already disturbed areas.

Bright Angel Point: Constructing the orientation/staging area on CC Hill, including buildings, picnic sites, trenching for utilities, and access roads, would create impacts as discussed under "Impacts Common to All Alternatives," with acreages described in table 3. Much of the top of CC Hill was previously disturbed, and the parking area and buildings would be located to minimize disturbance to mature trees and natural areas. Moving the mule staging area from the North Kaibab trailhead to the new orientation center on CC Hill would result in little or no impact. Revegetating the current mule staging area and replacing the North Kaibab Trail parking lot with a picnic area would restore semi-natural habitat. Converting approximately 20 historic cabins from employee housing to visitor lodging would have no additional environmental effect.

Constructing a new laundry/shower facility in the campground, and redesigning the campground, would improve landscaping and screening and ultimately increase the semi-natural habitat at this site. Installing winter huts with toilets in existing parking lots would have no effects.

NPS and concession housing units, including trenching for utilities, would be tightly clustered in already disturbed areas to minimize new disturbance. Minimal new disturbance would occur from constructing a new NPS maintenance building, a new ranger/emergency operations building, and a helipad because these facilities would be located in previously disturbed areas as much as possible. Site-specific environmental compliance and design would be necessary for all projects.

Walhalla Plateau: Establishing limits for vehicle sizes on Walhalla Plateau would reduce the need to widen or realign the scenic road, thus preventing future impacts to soils and vegetation. Adding small parking pull-offs, picnic sites, and trails on the plateau would disturb small amounts of soils and vegetation. These sites would lead to an increased human presence on the plateau, with some increased disruption of wildlife and an increase in trash and human waste.

■ **Water Resources**

Paved parking areas, access roads, and areas covered by structures at Lindbergh Hill and CC Hill would increase runoff, potentially carrying chemicals and petroleum-based pollutants from vehicles and the maintenance facility and posing hazards to surface water. Adequate stormwater retention and drainage structures would be necessary to mitigate this effect. Mitigating measures would be especially important for the facilities at these central locations within the watershed supplying Roaring Springs. Refueling and fuel storage facilities at Lindbergh Hill and Bright Angel Point (concession and NPS) must meet stringent standards to prevent any leakage into the groundwater. Drainage patterns may be affected by the new road alignment to CC Hill.

■ **Air Quality**

The use of shuttle buses on the North Rim would reduce the number of private vehicles, but would have a small effect on air pollution because of the size of the buses and because the options for clean fuel sources are limited on the North Rim for the near future.

Reducing the number of private vehicles on Bright Angel Point, encouraging transit use from outside the park and to the scenic overlooks, and encouraging hiking and biking would reduce vehicle emissions on the North Rim.

■ **Natural Quiet and Solitude**

Increased visitation on the North Rim would impact natural quiet and solitude inside the park. Increased transit use would reduce overall vehicle noise.

Reducing the number of private vehicles on Bright Angel Point, and encouraging transit use from outside the park (with commercial vehicles having to meet local noise standards) would reduce the level and duration of vehicle noise along roads, at overlooks, and on Bright Angel Point. Encouraging hiking and biking would also reduce vehicle noise.

■ **Visual Resources**

The addition of approximately 215 housing units would have minimal impacts on the visual character of the North Rim because the development would occur in the existing housing area, without increasing the area's overall footprint. Units would be designed to remain below tree cover and to blend well with the environment to reduce visibility.

Tuweep

■ **Species of Special Management Concern**

There are 6 species listed in table 9 that could be affected by proposed actions at Tuweep. As described in "Parkwide Effects," adopting an ecosystem approach with active research and recovery programs would tend to mitigate any potential adverse effects from actions proposed in this alternative.

The greatest potential threat to these species at Tuweep would be people straying off trails, potentially entering areas where sensitive species occur and causing impacts to these species. Visitor limits and well-defined trails would decrease the chances of such impacts.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

The impacts of existing road and trail systems would continue. Allowing no vehicles over 22′ long would reduce pressure to widen and improve the roads, activities that could cause substantial resource impacts. Creating a trail from the overlook to the Saddle Horse Canyon trail would disturb soils and vegetation and increase human presence in that area, with impacts such as trash, vegetation trampling, soil compaction, human waste, and increased interactions with wildlife.

New parking areas for the Saddle Horse Canyon and Tuckup trails would be in slickrock areas with little vegetation. A small number of ephemeral (or vernal) pools which provide water or habitat may be affected.

Removing parking and camping at the Toroweap overlook, and revegetating the site, would restore semi-natural habitat. Adding walk-in replacement sites at the campground would disturb soils and vegetation with acreage described in table 3. Placing limits on day and overnight visitors would help confine impacts from parking, camping, and hiking within designated areas.

Instituting a campground reservation system would help confine impacts to existing disturbed areas, and would help prevent overuse of individual campsites.

Enlarging the water catchment and septic systems near the ranger station and removing or upgrading the seasonal ranger trailer would be the same as the no-action alternative.

■ **Water Resources**
Same as the no-action alternative.

■ **Air Quality**
Same as the no-action alternative, except limits on day visitation and overnight camping would reduce the amount of dust raised by traffic on the dirt roads outside and within the park.

■ **Natural Quiet and Solitude**
Same as the no-action alternative, except limits on day visitation and overnight camping would limit impacts to natural quiet and solitude caused by visitors.

■ **Visual Resources**
Same as the no-action alternative, except removing parking from the Toroweap overlook and rehabilitating the irrigation structures across the valley from the ranger station would improve the visual quality of those sites.

CORRIDOR TRAILS

■ **Species of Special Management Concern**
There are 7 species listed in table 9 that could be affected in the area of the corridor trails. However, no impacts are expected unless hikers significantly venture off the main trails. As described above under "Parkwide Effects," adopting an ecosystem approach with active research and recovery programs would tend to mitigate any potential adverse effects from actions proposed in this alternative.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**
Same as the no-action alternative, except for the following:

Stock use would remain at current levels, or, in the case of visitor mules on the North Kaibab Trail, be reduced if resource impacts and visitor use conflicts were not adequately mitigated by measures being implemented by the concessioner to harden trails and construct bypasses.

Maintaining current numbers of pack mules on the Bright Angel and South Kaibab Trails would limit such mule impacts on those trails to existing levels.

Upgrading the Old Bright Angel Trail and the trail from Six Rock Meadow to the Old Bright Angel trailhead would create minimal impacts on soils and vegetation because these trails would be kept at a primitive standard rather than at the higher standard of the main corridor trails, and only a small amount of additional hiker use is expected. However, if a large amount of hiker use occurred, increased human presence in the area could disrupt wildlife, increase human waste and trash, and compact soils.

Providing additional toilets would disturb vegetation and soils in the immediate area; these impacts would be offset by greatly reducing human waste impacts throughout the trail area.

■ **Water Resources**
Minimum flows would be established for Bright Angel Creek to guard against adverse impacts from diverting Roaring Springs water for domestic use. Also, water not needed on the South Rim would be discharged untreated as near the source (Roaring Springs) as possible. Under this alternative efforts would be taken to restore the natural flow and ecology of Garden Creek, and to restore more natural flows from Roaring Springs into Bright Angel Creek. These actions would help restore natural conditions in the park.

Private and concessioner stock would continue to cross and contaminate water in Garden Creek, Bright Angel Creek, and below Roaring Springs the same as the no-action alternative.

The trail from Six Rock Meadow would need to be located to avoid impacts to wetlands.

■ **Air Quality**
Trail hardening would help reduce dust and improve air quality along the trails.

■ **Natural Quiet and Solitude**
Unlimited day hiker use of the main corridor trails, as well as encouraging more people to use the Old Bright Angel Trail, the trail segment from Six Rock Meadow to the Old Bright Angel trailhead, and the Hermit and Grandview Trails, would reduce natural quiet and solitude along these trails.

■ **Visual Resources**
New toilets on the trails could be visible from rim overlooks, but care would be taken to screen them and to blend into the natural scene from a distance.

Getting borrow material from sources not near the trails would reduce the visual impacts of existing borrow areas. Rehabilitating existing borrow areas near the trail would help restore more of a natural scene.

CONCLUSION

Alternative 2 would be a close second to alternative 3 in terms of being an environmentally preferred alternative from a natural resource perspective. New disturbance within the park boundaries would generally be confined to existing disturbed areas, but considerable new acreage would be impacted for such developments as realigning several roads, adding campsites at Desert View, and adding and upgrading corridor trails. Much of this new disturbance, however, would be offset by extensively revegetating and rehabilitating disturbed areas, restoring cultural landscapes and visual resources, emphasizing sustainable and environmentally sensitive design, minimizing the need for borrow pits and using pits outside the park for needed material, and extensive monitoring and research programs.

Impacts on air quality would be reduced by emphasizing transit, restricting wood burning, enforcing emission standards, and undertaking cooperative planning to mitigate local and long-range air pollution.

Impacts on natural quiet and solitude from visitor vehicles and train whistles and bells would be reduced, while moving people into previously little-used areas (Old Bright Angel, Hermit and Grandview Trails) and allowing increasing numbers of visitors would increase noise in some areas. The visual character of park developed areas would be improved by creating pedestrian-only areas in Grand Canyon Village and Bright Angel Point, by removing clutter and deteriorated buildings, as well as structures that do not blend with the historic setting in the village, and by rehabilitating and revegetating disturbed areas.

In summary, this alternative would solve problems while minimizing impacts to natural resources. Some of the impacts would be shifted from park lands to lands within the same ecosystem outside the park boundary; however, this alternative would not take this approach to the same degree as alternative 3. When the regional environment is considered, the impacts of alternatives 2 and 3 are fairly similar, but there is no question that direct impacts to the park are less in alternative 3.

CUMULATIVE EFFECTS

The development of an orientation/transit center and new federal community outside the park in Tusayan would be part of a larger development, including the railroad spur and/or land trade, whose impacts have been or will be evaluated in separate environmental documents. The Tusayan flameflower, a candidate species for listing as endangered or threatened, occurs in many areas where these facilities might be located. Site-specific design considerations and increased human presence in these areas could result in impacts to some flameflower populations. The cumulative effect of all this development in flameflower habitat, regardless of whether any single project had direct impacts on known populations, could have an adverse effect on the species and could result in its being upgraded to a more protected status under federal and state endangered species laws.

The cumulative effect of alternative 2 would be a net reduction in natural habitat within the park and region, but the amount of reduction would be less than under alternatives 1 and 4.

IMPACTS ON CULTURAL RESOURCES

ARCHEOLOGICAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

■ **Parkwide Effects**

The overall effects of alternative 2 would benefit the vast majority of archeological sites through a phased, comprehensive inventory and research program. A park research design would be developed to guide research and inventory, as well as data recovery efforts done to mitigate adverse effects to sites. A consistent, research-oriented approach to data recovery on sites that would be directly affected by development plans would result in

high quality mitigation efforts. Data recovery would add to the knowledge of prehistory in the park rather than simply being added to other unsynthesized data in the park's collection. As a result of phased inventory and research, national register evaluations would be required, thus eventually eliminating the need to assume that all archeological sites were equally significant.

The overall effects of the proposal would benefit the vast majority of traditional cultural properties through carefully planned ethnographic surveys and studies designed to inventory such sites and to elicit information from American Indian tribes, their cultural liaisons and recognized religious leaders about the types of areas that might contain such sites.

A rigorous monitoring, protection, preservation and stewardship program would complement the archeological research phases and ethnographic studies. The illegal collecting of archeological resources would be curtailed. Impacts from visitation and natural processes could be assessed on a routine basis, and those impacts addressed through the protection and preservation portion of the program.

■ South Rim

Three archeological sites would be destroyed by the construction of the parking lot for the Mather Point orientation/transportation center. New roads in connection with this facility have the potential to affect an additional four sites, although every effort would be made to avoid them.

A new mule barn south of the West Rim Drive would be placed near a thin scatter of recent historic trash. This archeological site has not been evaluated for national register significance, but probably is not significant. If the site is found to be significant, and if the new mule barn cannot be designed in such a way as to avoid the site, then data recovery should be relatively easy to accomplish. As usual, mitigative measures would be developed in consultation with the state historic preservation officer and the Advisory Council on Historic Preservation.

New expanded interpretive programs in the historic village area and through personal service programs along the rim would result in increased education about the sensitivity of archeological resources, thereby better protecting them. Expanded interpretation of American Indian cultures in the village area would sensitize visitors to the sacred values of the canyon and the traditional cultural properties therein, thus mitigating indirect impacts to those resources.

The construction of pedestrian trails in areas where social trailing is now occurring would direct visitors away from archeological sites and traditional cultural properties, thus providing additional protection from indirect impacts.

Archeological sites along the Hermits and Horseshoe Trails could receive indirect impacts from the dispersal of hikers from the Bright Angel and South Kaibab Trails. However, the proposed monitoring and preservation program should mitigate those effects.

A location for the gateway information center and joint Tusayan area staging has not been proposed, so its effects on archeological resources and traditional cultural properties are not known.

The site for a joint NPS/USFS community has not been chosen, so impacts on archeological and traditional cultural properties cannot be assessed. The Forest Service would survey the areas as part of an environmental impact statement to be done for the land trade. USFS surveys in the vicinity of the Grand Canyon airport indicate that site densities are relatively high in the area, and some direct impacts can be anticipated.

The proposed Maswik Road could directly or indirectly affect six archeological sites. There has been no archeological survey of West Rim Drive. If the density of archeological sites along East Rim Drive is any indication, there are likely to be a large number of important resources near the rim. Every effort would be made to avoid the sites, especially in the construction of the bike path and turnaround at Hopi Point.

A bikeway along East Rim Drive has the potential to affect at least 38 known archeological sites, and an unknown number of sites in sections that have not been surveyed, as well as an unknown number of traditional cultural properties. Every effort would be made to route the bicycle path and parking lots away from sites.

Proposed trails in the vicinity of Grandview Point out to the Coconino Rim have the potential to affect a series of lithic scatters, small Puebloan clusters and the archeological remains of Hance's original hotel and tourist accommodations. The trail would be routed to avoid direct impacts to sites. Active interpretation of Hance's hotel would partially mitigate indirect effects to that resource. This is also an area of significance to the Havasupai people. In the immediate vicinity of sacred sites, the trail would be diverted away from the rim to protect their sanctity.

The potential bypass for Arizona 64 at Desert View has not been surveyed for archeological resources or traditional cultural properties. Site density is high in nearby areas, and it might not be possible to design a route that would miss every archeological site.

■ North Rim

No archeological surveys have been conducted of the CC Hill area. There is a potential for an unknown number of archeological sites related to the historic CCC camps in the area to be affected.

The addition of picnicking spaces at overlooks could result in longer stays and increased indirect impacts on nearby archeological sites and traditional cultural properties.

Rim hiker trails in the scenic area have the potential to effect a large number of archeological sites and traditional cultural properties. The locations of archeological sites are relatively well-documented, and every effort would be made to either avoid the sites or actively interpret them. Additional archeological surveys may be necessary, as well as detailed ethnographic surveys. Such areas would be avoided to the extent possible when specific trails are designed.

■ Tuweep

A toilet in the campground now on an archeological site would be removed from the resource. Rigorous monitoring would reduce indirect impacts to the three sites in the campground. Other mitigating measures would be developed in consultation with the state historic preservation officer and the Advisory Council on Historic Preservation.

There would be no effects to known traditional cultural properties at Tuweep.

■ Corridor Trails

The concept of the proposed action is to reduce resource impacts along the corridor trails, resulting in beneficial effects to archeological resources and traditional cultural properties.

Specific plans for Phantom Ranch development would be accomplished in a separate document. The overall concept maintains the current use and does not change effects to archeological sites.

■ Conclusion

Three archeological sites would be destroyed by the construction of the parking lot for the Mather Point orientation/transportation center. An additional 49 known sites and an undetermined number of unknown archeological sites and traditional cultural properties in areas that have not been surveyed could be affected, although every effort would be made to avoid them during design phases of the project. The presence of a synthetic research plan would allow archeologists to place mitigative actions within an appropriate research context, maximizing efficiency in data recovery. A monitoring and preservation program would allow archeologists to determine the nature of cumulative impacts, and thereby devise avoidance or mitigation methods. An ethnographic survey program would allow planners to know what sorts of areas to avoid as new needs develop.

■ Cumulative Impacts

The slow degradation caused by erosion, casual collection, and deterioration to features such as rock walls would be mitigated through a monitoring, stewardship, and preservation program. The repair and maintenance of proposed facilities near archeological sites would increase the likelihood of inadvertent, eventual damage to the sites, and facilities such as utility lines or roads could clip the edges of sites, resulting in a slow "whittling-away" of resources over time as broken lines are repaired and road alignments changed to accommodate differing sized vehicles. Even controlled excavation of sites damages them as current methods, technologies, and research emphases cannot anticipate the needs of future researchers. However, these types of impacts would be partly alleviated through the use of a comprehensive research program that could effectively evaluate the significance of sites, their data potential, and the types of effects that sites can tolerate.

While cumulative effects might occur to traditional cultural properties, as outlined in alternative 1, these effects would be lessened due to the planned ethnographic survey program.

HISTORIC STRUCTURES AND LANDSCAPES

■ South Rim

Overall, the impacts of alternative 2 on the historic properties on the South Rim would be beneficial. The buildings (Hermits Rest, Lookout Studio, and the Watchtower) that make up the Mary Jane Colter National Historic Landmark would be converted to a level of use and character consistent with their original use.

Several structures within the Grand Canyon Village Historic District — including the Kolb Studio, old laundry, powerhouse, magistrate building, horse barn, blacksmith building, and community building — would be rehabilitated and adaptively reused. Rehabilitation is defined as the conversion of a building to a state that "makes possible an efficient contemporary use while preserving those features that are significant" and character-defining (NPS 1992f). The historic cabins at Maswik would be converted to visitor use. A positive effect on the structures and setting would be accomplished by providing for reuse, with rehabilitation and restoration consistent with federal historic preservation laws and NPS *Management Policies.* Impacts related to the rehabilitation of historic buildings would be addressed when uses were selected. Historic structure reports containing study and documentation would be required before restoration could occur.

In Grand Canyon Village, the NPS maintenance area would be preserved (a positive effect) and converted to recreation use for basketball, volleyball, and a playground. Removing roads to Hopi Point and Maricopa Point and revegetating these overlooks would change the historic landscapes, as would adding bus stops along the South Rim and removing some parking. These changes would have to conform to *The Secretary of the Interior's Guidelines for the Treatment of Historic Landscapes.*

Restoring historic landscapes along the South Rim would be a positive effect and would include the removal of the Kachina and Thunderbird Lodges in the historic village and other noncontributing structures, such as the personnel building for Grand Canyon National Park Lodges. Changes to the historic landscape would include moving out park operations and concessioner uses at the old NPS maintenance area, mule barn, and powerhouse and replacing them with visitor use activities. Eliminating the blacksmith shop and the mule operation would be an adverse effect. Pedestrian traffic would increase in those areas. All proposed changes to the historic landscapes would follow *The Secretary of the Interior's Guidelines for the Treatment of Historic Landscapes.*

Expanding park interpretive programs would be a positive effect on the protection and preservation of resources at facilities in the powerhouse area and the American Indian cultural center; the Yavapai observation station and the Tusayan museum would have revamped interpretive programs, and new South Rim orientation centers would also enhance knowledge and awareness of resources.

The Orphan Mine has been determined eligible for listing in the National Register of Historic Places, so the proposed actions of removing all structures, including the headframe, and contaminated soil from the site, bringing new soil in, and revegetating the site would have an adverse effect on the historic property.

Changes at the Yavapai observation station and the Tusayan museum would be minimal; however, the Park Service would be sensitive to the historic landscape as outdoor interpretation would be significantly expanded at the Yavapai, and outdoor exhibits and walks expanded at the Tusayan. Impacts to the settings would be evaluated as part of an interpretive planning effort.

Several changes under this alternative would occur at Desert View. The Grand Canyon National Park Lodges housing area just south of the existing parking lot would be removed. Reducing the sales area in the Watchtower to return it to historic uses, and moving the concession structure selling gifts and food would also have a positive effect. Guided by management policies, these changes along with restoration of the historic landscape, would return Desert View to it's historic character.

Conversion of the historic schoolhouse in Grand Canyon Village into personnel and sales offices, in conjunction with removal of the existing personnel building and revegetating the site, would have an adverse effect on the Grand Canyon Village Historic District.

■ North Rim

Several changes proposed by alternative 2 could affect historic structures. An orientation center at CC Hill with parking facilities and transit pickup/drop-off would be constructed. This development and the expansion of trails, redesign of overlook parking and picnic sites, would require historic clearances.

Grand Canyon Lodge is an integral part of a national historic landmark district, and the proposed rehabilitation encompasses the kitchen, office spaces, buffeteria, and bar. Rehabilitating this historic structure would be guided by federal preservation laws and management policies. A key reference document used to guide rehabilitation is *Grand Canyon Lodge Historic Structure Report, Grand Canyon National Park* (NPS 1982).

Historic cabins for visitors in both the Grand Canyon Lodge Historic District and the North Rim Inn Historic District would be converted from employee housing to guest lodging. This would be a positive effect. If modifications were made, a determination of effect would need to be carried out, using the criteria of effect developed by the Advisory Council on Historic Preservation.

Four to six frame cabins in the Grand Canyon Inn (North Rim Inn) and Campground Historic District would be rehabilitated for adaptive use, thus preserving the significant features of their original design. The remaining frame cabins would be torn down, thus constituting an adverse effect.

■ Tuweep

Rehabilitating the ranger station and expanding the water system could have an adverse effect (the same as the no-action alternative). A determination of eligibility for listing on the National Register of Historic Places is necessary since the station is more than 50 years old. An assessment of the historic landscape would be conducted for the Toroweap overlook area, the proposed area of a new trail, the location of a new parking lot, the additions to the campground, and the ranger station at Tuweep.

■ Corridor Trails

Encompassed by the designation of the Cross Canyon Corridor Historic District are the North and South Kaibab trails, the Bright Angel Trail, and developments at Indian Garden, Phantom Ranch, Cottonwood, and the shelters along the Bright Angel Trail. Under this alternative the trail tread in the highest use areas would be hardened with appropriate materials (such as cobbles) to withstand the constant wearing action of mule trains. This would constitute an adverse effect, requiring compliance with section 106 of the National Historic Preservation Act. Hiker and mule train conflicts prompt a need for short detours around pools of mule urine on the North Kaibab Trail. These actions constitute an adverse effect. They would necessitate installing a trail base other than the original, and the building of short detours would damage the integrity of the historic corridor.

The historic landscape of the trails and the developments along them, especially Phantom Ranch, would be monitored under this alternative. Careful adherence to preservation law and management policies would ensure that trail maintenance, area redesign, and hardening of trail surfaces would comply.

■ Conclusion

Under alternative 2 the cultural resources of Grand Canyon National Park would be protected and preserved. Rehabilitation of structures and the historic landscape would occur, and several cultural resources restored. Eligibility for the National Register of Historic Places would be determined for several resources. Some structures would be returned to their original uses, while others would be rehabilitated and adaptively reused.

■ Cumulative Impacts

Grand Canyon National Park harbors many different types of cultural resources. Several of these are not found in areas surrounding the park. The protection, restoration, and rehabilitation of resources embodied in this alternative would preserve them for the future. Development on the rims of the canyon would be minimized. There would be no cumulative effects to cultural resources under this alternative.

IMPACTS ON THE VISITOR EXPERIENCE

REGIONAL INFORMATION AND SERVICES

Effects would be the same as in alternative 1, except for the following:

From their homes people would be able to use network computer programs to access information about the park. Eventually, visitors might be able to get reservations from their homes, before they started their trips. Visitors would also benefit from the availability of computer information kiosks and information publications at airport terminals.

The gateway information centers in Tusayan and Jacob Lake would also provide check-in for overnight accommodation, allow-

ing visitors more time once they were in the park to enjoy the resource. These facilities would also provide introductory interpretive media about interpretive activities, programs, themes, and attractions in the region.

Even though overnight accommodations would be increased on the North and South Rims, many visitors would still need to find lodging outside the park, and this would be easier with regional information centers.

Visitors would have several travel options (tour bus, train, possibly private shuttle) available to them at the regional and gateway centers. This would give them the option of leaving their private vehicles outside the park and traveling at leisure with tour or shuttle companies.

Extra highway signs and radio broadcasts would inform people about the regional information centers and the park reservation systems, as described for alternative 1. Visitors would also benefit from cooperative efforts between the Park Service and the state of Arizona to develop state visitor centers and park information pulloffs along major routes to the canyon. Highway pulloffs would also be provided in cooperation with New Mexico and Utah, thus benefiting potential visitors in these states.

Under this alternative a new gateway information center would be constructed in the town of Tusayan, instead of using an existing structure as in alternative 1. The location of this new center would take into consideration visitor traffic flows, visibility from the highway, parking needs, the proximity of other facilities. With a new structure it would be easier to design interior spaces to meet specific needs, rather than revamping an existing structure.

This center would benefit visitors by allowing them to meet most of their basic trip planning needs before entering the park. By being able to make lodging reservations, pay the entrance fee, become familiar with the public transportation system, and get information about regional attractions, backcountry camping, and park themes, visitors would be better prepared to enjoy the park and get ready to learn more about its significant resources. Visitors also would benefit from the joint operation of the Tusayan center because they would be able to get all information about the park and the area with a single stop.

This facility would also provide introductory interpretive media about interpretive activities, programs, themes, and attractions in the region.

Parkwide Effects

Many visitors would continue to be disappointed at not being able to stay inside the park; advance planning opportunities would allow visitors to take advantage of other options either just outside the park or in other nearby communities such as Flagstaff. Overcrowding would be alleviated by better distributing people and better planning of visitor facilities and services. The total number of overnight accommodations would increase slightly, allowing opportunities for a few more people to stay in the park. A wider range of room types and rates would be available, varying from hostel-type rooms to luxury rooms, with increases in the economy and mid-range types of rooms.

Additional and remodeled food facilities would increase efficiency and capacity, and meal options would be enhanced.

Visitors could be inconvenienced by construction and relocation activities. Although construction and relocation would be scheduled to avoid peak visitation periods, some impact would be unavoidable because the time of year appropriate

South Rim

Removing private vehicles from South Rim developed areas — including the historic village core, West Rim Drive, and certain overlooks near the village — would provide a quieter, more peaceful, safer, and more pleasant environment for visitors to view the canyon, experience outdoor interpretive programs, dine, or relax with friends. Expanding visitor services primarily by adaptively reusing existing buildings would significantly expand visitor options and allow them to do more of the things they would like to do without long waits or dense crowds. Visitors would also be able to tailor their visits to their interests by being able to choose from a variety of transportation modes, different interpretive programs and facilities, various types of food service, and gifts more closely related to the Grand Canyon's natural and cultural environment. All facilities would be accessible to visitors with physical disabilities.

■ Visitor Access and Convenience

Inside the park an efficient, convenient, and effective park transit service would make it easier for visitors to get to all developed areas on the South Rim; they would also have the option of using separate hiking or biking trail systems. This would reduce frustrations that visitors now experience when they drive to a developed area and have to search for parking space or park along the roadside and walk through traffic. Visitors who wanted to drive directly to each interest point would be highly inconvenienced since approximately 15 miles of the South Rim, from Yaki Point to Hermits Rest, would be accessible only by transit service or hiking/biking trails.

Converting West Rim Drive to year-round transit service, and providing an off-road bike trail, would result in a quieter and more restful experience for visitors at overlooks. Since two separate routes with different schedules would be offered, visitors could choose the most convenient option for them — a loop from the West Rim interchange to the Abyss, or a loop all the way to Hermits Rest, providing opportunities for quieter, more secluded, and potentially less crowded experiences. Making West Rim Drive accessible only to transit vehicles and persons with disabilities who could not be accommodated by the transit system would inconvenience visitors wanting to use their own cars.

East Rim Drive would have convenient, safe, and diverse options for visitors. Visitors wishing to drive would still be able to access several overlooks.

Providing safe bike trails linking all major use areas and new rim trails would give visitors alternative ways to safely view the park and experience the resources. These trails would be especially important to families with small children and the elderly who may find the inner canyon trails overwhelming. Also some overlooks would only be accessible to bikers and hikers. In addition, transit vehicles would have bike racks available. The additional trails would open up more areas of the park, especially along the East Rim.

Removing all through-traffic out of the Desert View developed area and making the access road a loop road for bus access only would improve visitor safety and enhance the visitor experience along the rim.

■ Parking

Total parking along the South Rim would be increased by about 5%, from 3,320 spaces at present to 4,061. A total of 2,832 parking spaces would be provided in the village area; however, no parking would be allowed within the historic village. Day visitors would be able to park their private vehicles outside the village and at Mather Point and use the transit service or take pedestrian or bike paths. Visitors with overnight lodging accommodations on the rim would have to park back from the rim and use a convenient and efficient valet transit service. Overnight visitors staying back from the rim would continue to be able to park at their lodging. Tour bus visitors staying on the rim would be dropped off at the lodge entry.

At Desert View, the change in parking would make the overlook area quieter, provide a more natural feeling along the rim, and allow visitors to relax and enjoy the resource.

■ Visitor Services

Circulation patterns in Grand Canyon Village would be organized so visitors would have convenient access to the rim, could easily learn about park themes, could safely experience the entire area, and could obtain a diversity of visitor services without long waits.

Visitors would have access to many more interpretive facilities and programs.

More options for visitor activities in a pedestrian-friendly environment would be available. The number of economy rooms would increase greatly and would be available both on and near the rim. Even though overnight accommodations in the park would be expanded by about 20% (1,120 total units), this would not meet all lodging demands, and many visitors would still need to seek lodging outside the park. The additional units would be in the lower price ranges so a wider range of visitors would be able to afford to stay in the park.

Although it might not be possible for all visitors to eat at the facility of their choice, long waits would be reduced by adding food service facilities that meet visitors' changing eating habits throughout the day. These changes would include converting the Maswik Lodge from a cafeteria service during the day to a sit-down facility during dinner, providing additional seating at Bright Angel Lodge, and adding a restaurant in the powerhouse area (fast-service breakfast and lunch, sit-down at dinner).

Converting the historic rim structures designed by Mary Jane Colter from gift sales to other visitor uses, and closing the Bright Angel gift shop would be

offset by developing a major gift shop near other visitor facilities in the powerhouse area. These changes would reduce crowds in the historic rim structures, allowing for more restful and educational uses of these facilities. A new policy for sales items, which would relate to specific facilities, would enhance the visitor experience by providing opportunities to purchase gifts that are more related to educational and park themes. Adding a corner grocery store/deli, postal services, and an ATM in the powerhouse area would allow visitors to use these services without needing to travel to the business center.

Visitors would be able to relax and enjoy the business center much more because the parking would be significantly reduced and pedestrian, interpretive, and picnic space would be provided in a landscaped environment. In addition, new and expanded camper services would provide campers with better services.

Closing the service station and garage would require visitors to purchase these services outside the park. At Desert View removing the food service/deli building and the rim parking lot, along with providing rim trails, would open up the overlook area and provide space for picnicking and restful canyon viewing. This redesigned area would be more in keeping with a quality park experience, where visitors could use the Watchtower as it was meant to be used and enjoy the surrounding natural environment. The present gift and food service facility intrudes on the area's setting and visitors' views of the Watchtower.

A new and larger food service facility would relieve crowding and better handle additional food service needs. By incorporating the orientation center, grocery store, food service, and gift shop into a unified pedestrian complex south of the Watchtower, visitor needs would easily be met and the natural setting at the overlook restored and protected.

Providing 50 additional campsites would help meet visitor needs. Also, the possible construction of campground on USFS lands just south of Desert View would be convenient for many more visitors on that side of the park.

■ **Orientation and Interpretation:** Visitors would benefit from more conveniently located orientation centers inside the park and more in-depth and expanded interpretation focusing on the park themes. The orientation functions would be provided early in the visitors' experience of the Grand Canyon, thus allowing more efficient and effective trip planning. The centers would also provide information about programs and recreational and educational opportunities. The centers would be designed so that most visitors' questions could be answered through various media, making it unnecessary for visitors to stand in long lines at information desks.

The primary orientation centers would be at Mather Point and Desert View. In addition, specialized interpretive facilities would be developed in the former powerhouse area of the village; and interpretive media and programs would be expanded at the Yavapai observation station. The Tusayan museum and Kolb Studio would focus more closely on the resources associated with these facilities.

The orientation centers also would better serve the needs of both long- and short-term visitors. The centers would offer short-term visitors the opportunity to get a basic understanding and appreciation of the park resources and themes. The facilities would help direct long-term visitors to the focal interpretive facilities and programs on the South Rim. In addition, the orientation facilities would provide centralized locations for obtaining backcountry use permits, reservations for mule trips and concession bus tours, and information regarding other activities and programs.

While the orientation centers would be new structures, all interpretive facilities, which would focus on specific themes, would use existing park structures. Besides minimizing the need for new construction, this adaptive reuse would help preserve the integrity of several historic structures on the South Rim.

Each interpretive facility would focus on just one or two themes, allowing visitors to gain in-depth understandings of the main park stories. Most of these facilities would be concentrated in the village, while the Yavapai and Tusayan museums would be easily accessed by means of the park transportation system. Visitors desiring more detailed information on numerous themes would need to budget extra time to walk or ride to each of the facilities. This would be inconvenient for visitors wanting to learn everything in one stop, although dispersing visitors to various interpretive centers would lessen the potential for crowding at any one facility.

Educational opportunities for all ages would be enhanced with the development of a central education center in the former powerhouse building, plus an artist-in-the-park facility, a children's museum, and classroom space for the Grand Canyon Institute and other groups — all of which would be located in the village complex. Media and programs presented in these facilities would be of special benefit to organized educational groups, but most also would hold an interest for general park visitors.

Visitor access to outdoor program areas would be improved by relocating the amphitheater from near the existing visitor center to a more central site near the business center and the adjacent lodge and campground. A second amphitheater would be developed in the historic village area, replacing one that existed in the past.

Converting the historic structures designed by Mary Jane Colter — Hermits Rest, Lookout Studio, and the Desert View Watchtower — from gift shops to their historic uses would give visitors a greater variety of experience options at Grand Canyon. Exhibits in these facilities would introduce, reinforce, or provide different insights into some of the park's primary themes.

At Desert View visitors would benefit from a new combined information/orientation center in a more central location. With this arrangement more visitors would tend to stop at the center at some point during their stay.

NORTH RIM

Implementing a reservation system for the North Rim would ensure the continuation of a low-key uncrowded atmosphere. Even though additional use would be expected on the Walhalla Plateau, that area would remain a place where visitors could easily find opportunities for solitude. Specific points, such as the orientation center on CC Hill and Grand Canyon Lodge, would remain or become social areas. However, visitors would still have easy access to more solitary and nature-based experiences.

■ **Visitor Access and Convenience**

During peak times, visitors would be inconvenienced by having to obtain day reservations with the same effects as in alternative 1.

An efficient transit system, along with safe, direct pedestrian and bike paths, would provide visitors with easy access to both Bright Angel Point and the Walhalla Plateau. The transportation system would change visitor use patterns and inconvenience all day visitors wishing to drive to Grand Canyon Lodge. Limiting vehicle sizes would affect visitors who wanted to drive oversized vehicles on the Walhalla Plateau. However, this restriction would also improve traffic flows because oversized vehicles would not slow traffic on steep grades and tight curves.

The CC Hill orientation center would be easily accessible to all visitors and would offer visitors access all North Rim developed areas by means of the transit service, or biking and hiking trails.

■ **Parking**

Parking on the North Rim would be increased by providing additional parking at the CC Hill orientation center. Visitors could park their private vehicles at the nearby staging area and leave them until they had finished their visits. The North Kaibab trailhead parking area would be removed and revegetated, causing hikers to walk greater distances between the parking lot and trailhead.

Overnight users would be allowed to drive to their lodging or campsite. However, they would not be allowed to use their vehicles to drive to other locations on Bright Angel Point; instead, they would have to use the transit service or hike or bike.

■ **Visitor Services**

The orientation center on CC Hill would also have picnic sites, mule ride facilities, limited food service, and excellent views of the canyon increasing visitor convenience.

Because of reduced traffic and better distribution of visitors throughout the area, Bright Angel Point would become a quieter, less congested, more restful area. The contact station would provide visitors with additional information and help answer specific questions.

Increasing lodging and food service would allow a few more visitors to stay in the park and would reduce waits for food service. However, waits would still occur for sit-down service during peak times of the day and night. With added lodging rooms, expanded food service areas and seats, and better distribution of visitors and day-use limitations, this area would be better able to

meet visitor service needs during peak periods. Campground redesign would result in improved visitor experiences.

The visitor experience on the Walhalla Plateau would be improved by providing rim trails to connect specific overlooks and transit stops, safe bike paths, outdoor exhibits at Point Imperial, expanded picnic sites, and additional toilets.

■ **Orientation and Interpretation**

The CC Hill orientation center would help visitors understand all the North Rim themes, programs, and areas to visit.

Visitors would likely be much better informed about Walhalla Plateau through the information and orientation centers; as a result visitors would be better prepared and could spend more time experiencing and learning about this special resource area. This improvement would be in keeping with visitor surveys, which noted that visitors had their best experiences on the North Rim on the plateau.

Tuweep

■ **Visitor Access and Convenience**

Day use limits could cause some visitors to be turned away and considerably inconvenienced during peak times at Tuweep. This inconvenience would be reduced since visitors could plan ahead and get information about this area. Campers should be less inconvenienced than under alternative 1 because they could obtain a camping permit ahead of time and would already know if all campsites were full.

Visitors with vehicles over 22′ in length would not be able to enter Tuweep. However, this policy would increase safety for other visitors and prevent accidents.

Visitors would no longer be able to drive right up to the rim edge. While some visitors would find this inconvenient, others would appreciate being able to experience the overlook in a quieter, less car-oriented environment.

Campers wanting to stay right on the rim would no longer have this opportunity. However, replacement sites would be provided at the existing campground.

■ **Orientation and Interpretation**

Visitors would benefit from information signs posted along the three access roads. In addition, visitors to Pipe Spring National Monument and to other regional information centers could obtain information on Tuweep before making the long drive to the unit.

As described under alternative 1, information would be provided by a bulletin case at the unit. Information would be supplemented under this alternative be providing a pullout near the NPS boundary where visitors could be better oriented to the Tuweep unit. Much of this information would be contained in a brochure that visitors could take with them.

Corridor Trails

■ **Visitor Access and Convenience**

The number of hikers on the main corridor trails would continue to increase, especially on the North Rim since the CC Hill orientation center would be near the North Kaibab trailhead. By shifting a few more visitors onto the Hermits and Grandview trails, and slightly improving the Old Bright Angel Trail, more hikers could be accommodated, and trail conditions would be less crowded, even near developed areas.

Hiker/mule conflicts would continue on both the North and South Rim trails. However, by hardening portions of the trails used by mules and building bypasses around areas of mule waste on the North Kaibab Trail, some of these conflicts would be reduced or eliminated. If mule/hiker conflicts continued at unacceptable levels on the North Rim, the number of mule passes would be reduced. This would reduce the number of conflicts, but it would also reduce opportunities for visitors to take mule rides.

Many visitors would continue to be disappointed at not being able to take a mule ride into the canyon because of the need to make reservations well in advance, but they would at least know that it was necessary to call ahead, giving them some options for trip adjustments.

Phantom Ranch lodging and inner canyon camping (except for slightly fewer sites at Phantom Ranch) would continue at their present levels, resulting in the need for reservations well in advance during most of the year.

■ **Orientation and Interpretation**

With the centralized orientation centers at Mather Point, Desert View, and CC Hill, plus the gateway information centers at Tusayan and Jacob Lake, visitors would have multiple opportunities to obtain day and overnight hiking information and be better prepared to avoid the hazards of trekking below the rim. Signs and bulletin cases at the trailheads would continue to warn visitors of the hazards of hiking in the canyon and of the precautions necessary to avoid problems (the same as alternative 1).

Corridor trail users would benefit from the establishment of visitor contact stations in existing structures at Phantom Ranch and Indian Garden. These facilities would make it easier for trail users to locate park staff for information or assistance.

Additional amphitheater seating at Phantom Ranch would better accommodate audiences. A small amphitheater at Indian Garden would offer new interpretive opportunities for overnight visitors, as well as a location for interpretive talks for day hikers.

Interpretive exhibits at Phantom Ranch, along with a wayside exhibit plan for the corridor trail complex, would help visitors better understand and appreciate the significance of the inner canyon resources. In addition, roving interpreters on the corridor trails would interpret canyon resources on more of an impromptu basis. Visitors would also be better informed of safety precautions necessary for hiking below the rim.

Conclusions

Alternative 2 would increase the opportunities for visitors to get information about Grand Canyon and other tourism attractions in the area. Information provided would be current, accurate, and frequently updated, helping visitors make travel plans.

Alternative 2 would increase the opportunities for visitors to become oriented to park resources and learn about the primary themes at both gateway and in-park orientation and interpretation facilities. Orientation facilities would be located at key points in the visitor experience, and visitors would be well prepared to enjoy the park in an efficient, safe, and environmentally conscientious manner. Interpretive facilities would be resource based and large enough to provide in-depth coverage of key park themes. Both short- and long-term visitors would be able to understanding and appreciate park resources and their significance.

The combination of controls on park visitation, increases in park visitor facilities and services, and changes in services in Grand Canyon Village would substantially improve the visitor experience on the South Rim, continue an acceptable level of service and experience at the other park developed areas, and help to meet more of the current and expected increased demand in park use.

Present concession facilities would be more effectively used, and additional services would be provided by adaptively reusing historic buildings. Concessioners would benefit from increased visitor services and facilities; however, some of this benefit would be offset by the construction of employee housing on the South Rim, as well as some other support facilities.

Cumulative Effects

Orientation proposals would contribute to regional efforts to disperse tourism in the area and include other federal, state, and local resources. Programming would contribute to regional and national efforts to expand interpretive and educational opportunities for the public. Additional educational resources would be available for regional, national, and international visitors.

Information facilities and systems would contribute to regional and national efforts to expand public information about regional resources.

This alternative would set a precedent for limiting future development in the park by providing for visitor convenience only if natural resources could be protected.

Addressing the need for additional food services and more accommodations would have a beneficial cumulative effect on the visitor's experience.

Impacts on the Socio-economic Environment

Alternative 2 would accommodate all of the increased demand to visit the South Rim of the park by providing for a transit service that would allow most South Rim visitors to switch from touring the park in personal vehicles to public transit.

On the North Rim visitor limits would be established based on the capacities of the overlooks. All potential visitors would be allowed onto the North Rim through 2004, when a reservation system could be implemented. This system would only be im-

posed if management and information systems were unable to disperse use within the park. An in-park transit service would be established on the North Rim.

At Tuweep day use limits would be imposed to limit the number of vehicles and persons visiting during peak periods, causing inconvenience to some visitors.

Alternative 2 would greatly expand the park's bus fleet, would construct major visitor information facilities, parking, and transit staging areas both inside and outside the park. Alternative 2 would rehabilitate, replace, and adaptively reuse many of the park's administrative, commercial, and residential facilities. The alternative would allow for some expansion of in-park concessions and community services, but it would generally encourage the growing demand for these services to be met outside the park.

Regional Effects

The economies of northern Arizona and southwestern Utah are expected to benefit under this alternative because nearly all potential visitors would be allowed to enter the park. Permanent increases in employment by the National Park Service and in-park transit service providers would also have positive long-term impacts on area economies. In addition, local and regional economies would experience short-term economic benefits from the employment and purchases associated with major construction projects in the park area.

■ Short-Term Effects

All construction activities associated with this alternative would occur in Coconino County. Most park-related construction jobs would be filled by area residents. Workers could be expected to commute to construction sites from homes located elsewhere in the county. Coconino County businesses and workers would also benefit from substantial purchases of building materials, and construction supplies and services. Alternative 2 construction projects would be take place between 1996 and 2001, with the peak of employment occurring in 2000 and 2001.

■ Long-Term Effects

Alternative 2 would not limit the growth of businesses catering to South Rim visitors, but it would place modest limits on the growth of sales by businesses catering to North Rim and Tuweep visitors. The Coconino County economy would experience substantial benefit from increased NPS employment and staffing for an in-park transit service; many of these year-round jobs are expected to provide average or above average earnings, although some seasonal jobs would be low paying. The negative aspect of this growth in tourism jobs is that many of the new jobs would seasonal and part-time, and most of the jobs would be low paying.

Alternative 2 would cause more overall economic growth to occur in Coconino County than what is predicted under the no-action alternative. This alternative would allow park-related employment to grow by 5,288 jobs by 2010, an increase of 76%, and 449 more jobs than under the no-action alternative (+3.8%). Park-related earnings would grow by $90.1 million, an increase of 77% and $9.8 million more than no action (+4.9%, see table 46).

The net long-term increases in employment and earnings above the projections for the no-action alternative are largely the result of the direct and derivative effects of park transit services, which are not included in the no-action projections. The high growth in employment and earnings between 1996 and 2001 result from NPS construction projects.

Table 46: Projected Parkwide Visitation, Expenditures, and Employment - Alternative 2

	Predicted Visitation (in thousands)	Annual Visitor Expenditures (in millions)
1993	4,355	$ 402.6
2010	6,859	697.0
Net Change	+ 2,504	+ $ 294.3
Percentage Change	+ 57.5%	+ 73.1%
Total 1993–2010	100,960	$9,899.1
Compared to No-Action Alternative		
Net Change	- 5,580	- $ 0.5
Percentage Change	- 0.1%	- 0.08%
Total 1993–2010	- 22,520	- $ 2.3
Percentage Change	- 0.02%	- 0.8%

	Average Park-Related Jobs			Annual Park-Related Earnings (in millions)		
	Direct	Indirect/Induced	Total	Direct	Indirect/Induced	Total
1993	4,180	2,743	6,923	$ 68.1	$ 49.4	$117.6
2010	7,344	4,867	12,211	120.2	87.7	207.9
Net Change	+ 3,164	+ 2,124	+ 5,288	+ $ 52.1	+ $ 38.3	+ $ 90.3
Percentage Change			+ 76.4%			+ 77.0%
Total 1993–2010			174,823*			$2,990.0
Compared to No-Action Alternative						
Net Change			+ 449			+ 9.8
Percentage Change			+ 3.8%			+ 4.9%
Total 1993–2010			+ 6,793*			+ $123.4
Percentage Change			+ 4.0%			+ 4.3%

NOTE: Park-related jobs and earnings are projected for Coconino County.
* Total employment in person-years.

Table 47: Estimated Construction Employment and Earnings - Alternative 2

	Construction Employment	Direct Earnings
1996	174	$4.8
1997	87	2.4
1998	239	6.3
1999	185	5.1
2000	289	7.5
2001	357	9.2
Total	**1,331***	**$35.3**

NOTE: Construction employment is presented as full-time equivalent jobs. Earnings are in millions of dollars (1993).

* Total construction employment is in person-years.

■ Coconino County Population Effects

Alternative 2 would result in slightly more population growth than is predicted by Coconino County's growth projections, from 141,353 to 141,941, a net increase of about 590 persons above the no-action alternative. Park-related population effects would add about 9,000 persons to the county's population, accounting for about 23% of the growth from 1993 to 2010.

Alternative 2 would further increase the demand for public and private services in the park area. Park-related population growth is projected to generate demand for 4,070 additional housing units in Coconino County.

Parkwide Effects

Park visitation would increase to nearly 6.9 million visitors in 2010 (an increase of 57.5%). Imposing visitor limits at the North Rim and at Tuweep is predicted to reduce the growth in park visitation by about 5,600 persons in 2010 (about a 0.1% less than the no-action alternative). It is assumed that half of the visitors affected by Tuweep and North Rim reservation systems would rearrange their schedules and enter the park at another time. From 1993 through 2010, a total of 100,960,000 persons are predicted to visit the park, about 22,000 less than the no-action alternative. Alternative 2 would not meaningfully affect the number of foreign tourists visiting the southwestern United States or the Grand Canyon. Likewise, the number of U.S. residents visiting the Grand Canyon area would not substantially change.

Most expenditures made by Grand Canyon visitors are by persons touring the South Rim; minor limits on the growth of visitation at the North Rim and Tuweep would have little effect on overall expenditures by park

visitors. In 2010 park visitors are predicted to spend $697 million, 73% greater than in 1993, but about $500,000 less than the no-action alternative. From 1993 to 2010 visitors would spend an estimated $9.9 billion during their visits to the Grand Canyon, about $2.3 million less than the no-action alternative (see table 46).

Alternative 2 would switch the majority of visitors from touring the park in personal vehicles to transit service. In 1993, 80% of the visitors toured the park in personal vehicles; in 2010 about 75% of visitors are expected to use public or private transit to tour the park.

The transition from auto touring to bus touring is not expected to meaningfully change the total amount of money spent by park visitors, but it would probably cause some changes in purchasing patterns. For example, persons touring the park by bus could be inclined to purchase packaged picnic lunches from concessioners rather than carry their own picnic baskets on buses. For similar reasons, tourists could purchase smaller, more compact gift items from in-park retailers in lieu of bulky or heavy items. Transit system use would greatly reduce in-park gasoline sales and purchases of other automobile-related goods and services. If no charge was made for park transit, visitors might spend more on eating, drinking, lodging, gifts, and personal services.

The transition from automobile to mass transit would occur over several years. In-park concessioners would be expected to adapt to changes in consumer behavior. Alternative 2 would also influence the way visitors spend money in communities and at individual businesses outside the park, resulting in a net increase in sales. Community economies and individual businesses would also need to adjust to changes in market conditions.

From 1996 through 2001 park-related construction activities are predicted to create an average of 222 construction jobs. Construction workers are expected to live outside park boundaries.

The level and types of concessioner services and facilities would grow somewhat, providing additional income to concessioners on both rims. Increased employee housing resulting from changes in services and replacing inadequate employee housing on the South Rim would be a major expense for the primary concessioner. Project funding for both revenue producing and non-revenue-producing facilities (housing, maintenance, offices, etc.) would come from funds provided through concession contract provisions, such as investment requirements and funds set aside by concessioners in capital improvement accounts. Set-aside funds would be based on a percentage of the concessioner's gross receipts, to be determined in the concession contracting process. Initial feasibility analyses indicate the proposed visitor facility changes are feasible. Additional, updated feasibility analyses would be conducted prior to the development of specific design proposals, including actions involving support facilities, such as employee housing.

If the monitoring program indicated a need to adjust the number of inner-canyon mule trips from the North Rim, the concessioner's revenues would be reduced. However, the overall feasibility of this operation would be considered when any reductions were proposed.

South Rim

Alternative 2 would not limit the number of people visiting the South Rim. From 1993 to 2010 South Rim visitation is projected to grow by 2.4 million to 6.3 million, an increase of 62%. Under this alternative both the south and east park entrances would experience substantial increases in use in numbers of visitors; the number of visitors using the south entrance would increase by 67% and the number using the east entrance by 45% (similar to the no-action alternative). The proportion of visitors using the south entrance compared to the east entrance would be 80.6% to 19.4%.

South Rim visitors would spend an estimated $590 million in 2010, an increase of $258.7 million (78%) over 1993 expenditures (similar to the no-action alternative). Between 1993 and 2010 visitors would spend a total of $8.3 billion (the same as no action).

The switch in emphasis from auto touring to bus touring is not expected to change total expenditures by South Rim visitors. Visitation would have some influence on which communities and at which individual businesses tourist dollars were spent.

One effect of alternative 2 would be to greatly reduce the frequency that visitors enter the park from the south or east, traverse East Rim Drive, and leave the park at the other side. The percentage of visitors making this loop tour is unknown. Alternative 2 could reduce this level of use because of the need for visitors to obtain private vehicle reservations during the peak season.

It is uncertain what effect alternative 2 would have on visitor preferences to enter the park from the south or east. An increase in the market share for businesses at one gate would serve to limit business growth along other travel routes to the park. The Park Service would attempt to use its regional public information services to maintain approximately the current proportions of automobile visitors arriving from the south and east.

Nearly all automobile visitors who enter the park from the south have arrived by traveling I-40. About half of the automobile visitors entering the east gate have also arrived via I-40. If the south entrance gained a reputation for providing a superior mix of park amenities or visitor convenience, its share of I-40 travelers could increase. Growth in visitation at the south entrance would enlarge the market served by businesses along the travel corridors to the south gate.

The opposite effect could also occur if an increasing share of I-40 visitors opted to pass through the Navajo Reservation or by way of other East Rim attractions on their way to the park. The use of the east entrance could increase if the Navajo develop a cultural center or successful gambling casinos.

Another unknown is the effect the alternative 2 would have on visitation at other Arizona and Utah tourist attractions. Restrictions on making a loop tour through the South Rim could add three or more hours in travel time for persons wanting to enter the park from the south and then extend their tours to other attractions east and north of the park in Arizona and Utah. The additional travel time could deter some people from taking these regional tours. Limits on drive-through travel also could encourage greater use of the east entrance. The additional travel time for regional travelers would be reduced to about an hour if they chose to enter the park from the east rather than the south.

Restrictions on through-park travel could also result in more traffic being routed through Flagstaff, which would benefit businesses in this community, but would take away from businesses in the area's smaller communities.

South Rim employment opportunities in Coconino County would increase about 82% by 2010 (from 6,321 to 11,523, for a net increase of 5,202), and job-related earnings would increase by about 83% (from $107 million to $196 million, for a net increase of $87 million). Both of these impacts would be slightly higher than the no-action alternative: 438 additional jobs (+4.6%) and $9.6 million in additional total earnings (+5.1%).

■ Distribution of Economic and Population Effects

Alternative 2 would result in more overall economic and population effects in communities south of the park than under the no-action alternative. In addition, this alternative would result in considerably less expansion of in-park concession services than what is predicted under no action. Some NPS jobs would also be located outside park boundaries. One effect of this alternative would be to shift a greater share of park-related economic and population growth to other areas of southern and eastern Coconino County.

Tusayan would benefit from the unmet demand for visitor services. Alternative 2 would establish a major parking and transit staging area adjacent to Tusayan. An estimated 40–50% of the south entrance visitors arriving in private vehicles would be shuttled from the Tusayan staging area into the park. Because the parking/staging area would be located south of the existing townsite, so transit passengers would transfer to buses before driving through the Tusayan business district. The resulting reduction in drive-by traffic could be harmful to Tusayan businesses, depending on the extent of spontaneous purchasing decisions of automobile travelers.

During bus rides to and from the park passengers would see Tusayan businesses fronting Arizona 64. The shuttle bus would also stop in the Tusayan business district. Some passengers would get off and shop in Tusayan. Businesses near the bus stop would enjoy location advantages over businesses farther away. At the completion of their bus rides, some people would decide to drive their own vehicles back into Tusayan to buy goods and services. Since in-park gas station and automobile services would not be available to parties using the transit shuttle, Tusayan area businesses could expect to profit from increased sales of gasoline and car-traveler oriented foods and services. The difficulty in transporting items on buses could also encourage visitors to purchase more retail items in Tusayan.

Flagstaff, Valle, and Williams would also experience net increases in employment and population as a result of this alternative. Flagstaff would be the site of a park visitor information center, and some park-related administrative jobs would also be relocated to Flagstaff. Flagstaff would also benefit from the indirect and secondary economic effects of park-related construction, increased employment by the Park Service and transit service providers, and general business and employment growth attributable to South Rim tourist expenditures.

Additional business growth and new business development would also be likely in Williams and Valle. Both communities would benefit from general increases in drive-by traffic and from unmet demand for visitor services inside the park. Williams and Valle would also be well situated to serve as housing areas for workers on park construction projects and could also serve as bedroom communities for employees in the park and Tusayan.

Economic Effects with the Expansion of Tusayan: The expansion of existing businesses and the extensive new business development allowed by an enlarged townsite would allow Tusayan to capture much of the unmet demand for goods and services inside the park. An expanded townsite would slow that growth of tourism businesses and employment in other communities south of the park.

Economic Effects without the Expansion of Tusayan: If Tusayan did not expand, Flagstaff is predicted to experience the greatest share of park-related economic and population growth. Williams and Valle would also experience additional tourist-oriented business expansion, as well as employment and population growth. It is possible that Valle would develop a much more substantial commercial district, filling the unmet demand for visitor services in Tusayan. Valle and Williams could experience substantially more population growth due to the absence of affordable housing nearer the park. The lack of a community water supply and other community infrastructure pose major constraints to business and population growth in Valle.

Even without townsite expansion Tusayan would experience some business growth, along with increases in employment and population. Business growth would be constrained by the shortage of private land with commercial development potential. The small amount of undeveloped highway frontage would be developed, and some existing commercial properties would be enlarged and redeveloped into more intensive uses. It is also likely that some commercial development would occur back from Arizona 64. Population growth would be constrained by the lack of incentives for businesses to subsidize the construction of affordable housing for tourism-sector workers.

- **Communities East of the Park:**

Under alternative 2 the Park Service would use public information services to maintain the current proportion of visitors in private vehicles entering the park from the east. Businesses and communities along Arizona 64 and U.S. 89 would benefit from the predicted 45% growth in visitors entering at Desert View.

A Navajo cultural center or gambling casinos in Page could develop into prominent tourist attractions on their own, thus shifting park visitors from the south entrance to the east entrance. Increased use of the east entrance would benefit East Rim economies, but it would reduce the market growth for communities serving the south entrance.

North Rim and Tuweep

Through 2004 alternative 2 would allow all potential visitors to enter park's North Rim and would not limit the economic benefits of visitor expenditures in North Rim economies. In 2005 a reservation system is proposed for implementation to begin to control the number of people entering the park. At Tuweep a reservation system would begin in 1995. Between 1993 and 2010 visitation is expected to grow by 16% percent at the north entrance and by 38% at Tuweep, from 447,000 visitors to 518,000 total visitors (an increase of 71,000 visitors); however, this would be 5,600 fewer people than predicted under the no-action alternative.

Under alternative 2 annual expenditures by North Rim and Tuweep visitors would increase from $31 million in 1993 to $37 million in 2010. This is about $400,000 less in 2010 than what is projected under the no-action alternative. Over the 18 years between 1993 and 2010 park visitors would spend an estimated $617 million in Coconino, Mohave, Washington and Kane Counties, which is $1.6 million less than the no-action alternative.

Establishing a North Rim transit system would not meaningfully affect the total expenditures by tourists or the distribution of expenditures. Communities catering to visitors at southern Utah national parks and other regional tourist attractions could experience net increases in sales to tourists who were unable to visit the North Rim or Tuweep due to the park's reservation limits.

Under alternative 2 total North Rim-related employment (direct and induced) is predicted to increase from 602 in 1993 to 756 in 2010; this is about 22 more jobs than predicted in the no-action alternative. The largest employment increases would occur in 1998 and 1999 as a result of $9 million of improvements on the North Rim. Employment earnings would increase by $2.8 million (+26.5%) to $12.3 million, $500,000 (+4.0%) more than no action.

Alternative 2 would allow for only limited increases in employment by in-park concessioners, which would restrict in-park businesses from expanding their shares of the North Rim tourism market. The economic benefits of increased sales to North Rim visitors would occur mainly within northern Arizona and southwestern Utah communities, which function as staging areas and service communities for park visitors. Increased NPS and transit employment inside the park and at Jacob Lake would have positive indirect and secondary economic effects in Fredonia, Page, Kanab, and Cedar City. In 1998 and 1999 construction of in-park improvements would cause noticeably positive impacts on these same community economies.

Conclusions

Alternative 2 would foster more overall economic and population growth in the Grand Canyon region than would occur under the no-action alternative or any of the other alternatives. This alternative would accommodate increased demand to visit the national park by requiring most visitors to tour the park by means of public transit. Establishing a reservation system would allow some persons to continue to tour the park in personal vehicles.

Under alternative 2 an estimated 6,859,000 people are predicted to visit the Grand Canyon in 2010. An estimated 5,600 potential visitors would decide not to visit the park because of the limits or transit use requirements. Alternative 2 would result in 0.2% fewer park visitors than are predicted under the no-action alternative. Park visitors would spend $697.1 million in the Grand Canyon region in 2010, $0.4 million less (-0.1%) than the no-action alternative.

The economic effects of slightly decreased expenditures by tourists would be counterbalanced by more NPS and park transit service employment (+366 jobs) than predicted under the no-action alternative. Construction projects associated with this alternative would also cause substantial short-term increases in area employment and earnings between 1996 and 2001.

Most economic, population, and land use impacts attributable alterative 2 would occur in Coconino County. From 1993 through 2010, the direct, indirect, and induced economic effects attributable to the park would cause Coconino County's average annual employment to grow by 5,288 jobs and countywide personal earnings to grow by $90.3 million, compared to what is projected under the no-action alternative, resulting in about 9,000 additional county residents in 2010. Park economic effects would be responsible for 23% of the county's projected population growth between 1993 and 2010. Under alternative 2 the county economy would provide 449 more jobs and support 779 more people than predicted under the no-action alternative.

Alternative 2 would allow for some expansion of in-park concessions and community services, but it would generally encourage visitor services to be accommodated outside the park. An indirect effect of restricting the expansion of in-park concessions and services would be to transfer growth in tourist-oriented commercial land uses to small communities outside the park. Resulting employment and population growth the park would burden community infrastructures and services, and would add to existing shortfalls in affordable housing.

Cumulative Effects

Effects would be the same as the no-action alternative.

Impacts on Transportation, Parking, and Transit

South Rim

■ Access and Circulation

Outside the Park: This alternative would not cause major shifts in regional traffic patterns. All major access routes leading to the South Rim are expected to provide satisfactory levels of service through the year 2010.

The proposed information/bus staging areas in Cameron, Flagstaff, and Williams would be used by some visitors choosing to take a private transit bus to the park. The demand for this service is unknown.

Private vehicles would be prohibited on West Rim Drive and most of the roads in the village. When space was available, day visitors would be allowed to park in a new parking area near Mather Point. If parking space was not available, day visitors would have to park in Tusayan and ride a bus or the train into the park. Overnight guests would be permitted to drive to their campground, trailer site or the lodge parking areas at Maswik and Yavapai. When the Mather parking area was full, access to the parking area would be closed. When the gate was closed, the only way to access the village or the West Rim would be to take private transit from Tusayan.

The gate closure at the Mather parking area wound create a change in traffic circulation patterns within Tusayan. Visitors woud recirculate through Tusayan seeking alternative transportation to the village and West Rim. Some visitors would choose to wait in Tusayan for the afternoon opening of the gates to Mather. This would result in visitors recirculating through Tusayan looking for something to do while waiting.

Traffic circulation within Tusayan is not expected to change as a result of a proposed staging area located adjacent to the north end of town. All vehicles that have traditionally traveled through Tusayan to get to the park would continue to do so. The proposed staging area would be used by visitors who wish to use transit to access the village and West Rim.

Hourly traffic volumes on the major roads leading to the park would shift slightly as a result of the village access policy. It is anticipated that morning traffic volumes (7–10 A.M.) would increase due to visitor understanding of the first come first serve access policy at the Mather Point parking area.

USFS Road 302/307 would remain a dirt surfaced road closed to through-traffic. The use of this road is not expected to change as a result of this alternative.

Grand Canyon Village: Access to the village and the West Rim would change during the day. During the morning the Mather Point parking lot would be open to the public. When this 1,225-space lot was full, the gates leading to the Mather parking area would be closed. Vehicles would be able to exit the parking area at any time. When the Mather parking area was full, day visitors could only access the village area by parking at the staging area north of Tusayan and riding the transit bus or the train into the park.

During the middle of the day, when a significant portion of the vehicles have left the Mather parking area, the gates would reopen long enough to fill the lot and then be closed again. It is estimated that the parking lot would fill by 10 A.M. on most mornings during the peak season and most likely remain closed until about 1 P.M., when the gates lot would be reopened temporarily to allow the lot to refill. The lot would then remain closed until 3 or 4 P.M. The gates would be reopened when parking demand would not cause the lot to exceed capacity. Notice of the current status of the Mather parking lot would be easily available at the staging/orientation center in Tusayan and at the east entrance to the park.

Traffic congestion is anticipated near the gate to the Mather Point parking lot, especially within an hour of reopening the gate. Visitors would probably stay in line to wait for the gate opening. This situation is not desirable and would be discouraged through design of the road approaching the gate and strict enforcement of no parking zones, which would be posted within a half mile of the gate.

Several new roads in the village area would enable the transit system to operate efficiently by separating public transit vehicles from visitor/employee vehicles:

- A new road would be constructed between Center Road and the Maswik transportation center for use by overnight guests at Maswik Lodge, as well as transportation center users.
- A new road section between the business center and the residential area would allow residents to drive to the business center without traveling on the south entrance road or the village loop road, which would be limited to use by transit vehicles only.
- A new road between the south entrance road and the business center to be used by overnight guests staying at the Yavapai Lodge, Mather Campground, and Trailer Village, as well as persons wishing to access the business center.

Traffic volumes on most park roads would be well below the road capacities. The south entrance road, which would have the poorest operational characteristics, is expected to provide LOS C/D. Center Road is expected to operate at LOS C. All other village roads would operate at LOS B or better.

West Rim: Because West Rim Drive would not be accessible to visitors in private vehicles, it is expected to operate at an acceptable LOS B through the year 2010.

East Rim: Because visitors in private vehicles could drive the full length of East Rim Drive, it is expected to operate at LOS C/D in the year 2010.

Desert View: The alignment of East Rim Drive at Desert View would be changed so the road remains well away from the rim, with a single access road provided into Desert View.

Realigning the access road into Desert View would greatly reduce the impacts of traffic on East Rim Drive. The traffic volumes on the access road are expected to be well below the capacity of the road. Road realignments would also improve circulation patterns within the Desert View area. The internal loop circulation pattern would allow the buses to circulate without causing traffic congestion.

■ Parking

Outside the Park: A new parking area would be developed adjacent to the north end of Tusayan. This staging area would accommodate a total of 2,522 vehicles including 2,313 cars, 148 RVs, and 61 buses. This lot would require 25.3 acres, which includes 25% landscaping. When the Mather Point parking area is full, day visitors would leave their vehicles at the staging area and ride the transit bus or train into the park.

Grand Canyon Village: The main parking area for the village would be near Mather Point. It would be designed to hold 1,225 vehicles, including 1,021 cars and 81 RVs. A short-term tour bus parking area for 30 buses would be located close to the orientation center, and a long-term bus parking area for an additional 93 buses would be provided further away.

The proposed parking and staging area would provide visitor services (including restrooms) nearby at the orientation center. The staging area would be easily accessed by means of the transit system from all South Rim areas, and tour buses could access this area at all times.

All day vehicles would park at the staging area and take NPS-provided transit to the village and all other destinations west of the staging area.

Providing no additional parking in the village and reducing or eliminating parking along the rim would mean that visitors would have to park in designated areas. A valet shuttle service would be provided to transport overnight guests and their luggage to the lodges located along the rim. Buses with overnight guests would be allowed to drive to the lodge and drop off the guests and their luggage. They would then have to return to the long-term bus parking area near Mather Point.

The Maswik transportation center parking area would be used for loading and unloading tour buses during the day and for overnight guest parking in the evenings. This parking area would not have to be expanded to accommodate this shared use, although it might be necessary to restripe the parking area to improve operational characteristics.

West Rim: Parking would not be a problem on the West Rim. The only vehicles that would require parking would be a few concession tour buses. Parking areas along the West Rim would eventually be downsized and revegetated.

East Rim: Parking on the East Rim would not be expanded. Private vehicle parking would be limited to Desert View and a few small pull-outs along East Rim Drive. All other developed areas along East Rim Drive would be accessible by tour bus, transit or bicycle only.

Traffic congestion, on-street parking and parking capacity problems are expected to occur in the vicinity of each of the small pull-outs proposed for East Rim

Drive. These few parking places represent the only places private vehicles would be allowed to stop and park on the East Rim and would therefore be in high demand.

Desert View: The existing parking area at Desert View would be used for an orientation center. Any unnecessary paved areas of the existing lot would be removed and revegetated.

A new parking area would be constructed in the concessioner housing area. This new lot would be sized to hold 438 vehicles, including 398 cars, 25 RVs, and 15 buses. This would require that about 3.6 acres of land be developed into a parking area (4.5 acres if 25% landscaping is added).

■ Transit

Outside the Park: The National Park Service would provide shuttle service between the proposed staging area north of Tusayan and the Mather Point parking area. An example of the proposed transit service in the year 2010 is shown below:

Mather Point / Tusayan Shuttle
Stops: Tusayan Staging area, Moqui Lodge, Mather Point
Demand: 1,600 rides/hour
Vehicles: Eleven 100-passenger buses
Headway: 5.5 minutes

The Mather/Tusayan shuttle route could be a candidate for a light rail system. These systems are much more expensive than the example bus system presented above.

Grand Canyon Village: The transit system proposed in this alternative would be significantly larger than the one in alternative 1. The example transit system for the village would include 41 transit vehicles operating on five routes, compared to six buses operating on two routes under alternative 1. Separating transit vehicles and visitor/employee vehicles would allow the transit system to operate smoothly and efficiently.

NPS-provided transit service would be available from the Mather Point parking area. Buses traveling on fixed routes would serve all areas of the village, all lodges, the business center, and the campground. Operating transit vehicles on all routes with relatively short headways (less than 15 minutes between buses) would allow the system to be very responsive to visitor transit needs. The shuttles between Mather Point and the village and the village loop would both have headways of less than five minutes because these routes are expected to be used by the majority of the visitors.

The following is an example of how the proposed transit service in the village area could be implemented:

Mather Point / Yaki Point Shuttle
Stops: Mather Point, South Kaibab trailhead, Yaki Point
Demand: 540 rides/hour
Vehicles: Six 50-passenger buses
Headway: 5 minutes

Mather Point / Village Shuttle
Stops: Mather Point, former visitor center, Bright Angel Lodge, Maswik transportation center
Demand: 2,365 rides/hour
Vehicles: Sixteen 100-passenger buses
Headway: 4 minutes

Mather Point / Yavapai Observation Station Shuttle
Stops: Mather Point, Yavapai observation station
Demand: 540 rides/hour
Vehicles: Four 50-passenger buses
Headway: 5 minutes

Business Center Loop
Stops: Business center, Maswik Lodge, campground, camper services, former visitor center
Demand: 270 rides/hour
Vehicles: Three 50-passenger buses
Headway: 10 minutes

Village Loop Shuttle
Stops: Maswik transportation center, community building, general offices building, El Tovar, Bright Angel Lodge, West Rim interchange, Maswik Lodge
Demand: 1,780 rides/hour
Vehicles: Twelve 50-passenger buses
Headway: 3 minutes

Valet Shuttle
Stops: Maswik transportation center, Maswik Lodge, all rim lodges
Demand: 100 rides/hour
Vehicles: Two 25-passenger buses
Headway: 15 minutes

Employee Shuttle
Stops: Residential areas, work areas in the village area
Demand: 225 rides/hour
Vehicles: Three 25-passenger buses
Headway: Based on demand

Encouraging employees living in Tusayan to ride the NPS visitor transit system or employee shuttle into the park would reduce vehicular traffic on park roads.

West Rim: This alternative would include increase the level of transit service on the West Rim and split the West Rim shuttle loop into two routes with a transfer station at Hopi Point. The West Rim transit service would continue to start at the interchange on the west end of the village. An example of the transit service follows

West Rim Shuttle (West Rim interchange to Hopi Point)
Stops: Six overlooks
Demand: 890 rides/hour
Vehicles: Five 100-passenger buses
Headway: 6 minutes

Hermits Rest Loop (Hopi Point to Hermits Rest)
Stops: Five overlooks
Demand: 540 rides/hour
Vehicles: Four 100-passenger bus trains
Headway: 10 minutes

East Rim: No NPS transit service would be provided on the East Rim Drive. However, tour buses would be allowed access to all developed areas along East Rim Drive.

Desert View: No NPS transit service would be provided at Desert View.

■ Winter Use

Access and Circulation: Access to the park would change slightly during the winter season. Although the vehicle access restrictions and transit service would continue to be in effect in the village and the West Rim, private vehicle access to all of the developed areas on East Rim Drive would be permitted during the winter season.

Parking: The Mather Point parking area has been sized so that all visitors wishing to see the village during the winter season would fit in this parking area, thereby eliminating the need for the Tusayan/Mather transit service during the winter season.

No parking problems are anticipated during the winter season. The Tusayan information/orientation center would be closed during the low visitation months of the winter.

The Desert View staging area would continue to be used for all private vehicle parking at the Desert View developed area.

Transit: Transit service between Tusayan and Mather Point would not be available during the winter season. All other transit services on the South Rim would be operated year-round. The ridership on the transit system is expected to be about 40% of the summer demand on a peak winter day. All transit systems would be downsized to reflect demand during the shoulder months and winter. Winter transit operations would require that all-weather transit shelters be provided to protect visitors waiting for buses from the weather.

NORTH RIM

■ Access and Circulation

Outside the Park: Traffic patterns or the routes used to access the North Rim would not be changed. Traffic volumes on the major regional access routes are expected to be much lower than the capacity of the roads. No access problems are anticipated.

Bright Angel Point: All visitors and vehicles would be allowed access into the park. All day visitors to Bright Angel Point and visitors with oversized vehicles would have to park at a new staging area on CC Hill and ride the NPS shuttle to the developed areas, which would change the way visitors experience this area. Overnight guests would obtain an overnight vehicle permit at the orientation center, allowing them to drive to their lodge or campsite.

Establishing limits on the sizes of vehicles allowed on the scenic roads to Point Imperial and Cape Royal (less than 22′ in length and 8′ in width) would allow the scenic roads to remain unchanged, and the level of service on these roads would improve as a result. The vehicle size limits would also eliminate the need to provide parking for oversized vehicles at overlooks on Walhalla Plateau.

A new two-lane, paved road approximately one-half mile long between the north entrance road and the CC Hill staging area would traverse the hillside at a maximum grade of 6%.

Walhalla Plateau: Access to Walhalla Plateau would be restricted to vehicles less than 22′ long and less than 8′ wide. These visitors would have to park at CC Hill and use the transit service for access to the scenic overlooks on Walhalla Plateau. It is estimated that about 75 oversized vehicles would access the park on a peak day in the year 2010.

■ Parking

Outside the Park: The only parking impact outside the park would occur at the Jacob Lake information center, where parking for an additional 75 vehicles would be needed.

Bright Angel Point: Parking at the CC Hill staging area would accommodate 377 cars, 16 RVs, and 4 buses. The North Kaibab trailhead parking area and most of the amphitheater lot would be removed, and the areas revegetated.

Walhalla Plateau: Parking areas on Walhalla Plateau would be sized to better match visitor capacities at the overlooks (see table 48). These parking lot changes would not occur until all the other facilities were in place and monitoring of the visitor patterns had been re-examined.

■ Transit

Outside the Park: The National Park Service would not provide any transit service outside the park. The use of private transit service from the gateway communities would be encouraged; the demand for such service is unknown.

Bright Angel Point: A transit center at CC Hill orientation center would act as the hub for all North Rim transit operations. The transit vehicles on Bright Angel Point would be approximately 22′ in length. An example of the two transit services is summarized below; more detailed planning would be required before the service was implemented.

Bright Angel Shuttle

Stops:	CC Hill, campground, Bright Angel Lodge
Demand:	650 rides/hour
Vehicles:	Seven 25-passenger buses
Headway:	3 minutes

Employee Shuttle

Stops:	All employee residential areas, all employment areas on Bright Angel Point
Demand:	50 rides/hour
Vehicles:	Two 12-passenger vans
Headway:	10 minutes (variable based on demand)

Tour buses with overnight guests would be allowed to drop passengers and their luggage at the lodge then park at the staging area. The concessioner would continue to provide guided tours of the North Rim in vehicles less than 22′ long.

Walhalla Plateau: The Park Service would also provide shuttle service between the staging area on CC Hill and the overlooks on Walhalla Plateau. The following example shows how this shuttle service could operate:

Walhalla Shuttle

Stops:	CC Hill, all Walhalla overlooks
Demand:	100 rides/hour
Vehicles:	Two 25-passenger buses
Headway:	15 minutes

Guided tours of the Walhalla Plateau would continue to be provided by the concessioner. Private tour buses would be allowed to access Walhalla Plateau if they complied with vehicle size restrictions and air emission requirements.

TABLE 48: WALHALLA PLATEAU PARKING - ALTERNATIVE 2

Overlook	Existing	Proposed	Net Change
Point Imperial	50	32	-18
Vista Encantadora	27	8	-19
Indian Country	6	6	0
Walhalla	46	14	-32
Cape Royal	60	120	+60
Total	**189**	**180**	**-9**

TUWEEP

Limiting access to Tuweep to vehicles less than 22′ long and less than 8′ wide would affect an estimated 10 oversized vehicles per day during peak visitation periods. Access would be limited to 30 vehicles or 85 people.

Removing the existing 10-car parking area at the Toroweap overlook and replacing it with a 25-car parking area near the Saddle Horse Canyon trail, along with a small roadside pulloff near the Tuckup trailhead, would meet parking demand on peak days.

No NPS transit service would be provided to Tuweep.

CONCLUSION

The proposed action would use staging areas and transit services to manage and control the levels of visitor activity in various areas of the park. Vehicle limits have been established at various areas so that visitor demands would remain less than the capacities of the areas. All roads and parking areas would function effectively.

Eliminating parking along the rim in Grand Canyon Village and restricting vehicle traffic would be a major change in use patterns.

The largest transportation-related visitor impact would be associated with the use of the NPS transit system. The concept of visitors have to park their private vehicles and use the NPS transit system would affect most visitors to some extent. To minimize this impact, the various transit services proposed under this alternative have been designed to operate on small headways, providing a system that is very responsive to visitor demands.

CUMULATIVE EFFECTS

The cumulative impacts of this alternative would be similar, but less than, alternative 1, including better distribution of daily visitor demand with anticipated effects on the tour bus and air tour industries.

The NPS transit service proposed in this alternative would produce an energy benefit by trading private vehicle miles for transit miles. The transit service would reduce in-park private vehicle travel by 66.9 million miles each year. Taking into account the fuel used in the transit vehicles, the net fuel savings would be approximately 2.2 million gallons of gasoline per year.

The transit service would also benefit air quality by trading 66.9 million private vehicle miles/year in gasoline-burning cars for 2.9 million transit miles/year driven in clean natural gas-burning buses. This trade-off would produce a net reduction in vehicle generated pollutants and have a positive impact on the air quality the park.

IMPACTS ON AREA OPERATIONS

HOUSING

This alternative would require the construction of 1,301 total housing units to replace substandard housing and to provide adequate housing for 465 additional employees. Housing would be provided both within and outside the park — 1,090 for the South Rim (332 units outside the park at Tusayan and Flagstaff, Valle, or Williams), 216 for the North Rim (2 outside the park at Jacob Lake), 1 at Tuweep, 4 at Phantom Ranch, and 1 at Lees Ferry (see table 49).

■ Region

Employees: Under this alternative approximately 40 employees would be assigned to worksites outside the park. These employees would be primarily personnel to staff regional information and contact stations that would be jointly operated by the Park Service and other entities, including six new employees in Tusayan and two at Jacob Lake. In addition, some 32 employees would be relocated from Grand Canyon Village to Flagstaff or Williams; most of these employees would be Grand Canyon National Park Lodges reservations staff. This relocation would reduce the overall need for new park housing and would not adversely affect park operations since these positions are need not be located within the park.

The two employees at Jacob Lake would be housed in the current USFS housing area at Jacob Lake or could commute from the Fredonia/Kanab area. The six employees at Tusayan would be provided housing in the new planned community in Tusayan. The Flagstaff employees would obtain market sector housing in Flagstaff. Housing for these employees would have little effect on regional communities. Since this housing would not be subsidized by the Park Service or the concessioner, some financial burden could be realized by the employees if salary is not commensurate with the marketplace in Flagstaff/Williams.

The majority of new employees on the South Rim would be housed in the new planned community in Tusayan.

Housing Needs: Under this alternative 487 new housing units would be required in a new community in Tusayan, occupying 42.9 acres. Most housing units would be apartments with trailer pads for temporary and seasonal employees, and some duplexes for manager level employees. This amount of housing would require significant vegetation clearing and land preparation.

Jacob Lake would need two housing units on 0.3 acre. This would have minimal effects on the USFS housing area at Jacob Lake.

The type of housing needed in Flagstaff would depend entirely on the individual employee's needs. There would be negligible regional impact in meeting housing needs for 29 additional employees.

Community Structure/Social Characteristics: The employees assigned to in Flagstaff/Williams and Jacob Lake would tend to become assimilated into their respective communities, participating in activities and social events more often in those communities than with the park population. The remote character of Jacob Lake would tend to isolate these employees from the park community on the North Rim.

Employees living in the new employee community in Tusayan would have a diverse experience, ranging from associations with community residents to park employees. The employee community could contribute to the separation of in-park and out-of-the-park employees. With the dispersal of housing units inside and outside the park, the community structure of Grand Canyon employees would be somewhat fragmented.

Housing provided outside the park, such as Tusayan, would benefit employees by separating their residential units from visitor use areas, reducing potential conflicts between employees and visitors and promoting greater privacy for employees.

Employee access to the workplace and the park would be improved in this alternative. Employees living outside the park and commuting into the park would have a separate entrance, which would also be used for service deliveries, thus reducing congestion and delays at the visitor entrance.

Employees living at Jacob Lake and Tusayan could walk or bike to work, while employees living in Flagstaff could commute to their jobs by private vehicle or public transportation.

■ South Rim

Grand Canyon Village:

• *Employees* — An additional 363 employees would be needed in Grand Canyon Village as a result of expanded visitor facilities such as the Mather Point orientation center, the village education center, and the park transit system (see table 50). Housing for these employees would be split between new units in the village and the new community in Tusayan.

Employees relocated from substandard housing units to upgraded or new units would benefit from housing that would better meet their needs for privacy, room, and comfort, reducing present employee turnover associated with inadequate housing conditions at the Grand Canyon.

More employees would be relocated from existing employee housing areas that would either be converted to visitor lodging or removed and converted to other non-lodging uses. Many of these employees would be moved into new dormitory or apartment units in the Pinyon Park area, and the rest would be relocated to new housing in the new community in Tusayan. For those relocated to Tusayan, some would benefit by being placed in upgraded housing units, and others would suffer from having to drive, car pool, or take employee shuttles to work in the park in lieu of walking to work, as many do now. Many relocated employees would experience a range of trade-offs in this alternative.

• *Housing Needs* — A total of 498 new housing units on 19.4 acres in Grand Canyon Village would be required under this alternative. By using land now occupied by 113 substandard units, as well as trailers, a net increase of 77 units could be provided over existing conditions on 15.9 acres less than currently occupied. The decrease in acreage is attributed to a higher density of apartments and dormitories in place of existing housing units.

• *Community Structure/Social Characteristics* — The present residential community of Grand Canyon Village would be significantly altered under this alternative. The employee housing units in the eastern part of the village (the present trailer village and the nearby dorms) would all be removed and converted to visitor use. All employee housing would be concentrated in the south-central and southwestern areas of the village. The proposed housing area in Pinyon Park and the current YACC area would consist of high-density dorms and apartment units, clustering approximately 490 employees into this area. The employees would be from concession and NPS operations, creating a mix of employees within tight living conditions. This would be a departure from the existing patterns of low-density park housing with separate areas for NPS and concession employees.

All dorms in the current visitor use areas adjacent to hotels

TABLE 49: HOUSING SUMMARY, 2010 - ALTERNATIVE 2

Area	Existing Units	Substandard Units to be Replaced	Standard Units to be Converted or Replaced	Total Remaining Standard Units	New Units Needed to Meet Standards*				Additional Units Needed for New Employees				Total New Units Needed		Total Units Needed This Alternative	Net Change over Existing	
					NPS		Concessioner		NPS		Concessioner						
					Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.		Units	Ac.
South Rim Region																	
• Tusayan	0	0	0	0	77	5.1	193	12.8	21	2.8	196	22.2	487	42.9	303	303	37.3
• Flagstaff, Valle, or Williams	9	0	0	9	0		0		6		23		29		38	29	
• East Rim/Outside Park	0	0	0	0	0		0		0		0		0		0	0	
Subtotal	9	0	0	9	77	5.1	193	12.8	27	2.8	219	22.2	516	42.9	341	332	37.3
South Rim																	
• Grand Canyon Village	958	113	424	421	8	0.5	87	5.8	36	1.2	367	11.9	498	19.4	1,099	77	-15.9
• Hermits Rest	2	1	0	1	0		0		0		0		0		1	-1	-0.1
• Desert View	40	11	21	8	13	1.1	13	1.1	9	0.7	35	2.6	70	5.5	78	38	3.2
Subtotal	1,000	125	445	430	21	1.6	100	6.9	45	1.9	402	14.5	568	24.9	1,178	114	-12.8
North Rim																	
• Jacob Lake	0	0	0	0	0		0		2	0.3	0		2	0.3	2	2	0.3
• North Rim	173	22	94	57	29	2.2	55	2.7	17	1.1	112	7.4	213	13.4	270	97	8.3
• Tuweep	2	1	0	1	0		0		1	0.3	0		1		2	1	0.3
	175	23	94	58	29	2.2	55	2.7	20	1.7	112	7.4	216	13.7	274	100	8.9
Other Park Areas																	
• Corridor Trails	22	4	0	18	4		0		0		0		4		22	0	
• Lees Ferry	2	1	0	1	1		0		0		0		1		2	0	
Total	**1,208**	**153**	**539**	**516**	**132**	**8.9**	**348**	**22.4**	**92**	**6.4**	**733**	**44.1**	**1,305**	**81.5**	**1,817**	**546**	**33.4**

* Includes replacement of substandard units and additional units to eliminate double and triple bunking.

would be converted to visitor lodging. The displaced employees would be provided new housing either in the park or outside in the Tusayan community. Removing employee housing from prime visitor use areas would eliminate many conflicts between park residents and visitors. Visitors would have a better lodging experience, and employees more privacy.

Existing employee access patterns would also be significantly changed under this alternative. No employee vehicles would be allowed at facilities on the village loop. All roadways with visitor transit would be off limits to private auto access, including employee travel. Only limited employee vehicular travel would be allowed for authorized service vehicles, promoting the use of new employee shuttles, or walking or biking to work. Eliminating employee traffic on visitor routes and in parking areas would improve the visitor experience and reduce overall congestion. Providing employee shuttles would affect traditional methods of getting to work, likely requiring some form of employer subsidy.

Employee parking would only be allowed in designated areas at the current visitor center building and at short-term spaces for loading or official business adjacent to facilities on the rim. A new road from the residential area along Havasupai Street to Babbitt's store would allow employees to drive to the store for groceries, mail, and banking activities.

Expanded and improved residential trail systems would further promote walking and biking to work from the residential areas.

Hermits Rest: No new employees would be required at Hermits Rest under this alternative. Removing the substandard trailer, providing housing in Grand Canyon Village or Tusayan, and reclaiming the site would have the same impacts as described under alternative 1.

TABLE 50: PROJECTED EMPLOYEES, 2010 - ALTERNATIVE 2

Area	Park Employees							
	National Park Service			Concessioner			Total	Net Change
	Existing	New	Total	Existing	New	Total		
South Rim								
• Tusayan	0	6	6	0	0	0	6	6
• Flagstaff, Valle, or Williams	3	4	7	0	28	28	35	32
• Grand Canyon Village	286	116	402	1,318	247	1,565	1,967	363
• Hermits Rest	0	0	0	3	0	3	3	0
• Desert View	22	10	32	44	23	67	99	33
• East Rim/Outside Park	0	0	0	0	0	0	0	0
Subtotal	311	136	447	1,365	298	1,663	2,110	434
North Rim								
• Jacob Lake	0	2	2	0	0	0	2	2
• North Rim	67	13	80	230	47	277	357	60
• Tuweep	1	1	2	0	0	0	2	1
Subtotal	68	16	978	230	47	277	361	63
Other Park Areas								
• Corridor Trails	12	0	12	17	0	17	29	0
• Lees Ferry	2	0	2	0	0	0	2	0
Subtotal	14	0	14	17	0	17	31	0
Total	**393**	**152**	**992**	**1,612**	**345**	**1,957**	**2,502**	**497**

Desert View:

• *Employees* — This alternative would require 33 new employees at Desert View (10 NPS employees and 23 concessioner employees) to operate the proposed new orientation center and transit system, plus employees for expanded maintenance and ranger functions.

Over 22 employees would be relocated from substandard housing under this alternative. Relocated employees would benefit from upgraded living quarters and increased privacy, helping to reduce the present rate of turnover.

• *Housing Needs* — This alternative would require the construction of 70 new housing units on 5.5 acres to provide housing for new and relocated employees. By using existing disturbed areas (specifically, the area now occupied by 11 substandard units) 38 additional housing units could be provided with a new land disturbance of 3.2 acres. All housing units would be provided in and adjacent to the existing NPS housing area.

• *Community Structure/Social Characteristics* — With all new housing in and immediately adjacent to previously disturbed areas, the current mix of employers and employee housing unique to Desert View would continue. The strong sense of community found among residents due to the area's remoteness and physical community structure would be strengthened by locating all housing in a concentrated, remote location away from visitor activities and facilities.

All housing would be provided in the NPS employee area southeast of the visitor use area. This location would continue to provide nearly all employees the opportunity to walk to work. Little conflict would occur between visitor and employee traffic. Clear separation between employee housing and traffic areas and visitor use areas would contribute to a positive visitor experience and efficient employee operations.

Employees would continue to use Arizona 64 when traveling to the Tusayan museum or Grand Canyon Village for official business, or could bike to these areas on off-road bikeways. Employees could also use the public transit system.

■ North Rim

Employees: Under this alternative 60 new employees would be needed to operate the transit system, maintain more visitor lodging units, operate the orientation center, and staff expanded ranger, maintenance, and interpretive operations.

The current staff shortages contributing to high employee turnover on the North Rim would continue under this alternative.

A total of 158 existing employees would be displaced from current housing units. These employees would be removed from current substandard units and from current housing units that would be converted to visitor lodging. These employees would benefit by being relocated to upgraded housing units away from visitor use and lodging areas, thus allowing greater privacy for employees, reducing noise and disruptive activities for visitors, and eliminating current conflicts between visitors and employees.

• ***Housing Needs:*** A total of 213 new housing units on 13.4 acres would be required under alternative 2. Because existing disturbed areas would be used, a net increase of 97 housing units would be provided on an additional 8.3 acres of newly disturbed lands. The units would be located in and immediately adjacent to existing NPS and concessioner housing areas.

New housing would not be replaced in existing disturbed areas just south of the entrance road in the NPS housing area due to their potential negative visual impact from the road corridor. This disturbed area would be revegetated, and less visually sensitive areas in the current helipad area would be used for new housing.

• ***Community Structure/Social Characteristics:*** The separation of employee residential areas from visitor use areas would strengthen the sense of community for park employees. Employees relocated from visitor use areas would have opportunities to become more integral parts of the park community by living near their co-workers.

The separation of employer housing would continue under this alternative. New NPS housing would be provided adjacent to existing NPS housing, and new concessioner housing adjacent to existing concessioner housing. This separation is generally viewed by employees and employ-

ers as a positive element on the North Rim.

Relocating employee residences would improve access requirements for employees and visitors. Employee traffic and associated activities would be confined to employee housing areas, thus reducing traffic conflicts between employees and visitors.

Employee shuttles to transport employees between residential areas and work areas on Bright Angel Point would reduce employee traffic on the Bright Angel Point roads and eliminate employee parking in visitor parking areas. The concessioner employee shuttles would continue to operate on nearly a 24-hour status in order to adequately service all employee work shifts.

■ Tuweep

One new seasonal ranger at Tuweep would be provided under this alternative. A substandard trailer would be removed and one new seasonal trailer on 0.3 acre would be required. The trailer would be sited in a similar fashion to the existing ranger residence, using natural water catchment, solar power, and alternative energy sources to create a sustainable residence in the sensitive Tuweep environment. The trailer would also be sited near the current substandard trailer, which is physically separated from the existing ranger station and set back from visitor traffic areas.

Short-term employees would be required to stay at remote lodging and commute to the area or stay in the visitor campground.

The addition of a seasonal employee at Tuweep would help reduce the sense of isolation and disconnection from the larger park community for the existing ranger. Two rangers residing at Tuweep would also allow ranger coverage on days off or trips to Kanab or other remote communities for supplies, mail, and so on. The benefit to providing days off would decrease stress for the existing ranger and provide for greater environmental protection of the resources through more consistent patrols of the campground and other visitor use areas.

■ Corridor Trails

No new land disturbance or housing construction would be required under this alternative. One house at Indian Garden to be rehabilitated for a new interpretive employee, improving the living conditions at Indian Garden. Employees relocated from four substandard housing units into upgraded units would benefit under this alternative. Eliminating double-bunking in dorm rooms would help reduce employee turnover associated with housing problems found in the inner canyon. Otherwise, the corridor trails area would continue to function as a backcountry, remote housing area.

■ Lees Ferry

No new employees would be required at Lees Ferry under this alternative. One employee would be relocated from a substandard trailer to upgraded housing, benefiting the employee because of better living conditions. The new housing unit would be provided in a previously disturbed area, resulting in no new net land disturbance.

■ Conclusion

Park employee housing would be significantly expanded under this alternative to provide standard housing conditions and to meet new employee needs related to visitor services. While more housing units would be provided in the park on less land, the development of the new community in Tusayan, while not park land, would still require significant amounts of disturbance to previously undisturbed land.

This alternative would have substantial benefits for both employees and visitors. Removing employee residential units from visitor use areas would greatly improve the residential situation for employees, allowing greater privacy and the ability to relax during leisure time without concern for visitor intrusions. Visitors would benefit by not having off-duty employee activities adjacent to their lodging, protecting the expectations of the desired visitor experience.

Operational considerations would be improved by separating employee access and service routes from visitor access routes and areas. Employees would generally be able to walk or bike to work or take employee shuttles. Conflicts between visitors and employees over parking spaces would be eliminated. Prime visitor use areas would be dedicated to visitor enjoyment, reducing employee impacts associated with housing, parking, and off-duty activities.

The establishment of a joint USFS/NPS housing community outside park boundaries in Tusayan would provide benefits yet could present unique problems. A separate employee access route into the park from that community would reduce potential conflicts between residential traffic and visitor traffic. The physical separation of park communities inside the park and outside the park could divide the social structure of the park community. The greatest benefit to employees would be the provision of upgraded housing conditions, promoting less employee turnover and greater employee productivity.

■ Cumulative Effects

The greatest need for housing would be experienced on the South Rim, and continued visitation growth on USFS lands and surrounding commercial development could result in significant increases in employee housing needed to serve USFS and private development interests.

COMMUNITY SERVICES

■ Region

Facility and Space Needs: The regional communities of Flagstaff, Williams, and Page, Arizona and Kanab, Utah will continue to serve as primary regional community centers for park and local region residents, the same as alternative 1. The Tusayan land trade development would assume a primary role in providing those residents with a variety of services not currently available in the park or in Tusayan. Tusayan would experience a significant increase in residential community activity in providing many services and activities such as churches, post office, laundry, groceries, storage, and many other similar elements essential to community support.

Conflicts with Visitors: Conflicts with visitors would be reduced in this alternative since separate employee access routes and South Rim park entrances would be provided. The employees leaving the park for regional destinations would have fewer points of conflict with visitor traffic, making it easier for employees and visitors to reach their respective destinations.

Community Characteristics: The town of Tusayan would experience significant changes to its community as a result of this alternative. The planned introduction of a new high school, churches, grocery shopping, post office, bank, and other community facilities would greatly change the town of Tusayan. Benefits would include new, needed, more efficient, centralized community services out of the general visitor use patterns along the strip of Highway 64. Linkages from housing areas to those services via roads, trails, and bikeways would promote a separation of employee traffic from visitor traffic and alternatives to automobile use. Negative impacts of resource disruption, population growth, noise, and additional employee traffic would occur as community services are provided to a new community of federal employees in the town of Tusayan.

■ South Rim

Grand Canyon Village:

• *Facility and Space Needs* — Residents of Grand Canyon Village would benefit from this alternative. The historic NPS maintenance area would provide facilities for community meeting space, hobbies, arts and crafts, exercise areas, and personal storage. Outdoor courts and recreational facilities would also be provided, allowing all employees of Grand Canyon Village to have a common recreation area. The combination of the school facilities and the new recreation area would contribute to increased employee morale and the health of park residents by enabling them to pursue a variety of off-duty activities.

The proposed new community outside the park in Tusayan would also benefit park employees in providing much needed church, school, and shopping facilities. The expansion and construction of community facilities and programs in Tusayan would provide public services to town and park residents that are common to most small towns across the country. The proposed new community would fulfill the expectations and desires of the park community in the provision of adequate support services.

Residents of Grand Canyon Village would continue to travel to Williams or Flagstaff for major medical, dental, auto sales/repair, clothing, and other similar purchases or services.

• *Conflicts with Visitors* — This alternative would greatly reduce potential conflicts with visitors related to community services. The separate employee access road to the business center and separate employee parking at the former visitor center would greatly reduce traffic and parking conflicts between visitors and park employees. The Tusayan community would be linked to the park with a separate employee road on Rowe Well Road, again reducing conflicts between employee traffic and visitor traffic, both on roads

and at park entrances. Residents and employees traveling on the employee roads would experience fewer delays from becoming involved in visitor traffic.

The concentration of community services in residential communities, away from the fringes of visitor use areas, would also greatly decrease conflicts with visitors. The location of the recreation center and facilities in the historic NPS maintenance area would benefit employees by not being in the public eye for their off-duty activities. Visitors would benefit by not being disturbed with disruptive employee activities which are not conducive to the visitor's park experience.

• *Community Characteristics* — The duplication of some community services in the park and in Tusayan such as a bank, post office, meeting and activity rooms, recreation center, day care, grocery, medical, and dental facilities would tend to create two separate communities. Little integration related to the majority of community services would be needed between the in-the-park community and the Tusayan community. Tusayan residents would tend to develop stronger social ties with nearby neighbors in Tusayan, and the park residents would tend to develop stronger social ties to nearby park neighbors. The physical structure and duplication of social community facilities would contribute to segregated social interaction between the two communities.

Desert View

• *Facility and Space Needs* — This alternative would improve the community facilities at Desert View. The enlargement of the laundry and lounge facilities would provide employees with adequate off-hour recreation and support services. The provision of outdoor game areas would also provide employees with opportunities for recreation, improving the health and morale of Desert View employees.

Employees would still have to travel to Grand Canyon Village to participate in organized recreation, school, or church activities since these would not be available in Desert View.

• *Conflicts with Visitors* — This alternative would reduce conflicts between employee activities and visitors. By concentrating employee activity areas in the NPS housing and administration area, visitors would not see or hear employees during off-duty activities.

• *Community Characteristics* — This alternative would strengthen the strong social character among employees at Desert View. The provision of improved community services and recreational opportunities at Desert View would help reduce employee turnover and improve employee morale.

■ North Rim

Facility and Space Needs: This alternative would improve conditions for community services on the North Rim, particularly with relation to NPS operations. The addition of new management support facilities would enable the conversion of an existing structure to a recreation center. The expansion of the laundry building would also reduce congestion and crowding at those facilities. Outdoor recreation facilities would be improved, providing employees with better areas in which to play games during off-hours. The open area to the southwest of the TWRS/ARAMARK administration area would continue to serve as an informal softball field, providing a needed activity area for employee recreation.

This alternative would not change conditions with TWRS/ARAMARK employees whose needs for community services would continue to be met using existing facilities.

Employees would continue to travel to the remote communities of Kanab and Fredonia for primary shopping, auto repair, churches, and other year-round services not provided on the North Rim.

Conflicts with Visitors: This alternative would dramatically reduce the potential for employee/visitor conflicts as they relate to off-duty and recreational activities. The consolidation of all housing and community services into existing administrative areas, apart from visitor use areas, will greatly improve the ability for employees to engage in off-duty activities without impairing the visitor experience or being in the public eye.

Community Characteristics: This alternative would continue the segregated character of the North Rim community, concentrating concessioner facilities and activities in areas separate from those of the NPS. Minimal integration between these entities would occur due to the separation and duplication of facilities.

Employee morale would be improved in this alternative since most desired recreational needs could be met on the North Rim. Employee turnover would be reduced since more desired off-duty activities and facilities would be available to the employees.

■ Tuweep

No changes to the Tuweep community services would occur under this alternative.

■ Corridor Trails

No changes to the inner canyon community services would occur under this alternative.

■ Lees Ferry

No changes to the Lees Ferry community services would occur under this alternative.

■ Conclusion

This alternative would greatly improve community services to the residents of Grand Canyon National Park. Inadequate facilities would be expanded and new facilities would be provided that are desired by park residents. The developed areas in the park would be enhanced by this alternative, strengthening existing patterns of social structure that are desired to remain.

The separation and duplication of facilities on the South Rim would tend to create separate communities between in-the-park and Tusayan residents. While some detrimental effects may occur as a result of creating two socially segregated communities, the benefits of providing necessary and expected community facilities would outweigh the negative effects. Park employees would be able to participate in a wide range of recreational and personal pursuits, ranging from organized sports to individual hobbies. The facilities and activities available to them would help promote a stable, healthy, longer-term workforce for park employers.

■ Cumulative Effects

The short-term needs for support facilities in the new federal community will eventually outgrow the physical structures, requiring expansion and/or eventual relocation. The potential for dispersal of community facilities as a result of population growth could contribute to inefficient and disorganized community structure.

Since a more stable workforce would likely result from the provision of community services, the trend toward the need for more day care, recreation center, and school facilities could become more pronounced. The need for family-oriented services would tend to become more frequent as the average tenure of the workforce increases.

MANAGEMENT SUPPORT FACILITIES

■ Region

Facility and Space Needs: This alternative would have minimal to modest impact to regional communities in providing management support facilities for park operations. The relocation of 2-3% (32) of the workforce (with a goal of up to 25%) from the park to populated areas such as Williams or Flagstaff would create little effects to those communities in providing office space for reservations clerks, cooperating association offices, and NPS resources management staff offices. Each community would likely have the minimal office space available in current market conditions that would be required as a result of this alternative. It is likely that the additional costs of renting office space at local market rates could have some adverse financial impact to the normal operations of those respective park operations.

The sharing of orientation facilities outside the park in Tusayan by NPS and USFS personnel would pose little impact to the community for the modest size of facility being considered. The impact to USFS operations as a result of cooperative management of those facilities would be beneficial in monetary subsidies for the facility and staffing needs.

Operational Relationships: The relocation of some park operations to distant communities would have some negative impact on the operational relationships of each entity. The remote location would require more telephone and telecommunication contact with associated park divisions rather than the preferred face-to-face contact. Also, it would require a comparatively long commute for division managers overseeing the operations to travel back and forth between the park for inevitable and required park business, rather than existing short walks or drives from one building in the park to another. These changes would require adjustments in the normal character of business with other park units as well as create some additional expense to the operating costs for space rent, occasional commuting costs, and time spent on the road.

Conflicts with Visitors: This alternative would nominally reduce conflicts with visitors as a result of moving some uses to regional communities. The reservations operation would be relocated from a primary visitor use area to Flagstaff or Williams, slightly reducing the conflicts between employee traffic and visitor traffic during peak periods of visitation to the park. The minor amount of service traffic supporting those relocated uses would also be eliminated from traveling the park roads, again slightly reducing conflicts with visitors at the entrance gate and on park roads.

■ South Rim

Grand Canyon Village:

• *Facility and Space Needs* — This alternative would significantly improve facility and space needs (compared to baseline conditions) for all operations at Grand Canyon Village. Facilities and space requirements for NPS operations would be significantly improved. Converting of the former visitor center space in the headquarters building to NPS offices would allow most administrative functions to be centralized and would provide adequate office space for existing and projected personnel. This central location, combined with employee-only parking, would allow most employees to drive or work very short distances from their home to work.

Relocating backcountry offices to the Mather Point orientation center would greatly improve accessibility, space needs, and the working environment. Combining the NPS and GCNPL emergency response vehicles and operations in a central facility at the old NPS maintenance complex would improve office and equipment storage facilities, as well as provide a single, central, consolidated facility from which emergency response vehicles would originate.

Constructing new NPS maintenance facilities would meet exiting space needs (57% increase over baseline conditions). Space would be improved for the warehouse and Denver Service Center offices at the existing dry dump site. The new facilities would provide adequate centralized covered storage, office space, vehicle storage, and workshops for the maintenance division, eliminating the use of many small, dilapidated, separate, dispersed facilities in the park. Its location at the outer fringes of development in the Grand Canyon Village would slightly increase driving distances to job sites, but would reduce in service traffic through residential areas.

Relocating the NPS dry storage to the Southgate site would have little effect on space needs. Adequate space would be provided at the site, creating no change from existing conditions. New facilities for NPS mules and horses at the Southgate site would upgrade the operations by providing more efficient space and adequate covered storage.

Relocating the helicopter base to the lagoon area would improve conditions for helicopter operations, with more room for landings and take-offs without affecting surrounding uses.

GCNPL operations would be greatly improved, with transportation and food and beverage units experiencing the greatest facility improvements (67% and 35% space increases respectively). Relocating maintenance, purchasing, warehouse, commissary, and executive chef offices to the current NPS maintenance area would provide adequate space, and the buildings would be easily adaptable to efficient layout, making operations much more efficient.

Consolidating GCNPL offices and administrative functions into the general offices building would reduce the number of trips made by unit managers for day-to-day meetings with other staff. GCNPL accounting operations would be provided space for expansion, along with adequate, secure space for all records storage. GCNPL personnel offices would also be centrally located for easy employee access.

Some inconvenience could be experienced by employees not being able to park their private vehicles near the building. Since no new parking lots would be built or existing lots expanded, many employees would have to park at remote sites and walk, bike, or take employee transit to work.

A few spaces reserved at the Maswik transportation center would allow concession and NPS employees to park hear support buildings, but some inconvenience due to the distance between the parking and the buildings would still occur.

Relocating the executive chef's offices from the El Tovar to the commissary and new central kitchen would substantially improve operations. Adequate office space, testing areas, and centralized food preparation facilities would increase production, storage capabilities, and service access. The remaining rooms and porter supervisor's operations at the hotel would gain office and storage space as a result of the move.

Relocating the GCNPL village mule operations to the site near West Rim Drive would create little change from existing operations. A slight improvement to outdoor mule areas might be realized with a larger area and more shade structures for mules.

All other South Rim operations would continue to function with adequate space and facilities.

• *Operational Relationships* — Relocating NPS maintenance facilities to the current dry dump area would have slight negative impacts on operational relationships. The new location would be somewhat farther from the developed areas in the village, requiring slightly longer travel times between the base of operations and potential job sites. This could result in slightly increased fuel costs and vehicle maintenance, but those costs might be offset by the savings realized by consolidating storage into one area rather than many dispersed locations throughout the village.

Consolidating NPS maintenance facilities into a single area with adequate covered storage, workshops, and offices would greatly increase operational efficiencies. Trips to remote storage facilities would be reduced, as well as conflicts between employees vying for space in workshops and offices. Conflicts between emergency vehicles and NPS maintenance/service vehicles and activities would be eliminated.

Converting the current visitor center into NPS offices and consolidating many NPS administrative offices into a single location would enable more efficient communication, reduce employee travel between offices, and provide expanded office space.

Maintaining the visitor protection division in their existing location, with expansion into vacated offices, would greatly improve operations. Consolidating functions in a central location would enable the rangers to maintain a public presence and to respond quickly to emergencies.

Moving the backcountry ranger offices to the Mather Point orientation center would greatly improve visitor service functions by providing easy access and high visibility, as well as adequate space for administrative duties and backcountry traveler orientation.

Locating the helicopter base at the sewage lagoon site would have some detrimental effects and some positive effects on operational relationships. That location would cause greater driving distances between village operations and the base (particularly for maintenance and the clinic). Because the helicopter base would be the only use in the lagoon area, conflicts between maintenance, transit, and other training functions at the current site would be eliminated, creating a safer operation for the aircraft. However, if the lagoons continue to be used, insects and birds could be hazardous to persons and aircraft at the site. Rowe Well Road would also require significant upgrades to make it a year-round operation and accessible in inclement weather.

The emergency helipad at the clinic would improve emergency response for rescue operations. However, additional personnel might be needed to secure the helipad prior to use, and flight routes into and out of the site could be over populated areas, creating safety concerns. The helipad would also significantly reduce parking for vehicles at the clinic.

Housing NPS horses and mules at the Southgate site would improve the facilities and space needs, yet could cause some problems through lack of on-site personnel to oversee operations 24 hours a day. The existing barns are near residential units, which affords some monitoring of the area; relocating facilities to a nonresidential area would require more frequent patrolling or greater reliance on remote sensing and alarm systems.

This alternative would greatly improve the operational conditions of the Lees Ferry ranger group. Relocating the boat shop and equipment from the Grand Canyon Village to Lees Ferry would eliminate a great deal of commuting between the two sites. New facilities at Lees Ferry would improve operations by providing larger and more appropriate facilities for orienting river rafters and conducting administrative duties. Consolidating the boat shop with those facilities would provide a compact and more efficient operation.

GCNPL operations would be significantly in this alternative. The greatest improvements would be realized by relocating the maintenance, transportation, purchasing, commissary, warehouse, and food and beverage functions from the village area to the former NPS maintenance area. This move would allow for needed expansion and the consolidation of operations in a single area, with structures more suited for access to storage, movement of goods,

service deliveries. The new location would still be close to service destinations on the rim and in housing areas. By removing the transportation functions from the general offices building and area, the visual character of that area would be greatly improved as well. Bus parking and maintenance would be removed from public view, and access to larger and more suitable facilities would be easier and separate from most visitor traffic. The location is still centralized, minimizing haul distances, headways, and travel times for buses, taxis, service vehicles, and tow trucks.

Relocating personnel functions from their current building to the general offices building would have minimal effects on operations. That central location would be accessible from transit, employee roads, and trails from work areas and housing.

The porter supervisor's office, uniforms, and rooms department would be expanded once the food and beverage unit offices and the executive chef's offices were moved to the former NPS maintenance area. Storage and other functions could be expanded into the vacated space.

Converting one of the former NPS maintenance or warehouse buildings into a central kitchen facility would greatly improve operations for the food and beverage unit. This facility would provide the space needed to prepare standard food items, such as sauces and breads, that would be distributed to all restaurants in the village. Training rooms, product testing rooms, and offices would also be centralized.

Consolidating the NPS and GCNPL fire response crews in one facility at the current NPS maintenance area would centralize the operations for both entities. The NPS fire response unit would have adequate covered facilities for equipment and trucks. The GCNPL unit would have more room for offices, meetings, and training. Potential conflicts could occur between emergency response teams and vehicles leaving the base and other service and maintenance operations in that vicinity.

The GCNPL visitor mule operations would be affected as a result of moving functions to new facilities near the West Rim Drive interchange. This move would better separate mule operations from other visitor and housing areas, removing the source of undesirable odors. However, because employees would not be able to drive to work on the village loop roads, access to this more remote location would make it slightly more inconvenient for employees to get to work compared to current conditions. Employee transit would be available. The new location would still be accessible to visitors, who could seek out the mules for photographing or just watching them in their corrals. Service access by way of Rowe Well Road would be slightly farther for delivery and service vehicles, yet more easily accessible for larger trucks because conflicts with visitor and park traffic would be reduced and because of better maneuverability.

Other park operations would experience no significant impacts under this alternative and would continue to have adequate access and relationships to other park operations.

• *Conflicts with Visitors* — This alternative would significantly reduce conflicts between park management operations and visitors. The greatest improvements would be due to relocating the GCNPL maintenance, purchasing, commissary, mule, and personnel operations. Relocating these operations to areas at the edge of visitor use areas or in housing and administrative areas would greatly improve the visitor experience by reducing service traffic noise and congestion and by improving visual quality and safety.

Dedicating Rowe Well Road to employee access would reduce employee and service traffic conflicts with visitor traffic currently experienced at the south entrance station. Center Road also would become primarily service or residential traffic with limited overnight visitor traffic on a small portion of that road until its intersection with the proposed new Maswik loop road. This would also reduce conflicts with visitor traffic, keeping most residential streets free of visitor traffic and allowing employee and service vehicles to travel more freely on those streets.

Desert View:

• *Facility and Space Needs* — Many facilities would be expanded and improved under this alternative. The NPS ranger division at Desert View would see a significant improvement to their facility and space requirements as a result of this alternative. The largest increases would be for NPS maintenance, Fred Harvey Transportation, and new facilities for park transit to be located at Desert View. The new NPS district operations building would provide over 2,000 square feet of needed office, training, meeting, storage, and equipment space for fully functioning ranger operations. The new building storage would provide bays for emergency vehicle parking, eliminating the dispersed parking in impromptu areas such as garages, service station bays, or outdoors, exposed to the elements. This would improve the condition and extend the life of the vehicles and provide easy, centralized access to them and other equipment in times of emergency.

The maintenance division would benefit in this alternative by being provided over 7,000 square feet of new office, storage, and meeting space in the new district operations building. The trailers currently being used by both ranger and maintenance divisions would be eliminated and replace with the new building, eliminating substandard structures and providing adequate space for all operations.

The interpretive division would benefit from new office and space in the proposed district operations building. Operations at the Tusayan museum would continue in minimal space, requiring stronger ties to Desert View for support, storage, and office space. This reliance on Desert View would continue to cause some inconvenience to interpretive staff, requiring more time and trips between the Tusayan museum and Desert View for supplies, meetings, or other business matters.

There would be a significant increase in facilities at Desert View as a result of construction of a new transit maintenance and operations area. This facility would require approximately an 11,000 square foot area to house all necessary maintenance operations for the fleet and to provide fleet parking.

The GCNPL service station expansion would benefit visitors primarily, providing easier access and movement of RVs and larger vehicles in the fueling area. Little expansion of the support area for the service station would occur as a result of this alternative.

All other operations would continue to remain the same. GCNPL maintenance operations would continue to operate out of a substandard, small facility and be served primarily from Grand Canyon Village. Babbitt's store would continue to operate with adequate facilities and service functions.

• *Operational Relationships* — By expanding and constructing new facilities at the NPS administrative area, existing operations would be improved significantly. All NPS administrative offices at Desert View would be consolidated into a single structure, fostering better communication and operational efficiencies. Parking emergency vehicles in centralized, covered bays in the new building would promote fast, easy access to them and support equipment during emergencies.

Some continued operational inefficiencies would still occur with GCNPL maintenance operations being primarily served from Grand Canyon Village. The commute and response times from Grand Canyon Village would continue to be sources of inconvenience and delay to GCNPL residents and business operations, who would also continue to compete with Grand Canyon Village for priority in response to maintenance functions.

• *Conflicts with Visitors* — Conflicts between management operations and visitors would be reduced in this alternative. The removal of the GCNPL housing and its associated traffic from the area to the south of the primary visitor use area would reduce the negative visual character and traffic conflicts that visitors currently experience. The consolidation of NPS operations in the current administration area would continue to provide good separation between administrative functions and visitor use, also reducing conflicts between the two.

■ North Rim

Facility and Space Needs:
This alternative would improve space and facility requirements of NPS operations on the North Rim. Facilities would be expanded most for the NPS maintenance division (10% increase) and the construction of new park transit maintenance and operations facilities (13,000 square feet). Constructing a new 5,000-square-foot ranger operations building would provide adequate facilities for emergency vehicles, offices, meeting rooms, and training rooms.

Relocating the backcountry offices from the NPS administration building to the new orientation center would make the backcountry offices more easily accessible and visible to visitors, and would provide significantly improved facilities for office space and visitor orientation. Removing the backcountry offices from the administration building would

make offices quieter and reduce interruptions from visitors.

Converting the current visitor gas station into a support facility would improve operations for fleet maintenance and repair. Employees and visitors would need to plan ahead to ensure that they had enough gas for all travel within the park. Park employees would be inconvenienced by having to store gas or stop outside park boundaries for gas.

There would be little impact from relocating the helipad to an area near the NPS wastewater treatment plant. A new access road would link the treatment road to the site, and minor adjustments to flight patterns would have to be made, potentially reducing some noise impact on NPS housing units adjacent to the current helipad.

Placing a new 13,000-square-foot joint transit operations and maintenance facility at Lindbergh Hill would have minimal impacts on current operations. Depending on which concessioner provides transit services, this facility could be largely autonomous in terms of operational needs, only requiring telecommunications contact with other park units.

All other TWRS/ARAMARK and concession operations on the North Rim would be the same as in alternative 1.

Operational Relationships: NPS operations would be improved under this alternative. Consolidating most maintenance operations in a centralized 7,000-square-foot facility would make it more efficient for communications as well as for accessing equipment or supplies. The deterioration of equipment and supplies would be reduced because covered storage would be provided. More storage would be available on-site, allowing for a larger inventory of parts and supplies, reducing travel or delays in obtaining supplies from remote locations.

The proposed new 5,000-square-foot ranger operations facility would provide office, meeting, training, and equipment storage space in a central location. Operations would be improved by centralizing functions and equipment, and emergency vehicles would be stored under cover.

Converting the visitor gas station to NPS management support would provide needed space for other office and storage needs. While the facility would not be in the NPS administration area, it would be near most NPS operations, creating only minor travel inconveniences.

Relocating the helipad from the current location to an area near the wastewater treatment plant would make the NPS housing area safer because flight patterns would be away from residences.

Constructing a 13,000-square-foot transit facility at Lindbergh Hill could cause some operational inefficiencies because of the distance from Bright Angel Point. The Lindbergh Hill location would require relatively long commutes for employees and would make haul distances longer from the base facilities at Lindbergh Hill to the CC Hill orientation center. Communications between the transit center and related operations on Bright Angel Point would rely more on telephone or other telecommunications than face-to-face contact possible at centralized facilities. Meetings and other business activities would have to be more closely coordinated to reduce unnecessary commutes, resulting in inefficient time and energy expenditures.

Conflicts with Visitors: Conflicts between management support operations and visitor activities would be minimal under this alternative. Removing employee residences from visitor areas and reducing employee traffic to and from the workplace would result in improvements. Slightly negative impacts to the visitor experience would result from converting the gas station to NPS management support. The existing gas station is in a highly visible location for visitors. By converting this to NPS management support, some negative visual impacts would occur in having trucks, cars, and other official vehicles parked in this area.

The proposed transit facility on Lindbergh Hill would also cause some conflicts between operational traffic and visitor traffic on the park road. Traffic related to business activities and buses traveling from Lindbergh Hill to Bright Angel Point would cause some minor effects on the visitor experience by slightly increasing vehicle encounters and possible congestion near the CC Hill/park road intersection.

■ Tuweep

All management support facilities at Tuweep would be the same as alternative 1 with the exception of expanded office space for the seasonal ranger. This would require expanding a historic structure, with upgrades to its insulation, infrastructure, and structural system. Those upgrades would improve operating conditions for the ranger at Tuweep due to the current lack of space or adequate year-round facilities.

■ Corridor Trails

All management support facilities would continue to be the same as alternative 1. Some ranger functions would continue to operate out of cramped, substandard structures, but most support facilities would continue to function adequately give the continued limits on visitor use in the inner canyon.

Some conflicts with visitors would continue to occur as a result of administrative mule traffic on the South Kaibab trail.

■ Conclusion

This alternative would significantly improve NPS and concessioner operations at the Grand Canyon. Many operations would be centralized in new facilities, located out of visitor use areas but in close proximity to other related uses and park activities. Severe shortages of space, conflicts with visitors, substandard buildings, and operational inefficiencies would be corrected and would improve both management support functions and the visitor experience.

The greatest increases in support facilities would be experienced by NPS maintenance and the construction of new park transit facilities. Most other divisions would experience nominal increases in their operational facilities.

■ Cumulative Impacts

The actions under this alternative would have both beneficial and adverse impacts to NPS and concessioner operations. While most operations would benefit through new and expanded facilities, the increase in staff and facilities would result in higher operational costs for the NPS and concessioners.

UTILITIES

■ Water Supply

Water conservation and use of reclaimed water would be maximized under this alternative. Water would be provided to support NPS administrative uses located outside the park.

South Rim: This alternative considers maximization of water conservation for existing and new facilities throughout the South Rim, including the use of low-flow plumbing fixtures and dual plumbing for reclaimed water into all new facilities and retrofit into existing. The water savings by retrofitting existing facilities is difficult to estimate under this analysis; therefore, for purposes of water supply determination, calculations are based on providing maximum water conservation measures in new or rehabilitated structures only.

New housing construction, increased visitation, new restaurants, changes in visitor lodging, and new orientation centers would be the primary contributors to changes in water usage.

The secondary effluent plant, which produces reclaimed water for use, is sized for 750,000 gallons per day. Water would be supplied to NPS administrative housing outside of the park. The most feasible approach would be determined with further study.

An adequate supply of potable water is available to meet the demands of the proposed changes. Potable water use would increase by approximately 23%, and reclaimed water use would increase by 14 million gallons per year. The Indian Garden pump station is capable of delivering enough water, while pumping 21 hours on an average daily basis.

Approximately 5 million gallons of additional potable water storage would be required to meet the 2010 demands, while supplying adequate fire protection and equalizing storage.

Adequate supply of reclaimed water is available for use. Improvements to the storage and distribution system would be required to support increased use of reclaimed water. A detailed analysis must be performed when the actual plans for all reclaimed use are implemented. Potable water storage could be reduced if reclaimed water was used for fire protection (This must be considered as a separate study).

The transmission pumps supplying water to Desert View from the South Rim storage tank farm would be required to operate a few hours a day.

North Rim: Similar to the South Rim, analysis of water impacts includes consideration of low-flow plumbing fixtures and dual plumbing for use of reclaimed water in the new housing, conversion of the historic lodge cabins and inn cabins to visitor lodging, the orientation center at CC Hill, the maintenance operations building, and expanded restrooms. The analysis also considers increased visitation, and a joint gateway information center at Jacob Lake and a maintenance facility at Lindbergh Hill.

Visitation limitations in the year 2005 would result in peak visitations similar to 1992. Potable water demand would increase approximately 30% through the planning period. A 20% increase in water consumption would be observed if visitation limitations were imposed in 2005.

Minimal potable waterline extensions would be required for new housing. Approximately 3,000 lineal feet of potable water lines must be installed to supply the CC Hill orientation center.

To maximize reclaimed water use throughout the North Rim, waterlines must be extended and buildings retrofitted with dual plumbing systems. Additional reclaimed water line must be constructed to maximize use of reclaimed water.

Water from the park would be hauled to the new maintenance facility at Lindbergh Hill. Water storage would be provided to minimize water hauling.

Water supply for the staff stationed at the Jacob Lake gateway information center would obtain water from the USFS facilities.

Corridor Trails: The removal of a few campsites and restrooms at Phantom Ranch would reduce the potable water and reclaimed water use by a small amount.

Conclusion: The pumps at the Roaring Springs pumphouse are capable of delivering enough water to meet the increased water demand. For water delivery to the South Rim they would have to operate 21 hours a day, and approximately 5 million gallons of additional potable water storage would be required to meet the 2010 demands. Additional water storage would not be required on the North Rim. Reducing potable water consumption at Phantom Ranch would have a positive effect.

■ Wastewater

South Rim. An assumed size for both the Desert View orientation center and the gateway orientation center in Tusayan indicates that the Mather Point orientation center would generate approximately 762,000 gallons per year of wastewater and the Desert View center approximately 254,000 gallons per year. These quantities could vary due to design constraints.

The South Rim wastewater treatment facilities would have adequate capacity to meet projected 2010 year flows, while operating at approximately 95% capacity during peak visitation months. Peak daily flows would exceed the capacity of the plant's secondary process, but the excess could be absorbed by the pretreatment facilities.

Wastewater treatment facilities for the gateway orientation center would provided through the land trade agreement or through the town of Tusayan's community systems, as determined under a separate study.

The Desert View entrance station near Quarry Road would require a new and separate wastewater treatment system. A very small lagoon (approximately 1 acre) or a series of septic tanks might be considered.

The Desert View orientation center would be provided service through the existing lagoon system, which is currently undersized and requires expansion. Alternate treatment facilities could be evaluated.

North Rim: Wastewater from the Jacob Lake gateway information center would be treated locally. On the North Rim treatment plant expansion would be required. In addition, sewerline extensions would be needed to the CC Hill orientation center, and sewer taps would be reconfigured for the new housing and visitor lodging.

Corridor Trails: Removing a few campsites and converting existing restrooms to composting toilets at Phantom Ranch would reduce wastewater generation.

Conclusion: The South Rim wastewater treatment facilities would have adequate capacity to meet projected 2010 year flows, with excess flows on peak days handled by the pretreatment facilities. Treatment plant expansion would be required on the North Rim. Water treatment would be reduced at Phantom Ranch.

■ Power Supply

South Rim: Proposed changes affecting power supply include relocation of the powerhouse substation, increased housing and lodging, and new restaurants.

The South Rim supply system is now operating at approximately 50% capacity. The proposed plan would impose additional loads but would not exceed the capacity of the system. Only extension of the secondary distribution lines and some upgrading must be made. The substation would be relocated from the powerhouse to the Maswik transportation center vicinity. Although primary power lines would not be extended, they would require minor reconfiguration.

North Rim: Increased housing, changes in visitor lodging, and construction of the maintenance facility at Lindbergh Hill are the major contributing factors to increased power consumption on the North Rim under this alternative.

The North Rim power supply and distribution is adequate to meet the needs of the proposed changes. Only minimal primary and secondary distribution line extension would be required to service new facilities.

Conclusion: Power supply and distribution are adequate on the North and South Rims.

■ Telephone Service

The National Park Service would enhance regional information distributed to visitors and work cooperatively with surrounding communities to establish regional information centers. New facilities would be constructed in the park, such as housing, restaurants, and lodging.

Improved regional information would likely reduce phone calls to the park, while increased facilities and housing would result in more phone calls. Telephone line extensions to the new facilities would be required.

The net effect of the proposed changes and specific needs for expanded phone service can be determined only after more detailed site-specific planning subsequent to this plan.

Moving the lodging reservations functions and telephone lines outside of the park would significantly reduce demands on the telephone system in the park.

ALTERNATIVE 3 — REDUCED DEVELOPMENT WITHIN THE PARK

IMPACTS ON NATURAL RESOURCES

REGIONAL EFFECTS

■ **Species of Special Management Concern**

Outside the South Rim: As described for alternative 2, an ecosystem approach would benefit the region as well as the park. Providing a gateway information/transit center on the north side of Tusayan may affect species listed in table 9 the same as alternative 2.

No special status species are known from the area south of Desert View where the gateway orientation/transit center would be located.

USFS Roads 302/307 and 328 would experience the same actions and Effects as alternative 1.

Outside the North Rim: The same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Outside the South Rim: Same as alternative 2, except that the new gateway orientation/transit center south of Desert View and associated housing would disturb soils and vegetation in acreages shown in table 3. The exact location and extent of impacts would be evaluated in later planning and environmental compliance.

Outside the North Rim: The same as alternative 2.

■ **Water Resources**

Impacts outside the South and North Rims would be the same as alternative 2.

■ **Air Quality**

Impacts outside the South and North Rims would be the same as alternative 2.

■ **Natural Quiet and Solitude**

Impacts outside the South and North Rims would be the same as alternative 2.

■ **Visual Resources**

Impacts outside the South and North Rims would be the same as alternative 2.

PARKWIDE EFFECTS

■ **Species of Special Management Concern**

Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Impacts would be the same as alternative 2.

■ **Water Resources**

Impacts would be the same as alternative 2 except fewer housing units, parking areas, and vehicles in the park would further reduce effects on water resources.

■ **Air Quality**

Impacts would be the same as alternative 2 except the number of vehicles would be greatly reduced by limits on day use visitors on the North Rim and Tuweep, and by designating most of the South Rim transit only during peak visitation periods. Therefore, local air pollution would be less than alternative 2.

■ **Natural Quiet and Solitude**

Impacts would be the same as alternative 2 except the number of vehicles would be greatly reduced by limits on day use visitors on the North Rim and Tuweep, and by designating most of the South Rim transit only during peak visitation periods. Therefore, local noise pollution would be less than alternative 2.

■ **Visual Resources**

Impacts would be the same as alternative 2, except the number of vehicles would be greatly reduced by limits on day use visitors on the North Rim and Tuweep, and by designating most of the South Rim transit only during peak visitation periods. Therefore, local effects on visual resources would be less than alternative 2.

SOUTH RIM

■ **Species of Special Management Concern**

Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Impacts would be the same as alternative 2 except for the following:

Placing as many facilities as possible outside the park (including many management support facilities such as maintenance and park headquarters) would preserve undisturbed lands within the park that might otherwise be disturbed or allow disturbed lands to be revegetated. Also, fewer residents in the park would decrease interactions between residents and wildlife and other aspects of the environment, reducing the disruption of the in-park ecosystem by humans.

Removing all substandard housing (including Pinyon Park and the trailer village) and revegetating those areas would add semi-natural habitat in park housing areas, allowing for more movement and shelter of wildlife.

Emphasizing the sustainability of development and minimizing new disturbance would have more of a positive effect on park ecosystems than in any other alternative.

Roads and Trails: No new roads (including the road between Center Road and Maswik Lodge in alternative 2) or parking lots would be built, and many existing lots would be reduced in scale or completely removed and revegetated, thus increasing semi-natural habitat. No road improvements would be needed to the sewage lagoons because the park helibase would not be relocated there under alternative 3

Bike lanes would be added without road widening on both sides of the roads leading to major visitor destination areas and residential areas. This would require no new vegetation and soil disturbance.

The pedestrian trail system on the rim would be expanded only in areas where social trailing is damaging resources, which would reduce resource damage and allow restoration of habitat in those areas.

Grand Canyon Village / Mather Point: Constructing a small transfer center at Mather Point in a portion of the existing parking lot would not cause any new impacts, except for trenching. The road changes, parking lots, and orientation center at Mather Point would not be built, preserving natural habitat in the area. Providing interpretive exhibits in previously disturbed areas would have no impacts.

Removing and revegetating Trailer Village, Pinyon Park, the GCNPL personnel building and the NPS park headquarters /visitor center building would allow the restoration of semi-natural habitat, the reduction of water consumption and sewage, and fewer interactions between visitors and wildlife, all of which would help to increase the natural qualities of the ecosystem in Grand Canyon Village.

Placing all new and replacement housing outside the park in a new joint NPS/USFS community would eliminate new impacts in the park, and allow the restoration of habitat. Impacts currently occurring within the park would be transferred to areas outside the park, with the potential of continued effects on the regional ecosystem.

Hazardous materials would be removed from the Orphan Mine site the same as alternative 2, but the structures would be restored and interpreted. This would involve less soil removal and replacement, and less revegetation than in alternative 2.

The mule barns in Grand Canyon Village would remain in their current locations the same as the no-action alternative.

Desert View: Camping capacity and impacts would remain the same as the no-action alternative. Removing several buildings and revegetating the disturbed areas would allow restoration of semi-natural habitat. Constructing approximately 30 new housing units, plus and new maintenance and ranger operations buildings, in existing disturbed areas would minimize new disturbance. Increasing the number and density of residents in the park could lead to more interactions between residents and wildlife and a decreased quality of the environment adjacent to the developed area.

■ **Water Resources**

Impacts would be the same as alternative 2 except the mule barn in Grand Canyon Village would remain in its current location, and there would be less housing in the park. Both of these would benefit water resources.

■ **Air Quality**

Actions and impacts related to air quality would be similar to alternative 2, with the following exceptions:

There would be fewer vehicles on the South Rim than under any other alternative, which would result in the greatest reduction in emissions from

vehicles and the best local air quality of any alternative.

Fewer overnight guests and campers in Grand Canyon Village, combined with visitors having to use transit service or hike or bike in the village area, would decrease emissions of air pollutants into the village environment. Locating facilities outside the park would also decrease air pollutants in the developed areas in the park.

The campground at Desert View would remain the same as the no-action alternative, so there would be less smoke from campfires than in alternative 2.

■ **Natural Quiet and Solitude**

Effects would be the same as alternative 2, except for the following:

Removing day vehicles from the South Rim would further enhance opportunities for natural quiet and solitude along roadways and in developed areas compared to alternative 2.

The presence of fewer overnight guests and campers in Grand Canyon Village, and requiring visitors to use public transit or hike or bike on the South Rim, would decrease the intrusion of human-caused noise in this area. Locating facilities outside the park would also decrease noise in developed areas of the park.

Reflections from vehicles, which are visible in park wilderness areas, would be reduced, enhancing the feeling of solitude.

■ **Visual Resources**

The effects would be the same as alternative 2; however, because there would be fewer vehicles under this alternative, the positive effects on visual re sources would be greater.

North Rim

■ **Species of Special Management Concern**

Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Alternative 3 would set carrying capacities based on parking capacity, resulting in the same number of visitors as alternative 1, with the same impacts. Redesigning the campground and reducing the number of campsites would allow for a slight improvement of the environment within the campground. Prohibiting roadside parking would stop existing impacts and allow roadside areas to revegetate. Not allowing any road widening would limit impacts to current levels.

Most parking lots on the Walhalla Plateau would be reduced in size and revegetated, restoring semi-natural habitat.

Eliminating mule use on the North Rim would stop impacts related to mule use as described in "Impacts Common to All Alternatives." Removing and revegetating the corrals and staging area would restore semi-natural habitat in those areas.

Trenching for utilities to new housing units within existing residential areas would potentially result in impacts to paleontological resources. Other facilities would remain the same as alternative 1, with similar impacts.

■ **Water Resources**

Impacts would be the same as alternative 2.

■ **Air Quality**

Impacts would be the same as alternative 2.

■ **Natural Quiet and Solitude**

Impacts would be the same as alternative 2.

■ **Visual Resources**

Impacts would be the same as alternative 2.

Tuweep

All impacts on natural resources would be the same as alternative 2.

Corridor Trails

■ **Species of Special Management Concern**

Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Impacts would be the same as alternative 2 except for the following:

Eliminating mules on the North Kaibab and Bright Angel Trails would eliminate impacts discussed under "Impacts Common to All Alternatives" relating to trail erosion, concentrations of urine and feces, and gradually widened trail corridors as hikers tried to bypass mules. Reducing mule use on the South Kaibab Trail by half would reduce existing impacts by the same amount.

Establishing day hiker carrying capacities once mule use changes were carried out would limit hiker impacts such as trash and wildlife interactions. Establishing a monitoring system would ensure that impacts were at an acceptable level.

Reducing overnight lodging at Phantom Ranch would reduce the level of impacts now being experienced. Slightly reducing the number of campsites would reduce impacts on several cottonwood trees now being damaged.

Removing and replacing the ranger building and substandard housing units at Phantom Ranch in disturbed areas, and reusing an existing structure for housing at Indian Garden, would have minimal impacts on soils and vegetation.

The Old Bright Angel Trail and trail from Six Rock Meadow would not be upgraded, so impacts would be the same as the no-action alternative for those areas.

■ **Water Resources**

Impacts would be the same as alternative 2 except for the following:

Eliminating mules from the North Kaibab and Bright Angel Trails would eliminate mule crossings and associated pollution of Bright Angel Creek, Garden and Pipe Creeks, and the lower Roaring Springs area.

Reducing overnight lodging and camping use at Phantom Ranch, and converting to environmentally sensitive toilets in all the campgrounds, would reduce water input to sewage treatment plants and leachfields, and reduce outflow with resultant effects on water quality.

■ **Air Quality**

Reducing or eliminating mule use on the trails would greatly reduce erosion of the trail surface and associated dust.

■ **Natural Quiet and Solitude**

Establishing a hiker carrying capacity would limit human noises within the canyon. Reducing overnight use at Phantom Ranch would also reduce human-caused noise in that area, and increase opportunities for solitude.

■ **Visual Resources**

Reducing or eliminating mule use on corridor trails would reduce improve visual qualities by reducing trail erosion and dust and by reducing the need for borrow pits, which cause severe impacts on visual quality in some areas.

Rehabilitating existing borrow pits would restore much of the visual quality along the trails the same as alternative 2.

Conclusion

Because of the emphasis on sustainability and minimizing resource disturbance, alternative 3 would have the fewest adverse impacts on park natural resources of any alternative, and it could be considered the environmentally preferred alternative.

In addition to the actions with environmentally desirable aspects under alternative 2, alternative 3 would also eliminate stock use and their impacts on the North Rim and North Kaibab Trail, and it would reduce mule use on the South Kaibab Trail. It would remove some overnight and housing units in the park and replace them outside the park, reducing impacts on park resources and allowing more disturbed areas to be revegetated and rehabilitated than under alternative 2.

While alternative 3 has the fewest adverse effects and the most beneficial effects on park natural resources, it could shift many of the adverse environmental impacts to lands outside the park boundary somewhat tempering the beneficial effects of this alternative. In most cases, these lands are part of the same ecosystem as park lands, and the effects on the regional ecosystem would be about the same as if the actions occurred inside the park.

Cumulative Effects

The gateway information/orientation center and federal housing on the north side of Tusayan would be part of a larger development, including the railroad spur and possibly development associated with a land exchange, whose impacts have been or will be evaluated in separate environmental documents. The Tusayan flameflower occurs in many areas where these facilities might be located. Site-specific design considerations and increased human presence in these areas could result in some impacts to some flameflower populations. The cumulative effect of all this development in flameflower habitat, regardless of whether any single project had direct impacts on known populations, could have an adverse effect on the species.

Impacts on Cultural Resources

Archeological Resources and Traditional Cultural Properties

■ Parkwide Effects

The planned archeological research and inventory programs, ethnographic surveys, and monitoring, preservation and stewardship programs would result in the overall effects of this alternative being much the same as in alternative 2. The effects of specific actions would be much reduced as the emphasis of this alternative is to greatly minimize disturbance to resources through more structured visitation and fewer facilities in the park.

■ South Rim

The potential effects of a joint community with the U.S. Forest Service in Tusayan and joint visitor orientation centers at Tusayan and Desert View would be more than any other alternative since there would be more disturbance. Additional parking in the Tusayan area for day use visitors has the potential to disturb an unknown number of archeological sites and traditional cultural properties beyond those that could be disturbed by parking proposed in alternative 2.

New expanded interpretive programs in the historic village area and through personal service programs along the rim would result in increased education about the sensitivity of archeological resources and traditional cultural values, thereby better protecting the associated sites and increasing knowledge of cultural diversity.

The construction of pedestrian trails in areas where social trailing is now occurring would direct visitors away from archeological sites and traditional cultural properties, thus providing additional protection from indirect impacts.

■ North Rim

There would be no effects on known archeological resources. The consequences to traditional cultural properties would be of the same kind as in alternative 2, although somewhat reduced due to lower numbers of people. There would be no new trails except small linkages to two existing wilderness trails.

■ Tuweep

The effects on archeological resources would be the same as in alternative 2, except restricting the number of campsites would reduce indirect impacts to archeological resources in the campground area. There should be no effects to known traditional cultural properties.

■ Corridor Trails

Reducing mule use on the corridor trails and the number of over-night users at Phantom Ranch would reduce ongoing effects to nearby archeological sites and traditional cultural properties.

■ Conclusion

Overall, impacts to archeological sites and traditional cultural properties would be less than in the proposal. As many as 38 known sites and an undetermined number of unknown sites in areas that have not been surveyed could be affected, although every effort would be made to avoid them during design phases of the project.

■ Cumulative Effects

The cumulative effects of alternative 3 on archeological sites and traditional cultural properties would be much the same as in alternative 2, although they would be less due to limited and controlled visitation, housing and facilities.

Historic Structures and Landscapes

■ South Rim

This alternative would be beneficial to the entire South Rim. Many of the park operation functions would be moved outside the park, as would much employee housing. Structures that are part of the Mary Jane Colter National Historic Landmark would be converted to a level of use consistent with their original use (the same as alternative 2). Several structures in the Grand Canyon Village National Historic District would be rehabilitated and adaptively reused for visitor functions (the same as alternative 2), except the dormitories, mule barn, and blacksmith shop would continue in those functions. Rehabilitation would be consistent with federal historic preservation law and NPS *Management Policies.*

Historic landscapes along the South Rim would benefit from rehabilitation to their historic character and the removal of nonhistoric structures: Thunderbird and Kachina Lodges, and the Grand Canyon National Park Lodges personnel office building in the Grand Canyon Village Historic District (the same as alternative 2). These actions would have positive effects.

The NPS maintenance area would be preserved (a positive effect) and converted to recreation use for basketball, volleyball, and a playground. Removal of roads to Hopi Point and Maricopa Point and the revegetation of these overlooks would change historic landscapes, as would adding bus stops along the South Rim and removing some parking. These changes would have to conform to *The Secretary of the Interior's Guidelines for the Treatment of Historic Landscapes.*

■ North Rim

Employee cabins in the Grand Canyon Lodge Historic District would be converted to original use as guest lodging units. Should any modifications be made, a determination of effect would need to be carried out using the criteria of effect of the Advisory Council on Historic Preservation. Rehabilitating the 30 frame cabins in the Grand Canyon Inn (North Rim Inn) and Campground Historic District, which would be a positive effect, would be guided by historic preservation legislation and NPS *Management Policies.*

■ Tuweep

This alternative is that same as alternative 2 except for the addition of trails near the Toroweap overlook. The Tuweep ranger station should be evaluated to determine its eligibility for listing in the National Register of Historic Places. If it is determined to be eligible for listing, rehabilitation of the station and expansion of its water system could constitute an adverse effect. An assessment of the historic landscape should be conducted for the Toroweap overlook area since a reduction of camp sites is included in this alternative.

■ Corridor Trails

A significant reduction in mule traffic is the principal feature of this alternative. A positive effect would be experienced on the Bright Angel, North Kaibab, and Plateau Point Trails due to eliminating all mule use. Mule traffic on the South Kaibab Trail would be the same as now, and both pack and passenger mules would use the trail. Some protection would also be offered the corridor trails due to regulating the number of hikers and establishing lower carrying capacity limits on the North Rim.

At Phantom Ranch guest use would be reduced to near historic levels. This lowering would serve as a means of protecting the historic resources there. Rehabilitating the historic recreation building would occur, and four walled tents (to accommodate up to 10 hikers each) would replace the bunkhouses. The present ranger station would be moved to a less obtrusive location. These changes would help return Phantom Ranch to its historic setting. Federal preservation law and management policies would guide the rehabilitation. In addition, the restoration of the landscape to it's historic character would be guided by *The Secretary of the Interior's Guidelines for the Treatment of Historic Landscapes.*

■ Conclusion

Under this alternative the cultural resources of Grand Canyon National Park would receive the most protection. A considerable number of park operation functions and employee housing would be moved outside the park. Reducing mule use on the corridor trails would enhance protection, and rehabilitating historic structures would return them and landscapes to a semblance of historic use and setting.

■ Cumulative Effects

An emphasis on preservation in this alternative would benefit the cultural resources at Grand Canyon. The protection, restoration and rehabilitation of resources would ensure preservation. There would be no cumulative effects to cultural resources in this alternative.

Impacts on the Visitor Experience

Regional Information and Services

Impacts from regional information proposals for this alternative would be the same as described for alternative 2. Locating the orientation and interpretive facilities outside the park would benefit visitors by maximizing the potential to operate these facilities jointly with other entities and to provide regional information and interpretive services. However, park visitors might not be ready for a comprehensive presentation of park themes before even seeing the canyon. The primary goal for many visitors would be just to get to the park and see the canyon.

After seeing the canyon, some visitors could change their minds about trip decisions they had made before entering the park. Other visitors who had ignored

the detailed orientation or interpretive media could feel the need to go back and view this information.

Parkwide Effects

Many visitors would continue to be disappointed at not being able to stay inside the park; as described for alternative 1, advance planning opportunities would make information more readily available to visitors. Other options would be available either just outside the park or in other nearby communities such as Flagstaff. Overcrowding would be alleviated through the better distribution of people and better planning of visitor facilities and services. The total number of overnight accommodations would decrease slightly, resulting in fewer opportunities to stay in the park. Food service facilities would continue to be insufficient to meet visitor needs.

Visitors could be inconvenienced by building removal and associated activities. Although removal and revegetation would be scheduled to avoid peak visitation, some impacts would be unavoidable because the time of year appropriate for some of these activities is also the main season for visitation.

South Rim

On the South Rim all visitors would be allowed entry into the park, but only by means of public transit or by hiking or biking; private modes of transportation (tour buses, cars, RVs) would have to be left outside the park boundary (overnight and employees excepted). Even though the transit system would be convenient and efficient, many visitors would feel that using these systems was highly inconvenient. Even though private vehicles are the preferred means of travel for the vast majority of visitors to Grand Canyon, virtually no private vehicle experience would be offered under this alternative.

Eating, gift, and supply shops would be available either near or at the gateway information/orientation centers, providing convenient services for visitors entering at both the south and east entrances.

Reduced lodging on the South Rim would mean that visitors would still need to plan far in advance to stay overnight in the park, and more visitors would have to find accommodations outside the park. Expanded eating facilities, gift shops, and interpretive facilities on the South Rim would ensure the adequacy of these services.

■ Visitor Access and Convenience

Except for visitors with disabilities, no day use visitors in private cars, RVs, or tour buses would be able to drive into the park. Instead, visitors would have to use convenient, attractive, and effective year-round public transit to all South Rim developed areas. Only overnight guests would be able to drive into the park, but they would be restricted as to where they could drive and park. These restrictions on private vehicular use would inconvenience visitors and would in many cases lengthen the time they needed for their visit.

Since no visitors would be able to drive through East Rim Drive, anyone wishing to use this road (approximately 40% of the visitors) for connections to other areas in the region would have to backtrack to use through-routes outside the park.

Restricting the entire South Rim to public transit would allow for excellent visitor distribution so areas would not become overcrowded. The reduced number of vehicles would also make the entire South Rim quieter than under any other alternative. Since all in-park circulation would be by public transit, biking, or hiking, many tour bus visitors would be inconvenienced by having to get out of their buses and use the public shuttle system.

On-road bike lanes would provide a safer biking experience than now, but not as safe as separated paths in alternative 2. Since bikers would only be allowed on roads, they would be restricted to the same routes as the transit system. Rim trails would only be added where social trailing was occurring, so visitors would continue to have the same limited number of rim hiking experiences and would be concentrated in fewer areas.

■ Parking

All day parking areas along the South Rim would be removed. Parking within the village would be reduced by 51% (from 2,686 spaces to 1,325 spaces); parking would continue to be provided for overnight guests; however, they would be required to park in designated areas and could not use their vehicles for day trips within the park.

■ Visitor Services

Visitor services would be expanded in the village, which would add visitor convenience and reduce wait times. However, in other areas of the park, like Desert View, services would be significantly reduced, giving visitors fewer options to buy needed supplies.

Visitors would have expanded and improved restroom and toilet facilities; however, many more toilets (rather than restrooms) would be supplied compared to alternative 2.

Since overnight accommodations would be reduced from about 920 to 835 rooms, more visitors than under any other alternative would need to find lodging outside the park. Camping would also be reduced from about 480 to about 400 sites, the least of any other alternative.

Reducing the number of lodging rooms and removing the RV park would further exacerbate an already difficult problem of meeting visitor demands for overnight lodging. The number of economy rooms would continue to be low on the South Rim.

Food service would be inadequate for demand, and rim gift shops in Grand Canyon Village, including those in historic structures, would continue to be overcrowded. Removal of the bank would cause inconvenience to park visitors and park residents who need banking services and would now have to go outside the park, necessitating more driving to get to the needed service area. Removing the three gift shops would create pressure on the other gift shops on the South Rim.

The visitor experience in Grand Canyon Village would be much the same as alternative 2. The primary differences are that visitors would not have a major in-park orientation center, and that the mule barn would remain in the powerhouse area, with unpleasant odors affecting adjacent eating, shopping, and interpretive spaces.

The village would be much quieter and safer than under alternative 1 but less than under alternative 2 because buses would be permitted to drive next to the rim at Mather Point, and overnight guests would be allowed to use more of the village roads.

Providing visitor activities and services (food service and gift shops) in the powerhouse area would have the same benefits for visitors as alternative 2. However, the continued presence of mules would result in odors and conflicts between visitors and mule operations. The number of rooms would be reduced from about 920 to 835; however, about 30 lower priced cabins would be added for visitors.

The business center would remain the same as alternative 2 except that the existing camper services store would remain and would be overcapacity during the peak season. In addition, restroom facilities in the business center would become more and more inadequate.

Removing the gas station, public garage, and RV campground would create the same inconveniences as described under alternative 2.

Many visitors would consider having to leave their vehicles outside the park and using the transit system to enter Desert View a major inconvenience. This impact would be greater than under any other alternatives because the staging area would be several miles from the canyon rim. However, removing all visitor traffic and parking would make Desert View quieter than under any other alternative. Reducing visitor services on the rim would inconvenience campers and visitors since no goods would be sold in the park. At Desert View removing the store and food service would add inconvenience and frustration to campground users and other park visitors, as well as add pressure for the construction of a gateway community outside the east entrance.

Without the addition of any rim pedestrian paths, Desert View would continue to be merely a viewing point, with limited opportunities to distribute visitors and provide easy access to solitude.

■ Orientation and Interpretation

The Maswik transportation center would be the only information/orientation facility inside the park, and excessive pressure could be placed on it or on other smaller interpretive centers in the park, as visitors tried to find out more about park themes.

At Mather Point visitors would benefit from the expanded outdoor interpretive exhibits. This would be the first stop inside the park for many visitors and perhaps the only stop for some. The interpretive media would introduce visitors to the geologic significance of the canyon and its importance to various peoples over time.

As described for alternative 2, visitors would benefit from the in-depth treatment of the main park themes at smaller interpre-

tive centers. Two exceptions are the Tusayan museum and Yavapai observation station, where no additional interpretation would be provided. Both of these facilities are too small to handle current or projected visitation levels. The potential for developing sufficient media to provide in-depth interpretation of geology and prehistory themes would be limited by the small interior spaces.

Restoring the Orphan Mine structures would attract more visitor interest than if the structures were removed and interpreted only through wayside exhibits, as proposed under alternative 2.

North Rim

On the North Rim a day use reservation system would be established, with limits the same as alternative 1. Even though a reservation system would help ensure a quality visitor experience without crowding, and a transit system would be designed to provide efficient and convenient service, many visitors would feel that these systems were bothersome. All visitors would be allowed to bring their vehicles into the park; however, vehicle sizes would be restricted on Walhalla Plateau (the same as alternative 2).

Minimal additional lodging on the North Rim would mean that visitors would still have to plan in advance to stay in the park.

■ Visitor Access and Convenience

During peak times day visitors would have to obtain reservations. As described for alternative 1, the reservation system would limit the number of visitors to about 1,744 visitors at any one time or 495 vehicles. An estimated 749 visitors (227 vehicles) would be turned away on peak days or assigned different entry times. The period that the reservation system was needed would gradually expand to meet demand; however, no reservations are expected to be needed during May or the end of August.

The sequence of visitor events would remain the same as alternative 1. The existing contact station on Bright Angel Point would continue to draw people to an already congested area.

The visitor experience on the Walhalla Plateau would be improved for drivers since they would not have to contend with oversized vehicles slowly negotiating steep grades or tight curves. However, the overall visitor experience would continue to be vehicle oriented, the same as alternative 1.

Bikers would continue to share roads with vehicular traffic, except for the Arizona Trail, with resulting safety hazards (the same as alternative 1). Hiking opportunities would remain the same as alternative 1.

■ Parking

Parking on the North Rim would only be provided for people staying overnight at the lodge or in the campground. This would allow parking to be reduced by 13%, from 575 spaces at present to 502 spaces. No day parking would be provided.

■ Visitor Services

Lodging would be increased by about 25% (245 lodging units total). Approximately 30 rooms would be economically priced accommodations, thus increasing the range of lodging opportunities, the same as alternative 2. This slight overall increase would do little to meet the demand for overnight accommodations during peak times. Therefore most visitors would need to find lodging outside the park, the same as alternative 1 and 2.

Food service would be the same as alternative 1.

■ Orientation and Interpretation

All impacts on information proposals for the North Rim would be the same as described for alternative 2, and all impacts on orientation and interpretation would be the same as for alternative 1.

Tuweep

At Tuweep day use limits would be implemented during peak times, but fewer vehicles or people would be allowed than under any other alternative. Even though the intent of the reservation system would be to ensure an uncrowded visitor experience and to allow visitors to reserve campsites, many visitors would feel that this system was an annoyance.

■ Visitor Access and Convenience

The day use reservation system at Tuweep would limit the number of visitors during peak times to 20 vehicles or 55 people, more restrictive than any other alternative. Visitors with vehicles over 22′ would not be permitted into Tuweep, the same as alternative 2.

Moving the Toroweap overlook parking area back from the rim would have the same impacts as alternative 2.

Removing the two campsites at the overlook would slightly reduce the total number of sites available to the public.

■ Orientation and Interpretation

All impacts on information proposals for Tuweep would be the same as those described for alternative 2. The impacts on orientation and interpretation at Tuweep would be the same as alternative 1.

Corridor Trails

■ Visitor Access and Convenience

The number of hikers on South Rim trails would continue to increase, while on the North Rim, the number of hikers would remain about the same as now.

Reducing the number of mules on the South Rim (eliminating day use and cutting overnight use in half) and increasing trail maintenance would enhance the hiker experience. Removing mules on the North Rim would significantly improve the hiker experience. However, these changes would reduce mule ride opportunities for approximately 100 visitors per day and would reduce the options visitors have for experiencing the inner canyon.

Moving the overnight mules to the South Kaibab Trail would make the mule ride more dangerous and frightening for visitors, especially near the top of the trail, where grades and side slopes are steep.

Reducing Phantom Ranch lodging by about half (to 85 beds) would reduce opportunities for visitors to stay at the bottom of the canyon. This reduction would reduce the number of overnight people and return uses to historic levels.

■ Orientation and Interpretation

The consequences of actions in this alternative on information and orientation regarding the corridor trails would be the same as those described for alternative 2 except the amphitheater seating would not be expanded at Phantom Ranch (however, a reduction in lodging would also reduce demand), an amphitheater would not be provided at Indian Garden, limiting program offerings to informal gatherings, probably near the proposed visitor contact station.

Conclusions

Like alternative 1 information provided on an international, national, regional, and local level would increase opportunities for visitors to get information about the park and other attractions in the area. Information would be current, accurate, and frequently updated, thus helping visitors make travel plans.

This alternative would increase the opportunities for visitors to be oriented to the park and region and to be introduced to the primary interpretive themes at gateway orientation centers sited at key locations outside the boundary. Visitors would be well prepared to enjoy the park in an efficient, safe, and environmentally conscientious manner. Interpretive facilities in the park would be resource based, and most would be large enough to provide in-depth coverage of key park themes. Both short- and long-term visitors would have opportunities to learn about and appreciate park resources and their significance.

Fewer overnight visitors, day use limits, a heavy emphasis on transit, and placing needed facilities outside the park would improve natural quiet and solitude, reduce local air emissions, and improve visual quality inside the park more than any other alternative.

Cumulative Effects

Information facilities and systems provided would contribute to regional and national efforts to expand information opportunities for the public.

Orientation proposals would contribute to regional efforts to disperse tourism in the area and include other federal, state, and local resources. Programming would contribute to regional and national efforts to expand interpretive and educational opportunities for the public. Additional educational resources would be available for regional, national, and a large number of international visitors.

By limiting visitor-related development, this alternative would establish a precedent for preserving the natural qualities of the park at the expense of visitor convenience. While visitor needs would be met, the emphasis on public transit would underscore the importance of protecting the park's natural resources first and providing for visitor services second.

Impacts on the Socio-economic Environment

Alternative 3 would emphasize the protection of natural and historical resources within the Grand Canyon National Park by restricting the use of personal vehicles inside the park and by supporting the development of visitor facilities in nearby communities. This alternative would fully accommodate the increase in visitor demand on the South Rim by requiring nearly all visitors to use a transit service to tour the park. A reservation system would allow people with special transportation needs (such as visitors with disabilities) to drive their own vehicles in the park. Persons staying overnight would be allowed to drive their private vehicles into the park, but they would then be required to park them and use the park transit system.

Personal vehicles would remain the primary mode for touring the North Rim. Alternative 3 would establish a reservation system and limited transit service; in 2004 the North Rim reservation system could be used to restrict the number of people on the North Rim. The number of visitors would only be limited if transit and other North Rim management measures were unsuccessful in dispersing visitor use. Alternative 3 would also impose a reservation system at Tuweep, which would be more restrictive than under alternative 2.

Alternative 3 would greatly expand the bus fleet serving the South Rim, but it would involve less elaborate construction than that proposed by alternatives 2 and 4. Under alternative 3 visitor information facilities, parking, and transit staging areas would be constructed outside of park. Administrative, commercial, and residential facilities inside the park would be rehabilitated, replaced, or adaptively reused. This alternative would allow for some expansion of in-park concessions and community services, but it would generally encourage the growing demand for services to be met outside the park. Like alternative 2, a regional information network would be established, and selected park-related administrative operations would be relocated outside the park. Alternative 3 would provide for very little new construction on the North Rim.

Regional Effects

The economies of northern Arizona and southwestern Utah are expected to benefit by being able to accommodate nearly all prospective park visitors, by permanently increasing NPS employment, and by creating a substantial number of new long-term jobs for the park transit service. In addition, local and regional economies would experience short-term economic benefits from the employment and purchases associated with the proposed $69 million park construction projects.

■ Short-Term Effects

All construction activities associated with alternative 3 would occur in Coconino County. Most in-park construction jobs would be filled by area residents, with workers expected to commute from homes located elsewhere in the county. Coconino County businesses would also benefit from substantial purchases of building materials, supplies, and services related to construction. Construction employment would begin in 1996 and continue through 2001. The years of peak construction employment would be 2000 and 2001.

■ Long-Term Effects

Alternative 3 would not limit the growth in jobs and earnings among South Rim businesses catering to Grand Canyon visitors, but it would place modest limits on employment and earnings growth for businesses serving North Rim and Tuweep visitors. A negative aspect would be that many of the new jobs would be seasonal or part-time, and most would be low paying.

The Coconino County economy would also benefit from increases in employment by the National Park Service and the staffing of a park-area transit service. Year-round NPS and transit jobs are expected to provide average or above average earnings, although some seasonal jobs for the Park Service and the transit provider would be low paying.

Alternative 3 would cause more overall economic growth to occur in Coconino County than is predicted by baseline projections. From 1993 to 2010 park-related employment is predicted to increase by 74.6% (an increase of 5,163 jobs, 325 more jobs than under the no-action alternative); earnings would increase by 73.9% (an increase of $86.8 million, $6.4 million more than the no-action alternative).

■ Coconino County Population Effects

By 2010 park-related population effects under alternative 3 would add an estimated 8,775 persons to Coconino County. This alternative would result in slightly more population growth than is predicted by county growth projections, with an increase in the 2010 population from 141,353 to 141,723, a net increase of 1% above the no-action alternative. Park-related population effects would account for about 23% of the county's growth from 1993 to 2010.

Alternative 3 would further increase the demand for public and private services in the Grand Canyon area. Park-related population growth is projected to generate demand for 3,975 additional housing units in Coconino County.

Table 51: Estimated Construction Employment and Earnings - Alternative 3

	Construction Employment	Direct Earnings
1996	76	$2.1
1997	120	3.3
1998	120	3.3
1999	87	2.4
2000	223	5.7
2001	248	6.2
Total	**874***	**23.0**

NOTE: Construction employment is presented as full-time equivalent jobs. Earnings are in millions of dollars (1993).

* Total construction employment is in person-years.

Parkwide Effects

Under alternative 3 park visitation would increase to about 6.8 million visitors by 2010, a 57.4% increase. This would be about 11,000 fewer visitors in 2010 than under the no-action alternative. The slight decrease in total visitation assumes the imposition of limits on the number of people allowed on the North Rim and at Tuweep, which would reduce total park use by 0.15% in 2010. (It is assumed that half of the visitors affected by Tuweep and North Rim reservation systems would rearrange their schedules and enter the park at another time.) From 1993 through 2010, some 100,935,000 total visitors are projected to visit the park, approximately 47,000 fewer than under the no-action alternative. This alternative would not meaningfully affect the number of foreign tourists visiting the southwestern United States or the Grand Canyon, nor would it substantially change the number of U.S. residents visiting the Grand Canyon area.

In 1993, 80% of the park's visitors used their private vehicles for sightseeing. In 2010 less than 10% of visitors would be allowed to tour in personal vehicles. The transition from auto touring to bus touring, and limits on the growth North Rim and Tuweep visitation, are not expected to substantially change the total amount of money spent by persons visiting the Grand Canyon area. In 2010 park visitors are predicted to spend $696.7 million, 73% greater than in 1993 but $800,000 less than the no-action alternative. From 1993 through 2010 visitors would spend $9.9 billion during their park visits (see table 52).

The transition from auto touring to bus touring is likely to cause some changes for in-park purchasing patterns. Bus passengers are less inclined to carry heavy or bulky items and can be expected to adjust their in-park purchases accordingly. Park concessioners are expected to adapt to changes in consumer behavior. If no charge (or minimal charge) is made for park transit, visitors would have more disposable income to spend on eating, drinking, lodging, gifts, and personal services.

By limiting the expansion of park concessions, alternative 3 would allow for additional growth in sales for businesses outside the park, but business districts and individual businesses would also need to adjust to changes in market conditions.

Alternative 3 proposed some $69 million in park area construction expenditures between 1996 and 2001. Construction activities would include major road and parking improvements and the construction of information centers, transit facilities, commercial buildings, and housing construction, along with building and housing maintenance, rehabilitation, and reconstruction. Approximately $68 million of park improvements would occur on the South Rim and $1 million on the North Rim. Approximately $32 million of the South Rim construction would occur outside the park in Tusayan.

Removing concessioner facilities would have a negative economic impact on concessioners, such as Grand Canyon National Park Lodges and Babbitt Brothers. Significant capital costs would be incurred by the concessioners who had to relocate or rebuild nonrevenue producing facilities in new locations. Eliminating North Rim mule trips into the canyon could cause this concession operation to close if the demand for rim trips was not sufficient to achieve financial viability.

From 1996 through 2001 park-related construction activities are predicted to create an average of 146 construction jobs. Construction workers are expected to live outside park boundaries.

SOUTH RIM

Alternative 3 would not limit the number of people visiting the South Rim. Between 1993 and 2010 South Rim visitation would grow by 2.4 million visitors, an increase of 62% (the same as the no-action alternative and alternative 2). Both the south and east park entrances would experience substantial increases in visitor use — 67% more visitors would arrive through the south entrance, and 45% more through the east entrance (the same as no-action and alternative 2).

The switch from auto touring to bus touring is not expected to change total expenditures by South Rim visitors, but it would influence where and what types of purchases park tourists made. Businesses within the park and along travel routes to and from the park would need to adapt to changes in visitor purchasing patterns. For example, businesses outside of the park would capture nearly all of the auto traveler-oriented trade.

South Rim visitor expenditures would again be similar to the no-action alternative and alternative 2, increasing by $258.7 million to $590 million (a 78% increase). Total expenditures between 1993 and 2010 would amount to $8.3 billion.

Alternative 3 would allow for slightly more long-term employment growth in South Rim communities than is forecast to occur under the no-action alternative. From 1993 through 2010 the total number of jobs attributable to the direct, indirect, and induced economic effects of South Rim operations and visitor expenditures would grow by about 80% (from 6,321 to 11,402, for a net increase of 5,081). Job-related earnings would also grow by about 80% (from $107.2 million to $192.5 million, a net increase of $85.5 million). These increases would be slightly higher than under the no-action alternative — 317 additional jobs (+2.9%) and $6.2 million additional total earnings (+3.3%). The net increase in South Rim employment and earnings would result mainly from the effects of the transit system, which would directly and derivatively create a substantial number of new jobs. Growth in transit employment would more than offset the limits alternative 3 places on the growth of NPS jobs. Visitor use of the transit system would allow the park to fully accommodate the projected increase in South Rim visitors, which would allow for optimum growth in tourism jobs.

Construction projects would have positive short-term impacts on South Rim economies. The peak of construction employment and earnings is predicted to occur in 2000 and 2001.

The restriction of personal vehicle travel along the South Rim—East Rim loop would change travel patterns for an unknown number of park visitors. A decrease in automobile traffic along Arizona 64 east of the park would limit the growth in sales for businesses in this travel corridor. The biggest effect would be on Navajo craft booths. Any increase in traffic south of the park would benefit businesses along these corridors.

It is uncertain what effect this would have on visitor preferences for entering the park from the south or east. If the south entrance became widely known for providing a better mix of park amenities or visitor services, the proportion of visitors arriving through this entrance could increase, thus benefiting businesses along the access corridors, but market growth south of the park would likely be to the detriment of market growth along eastern travel routes.

An opposite effect could occur if an increasing share of persons coming to the park area by way of I-40 decided to pass through the Navajo Reservation or visit other East Rim attractions on their way to the park. This visitation pattern would then benefit businesses and community economies east of the park.

It is also uncertain what effect alternative 3 would have on visitation at other Arizona and Utah tourist attractions. Any change in regional travel patterns as a result of closing East Rim Drive to drive-through traffic could adversely affect business growth either south or east of the park. Visitors would not be allowed to use USFS Road 302/307 as a shortcut connecting the south and east segments of Arizona 64.

Equally uncertain are the effects that Navajo economic development projects could have on park visitation patterns. A major Navajo cultural center or gambling casinos in the Cameron or Page could increase the proportion of visitors entering the park from the east. Closing East Rim Drive to through traffic could make the proposed location for the Navajo cultural center at the juncture of Arizona 64 and the Little Colorado River less viable.

■ Distribution of Economic and Population Effects

Alternative 3 would result in considerably less employment and population growth inside the park than what is predicted under the no-action alternative. One effect of this alternative would be distribute most of park-related growth in employment and population into communities outside the park.

Alternative 3 would result in a net decrease in NPS employment and only limited expansion of park concession services. The alternative assumes that most of the additional housing needed to accommodate in-park workers would be built outside the park. About 80 NPS jobs would be in Tusayan, of which 58 are existing jobs that would be relocated from inside the park. The alternative also assumes the 193 transit workers would work out of Tusayan. Alternative 3 assumes that NPS and transit workers whose jobs were located outside the park would also live outside the park.

Under this alternative a major parking and transit staging area would be established north of Tusayan. An estimated 90% of south entrance visitors arriving in private vehicles would be shuttled from the Tusayan staging area into the park. This parking/staging area would have minimal adverse effects on existing Tusayan businesses. Transit

TABLE 52: PROJECTED PARKWIDE VISITATION, EXPENDITURES, AND EMPLOYMENT - ALTERNATIVE 3

	Predicted Visitation (in thousands)	Annual Visitor Expenditures (in millions)
1993	4,355	$402.6
2010	6,854	696.7
Net Change	+ 2,499	+ $294.1
Percentage Change	+ 57.4%	+ 73.0%
Total 1993–2010	100,935	$9,897.6
Compared to No-Action Alternative		
Net Change	- 11,000	- $0.8
Percentage Change	- 0.16%	- 0.11%
Total 1993–2010	- 47,000	- $ 3.8
Percentage Change	- 0.05%	- 0.04%

	Average Park-Related Jobs			Annual Park-Related Earnings (in millions)		
	Direct	Indirect/Induced	Total	Direct	Indirect/Induced	Total
1993	4,180	2,743	6,923	$ 68.1	$ 49.4	$117.6
2010	7,284	4,802	12,087	117.8	86.6	204.4
Net Change	3,104	2,060	5,163	$ 49.7	$ 37.1	$ 86.8
Percentage Change			+ 74.6%			+ 73.9%
Total 1993–2010			172,720*			$2,935.0
Compared to No-Action Alternative						
Net Change			+ 325			+ $ 6.4
Percentage Change			+ 2.8%			+ 3.2%
Total 1993–2010			+ 4,690*			+ $ 97.9
Percentage Change			+ 2.8%			+ 3.4%

NOTE: Park-related jobs and earnings are projected for Coconino County.
* Total employment in person-years.

passengers would be transferred to buses after they had driven through the Tusayan business district. Alternative 3 would not reduce the volume of drive-by traffic available to businesses catering to automobile travelers. In addition, restrictions on driving through the park on East Rim Drive could increase traffic volumes through Tusayan by increasing the number of people exiting the park area to the south (rather than through Desert View). Tusayan area businesses could also expect to profit from increased sales of foods and services for automobile travelers, as visitors would no longer have access to in-park automobile services. The inconvenience of transporting items on buses could also encourage visitors to purchase more retail items in Tusayan. Businesses located adjacent to the south entrance, in the Moqui Lodge area, could experience much reduced drive-by traffic.

Flagstaff, Valle, and Williams would also experience net increases in employment and population under alternative 3. The Williams and Valle economies would benefit from general increases in drive-by traffic and the unmet demand for tourist services within the park. Flagstaff would also experience increases in tourism trade and would be the location for 32 NPS workers. Flagstaff would also benefit most from the indirect and secondary economic effects of park-related construction, increased NPS and transit service employment, and general business and employment growth attributable to rising tourist expenditures.

Tusayan is within a 15-minute commute of Valle and within an hour of Williams. Locating NPS and transit jobs in Tusayan, along with increased tourism employment, would improve the viability of Williams and Valle as bedroom communities. Unlike Valle, Williams has an adequate water supply and public infrastructure in-place to accommodate substantial population growth. Williams and Valle could also serve as staging areas and provide housing for construction workers.

Economic Effects with the Expansion of Tusayan: The expansion of existing businesses and extensive new business development permitted by an enlarged townsite would allow Tusayan to capture much of the unmet demand for goods and services inside the park. Expanding Tusayan would slow growth of tourism businesses and employment in other communities south of the park.

New business development in Tusayan would create new competition for the established Tusayan business district. The direction in which the Tusayan townsite is expanded would also influence Tusayan's existing business area. If the townsite was expanded to the north, the area targeted for new development would be the same general area as the parking and transit staging area. This close relationship of the two developments would create opportunities for pedestrian-oriented business development.

Developing the parking and transit staging area to the north of the existing business district would also allow visitors approaching the park area from the south to pass through the existing Tusayan business district before coming to the new business area; this would afford the existing business district the preemptive opportunity to sell goods and services to arriving automobile visitors. Townsite expansion to the south of the existing business district would not provide new businesses locational advantages relative to the site of the parking and transit staging area. Any new businesses south of the existing townsite would then have the first opportunity to sell goods and services to arriving visitors.

Economic Effects without the Expansion of Tusayan: Without expansion, the shortage of private land with commercial development potential and limited water and public infrastructure would constrain the ability of the townsite to accommodate commercial growth. If Tusayan did not expand, Flagstaff is predicted to experience the greatest share of the park-related economic and population growth. Williams and Valle would also experience additional tourist-oriented business expansion, and employment and population growth. It is possible that Valle would develop a much more substantial commercial district, filling the unmet demand for visitor services in Tusayan. Valle and Williams could experience substantially more population growth due to the absence of affordable housing nearer the park. Lack of a community water supply and other community infrastructure pose major constraints to business and population growth in Valle.

Even without expansion, Tusayan would still experience business growth, along with employment and population increases. Business growth would be constrained by the shortage of private land with commercial development potential. The small amount of undeveloped highway frontage would be developed, and some existing commercial properties would be enlarged and redeveloped into more intensive uses. It is also likely that some commercial development would occur farther back from Arizona 64. Tusayan's population growth would be constrained by a lack of incentives for businesses to subsidize the development of affordable housing for tourism sector workers.

Communities East of the Park

Under alternative 3 the Park Service would use public information services to maintain the current proportion of personal vehicle visitors arriving at the park from the east. Businesses and community economies along Arizona 64 and U.S. 89 would benefit from increased use of the east entrance (predicted to grow by 45% by 2010). In addition, East Rim businesses would benefit from meeting demands for visitor services that could not be met inside the park. East Rim businesses would also benefit from increased sales of automobile-related goods and services, because in-park auto facilities would no longer be accessible to most tourists.

Restricting the use of East Rim Drive for through-park travel could reduce potential market growth for Navajo-operated craft businesses along Arizona 64. Specialty businesses in Cameron and other U.S. 89 communities could also experience less overall growth as a result of this restriction. Limiting drive-through travel could also reduce the economic viability of the Navajo economic development projects being considered east of the park, as well as the potential market for a Navajo cultural center or gambling casinos in Cameron or Page. Conversely, a Navajo cultural center or gambling casinos could become tourist attractions that would shift park visitors from the south to the east entrance.

North Rim and Tuweep

Under alternative 3 it is projected that up until 2004 all persons wishing to visit the North Rim could do so, thus optimizing the economic benefits of visitor expenditures on North Rim economies. Beginning in 2004 restrictions could be imposed on the number of visitors allowed if efforts at redistributing visitor use were not successful. At Tuweep the number of vehicles and people would be limited beginning in 1995, with limits more restrictive than those proposed under alternative 2.

From 1993 to 2010 total North Rim visitation is estimated to grow by 14.8% (an increase of 66,000 visitors, for a total of 499,000). Total visitation would be 10,500 less than that expected under the no-action alternative.

Limits on the number of people allowed to visit the North Rim and Tuweep would slightly reduce expenditures in nearby communities. In 2010 North Rim and Tuweep visitors would spend an additional $5.9 million (+19.2% to $37 million), about $700,000 less (-0.1%) than under the no-action alternative. From 1993 to 2010 visitors would spend a total of $615.4 million, $3.4 million less than the no-action projection.

Restrictions on the number of Grand Canyon visitors could increase tourism at national parks and other attractions in southern Utah, which would benefit local economies in those areas. Providing an in-park transit service is not expected to affect expenditures by North Rim visitors.

Under alternative 3 increases in NPS and transit-service employment inside the park and at Jacob Lake would have positive indirect and secondary economic effects in Fredonia, Page, Kanab, and Cedar City. In 2001 construction of in-park improvements would have positive short-term economic impacts on these same community economies. These impacts would offset any adverse effects on jobs and earnings caused by a decrease in visitation. Consequently, 2010 average annual park-related employment and earnings would grow by approximately 22% (the same as the no-action alternative): Jobs are predicted to increase by 132 to 734 total jobs, and total earnings by $2.3 million to $12.7 million. In 2001 NPS construction projects would cause short-term increases in employment and earnings for North Rim communities.

Alternative 3 would allow for substantial increases in employment by park concessioners, allowing them to expand their shares of the market created by North Rim tourist expenditures. Business expansion inside the park would limit business growth

in other northern Arizona and southwestern Utah communities. Areas outside the park would still experience net increases in jobs and population attributable to park visitation, but growth would be slightly less.

CONCLUSIONS

Under alternative 3 an estimated 6,854,000 people are predicted to visit the Grand Canyon in 2010. An estimated 10,514 potential visitors would decide not to visit the park because of the reservation or transit use requirements. This alternative would result in 0.2% fewer park visitors than are predicted by the no-action alternative. In 2010 park visitors would spend $696.7 million in the Grand Canyon region, $0.9 million less (-0.1%) than under the no-action alternative. This alternative would slightly reduce the growth in tourism-oriented employment and earnings.

The economic effects of decreased visitor expenditures would be counterbalanced by 298 additional jobs in NPS and park transit service employment. Overall economic and population growth would be greater under either the no-action alternative or alternative 1, but less than under alternatives 2 and 4.

Most economic, population, and land use impacts attributable to alterative 3 would occur in Coconino County. From 1993 through 2010 the direct, indirect, and induced economic effects attributable to the park would cause the county's average annual employment to grow by 5,164 jobs, and countywide personal earnings by $86.8 million. Total employment and earnings growth attributable to this alternative would support about 8,775 additional county residents in 2010. Park economic effects would be responsible for 23% of the county's projected population growth between 1993 and 2010. Under alternative 3 the county economy would provide 325 more jobs and support 561 more people than predicted under the no-action alternative. Construction projects associated with this alternative would also cause short-term increases in area employment and earnings between 1996 and 2001.

Alternative 3 would allow for some expansion of in-park concessions and community services, but it would generally encourage the growing demand for visitor services to be accommodated outside the park. An indirect effect of restricting expansion of in-park concessions and services would be to promote additional growth in tourist-oriented commercial land uses and employment in communities outside park entrances. Resulting business and population growth would burden community infrastructures and services and would add to existing shortfalls in affordable housing. Additional NPS and transit service employees would also be expected to reside in communities outside of park, contributing positively to small town economies, but also adding to housing shortages and public facility and service deficiencies.

Alternative 3 would effectively close the East Rim Drive to drive-through traffic. Changes in regional travel patterns could adversely affect some tourist oriented businesses. Businesses in East Rim communities, and especially businesses located along Arizona Highway 64 east of the park, would be most vulnerable to restrictions on through-park travel. Most sales lost due to the rerouting of traffic would be recouped by other businesses in the region.

Fewer visitors would have the opportunity to stay overnight, and day-use food and gift store services would continue to be overcrowded and inadequate. Concessioners would face reductions in income, together with the need for funding nonrevenue producing facilities.

CUMULATIVE EFFECTS

Same as the no-action alternative except that this alternative would reduce the customer base available to the Navajo projects because drive-through traffic would virtually be eliminated. Also, continuing concessioner facilities and services at existing or reduced levels would have a negative cumulative effect on the effective use of concession facilities and the provision of adequate services to visitors. In some cases a concessioner might find it economically infeasible to continue offering some services, such as the North Rim stock operation.

IMPACTS ON TRANSPORTATION, PARKING, AND TRANSIT

SOUTH RIM

■ Access and Circulation

Outside the Park: The "transit only" design of this alternative would impact the areas outside the South Rim. Visitors would no longer be able to travel between Tusayan and Cameron by driving through the park. Some day visitors would have to modify their travel plans and routes due to the park access changes.

All overnight guests staying in the village would be required to enter the park through the south entrance, and overnight guests staying at Desert View would have to enter through the east entrance. This would force some overnight visitors having to drive from one entrance to the other in order to drive their vehicles into the park. However, the only alternative route outside the park that would be available to travel between the south and east entrances is the southern route through Flagstaff. Through-traffic on USFS 302/307 would not be allowed. It is estimated that this alternative would increase the traffic volumes on the following roads:

- U.S. 89, Cameron-Flagstaff — +1,100 vehicles/day
- I-40, Flagstaff to Williams — +700 vehicles/day
- U.S. 180, Flagstaff to Valle — +400 vehicles/day
- U.S. 180, Valle to Tusayan — +1,100 vehicles/day
- AZ 64, Williams to Valle — +700 vehicles/day

It is estimated that these additional traffic volumes would not alter the operation or change the level of service on any of the roads.

Traffic circulation patterns in the Tusayan area would change slightly since the proposed visitor staging area would be at the north end of Tusayan. Although visitors in private vehicles would still drive through Tusayan, transit buses that operate between the staging area and the park would not pass through the community. It is estimated that the traffic volumes on the main street through Tusayan would increase by about 2,000 vehicle trips per day as a result of this alternative.

Grand Canyon Village: Within the park private vehicles would only be allowed for residents, overnight guests, and NPS uses. Buses with overnight guests would be allowed to drive to the lodge and drop off the guests and their luggage; they would then have to return to the staging area in Tusayan to park.

Overnight guests would be allowed to drive their vehicles into the park, with access controlled through the south entrance station. People staying at the Yavapai Lodge or campground would use the south entrance road, and those staying at Maswik or any of the lodges on the rim would use Center Road and a short portion of the village loop road to access the Maswik transportation center or the Maswik Lodge.

The south entrance road (from the business center west) and the village loop road would be used as the main transit route to the village. Center Road would be the main access route for residential traffic.

Traffic volumes would increase on Center Road by about 2,000 vehicles per day, and the road would operate at LOS C/D. The south entrance road west of the business center and the village loop road would experience a significant decrease in traffic volumes and would operate at LOS A. All other portions of the south entrance road would operate at LOS C/D. All other roads within this area are expected to operate at an acceptable LOS B/C under this alternative.

West Rim: Access to West Rim Drive would be limited to NPS shuttle buses and concessioner tour buses.

East Rim: Access to East Rim Drive would be by NPS shuttle bus. No private vehicles would allowed. The level of service on East Rim Drive would be LOS A/B.

Desert View: Public transit access would be provided between the staging area at the east entrance and the Desert View developed area. Only overnight guests staying at the Desert View campground would be allowed to drive their private vehicles into the park, and they would have to park at their campsites.

■ Parking

Outside the Park: All day visitors arriving by private vehicles would be required to park at staging areas located on the north end of Tusayan or outside the east entrance. The Tusayan staging area would accommodate a total of 3,512 vehicles (3,186 cars, 203 RVs, and 123 buses). The east entrance staging area would accommodate a total of 879 vehicles (797 cars, 51 RVs, and 31 buses).

Grand Canyon Village: Only overnight visitors would be allowed to park within the park. Guests staying at the Yavapai or Maswik Lodge would be allowed to park at their lodge, and visitors at the campground could

park at their campsites. All guests staying at one of the rim lodges would park at either the Maswik transportation center or Maswik Lodge, with a valet shuttle service to lodges along the rim. Visitor parking areas near the rim in the village would be removed and revegetated (the same as alternative 2). Parking would be adequate within the park for all visitor vehicles.

West Rim: Parking would be provided for concessioner tour buses at various overlooks on the West Rim. All other parking would be removed.

East Rim: Parking areas along East Rim Drive would be available for use during the winter. These areas would eventually be converted to transit stops and reduced in size to meet the parking needs of transit vehicles and concession tour buses. All unnecessary parking spaces would be removed and revegetated.

Desert View: The parking area at Desert View would be used during the summers and for private vehicles during the winter (for the next few years). The parking area at Desert View would eventually be reduced in size to meet the needs of the transit system. All unnecessary parking spaces would be removed and revegetated.

■ Transit

Outside the Park: Transit services would be provided by the Park Service between the staging areas and the park. Within the staging areas tram service would be provided to help visitors get from their cars to the transit terminal. One example of a transit service is summarized below; before implementation, more detailed planning would be required.

South Entrance Shuttle
- Stops: Tusayan staging area transit terminal, Mather Point, the business center, Bright Angel Lodge, Maswik transportation center
- Demand: 2,450 rides/hour
- Vehicles: Twenty-five 100-passenger bus trains
- Headway: 3 minutes

Tusayan Staging Area Tram
- Stops: Tusayan staging area transit terminal, parking area
- Demand: 1,225 rides/hour
- Vehicles: Four 50-passenger trams
- Headway: 10 minutes

East Entrance Shuttle
- Stops: Desert View staging area, Desert View orientation center
- Demand: 600 rides/hour
- Vehicles: Three 50-passenger buses
- Headway: 5 minutes

Grand Canyon Village: A public visitor transportation system would meet all visitor access needs within the park. All NPS shuttle buses would be fully accessible to visitors with disabilities, and a special para-transit service would be available through the concessioner.

The Grand Canyon National Park Lodges would continue to be the only company authorized to provide guided tours on the South Rim. All tour buses operating in the park would have to meet the current EPA emissions standards.

An example of the various transit services provided in the village area under this alternative follows:

Mather Point / Yaki Point Loop
- Stops: Mather Point, South Kaibab trailhead, Yaki Point
- Demand: 280 rides/hour
- Vehicles: Three 50-passenger buses
- Headway: 15 minutes

Mather Point / Yavapai Observation Station Shuttle
- Stops: Mather Point, Yavapai observation station
- Demand: 560 rides/hour
- Vehicles: Four 50-passenger buses
- Headway: 5 minutes

Business Center Loop
- Stops: Business center, Maswik Lodge, campground, backcountry office, old visitor center
- Demand: 280 rides/hour
- Vehicles: Three 50-passenger buses
- Headway: 10 minutes

Village Loop Shuttle
- Stops: Maswik transportation center, community building, general office, El Tovar, Bright Angel Lodge, West Rim interchange, Maswik Lodge
- Demand: 1,400 rides/hour
- Vehicles: Ten 50-passenger buses
- Headway: 3 minutes

Valet Shuttle
- Stops: Maswik transportation center, Maswik Lodge, all rim lodges
- Demand: 100 rides/hour
- Vehicles: Two 25-passenger buses
- Headway: 15 minutes

Employee Shuttle
- Stops: Residential areas, work areas in the village
- Demand: 225 rides/hour
- Vehicles: Three 25-passenger buses
- Headway: Based on demand

West Rim: Transit service on the West Rim would be the same as it is currently, except that the number of vehicles operating on this route would increase to meet demand, as indicated in the following example:

West Rim Shuttle
- Stops: West Rim interchange, Trailview 1 and 2, Powell Memorial, Hopi Point, Mohave, Abyss, Pima Point, Hermits Rest
- Demand: 1,050 rides/hour
- Vehicles: Eleven 100-passenger bus trains
- Headway: 10 minutes

East Rim: NPS transit would be provided on the East Rim from Mather Point to Desert View. The service would initially be operated only during the peak season, but would gradually be extended to be year-round by 2010. An example of the proposed transit services follows:

Mather Point / Grandview Shuttle
- Stops: Mather Point, pull-offs A and B, Grandview
- Demand: 1,225 rides/hour
- Vehicles: Twelve 100-passenger buses
- Headway: 6 minutes

Grandview / Desert View Shuttle
- Stops: Desert View, Tusayan museum, Lipan Point, Navajo Point, Grandview
- Demand: 525 rides/hour
- Vehicles: Seven 100-passenger buses
- Headway: 15 minutes

Desert View: The east entrance shuttle would operate between the staging area and the Desert View transit terminal. The Grandview/Desert View Shuttle would also use this transit terminal (see the previous example).

■ Winter Use

Access and Circulation: Access to the park would change during the winter to allow visitor vehicles on East Rim Drive. This would mean that motorists could travel through the park between Tusayan and Cameron during the winters. This policy would continue until vehicle demands on the East Rim exceeded the available parking supply. At that time year-round access would be restricted to transit vehicle. Access year-round would continue to be restricted to transit vehicles between Mather Point and Hermits Rest. Access for overnight guests would be the same as described for alternative 2.

Due to the relatively low volume of traffic on the South Rim during the winter, no access or traffic circulation problems are anticipated.

Parking: Parking would not be a problem at the Tusayan staging area during the winter because demand would be about 40% of the summer demand.

Parking would not be a problem at most overlooks on the East Rim in the near future. As winter visitation increased, parking capacity problems would be likely. At that time year-round transit service would be provided.

Transit: Transit services on the South Rim would be operated year-round, with ridership on a peak day in winter expected to be about 40% of the summer ridership. Transit service would be downsized to reflect demand during the shoulder months and the winter. Winter transit operations would require that all-weather transit shelters be provided.

NORTH RIM

Access and Circulation

Establishing a carrying capacity for the North Rim based on the current parking supply would affect only about 50 vehicles on peak visitation days in the year 2010. Most of these visitors could be accommodated during an off-peak time on the same day. The carrying capacity limit established for the North Rim would be 455 vehicles — 425 cars, 23 RVs, and 7 buses. The vehicle limit for Bright Angel Point would be 346 vehicles to avoid exceeding the parking supply.

All vehicles would be allowed to drive to Point Imperial. However, vehicular access to Cape Royal would be restricted to vehicles no longer than 22′ and no wider that 8′.

Parking

No additional parking facilities would be provided on Bright Angel Point. All parking must occur in designated parking areas. Bus and RV parking spaces would be designated in the amphitheater parking area the same as alternative 1. Overflow parking would occur at the parking areas for the amphitheater, laundry, and camper store.

The parking areas on the Walhalla Plateau would remain the same as alternative 1. Roadside parking would not be allowed. Allowing a maximum of 455 vehicles would match the existing parking capacity for the North Rim, which may cause some localized parking capacity problems due to an uneven distribution of visitors within the North Rim area.

Transit

The Park Service would provide shuttle service to all locations on Bright Angel Point. There would be a transit transfer at the North Kaibab trailhead parking area, where visitors would transfer to the Walhalla shuttle. A few parking spaces would be removed at the trailhead to allow for use by the transit system. One example of a proposed shuttle system for Bright Angel Point is summarized below.

Bright Angel Shuttle
- Stops: All visitor-related developed areas on Bright Angel Point, including the North Kaibab and Widforss trailheads
- Demand: 200 rides/hour
- Vehicles: Three 25-passenger buses
- Headway: 7 minutes

Employee Shuttle
- Stops: All employee residential areas, all employment areas on Bright Angel Point
- Demand: 50 rides/hour
- Vehicles: Two 12-passenger vans
- Headway: 10 minutes / based on demand

Tour buses would be allowed to drop passengers at the lodge and park at the amphitheater. Tour buses with overnight guests would be allowed to drop of the passengers and their luggage at the lodge then park at the amphitheater. Private tour buses would be allowed to drive the Cape Royal Road if they met the vehicle size restrictions (same as alternative 2).

The concessioner would continue to provide guided tours of the North Rim and the Walhalla Plateau, with tours originating from the lodge on Bright Angel Point.

The Park Service would also provide shuttle service between the North Kaibab Trailhead parking area and the overlooks on the Walhalla Plateau. The transit service could have the following characteristics.

Walhalla Shuttle
- Stops: North Kaibab trailhead, all Walhalla Plateau overlooks
- Demand: 100 rides/hour
- Vehicles: Two 25-passenger buses
- Headway: 15 minutes

TUWEEP

Access to Tuweep would be limited, based on the number of available parking spaces, to 18 vehicles (10 at the overlook and 8 at the campground). A vehicle reservation system would be used to manage and enforce this vehicle limit. Maintaining the existing access roads would continue to provide an acceptable level of service. No NPS transit service would be provided at Tuweep.

The parking area at Toroweap overlook would be limited to 10 parking spaces, with no roadside parking.

CONCLUSIONS

The use of staging areas and transit systems would provide day visitors with access to all areas of the South Rim. While overnight visitors would be able to drive to their overnight destination, they would have to use the transit system for access within the park. To minimize the impact on park visitors, transit services would be designed to operate on short headways in order to be responsive to visitor transportation needs.

The all-transit concept on the South Rim would have a negative impact on the major access routes to the South Rim because motorists would be unable to drive through the park when traveling between Tusayan and Cameron.

The vehicle reservation system on the North Rim would only affect visitors in about 226 vehicles on a peak visitation day. These visitors could most likely be accommodated during an off-peak period of the same day.

All of the roads and parking areas would function effectively as described.

CUMULATIVE EFFECTS

The transit-only restriction on the South Rim would have a negative impact on the tour bus and air tour industries. The tour companies that serve the Grand Canyon would have to modify their operations to meet the new demand patterns.

The traffic volume increases that would be expected to occur on certain roads outside the park could have a cumulative impact on the communities of Cameron, Flagstaff, Williams, Valle, and Tusayan.

The NPS transit service that is proposed in this alternative produces an energy benefit by trading private vehicle miles for transit miles. The transit service would result in a reduction of 104.7 million miles of private vehicle travel each year within the park. Taking into account the fuel used in the transit vehicles, the net fuel savings is approximately 3.5 million gallons of gasoline each year.

The transit service also produces an air quality benefit. The transit service trades 104.7 million private vehicle miles/year in gasoline burning cars for 3.8 million transit miles/year driven in clean natural gas burning buses. This trade-off would produce a net reduction in vehicle generated pollutants and have a positive impact on the air quality in the park.

IMPACTS ON AREA OPERATIONS

HOUSING

Under alternative 3 a total of 1,721 housing units would be required for park employees. On the South Rim the majority of these housing units would be provided outside the park, primarily in Tusayan in a joint NPS/USFS residential community. Most housing on the North Rim would be provided inside the park, with the most possible use being made of previously disturbed areas.

■ Regional Effects

Employees: The National Park Service would seek to develop approximately 700 housing units outside the park to correct substandard housing conditions and to provide accommodations for new employees. Significant numbers of employees would be relocated from inside the park to live and work in areas outside the park. Tusayan would absorb 95 employees and their worksites from Grand Canyon Village, and Flagstaff/Williams would absorb 32 employees and their workplace, relocated from the South Rim Village. Employees relocated from the park to east of Desert View and to Tusayan would benefit from new housing units in those communities, often resulting in an upgrade from substandard conditions in the park. Effects for employees relocated to Flagstaff/Williams would be the same as alternative 2.

This alternative would impact surrounding communities from new employees and employee operations. Two new employees would be required to live and work at Jacob Lake. The most significant new impact to the surrounding region would be the 31 employees required to work and live outside the eastern park boundary east of Desert View. This area is currently undeveloped and would experience dramatic changes in developing an employee community and support services.

Housing Needs: Housing in surrounding communities would be a mix of duplexes, apartments, dorms, and trailer pads built at the relatively high density of approximately 15 units per acre. On the South Rim a total of 648 new housing units on 43.5 acres would be required in a new NPS/USFS community in Tusayan (see table 53). A new community outside the park east of Desert View would require 22 new housing units on 1.4 acres. In Flagstaff/Williams approximately 29 housing units would be needed; presumably this demand could be met in the existing housing market.

On the North Rim two new housing units would be required at Jacob Lake; these units would likely be provided on 0.3 acre in the USFS housing area.

Community Structure/Social Characteristics: New employee communities in Tusayan and outside the east entrance near Desert View would have the most significant impacts. In both instances, the new communities

would be both physically, and in some ways socially, separated from their in-park counterparts, with the same effects as described for alternative 2. A fairly large park employee population in Tusayan would alter that community's image and social structure. Demand for employee activities and facilities outside the park would be the greatest in this alternative than any other. Because adequate recreational and institutional facilities are lacking in the park (such as churches and schools), residents would make more and more use of Tusayan facilities.

Minimal impact would be made on the community structure of Jacob Lake resulting from 2 employee residences being located in the USFS housing area. Those employees would likely assimilate into the community of employees at that area rather than being socially tied to the park community over 30 miles away.

Relocating housing units and workplaces outside park boundaries would increase commuting for work. Most employee traffic would occur between the residence and the workplace, with relatively few trips being required in and out of the park. Depending on the design of the outside communities, employees might be able to or bike to work, reducing traffic on local roads.

No employee access would be allowed on East Rim Drive other than for official business. Regional traffic from west to east and east to west would have to use USFS roads or make a wide loop from Tusayan to Flagstaff to Cameron to Desert View and areas north.

■ South Rim

Grand Canyon Village:

• *Employees* — Over 500 employees would be moved from substandard housing into upgraded or new housing units outside the park. These employees would benefit from improved living conditions, and employers would be better able to retain employees.

Over 260 new employees would be needed under this alternative, with the majority (193) needed to operate the transit system. The remainder would be needed to operate a new education center in Grand Canyon Village, expanded food service facilities, and maintenance, interpretive, and ranger operations. While a significant number of new employees would be required to work on the South Rim, no new housing would be provided in the park for those employees. All impacts associated with housing for new employees would be experienced outside the park in the new NPS/USFS community in Tusayan.

Approximately 600 employees would live outside the park but commute to their job sites in the park. This could cause reverse commuting and force some employees who previously walked or biked to work to ride employee shuttles. Negative effects could include more time spent commuting, increase gasoline costs for employees not using the transit system, and increased air pollution and traffic.

• *Housing Needs* — No new housing would be constructed in Grand Canyon Village. The 113 substandard units would be removed and those areas revegetated; an additional 145 units would be converted to visitor uses or removed and replaced with other uses. The total remaining standard units in the village would be 700 units, an overall reduction of 258 units. All new housing would be constructed outside of park boundaries.

• *Community Structure / Social Characteristics* — Relocating significant numbers of existing employees and providing housing for new employees outside the park in a new government community in Tusayan would decrease the size of the park community. The physical separation between the two communities would also tend to create a social separation, particularly as community facilities such as schools, day care, post offices, and banks were built outside the park that duplicated those in the park. This duplication would serve each community's own residents, reducing the need for, and frequency of, social contact between the two communities.

Existing patterns of separation between NPS and concessioner housing in the park would remain, even with significant reductions in the number of park units. Differences in housing as a result of grade would also remain the same, with lower level employees in dorms clearly separated from mid-level employees in apartments and upper level managers in single-family homes.

Retaining employee housing in prime visitor use areas, particularly dorms adjacent to hotel and visitor activity areas, would continue to create conflicts between visitors and employees. Off-duty employee activities would continue to frustrate visitors and employees, who would have little

TABLE 53: HOUSING SUMMARY, 2010 - ALTERNATIVE 3

Area	Existing Units	Substandard Units to be Replaced	Standard Units to be Converted or Replaced	Total Remaining Standard Units	New Units Needed to Meet Standards*				Additional Units Needed for New Employees				Total New Units Needed		Total Units Needed This Alternative	Net Change over Existing	
					NPS		Concessioner		NPS		Concessioner						
					Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.		Units	Ac.
South Rim Region																	
• Tusayan	0	0	0	0	81	5.5	280	18.8	18	1.1	269	18.1	648	43.5	648	648	43.5
• Flagstaff, Valle, or Williams	9	0	0	9	0		0		6		23		29		38	29	
• East Rim/Outside Park	0	0	0	0	0		0		5	0.3	17	1.1	22	1.4	22	22	1.4
Subtotal	9	0	0	9	81	5.5	280	18.8	29	1.4	309	19.2	699	44.9	708	699	44.9
South Rim																	
• Grand Canyon Village	958	113	145	700	0		0		0		0		0		700	-258	-13.8
• Hermits Rest	2	1	0	1	0		0		0		0		0		1	-1	-0.1
• Desert View	40	11	21	8	13	1.1	13	1.1	4	0.4	0		30	2.6	38	-2	-1.7
Subtotal	1,000	125	166	709	13	1.1	13	1.1	4	0.4	0	0	30	2.6	739	-261	-15.6
North Rim																	
• Jacob Lake	0	0	0	0	0		0		2	0.3	0		2	0.3	2	2	0.3
• North Rim	173	22	98	53	29	2.2	55	2.7	13	1.1	96	6.5	193	12.5	246	73	7.4
• Tuweep	2	1	0	1	0		0		1	0.3	0		1		2	1	0.3
	175	23	98	54	29	2.2	55	2.7	16	1.7	96	6.5	196	12.8	250	76	8.0
Other Park Areas																	
• Corridor Trails	22	4	0	18	4		0		0		0		4		22	0	
• Lees Ferry	2	1	0	1	1		0		0		0		1		2	0	
Total	**1,208**	**153**	**264**	**791**	**128**	**8.8**	**348**	**22.6**	**43**	**3.5**	**382**	**25.7**	**930**	**60.6**	**1,721**	**514**	**37.3**

* Includes replacement of substandard units and additional units to eliminate double and triple bunking.

TABLE 54: PROJECTED EMPLOYEES, 2010 - ALTERNATIVE 3

Area	Park Employees							
	National Park Service			Concessioner				
	Existing	New	Total	Existing	New	Total	Total	Net Change
South Rim								
• Tusayan	0	80	80	0	21	21	101	101
• Flagstaff, Valle, or Williams	3	4	7	0	28	28	35	32
• Grand Canyon Village	286	-58	228	1,318	186	1,504	1,732	128
• Hermits Rest	0	0	0	3	0	3	3	0
• Desert View	22	6	28	44	-25	19	47	-19
• Est Rim/Outside Park	0	6	6	0	25	25	31	31
Subtotal	311	38	349	1,365	235	1,600	1,949	273
North Rim								
• Jacob Lake	0	2	2	0	0	0	2	2
• North Rim	67	8	75	230	30	260	335	38
• Tuweep	1	1	2	0	0	0	2	1
Subtotal	68	11	777	230	30	260	339	41
Other Park Areas								
• Corridor Trails	12	0	12	17	0	17	29	0
• Lees Ferry	2	0	2	0	0	0	2	0
Subtotal	14	0	14	17	0	17	31	0
Total	**393**	**49**	**791**	**1,612**	**265**	**1,877**	**2,319**	**314**

privacy or escape from the visitor's eye. Employee traffic to residential units and traveling in and out of the park's south entrance gate would continue to cause congestion and conflict with visitor traffic.

Eliminating employee traffic on the main shuttle routes and in primary visitor use areas would enhance the visitor experience by reducing congestion. Designated employee parking areas separated from visitor parking areas would eliminate conflicts between the two groups, making it easier and more efficient for both to find adequate parking. Eliminating visitor traffic from Center Road and other residential streets would create quieter residential neighborhoods. Travel restrictions on East Rim Drive would affect village residents wanting to drive to Desert View, Cameron, or Page.

Hermits Rest: Relocating one employee residence would have the same effects as described for alternative 2.

Desert View:

• *Employees* — The number of employees at Desert View would be reduced by 19 as a result of removing the gift shop, deli, and store and constructing housing and the east entrance orientation center outside park boundaries.

A total of 54 employees would be relocated from substandard housing or from housing being removed near visitor use areas. A few additional employees would have to move from Desert View to a new housing area near the east entrance orientation center to operate visitor information and transit facilities. Employees relocated to new housing in the park would benefit from upgraded housing conditions. Employees relocated to the new housing area outside the park would also benefit from upgraded housing conditions, but would likely experience a sense of separation from in-park community, depending on the where the new housing area is located.

• *Housing Needs* — A total of 30 new housing units would be needed at Desert View on 2.6 acres of land. Removing substandard units in the NPS housing area and utilizing that land for new construction, along with removing two units, would allow the restoration of 1.7 acres of land. This net reduction would result from fewer employee housing needs at Desert View and the relocation of employees to the new community outside the park boundary.

One historic residence would be retained in the former Grand Canyon National Park Lodges housing area; all substandard housing would be removed and the remainder of the area revegetated. This would remove much of the negative visual impact on visitors.

• *Community Structure / Social Characteristics* — The creation of two communities in the Desert View area would likely contribute to a social division between the two, depending on the final location of east center and its proximity to Desert View. The duplication of community facilities at each area would reinforce the social separation of the communities, whereas the sharing of community facilities would reduce perceived barriers and increase social interaction between the two groups. In either case, this alternative would have negative effects on the social cohesion and strong sense of community that is strongly valued by current Desert View residents.

All housing in the area, except for the historic residence, would be provided in the NPS employee area southeast of the visitor use area. This location would allow nearly all park employees to walk to work if they wished. There would be little conflict between shuttles, visitor campground traffic, and employee traffic. Clearly separating employee housing and traffic areas and visitor use areas would contribute to a positive visitor experience and more efficient employee operations.

Employees would continue to use Arizona 64 when traveling to the Tusayan museum or Grand Canyon Village for official business, or could bike to those areas on off-road bikeways. Employees would also take a shuttle or travel around a lengthy southern loop through Cameron, Flagstaff, and Tusayan, or travel on gravel USFS roads.

Limited employee access would be allowed between the new housing area outside the park and Desert View. Employees coming into the park would have access to the housing area but would have to park in the housing area and use bikes, hiking trails, and public or employee shuttles for transportation inside the park. These restrictions would affect employee travel patterns in and around Desert View, likely reducing the allure of living in this remote community.

■ North Rim

Employees: This alternative would require 38 new employees on the North Rim, including 18 employees for the transit system and the remainder for expanded lodging, interpretive, maintenance, and ranger operations.

Approximately 208 employees would be relocated from substandard housing units, historic lodging units converted back to visitor lodging units, and low density units converted to higher density housing. Employee housing would be concentrated in two primary housing areas away from visitor uses and activities, improving employee residential conditions and the visitor experience. Relocated employees would benefit from upgraded housing conditions and increased privacy.

Housing Needs: A total of 193 new housing units on 12.5 acres would be required on the North Rim under this alternative. New housing units under this alternative would be a mix of apartments, dorms, and trailer pads at an average density of 15 units per acre. Removing 22 substandard units and utilizing most of those disturbed areas for the construction of 73 units would affect only 7.4 acres. All new housing units would be constructed in and immediately adjacent to existing housing and administrative areas.

Community Structure/Social Characteristics: Separating employee residential areas from visitor use areas would have the same impacts as alternative 2, as would reducing employee traffic and providing employee shuttles.

■ Tuweep

As described for alternative 2, one new seasonal employee would be added, and a substandard trailer would be removed and a new seasonal trailer would be provided on 0.3 acre. Short-term employees would have to stay outside the park and commute to their worksite or stay in the visitor campground. The addition of a seasonal ranger would benefit the full-time ranger in terms of workload and days off.

■ **Corridor Trails**

No new employees would be added under this alternative in the inner canyon areas. Replacing four substandard housing units would benefit employees (the same as alternative 2).

■ **Lees Ferry**

No new employees would be required under this alternative. Upgrading one substandard housing unit would have the same benefits as in alternative 2.

■ **Conclusion**

This alternative would help protect park resources but would have potential significant impacts on park housing communities, particularly the South Rim/Tusayan and Desert View/East Rim communities. Physically splitting communities and placing new housing outside park boundaries could adversely affect the social structure of those communities. As the physical separation was reinforced by duplicate support facilities (such as recreation centers, day care, and schools), the social separation of the communities would be reinforced.

Restricted access for employees would benefit visitors, as well as employees, by reducing traffic conflicts and competition for parking. Employee enjoyment of the park and ease of access could be affected by closing East Rim Drive to through-park travel. Requiring employees to either ride shuttles, bike, hike, or take a roundabout trip on regional roadways to move east/west along the South Rim could be detrimental to off-duty enjoyment of the park and reduce opportunities for leisure recreation in the park.

The ultimate restriction on the number of visitors would benefit the park by reducing the long-term need for housing. The viability of this alternative depends on efficient shuttle systems for visitor and employee transit, requiring significant numbers of new employees to operate those systems. The large numbers of new employees would require a great deal of new housing and land disturbance, which would occur outside park boundaries. This alternative would shift most housing impacts to surrounding communities and agencies, preserving park property yet still having an impact on regional resources.

■ **Cumulative Effects**

Resource impacts would continue to occur just outside the park boundary. While this alternative would preserve and reclaim disturbed land for the park, new housing impacts would be created on surrounding agencies and communities. The largest housing impact would be on the community of Tusayan, which would ultimately accommodate almost 650 NPS housing units and the related community support services. Shifts in use to national forest lands and Tusayan commercial facilities could also be seen, putting more development pressure on lands and agencies outside the park.

The new housing area outside Desert View could initiate a potential development spin-off community. As visitors were forced to park in large numbers at the remote parking lot, increased pressure for commercial support services and associated housing would likely occur in this area, contributing to the degradation of resources just outside park boundaries. Ultimately, development could occur at levels that would be visible along geopolitical lines, preserving park property on one side of the line but experiencing intense development on the other. The growth of these outside communities could have long-term negative impacts on park resources and visitor experiences in approaching the Grand Canyon.

Community Services

■ **Region**

This alternative would require more community services to be provided in Tusayan. The town of Tusayan would absorb some current community services that are proposed to be relocated from the South Rim Village. The bank and post office functions would be moved from within the park to Tusayan, requiring all park residents to travel out of the park to those facilities. Both of those functions would also be in larger facilities in this alternative because all services to park and Tusayan residents would be concentrated in one area instead of duplicating the functions in both areas.

Since no new facilities would be built in the park to provide community services, the town of Tusayan would experience more pressure to provide community services not only for its population, but for that of Grand Canyon Village as well. Tusayan would need to provide for expanded schools, churches, community buildings and recreation centers, outdoor game courts and fields, movie or entertainment centers, and so on. Park residents would necessarily commute from within the park to organized functions and activities outside the park. The increased number of park staff required to live outside park boundaries in this alternative would also contribute to the increased need for community services in the town of Tusayan.

Little impact to other regional communities would occur as a result of this alternative since the number of employees proposed to reside in other regional communities is negligible relative to current populations.

■ **South Rim**

Grand Canyon Village:

• *Facility and Space Needs* — Residents of Grand Canyon Village would experience an overall benefit in this alternative. While the majority of community services would be established in the town of Tusayan, some services would still occur in the park. Park residents would continue to use the school, day care, grocery store, and clinic in the same manner as today. Limited new community services such as personal storage areas, meeting and activity rooms, and exercise facilities would help meet park resident needs in the historic NPS maintenance area. Most other desired services such as churches, barber shops, recreation centers, and game fields would be provided outside the park in Tusayan, filling the gap in the need for those functions yet creating a commute between the park and Tusayan for high numbers of park residents in order to utilize them.

Access to the relocated bank and post office would become more difficult for employees working and living in the park. Casual trips during lunch hour would be reduced due to the inconvenience of having to go further away and leave the park in order to access those facilities. Many relocated employees working and living in Tusayan would experience less inconvenience with those relocated facilities than their park resident counterparts.

The remote communities of Flagstaff or Williams would continue to serve park and Tusayan residents' needs for comprehensive services such as major medical, auto repair and sales, the same as alternative 1.

• *Conflicts with Visitors* — This alternative would minimize residential conflicts with visitors with regard to the use of community facilities. The proposed facilities in the historic NPS maintenance area would provide recreational and other off-duty activity opportunities to park residents in an area clearly separated from visitor view and use. The separate employee access road between the park and Tusayan on Rowe Well Road would reduce residential conflicts with visitor traffic at the entrance station.

The relocated post office and bank facilities proposed in Tusayan would reduce visitor/employee conflicts. If properly sited, the post office and bank would be more easily accessible to the residential community, located separately from other major visitor destinations, reducing traffic and parking conflicts with visitors. Visitors would experience increased difficulty in accessing those facilities as a result of this alternative.

• *Community Characteristics* — While most community services for park residents would be located in Tusayan, there would be a great benefit to all South Rim residents in having a range of desired community facilities. The provision of recreation centers and other off-duty activities would have the same impacts to the community as alternative 2. In this alternative, more employees would experience difficulty and inconvenience in their needs to travel into the park during lunch hour for personal needs such as lunching with their children at the day care center or at the school.

The location of most community facilities outside of park boundaries would tend to encourage a stronger interaction between park and Tusayan residents in off-duty activities. Since very few facilities would be duplicated in the park, the concentration of most services in Tusayan would promote a social integration of the two physically separate communities.

Desert View:

• *Facility and Space Needs* — Providing a new laundry, lounge, and outdoor recreation area would improve conditions for off-duty activities for employees and other residents at Desert View. These facilities, while limited in size and scope, would provide residents with opportunities for impromptu recreation and basic services and activities. Residents would still have to travel to Grand Canyon Village or other remote communities for organized programs, school and church activities, and other off-duty business needs.

• *Conflicts with Visitors* — The community outside of the park would be primarily operational facilities and housing. The community services provided in the NPS housing area would serve both in-the-park and out-of-park residents. No secondary employee access would be provided from outside the park, causing

frequent employee/visitor conflicts with employees traveling into the park on the main visitor access route. Traffic congestion and delays would be exacerbated by increasing the integration of visitor and employee traffic.

Once inside the park, employees would have their facilities and activities out of the view and hearing range of most visitor use areas, enhancing the visitor experience and providing a more private setting for park employees.

• *Community Characteristics* — By providing a single focus area for recreation and community services inside of the park, residents of both housing areas would utilize those facilities, promoting social integration between the two physically separate communities. The tight knit social structure of the Desert View community would be slightly affected by the split housing areas, but the common community activity areas would tend to reduce the negative impacts of physical separation.

■ **North Rim**

Facility and Space Needs: North Rim residents would benefit from this alternative. TWRS/ARAMARK employees would experience little change since the employee dining room and current outdoor game areas would continue to meet their needs. The NPS employees would experience the same impacts as alternative 2.

North Rim residents would still continue to travel to Kanab or Fredonia for major purchases or personal needs, the same as alternative 1.

Conflicts with Visitors: This alternative would dramatically reduce the potential for employee/visitor conflicts, the same as alternative 2.

Community Characteristics: This alternative would continue the segregated character of the North Rim community, improve employee morale, and reduce employee turnover, the same as alternative 2.

■ **Tuweep**

No changes to the Tuweep community services would occur, remaining the same as the no-action alternative.

■ **Corridor Trails**

No changes to the inner canyon community services would occur, remaining the same as the no-action alternative.

■ **Lees Ferry**

No changes to the Lees Ferry community services would occur, remaining the same as the no-action alternative.

■ **Conclusion**

This alternative greatly improves conditions related to community services at the Grand Canyon. The benefits and impacts to the surrounding communities and to park residents would be the same as alternative 2, except that more facilities and services would be located in the Tusayan area in this alternative than in any other. Remote communities would still serve the needs of park and local region residents for major facilities and services, the same as alternative 1.

■ **Cumulative Effects**

The requirement that all day use visitor parking, new employee housing, primary community services, and management support facilities be built in the Tusayan area rather than in the park would create a much larger community and activity structure in Tusayan than currently exists. With increasing visitor services and associated support structure occurring over time, the long term demand for services such as major grocery shopping, clothes outlets, auto sales, and other commercial and support facilities would also increase. Significant impacts related to out-of-park commercial and support structure growth could be realized in this alternative.

MANAGEMENT SUPPORT FACILITIES

■ **Region**

Facility and Space Needs: This alternative creates a significant impact on the town of Tusayan and similar impacts as alternative 2 upon the communities of Kanab, Fredonia, Jacob Lake, Flagstaff, Valle, or Williams. The relocation of current park operations such as administration, superintendent, professional services, concessions, resources, ranger, and division chief offices to Tusayan would require the most land disturbance, more employee shuttles between park housing and Tusayan, and significant new construction of NPS and concessioner operations structures in Tusayan. This alternative has the greatest impact on the Town of Tusayan than any of the other alternatives.

The construction of new administrative headquarters for the NPS and GCNPL operations in Tusayan would benefit both entities with the ability to design more environmentally sensitive and efficient structures. The facilities could be designed to meet the facility and space needs of both entities with up-to-date heating and cooling systems, state-of-the-art telecommunications networks, and energy efficient and environmentally sensitive design. The structures would be more easily accessible to service or other work-related traffic coming to the park from regional destinations.

Operational Relationships: The proposed location of many NPS and concessioner operations in Tusayan would have significant impacts upon operational relationships. The removed nature of headquarters functions in Tusayan for the NPS and GCNPL operations would require significant changes in operational structure. More emphasis on telecommunications and more stringent scheduling would be necessary to reduce the need for commuting between the park and Tusayan to conduct day to day business. This alternative would dramatically increase the amount of work related traffic between the town of Tusayan and the South Rim Village, contributing to increased operational costs in operating employee shuttles and increased impacts in lost time, spent gasoline, air quality, noise, and other environmental factors associated with commuting between the park and Tusayan. More time would be lost to traveling between the park and Tusayan, reducing efficiencies of operation. Increased costs for employee road upgrades and maintenance on Rowe Well Road would also be realized in this alternative since significantly more service traffic would travel the road than other alternatives.

Conflicts with Visitors: Depending upon the final location of the administrative headquarters functions in Tusayan, this alternative could have negative impacts to the visitor experience due to the potential for high incidences of conflict between visitor traffic and official/administrative traffic in the Tusayan area.

■ **South Rim**

Grand Canyon Village:

• *Facility and Space Needs* — This alternative requires increases in management support facilities from the baseline and alternative 1, but often requires less expansion in Grand Canyon Village than in alternative 2 due to the relocation of many support operations to the town of Tusayan. The greatest expansion of facilities would be realized by maintenance divisions, administrative divisions, and the construction of new transit maintenance and operation facilities.

Converting the historic Superintendent's house into NPS meeting facilities would provide a place for in-the-park work-related meetings, but would be a duplication of functions since those type facilities would also be provided in the headquarters complex in Tusayan.

Relocating river operations storage from Grand Canyon Village to Lees Ferry would have the same impacts as in alternative 2.

Converting Albright Training Center to ranger operations would benefit the ranger division in the provision of adequate facilities for office, meeting, and training space, but would be detrimental to the Albright functions. The history associated with the training center would be lost and the costs in relocating and constructing the center at another location would be detrimental to the Park Service. The ranger operations also require special equipment and design considerations, requiring significant upgrades to the Albright facility in order to meet the demands of the division.

GCNPL transportation and park transit operations would experience negative impacts by having more remote facilities in Tusayan, requiring longer travel distances and times to service visitors. The remote location would also increase operational costs for fuel and time expenditures. Facility and space needs would be improved by locating in new, energy efficient structures designed to meet today's needs.

Keeping the GCNPL mule operations in Grand Canyon Village historic structures would continue historic uses in their original structures, maintaining an important part of the history of the village. All space and facility needs would continue to be adequately met in the current structures. All other GCNPL operations in the village core would be the same as alternative 2.

The GCNPL accounting offices would remain in the general offices building. DSC offices, NPS fire and safety facilities, dry storage, helicopter base, mules, horses, trash compacting, and wet dump site would have impacts the same as alternative 1.

• *Operational Relationships* — The location of NPS offices outside the park in Tusayan would cause both benefits and detrimental effects to the operations, as described in the regional section of this alternative analysis.

Consolidating many NPS offices into a single structure in

Tusayan would make operations more efficient. The remote location from active in-park operations would have negative effects, as compared to close-in locations in alternative 2.

DSC offices, NPS fire and safety facilities, dry storage and helicopter base, mules and horses and trash compacting and wet dump site would have impacts the same as alternative 1.

Moving the boat shop to Lees Ferry would have the same impact as alternative 2.

Retaining the GCNPL mule operations in the village would continue to serve visitors well and serve as an attraction. By removing other service functions from the area, many of the conflicts between visitors and service traffic would be eliminated. Some negative effects on the visitor experience would result from having mules and associated odors near visitor use areas.

• *Conflicts with Visitors* — Conflicts between management operations and visitors would be reduced in this alternative. The separation of visitor traffic routes and employee traffic routes would improve operations and the visitor experience the same as alternative 2. Maintaining the GCNPL mule operations in their current location would still require some service traffic into the area, creating some minor conflicts between visitors and service vehicles, although the situation would be greatly improved over alternative 1 by moving all other GCNPL operations out of the village core.

Desert View:

• *Facility and Space Needs* — GCNPL operations would experience significant changes as a result of this alternative. By relocating most of their facilities out of the park, new facilities would be built, improving the operations with expanded and efficient structures. The maintenance unit would be provided new and expanded facilities for their operations, significantly improving upon existing conditions.

The new orientation center would provide a significant improvement in the office and orientation space for NPS and cooperating association information functions. The facilities would be larger, more efficient, and easier to find for visitors than in alternative 1.

The construction of NPS ranger and maintenance facilities in the park would benefit those operations the same as alternative 2. Converting the gas station into the NPS fire and safety facility would reduce the size and costs associated with the new ranger operations facility proposed in alternative 2.

Tusayan museum would operate the same as alternative 1.

• *Operational Relationships* — There would be some detrimental effects on operations as a result of this alternative. By having two separate operational developments, some inefficiencies in traveling between the two for business activities will occur. Coordination between the two centers would be more difficult than consolidated facilities since both centers would still be managed by one management structure for each operational division or unit. Increases in operational costs associated with the increased travel distances and the demolition and new construction of facilities would be experienced.

• *Conflicts with Visitors* — This alternative would reduce conflicts between visitors and management operations. By requiring visitors to ride shuttle buses from the remote orientation center, their activities would be focused in only those areas to which shuttle buses would take them. This alternative separates most management support functions from visitor use areas, reducing the potential for conflict between the two.

■ North Rim

Facility and Space Needs: As figure 21 illustrates, most operations would be the same as alternative 2, with the exception of significant reductions in park transit facility needs (50% less than alternative 2), and the elimination of Grand Canyon Trail Rides operations.

This alternative would have a severe negative effect on mule operations on the North Rim. That operation would be eliminated from this alternative, eliminating a historic use and their business opportunities. Revegetation of the mule barn and corral area and staging area on CC Hill would improve the visual character and natural environment of those areas.

All NPS operations would be the same as alternative 1 except for the construction of new 7,000 square foot maintenance facilities which would have the same impact as alternative 2.

The construction of a 6,500 square foot transit facility on Lindbergh Hill would have the same functional impacts as alternative 2.

Operational Relationships: All NPS operations would remain in scattered, substandard facilities, the same as alternative 1, with the exception of the maintenance division, which would experience the same impacts as alternative 2.

TWRS operations would function adequately, the same as alternative 2.

Conflicts with Visitors: Conflicts with visitors at the NPS administration area and the backcountry offices would be the same as alternative 1. Other potential conflicts associated with the transit complex at Lindbergh Hill would be the same as alternative 2.

■ Tuweep

All management support facilities at Tuweep would be the same as alternative 1 with the exception of expansion of office space for the seasonal ranger to work in. This would require the expansion of a historic structure, requiring upgrades to its insulation, infrastructure, and structural system. Those upgrades would improve operating conditions for the ranger at Tuweep due to the current lack of space or adequate year-round facilities.

■ Corridor Trails

All management support facilities would continue to be the same as alternative 1. Some ranger functions would continue to operate out of cramped, substandard structures, but most support facilities would continue to function adequately give the continued limits on visitor use in the inner canyon.

Some conflicts with visitors would continue as a result of administrative mule traffic on the South Kaibab trail.

■ Conclusion

This alternative would promote preservation and restoration of park property and resources, but would have significant negative effects on par operations. The separation of divisions and their relocation to areas outside of park boundaries would contribute to a number of operational inefficiencies and would require new methods of operation to be developed to compensate for physical separation between park units and related functions. This alternative would also have a significant fiscal impact in the required new construction of many new facilities outside of park boundaries, not only requiring the costs of new construction but new costs in utility extensions, employee transit, and time spent commuting between operations and the park.

■ Cumulative Effects

This alternative would have the highest cost of all alternatives related to new construction for management support facilities. This alternative would also have the greatest impact to areas just outside park boundaries, requiring new construction of many facilities on forest service or land trade areas. The benefits to the park would be a significant reduction in the built environment inside of park boundaries, removing many substandard or inefficient facilities and replacing them with new, efficient, facilities outside the park.

The establishment of a park carrying capacity for visitation on the North Rim and Tuweep would place a limit on the number of management support facilities required to support that visitation in those areas. With the limits on visitation there, long-term expansion of support facilities would be minimal or eliminated since facilities would eventually be sized to service a fixed number of peak visitors.

UTILITIES

■ Water Supply

Water conservation and use of reclaimed water would be maximized under this alternative (the same as alternative 2). The extension of water- and sewerlines would be minimized.

Regional Communities: Regional information centers in Flagstaff, Williams, Cameron, and Jacob Lake would require NPS staff to reside in these areas, with water needs provided by local community systems (the same as alternative 1).

South Rim: This alternative considers maximization of water conservation for existing and new facilities throughout the South Rim and minimizing the number of line extensions. Removing several visitor lodging facilities and providing NPS administrative and staging facilities outside the park would reduce park potable water consumption. New housing, increased visitation, and added restrooms would increase water use. The calculated reduction in water use is based on maximizing water conservation in new facilities only. Additional water saving could be observed with conversion of existing facilities.

Waterline extensions would not be provided to the staging area or administration center in Tusayan, which would be serviced by Tusayan utilities. Waterline extension to the staging area outside of Desert View would be provided.

An adequate supply of potable water is available to meet the demands of the proposed changes. Potable water use would increase approximately 10%, and the Indian Garden

pump station is capable of delivering enough water while pumping 17 hours per day during peak usage months. This is slightly less than under alternative 1 or 2 because potable water usage would decrease with a concentrated effort to replace all existing plumbing devices with low-flow fixtures. The water savings is dependent on the level of replacement and would be studied separately.

Reclaimed water use inside the park could increase by 10 million gallons per year with maximum utilization of the reclaimed water system in place. Dual plumbing systems must be provided in new facilities.

No additional water storage would be required to meet the projected 2010 demands while supplying adequate fire protection and emergency storage.

Extending water mains on the South Rim would not be required under this alternative, but additional service taps would be required. Main waterline extension would be needed to the Desert View staging area outside of the park on USFS land. Approximately 3 to 5 miles of line would be required and would be constructed in as much disturbed land as possible.

North Rim: Replacing substandard housing and constructing new units, increased visitation, and building a new maintenance facility are the primary contributing factors to increased water usage. Water conservation would be maximized while minimizing line extensions. New housing and conversion of facilities to visitor lodging are planned to occur in disturbed areas, where water service is available (the same as alternative 2). Consideration of a line extension to the Jacob Lake orientation center would not be considered.

Reclaimed water mains are available in the North Rim development; however, dual plumbing facilities must be provided in each building.

Approximately a 30% increase in potable water consumption would occur with the proposed changes (the same as alternative 2). Additional water storage would not be required. Main waterline extension would not be required, but service taps would require reconfiguration. Dual plumbing fixtures would be required in all new facilities to utilize the reclaimed water for toilet flush. The Jacob Lake orientation center would acquire water service from the USFS facilities.

Corridor Trails: A reduction in Phantom Ranch lodging and campsites and the conversion to composting toilets would reduce the amount of water usage by 1.2 million gallons per year.

Conclusion: On the South Rim the potable water is adequate to meet the demands under this alternative. Potable water use would increase approximately 10%, and the Indian Garden pump station is capable of delivering enough water while pumping 17 hours per day during peak months, slightly less than under alternative 1 or 2 because potable water usage would decrease with a concentrated effort to replace all existing plumbing devices with low-flow fixtures. No additional water storage would be required. Water supply is adequate on the North Rim, and no additional storage would be required.

■ Wastewater

Regional Communities: Wastewater treatment needs created by NPS staff in Flagstaff, Williams, Cameron, and Jacob Lake would be met by the local community systems.

South Rim: Wastewater treatment would only be provided for facilities within the park. Projected water usage (excluding retrofitting of low-flow plumbing fixtures in existing facilities) through the planning period is estimated to increase by 15% over 1992 documented use. Sewer main extension would be minimized

Locating facilities outside the park would significantly reduce the impacts to the South Rim and Desert View wastewater systems. The South Rim wastewater treatment facilities would have adequate capacity to meet projected 2010 year flows and would operate 15% below capacity during peak visitation months.

Minimal sewerline extensions would be required. Sewer taps must be reconfigured for the new housing and conversions of employee housing to visitor lodging.

Facilities outside of the park, such as housing and the Tusayan orientation center, would connect to local community wastewater treatment systems (the same as alternative 2).

Removing minimal park housing from Desert View and relocating the orientation center outside park boundaries would provide the existing overtaxed Desert View lagoons some relief. However, only a reduction of 1,500 gallons per day might be observed, leaving the lagoons marginally operating at capacity. Once design details were defined for the proposed plans, the lagoon sizes should be reevaluated to determine actual impact.

New wastewater treatment facilities must be required for the housing and orientation center outside of the park near Desert View. The most feasible system would be determined under a separate study. However, 2 to 3 acres of land could be disturbed if a lagoon system was constructed.

North Rim: Increased potable and reclaimed water use would increase the amount of wastewater requiring treatment. Sewerline extensions would be kept to a minimum. Only facilities located within the park boundary would be serviced by the North Rim wastewater treatment plant.

The wastewater treatment plant would require expansion (the same as alternative 1) to meet the projected flows through the planning period. An additional 30,000 gpd of capacity during peak months is required. Approximately 1 additional acre of land would be impacted for plant expansion (the same as alternative 1).

Sewerline extensions must be provided to the new maintenance shop and sewer taps reconfigured for the new housing.

Corridor Trails: Similar to alternative 2, reduced lodging, removal of campsites, and conversion of water toilets to composting toilets would reduce the amount of wastewater requiring treatment at Phantom Ranch by 1.1 million gallons per year. A reduction in lodging would further reduce the amount of wastewater generated over that identified in alternative 2.

Conclusion: Locating facilities outside the park would significantly reduce the impacts to the South Rim and Desert View wastewater systems. The South Rim wastewater treatment facilities would have adequate capacity to meet projected 2010 year flows and would operate 15% below capacity during peak visitation months. Desert View facilities would operate at capacity but would not need expansion. The North Rim wastewater treatment plant would require expansion to treat an additional 30,000 gpd of capacity during peak months, resulting in approximately 1 additional acre of land being impacted for plant expansion (the same as alternative 1). Water treatment would be reduced at Phantom Ranch.

■ Power Supply

South Rim: Major impacts to power on the South Rim and at Desert view would result from new housing, reduced visitor lodging, and visitor staging areas. Several new facilities such as housing, staging areas, and administrative complexes would be constructed in outlying communities. Electrical buses would be used for visitor and employee transportation.

The net impact of increased power consumption within the park is not significant. Minor secondary line extension would be required to provide power service to new facilities in the park.

Power supply for facilities planned in outlying communities would be provided by the community.

North Rim: New housing, visitor lodging, and a new maintenance facility would be constructed, increasing power consumption.

Adequate power supply is available to service the new facilities. Only minor extension of secondary power would be required to service the new facilities.

Conclusion: Adequate power supply is available on the North and South Rims to service new park facilities.

■ Telephone Service

Similar to alternative 2 the Park Service would work with land managers, agencies, and communities to provide visitor information before they arrived at the park, including regional information communication centers and lodging reservations.

Park jobs which have limited indirect relationship to park visitor or resources would be relocated to urban areas where office space is available. Most new housing for remaining employees would be provided outside the park. These changes would have a significant positive impact to the phone system on both the North and South Rims.

Significant reduction in phone calls to the South Rim, Desert View, and North Rim would be observed with the removal of the GCNPL reservation system and relocating jobs outside the park. Minor line extension would be required to provide phone service to the new and rehabilitated facilities.

Impacts on Natural Resources

In addition to "Impacts Common to All Alternatives," alternative 4 would have the following effects:

Regional Effects

■ **Species of Special Management Concern**

Outside the South Rim: Designating USFS Road 302/307 as Arizona Highway 64, widening the roads, and paving them could affect known populations of several species listed in table 9 that occur close to existing roadsides. A substantial increase in human presence and noise in this area could displace or affect reproduction in animals or result in trampling or other physical impacts on plants. Dust raised during construction would reduce productivity in plants, and construction activities would remove vegetation and compact soils within the road corridor, depending on where construction vehicles and workers drove and parked, and exactly where road construction activities took place. The impacts of this road improvement would be analyzed in a separate environmental compliance document after site-specific design.

The general area near the airport considered for the gateway information center and the federal housing area also contains species listed for outside the park in table 9. While facilities would be located to avoid any direct effect on known populations, more human presence in the area could result in increased indirect impacts to the species (e.g., trampling) and in the loss of potential habitat. The impacts of these facilities would be analyzed in a separate environmental compliance document after site-specific design.

Outside the North Rim: Species near USFS roads that lead to Indian Hollow, Monument Point, and Fire Point could be affected by increased traffic. Impacts would include dust and possible displacement of wildlife (the same as alternative 2).

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Outside the South Rim: Paving and maintaining USFS Road 302/307 for year-round use as Arizona Highway 64 would require extensive widening, and probable rerouting and road cuts. Extensive vegetation and soil disturbance would occur. Also, road cuts could unearth or destroy paleontological resources, and any required blasting could also affect subsurface cave resources. The new highway would become much more of a barrier to wildlife movement, and road kills of deer and elk could be expected. More people in this area would greatly increase impacts on wildlife, including displacement. Paving and formalizing a Grandview entrance to the park would have similar impacts.

The gateway information center and federal housing area in Tusayan near the airport would have similar impacts to the similar facilities in alternative 2 north of Tusayan.

Outside the North Rim: Actions and impacts would be similar to alternative 2, except because there would be no day use limits in the park, there could be less pressure for use of the forest north of the park. Also, posting information signs along the three access roads to Tuweep could disturb limited amounts of vegetation, and any required road widening for pullouts would increase the extent of these impacts.

■ **Water Resources**

Impacts outside the North and South Rims would be the same as alternative 2.

■ **Air Quality**

Impacts outside the North and South Rims would be the same as alternative 2.

■ **Natural Quiet and Solitude**

Impacts outside the North and South Rims would be the same as alternative 2.

■ **Visual Resources**

Impacts outside the North and South Rims would be the same as alternative 2.

Parkwide Effects

■ **Species of Special Management Concern**

Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Impacts would be the same as alternative 2 except that positions and housing would not be moved further away from the park than Tusayan, so the impacts of residents and housing would be greater in this alternative than any other, with more interactions between humans and the natural environment, increased water consumption and sewage, and more land area devoted to housing.

■ **Water Resources**

Impacts would be the same as alternative 2 except that increasing overnight lodging units and employee housing adjacent to the park would increase water consumption and sewage, which could indirectly impact park water resources. Also, programs to cut per capita water consumption would not be instituted to the extent of alternative 2, so additional pumping and water storage would be needed, but not additional withdrawals.

■ **Air Quality**

Air pollution would increase locally due to the lack of vehicle limits and limited use of transit on the South Rim and North Rim. Lodging and/or campsites would also increase in all areas except the Corridor trails, with increased smoke from campfires and pollution from supporting more people overnight. Localized pollution problems in parking lots and along roadsides would continue to occur despite emissions restrictions on commercial vehicles, due to increased visitors and vehicles.

These adverse effects would be offset by employee shuttles, mail delivery, encouraging use of clean fuels, requiring buses to turn off engines, expanded bicycle and trail systems, and wood burning stove and fireplace requirements the same as alternative 2. The net effect is expected to be higher amounts of some types of pollutants and lower amounts of others compared to today.

■ **Natural Quiet and Solitude**

Impacts would be the same as alternative 2 except increasing the number of vehicles, lodging units, and campsites, along with continued parking on the rim, would increase impacts on natural quiet and solitude compared to alternative 2.

■ **Visual Resources**

Impacts would be the same as alternative 2 except a large number of vehicles would continue to dominate the landscape in many areas, although vehicle impacts in transit-only areas of Grand Canyon Village would be reduced.

South Rim

■ **Species of Special Management Concern**

Actions and impacts would generally be the same as alternative 2, although increased visitors, vehicles, lodging and camping could indirectly result in increased impacts to the species listed in table 9 compared to alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Allowing nonsustaining landscaping in the park to provide shade, seating on grass, and other landscape elements for visitor comfort would perpetuate nonnatural ecosystems. Nonnative plant species could spread and compete with native species, thus compromising the integrity of natural systems.

Developing and implementing a coordinated program for vista clearing and actively maintaining overlooks for resource protection and scenic quality would have the same beneficial effects described for alternative 2.

Expanding South Rim water storage and distribution systems would require trenching and other impacts which would be evaluated in site-specific environmental compliance after design.

West Rim Drive: Constructing a road from the Abyss to Rowe Well Road to create a transit loop would disturb soils and vegetation and become a barrier to wildlife, depending on traffic and design. Site-specific environmental compliance would be required.

Removing the parking areas and overlooks Maricopa Point and Hopi Point would allow semi-natural habitat to be restored in these areas the same as alternative 2.

Removing hazardous materials from the Orphan Mine site would require replacing soil and revegetating the area, which would

help restore semi-natural habitat and protect people and wildlife from radioactive materials.

Grand Canyon Village / Mather Point: The Mather Point orientation/transit facility and its large parking lot complex will impact acreages shown in table 3, having the greatest impacts on that part of the park of any alternative. In addition to its impacts on soils and vegetation, trenching for new facilities at Mather Point and for water system expansion, could dig up or destroy fossil resources. Blasting could also impact subsurface cave resources or cause landslides.

Increasing overnight lodging at Yavapai Lodge, converting employee dorms to lodging, and removing employee trailers from visitor RV sites in the trailer village would all be accomplished in existing disturbed areas with no additional disturbance to vegetation or soils. However, these actions would increase human presence in the developed areas, especially at night, with potential effects on nocturnal wildlife species.

Up to 10 acres of vegetation and soils would be newly disturbed as a result of moving the park's main helibase to an undisturbed area next to the current dry dump location.

Adding a road to link the housing area and the business center, constructing a road to link Maswik Lodge and Center Road, developing a bicycle/pedestrian path system from Hermits Rest to Desert View, converting the trailer village to only visitor RV use, and providing overnight visitor parking and access would be the same as alternative 2.

East Rim: Moving the mule facilities to the South Kaibab trailhead would result in little or no additional vegetation and soil disturbance, since they would be located in a previously disturbed area.

The ecosystem along much of the East Rim Drive would be significantly altered by adding an entrance station near Grandview Point and upgrading the road into the park in the Grandview area, by more than doubling the parking area near Grandview Point, and by adding parking at other East Rim overlooks and the Tusayan museum to meet demand. Impacts from such actions are discussed in general terms in "Impacts Common to All Alternatives."

Constructing an American Indian cultural center at the Tusayan museum would disturb soils and vegetation with acreages shown in table 3. Any trenching for utilities could affect fossil resources. Blasting could also impact subsurface cave resources or cause landslides.

Constructing a trail along the East Rim for day mule rides would have impacts as described under "Impacts Common to All Alternatives." In the Grandview/ Sinking Ship area, developing a trail system along the rim would require site-specific environmental compliance after careful design to avoid sensitive areas.

Desert View: Constructing a new road alignment at Desert View, moving and upgrading the entrance station, and constructing an orientation center would be the same as alternative 2. Similar, but slightly more impacting than alternative 2, would be providing a one-way loop road into Desert View, constructing approximately 75 housing units, expanding the campground, and constructing the new parking area with acreages shown in table 3. However, removing most of the existing parking lot would restore semi-natural habitat. The net change would be slightly more impacted area than in alternative 2.

■ **Water Resources**

The effects would be the same as the parkwide effects and the impacts for alternative 2, except there would be additional water storage and additional pumping from Indian Garden. Also, there would be no mule impacts to Bright Angel Wash.

■ **Air Quality**

The impacts would be the same as alternative 2 except that vehicle emissions would be greater because most of the South Rim would be oriented to private vehicles. Despite the availability of alternative transit modes and employee shuttles, overall vehicle emissions would increase causing localized pollution concerns, especially in the Mather Point area. However, vehicle emissions would still be a minor source of pollutants compared to long-distance transport from major industrial centers.

■ **Natural Quiet and Solitude**

Effects would be the same as alternative 2, except that increasing the number of overnight lodging units, campsites, and employee housing units would increase noise levels and reduce opportunities for solitude. Also, this alternative would have more vehicles and more parking lots than any other alternative, re sulting in more vehicular noise.

■ **Visual Resources**

The effects would be the same as alternative 2 except that more overnight lodging units, campsites, and employee housing units would increase light sources, which could affect night sky viewing.

The presence of more vehicles, parking lots, and lodging units in the park would detract more from views of park resources and other landscape components under this alternative than under any other alternative. Allowing non-historic buildings (such as Thunderbird and Kachina Lodges) to remain in historic areas, and continuing non-historic uses in national landmark buildings (including the Desert View Watchtower, Hermits Rest, and Lookout Studio) would also detract from visual settings and landscapes compared to alternative 2.

NORTH RIM

■ **Species of Special Management Concern**

Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**

Walhalla Plateau and North Entrance: The road on Walhalla Plateau would need to be widened in several areas to accommodate all sizes of vehicles; the extent of impacts would depend on designs which would be evaluated in site-specific environmental compliance. Not restricting numbers of day visitors or vehicles would cause the paved roads to be more congested over the life of this plan and create more of a barrier to wildlife. Parking areas on Walhalla Plateau would be sized to meet demand and would probably increase in size over the life of this plan, with impacts as generally described in "Impacts Common to All Alternatives."

Constructing bicycle and pedestrian trails throughout the area, and constructing the transit maintenance center at Lindbergh Hill would be the same as alternative 2.

Adding a museum at Point Imperial would require site-specific environmental compliance after design before the amount of impact could be adequately evaluated.

Bright Angel Point: Approximately 265 additional housing units would be built, where possible, in existing disturbed areas, however impacts may occur in the acreage shown in table 3. Any required trenching or blasting could also affect paleontological and/or cave resources. Increasing the campground by 50 sites would disturb the acreage shown in table 3. Converting employee housing to lodging units is the same as alternative 2. Constructing an additional 100 lodging units and a new restaurant in the inn area would disturb little or no ground not already disturbed by the frame cabins and laundry/showers building. In combination with no limits on day visitation, all this would increase human presence in the area, causing greater interaction of humans with wildlife and increased trash.

Removing and replacing the laundry/shower facility within an already disturbed area of the campground would be the same as alternative 2. Retaining the gas station would have no additional impacts the same as the no-action alternative. Providing winter huts in existing parking ares would have no impacts the same as alternative 2.

Removing the North Kaibab trailhead parking lot and replacing it with a new parking area and access road on CC Hill would be the same as alternative 2. Road cuts and blasting could affect fossil and subsurface cave resources. Adding food service at CC Hill would generate more trash and probably attract animals that scavenge on human food.

Adding a new access road and parking lot by the existing ballfield would disturb soils and vegetation with acreage shown in table 3, and could disrupt wildlife movement. Although this area is already somewhat disturbed, paving would increase runoff and soil compaction and create much more of a barrier and permanent impact.

Constructing a new NPS maintenance building, a new ranger/ emergency operations building, and a helipad in previously disturbed areas would minimize new impacts on soils and vegetation the same as alternative 2.

■ **Water Resources**

Impacts would be the same as alternative 2 except more employee housing, visitor lodging and campsites under this alternative would increase water consumption, runoff, and sewage treatment needs.

■ **Air Quality**
Providing an employee and public transit service on Bright Angel Point would reduce the number of vehicles and resulting pollution in that area, which would reduce localized pollution concerns. This would also help reduce some congestion in parking lots and resulting pollution from idling vehicles. However, the lack of day use limits would probably offset any gains made by these actions as visitation and vehicles increased.

■ **Natural Quiet and Solitude**
More day and overnight visitors, and more employee housing, visitor lodging and campsites, would increase human noise and decrease opportunities for solitude more under this alternative than any other alternative.

■ **Visual Resources**
The same as alternative 2, except that, because there would be more vehicles and parking areas in the park than under any of the other alternatives, there would be more impacts on views of park resources and other landscape components.

Tuweep

■ **Species of Special Management Concern**
Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**
Impacts would be the same as alternative 2, except that adding four sites in the campground and allowing parking to continue on Toroweap overlook would disturb additional resources.

■ **Water Resources**
Impacts would be the same as the no-action alternative..

■ **Air Quality**
Impacts would be the same as alternative 2.

■ **Natural Quiet and Solitude**
Increased numbers of people camping overnight would decrease opportunities for solitude.

■ **Visual Resources**
Moving the campsites from the overlook to the campground would improve the visual aspects of the overlook, but increasing the size of the overlook parking lot to 25 vehicles could offset any such effect, depending on the site design. Adding campsites could increase the visibility of the campground to visitors from the road.
Rehabilitating irrigation structures across the valley from the ranger would improve the natural character of the view.

Corridor Trails

■ **Species of Special Management Concern**
Impacts would be the same as alternative 2.

■ **Geologic Resources, Soils, Vegetation, and Wildlife**
Allowing unlimited hiker use could cause increases in trash and human waste, and in trail widening and erosion (but very small compared to stock use impacts). Adding new loop trails for hikers branching off the Bright Angel and South Kaibab Trails would disturb vegetation and soils, and introduce hikers into new areas which could disrupt wildlife movement and introduce trash and human waste in these areas. More hikers on the Hermit and Grandview trails would increase impacts along those trails.
Impacts of stock use on the South Kaibab and Bright Angel Trails would be the same as the no-action alternative. Adding mule rides on the South Rim and pack mules to carry visitor packs into and out of the canyon would increase these impacts as discussed under "Impacts Common to All Alternatives."
Trail maintenance and hardening, would have the same impacts as described for alternative 2, including a reduced need for borrow material and less dust and erosion along the trails.
On the North Rim, moving concession mule use from the North Kaibab Trail to the Six Rock Meadow and the upper section of the Old Bright Angel Trail, and constructing new loop trails and a rim trail, would require significant trail-building impacts as discussed under "Impacts Common to All Alternatives." Adding mules to the Six Rock Meadow Trail, Old Bright Angel Trail, and part of the Ken Patrick Trail would greatly increase related impacts along those trails and would also introduce mules into a part of the North Rim environment where they have rarely if ever been. Without mitigating measures, the Old Bright Angel and Six Rock Meadow Trails could over time become heavily eroded and dusty, like the present North Kaibab Trail, with more mule waste than on either of the South Rim trails.
Developing a parking/corral/staging area and trail at Six Rock Meadow would disturb the acreage shown in table 3, with stock impacts as discussed in "Impacts Common to All Alternatives."Because the meadow may be a wetland, special care would need to be taken to ensure that wetland impacts do not occur as discussed below under "Water Resources." The North Rim concession mule barn would remain the same as the no-action alternative.
Removing concession mules from the North Kaibab, Uncle Jim and part of the Ken Patrick Trails would reduce trail erosion and other stock use effects in those areas. Because mule-related impacts on former mule trails could be evident for quite some time, the overall effect of moving stock use to new areas would be to increase the net area impacted by mules on the north side of the river.
The impacts of adding a concession mule trail along the South Rim east of the South Kaibab trailhead were previously discussed under the South Rim.
Adding a small amphitheater at Indian Garden would have minimal impacts the same as alternative 2. Existing impacts from visitor use at Phantom Ranch would remain the same as the no-action alternative.

■ **Water Resources**
Impacts would be the same as alternative 2, except that mule waste at the Six Rock Meadow corral/staging area on the North Rim could affect water resources. The meadow may be a wetland, with additional requirements for site-specific environmental assessment that would be necessary before the corral and trail could be constructed. Any adverse effect could be successfully mitigated by such actions as daily cleanup and berms controlling runoff. Consistent with NPS policy, no facilities or significant disturbance would be allowed in wetlands unless there is no practical alternative, and there would be alternatives here.
Moving concession mules from the North Kaibab Trail to the Old Bright Angel Trail would add mule waste to the water resources in Bright Angel Creek, while eliminating it in Roaring Springs Canyon except for private stock use. Stock would also continue to cross and contaminate Garden Creek.

■ **Air Quality**
Changes in mule use would decrease dust along the North Kaibab Trail, but increase it on the Old Bright Angel Trail.

■ **Natural Quiet and Solitude**
Allowing unlimited hiker use would increase visitor noise along the trails, and decrease opportunities for solitude. The Old Bright Angel Trail and Six Rock Meadow Trail would change from seldom used trails to major trails with evidence of people and mules very much in evidence, decreasing solitude in this part of the park..

■ **Visual Resources**
The Old Bright Angel Trail and Six Rock Meadow Trail would change from barely visible to major trails with substantial impacts visible from long distances. In contrast, the North Kaibab, Ken Patrick and Uncle Jim Trails would look less impacted over time as they recovered from dust, erosion and other stock use impacts.

Conclusion

Alternative 4 would have greater impacts on park natural resources than any other alternative. Alternative 4 would result in more housing and facilities inside park boundaries, more day and overnight visitors, more vehicles and parking, more water consumption and sewage, more stock use and new stock trails, and more trenching for utilities and infrastructure. All of these actions would result in more impacts to vegetation and soils, geologic resources, water resources, and air quality than any other alternative.
In addition, alternative 4 would have more potential to impact species of special management concern than any other alternative, primarily due to paving USFS Road 302/307, in addition to constructing a new Grandview entrance and gateway information center near the airport. Alternative 4 would also allow nonnative plants to be used in landscaping, with potential adverse effects on native ecosystems.

Cumulative Effects

Upgrading USFS Road 302/307 to be Arizona Highway 64, constructing a gateway information center near the airport in Tusayan, and providing a new Grandview entrance to the park would all occur in or near known locations for sensitive plant and animal species. In addition, the Forest Service land trade and railroad spur projects, which would be evaluated in separate planning and environmental documents, also occur in or near known locations for many of the

same species. Site-specific design considerations and increased human presence in these areas could result in impacts to some populations of these sensitive species. The cumulative effect of all this development in the area, regardless of whether any single project had direct impacts on known populations, could adversely affect on one or more of these species.

This alternative would have the greatest potential of any alternative to increase development both inside and outside the park, with the greatest potential effects on regional ecosystems.

The emphasis on private vehicles, the lack of day use limits, and increased lodging and camping would have the greatest impacts of all the alternatives on local water resources, air quality, natural quiet and solitude, visual resources.

Impacts on Cultural Resources

Archeological Resources and Traditional Cultural Properties

■ Parkwide Effects

The overall effects of this alternative would be much the same as in alternative 2 as a result of the planned ethnographic surveys and phased comprehensive inventory, research, and monitoring program. Increased visitation throughout the park and numerous new facilities, some in undisturbed areas, could result in direct impacts to more archeological sites and traditional cultural properties, but these would be partially ameliorated by being able to place the resources within a broader research and preservation context. In particular, there would be greater direct effects to archeological sites on the East Rim and Walhalla Plateau.

■ South Rim

The effects of this alternative on archeological resources along the South Rim would be the same as in alternative 2 with the following additions.

Constructing a loop road from the Abyss to Rowe Road, and adding a mule trail on the East Rim from the South Kaibab trailhead has the potential to affect an undetermined number of archeological sites and traditional cultural properties, although every effort would be made to avoid sites during design phases.

The construction of a new American Indian cultural center at the Tusayan ruins could affect nearby archeological sites. Active archeological excavations in the area would provide a means to educate visitors about the need to be sensitive to archeological resources. The excavation of archeological sites could affect sacred values held by the Hopi.

Additional parking along the East Rim Drive and a bike path could affect at least 38 known archeological sites, and an unknown number of sites in sections that have not been surveyed. Every effort would be made to route the bicycle path and parking lots away from sites, but due to the density of parking, avoidance would not always be possible.

Proposed trails in the vicinity of Grandview Point along the South Rim to the Coconino Rim would have the potential to affect an area of known significance to the Havasupai people. A new mule trail along the east rim could affect an unknown number of traditional cultural properties.

Widening and paving USFS 302/307 and upgrading the Grandview entry road would impact at least 37 archeological sites. Mitigating measures would be developed in consultation with the state historic preservation officer and the advisory council on historic preservation.

At Desert View the effects on archeological resources would be the same as in alternative 2, except expanded parking beyond the existing concessioner housing area could affect an unknown number of sites.

■ North Rim

The effects on archeological resources and traditional cultural properties would be much the same as in alternative 2, although with no limit on visitation, more people could cause indirect effects to unknown properties. In addition, there would be potential for greater impacts to an unknown number of archeological sites on CC Hill. No archeological or ethnographic surveys have been conducted at Point Imperial, so it is not possible to assess the effects of a museum at that location. Shoulder widening on Cape Royal Road likewise could affect an unknown number of sites and properties.

There have been no archeological or ethnographic surveys of the Six Rock Meadows area where a mule facility is proposed, so it is not possible to assess the potential effects of a covered mule facility and corral in that area.

■ Tuweep

The effects on archeological resources and traditional cultural properties would be the same as in alternative 2.

■ Corridor Trails

The effects on archeological resources and traditional cultural properties would be the same as in alternative 2, with the addition of potential effects to an unknown number of sites and properties from upgrading the Old Bright Angel Trail and building a new trail off the South Kaibab Trail.

■ Conclusion

Overall, impacts to archeological sites and traditional cultural properties would be greater than under alternative 2. Three archeological sites would be destroyed by the Mather Point orientation/transportation center. As many as 78 known sites and an undetermined number of unknown sites in areas that have not been surveyed could be affected, although every effort would be made to avoid them during design phases of the project.

■ Cumulative Effects

The cumulative effects of alternative 4 on archeological sites and traditional cultural properties would be similar to those in alternative 2, although they would be greater due to more extensive visitation, housing and facilities and paving USFS 302/307.

Historic Structures and Landscapes

■ South Rim

Because of a new entry spur road at Grandview, the integrity of the USFS Hull Cabin and the NPS entry station would be threatened.

As demonstrated below, alternative 4 presents a number of changes that facilitate public use, especially through automobile access. Along the South Rim there are numerous additions to facilities, including a series of parking lots at Mather Point and at overlooks along East Rim Drive and Desert View, new access roads to the Mather Point center and a loop road from the Abyss to Rowe Road and Hermits Rest, additional camping at Grand Canyon Village, new biking and pedestrian trails along the South Rim, and cluster housing developed for employees.

Nonhistoric landscapes within the Grand Canyon Village Historic District would reflect changes under this alternative. Nonhistoric structures would remain in place, such as the Kachina and Thunderbird Lodges, although the facades would be altered so they blend better with nearby structures. Leaving these and other noncontributing structures would be a negative effect. The powerhouse area and the present NPS maintenance area would be the same as alternative 2. Guidelines for rehabilitation of structures and treatment of historic landscapes would be fully utilized.

The Tusayan museum changes include building a new American Indian cultural center and expanding outdoor interpretation, including new archeological investigations. Under federal preservation laws and management policies, these changes would constitute an adverse effect. Historic landscape changes would compromise the integrity of the museum and surrounding resources.

At Desert View additional camping and ranger facilities would be enlarged, as would maintenance facilities for the Park Service and Grand Canyon National Park Lodges. Existing sales spaces at all the structures making up the Mary Jane Colter National Historic Landmark would also continue, an adverse effect.

■ North Rim

Rehabilitating four to six frame cabins and removing the remaining frame cabins in the Grand Canyon Inn (North Rim Inn) and Campground Historic District would constitute an adverse effect. The building of 100 new lodging units, a restaurant, and 50 new campsites would severely alter the character of a historic landscape. Mitigation measures under federal preservation law and management policies are required to document the historic resources destroyed by this alternative.

Another North Rim area, the North Rim Headquarters Historic District, would be adversely affected by adding a new ranger building, a maintenance building, and additional cluster housing. The historic landscape would be changed and careful adherence would need to be made to *The Secretary of the Interior's Guidelines for the Treatment of Historic Landscapes.*

■ **Tuweep**

The Tuweep ranger station should be evaluated to determine its eligibility for listing in the National Register of Historic Places. If the station was determined to be eligible for listing, its rehabilitation and expansion of its water system could constitute an adverse effect. Historic preservation law and NPS management policies would direct the rehabilitation of the complex. A change of the rim landscape would occur with the expansion of the parking lot at the Toroweap overlook. The result could have a potential effect on the historic and ethnographic resources.

■ **Corridor Trails**

For alternative 4 mule traffic on the corridor trails would continue at present levels on the South Rim, while on the North Rim mule numbers would remain the same, although use would be moved to the old Bright Angel Trail. Trail maintenance activities using materials from within the corridor would continue to adversely affect trail resources of this historic district. New rim trails would have an impact on the landscape and could potentially affect ethnographic and historic resources.

Historic structures at Indian Garden and the recreation building at Phantom Ranch would be rehabilitated for park operations use. Historic preservation law and management policies would direct this work. Restoring the landscape at Phantom Ranch and relocating the ranger station would be guided by *The Secretary of the Interior's Guidelines for the Treatment of Historic Landscapes.*

■ **Conclusion**

The changes recommended in this alternative encompass expansion of visitor facilities. The development of additional park roads, parking, lodging, camping, and trails under this alternative would expand visitor facilities. Private automobile use would continue to dominate many areas. Adverse effects would result from retaining several non-contributing buildings along the South Rim, including the Kachina and Thunderbird Lodges. Continuing present uses of the three national historic landmark properties designed by Many Jane Colter would also be an adverse effect. Removing all but four to six frame cabins from the Grand Canyon Inn (North Rim Inn) and Campground Historic District would constitute an adverse effect.

■ **Cumulative Effects**

The results of a continued increase in visitation at Grand Canyon National Park would result in short- and long-term impacts to cultural resources. Increased visitation would create a demand for the expansion of parking, overlooks, and other facilities; therefore, development would impact both disturbed and undisturbed lands. The development of facilities in undisturbed areas could require the recovery of historic and ethnographic resources, which could be found in areas of planned development.

Impacts on the Visitor Experience

Regional Information and Services

All impacts on regional information proposals would be the same as alternative 2. Expanding information programs would have the same impacts as alternative 1. Providing additional visitor services in all developed areas of the park would reduce the demand for services outside the park, although some visitors would still need to find accommodations outside the park. Visitors would benefit by being able to get entry passes and limited park information at the center in Tusayan.

Parkwide Effects

Many visitors would continue to experience disappointment at not being able to stay inside the park, but because of advance planning opportunities, they would take advantage of other options available, either just outside the park or in nearby communities such as Flagstaff. Over-crowding would be alleviated due to better distribution of people and better planning of visitor facilities and services. The total number of overnight accommodations would increase, allowing more people to stay in the park. A wider range of room types and rates would be available, varying from hostel-type rooms to luxury rooms, with increases in the economy and mid-range types of rooms. Additional and remodeled food facilities would increase efficiency and capacity, and meal options would be enhanced.

Visitors may experience inconvenience from construction and relocation activities. Although construction and relocation would be scheduled to avoid peak visitation, some impact would be unavoidable because the time of year appropriate for construction is also the main season for visitation.

South Rim

Visitors would use their own vehicles to experience most of the developed park areas. Areas designated for transit service only would be conveniently and regularly served, and hiking and biking trails would be provided. Continued private vehicular access would be convenient for visitors, but it would make many rim areas noisier and less relaxing than under the other alternatives.

The sequence for visitors would be significantly improved, as described for alternative 2.

Visitor services (lodging, camping, food service, gift shops, and restrooms/toilets) would be significantly expanded on the North and South Rims and camping would be expanded at Tuweep. This would allow the most visitors of any alternative to obtain desired services without leaving the park.

■ **Visitor Access and Convenience**

Allowing private vehicular access and parking in most areas of the South Rim, including the entire East Rim Drive, Desert View, and the Mather Point orientation center, would be the most convenient for visitors driving to the park. At the orientation centers public tram service would be provided between the parking area and the center because the scale of development would require visitors to walk some distance. Providing convenient public transit to link all areas from Hermits Rest to Desert View would offer an option for visitors who did not want to drive in the park, allowing them to relax and enjoy the views without having to worry about traffic and parking. Restricting access in the village and on West Rim Drive to transit service only would provide a relaxing, safe, and quieter visitor experience, the same as alternative 2, although some visitors would find this inconvenient.

Developing off-road bike paths, bike/pedestrian only overlooks, and additional rim pedestrian trails would enhance the visitor experience, the same as alternative 2.

■ **Parking**

Parking along the entire South Rim would be increased by 68%, from 3,320 spaces at present to 5,574 spaces. This number of spaces would meet anticipated parking demands in the year 2010, reducing frustration for drivers trying to find parking.

Parking in Grand Canyon Village would increase from 2,686 spaces to 4,657 spaces, the most of any alternative. Along East Rim Drive a total of 558 parking spaces would be provided east of Yaki Point; however, parking could be up to a mile from an overlook in order to avoid affecting resources nearer the rim. At Desert View parking would be increased from 140 spaces at present to 456 spaces, all conveniently located near the rim.

■ **Visitor Services**

Expanded food service facilities would be the same as described for alternative 2. In addition, more gift shops would be provided than under any other alternative because Hermits Rest, Lookout Studio, and the Watchtower would remain gift shops (the same as alternative 1), plus a gift shop in the powerhouse area (the same as alternative 2) and one at Mather Point.

Increasing both lodging and camping accommodations would meet more visitor demand than any other alternative. Lodging units would increase by about 40%, from 920 rooms to 1280. The number of campsites would increase by 27%, from about 480 to 610 sites.

The Mather Point orientation center would provide the same services as described for alternative 2 plus a cafeteria-type restaurant, lodging check-in, a gift shop, and adjacent parking. Concentrating all these services in one area would make it easier for visitors to take care of all their needs with one stop. Because there would be more people and they would be staying longer, the area would be noisier.

The powerhouse area and the business center would provide the same visitor functions and amenities as alternative 2. Closing the village gas station and public garage would have same impacts as described for alternative 2.

At Desert View visitor service would increase. Besides retaining the gift shop in the Watchtower and the camper store, the gift shop and deli would be enlarged to provide adequate space for the increased number of visitors. While visitors would have easy

access to various services, the overlook area would continue to be cluttered by development.

The campground would be enlarged, the same as alternative 2.

■ **Orientation and Interpretation**

With most of the NPS information function located at the Mather Point orientation center, visitors would benefit from having a strong sense of arrival in the park. Many visitors seeking lodging in the park would need to go to the Mather Point center first, then backtrack to get to their rooms, or return to Tusayan if all park lodging was full.

The impacts on information proposals for Desert View would be the same as described for alternative 2.

Locating the American Indian cultural center at Tusayan, instead of in the village as described in alternative 2, would give visitors one primary location to learn about the associations of American Indians with the canyon. Media in an expanded Tusayan museum facility could better present the continuum of Native American associations with Grand Canyon, clearly showing connections between prehistory and the present.

Due to the distance of the Tusayan museum from the village, many visitors might not be willing or able to make the time commitment to visit the facility; consequently, fewer people would benefit from learning more about American Indian associations with the canyon.

Retaining the historic Mary Jane Colter structures as gift shops would mean that visitors could not experience the historic character and uses of these buildings, as proposed in alternatives 2 and 3. Also, there would be no opportunity to use the buildings to present or reinforce elements of the park's interpretive themes. This would be especially true at Desert View, where there is an excellent opportunity to interpret the history of Grand Canyon tourism and its relationships to Native Americans, with the Watchtower being a symbol of one aspect of that association.

As described under alternative 3, restoring the Orphan Mine structures would attract more visitor interest than if the structures were removed and interpreted only through wayside exhibits.

All other impacts on orientation and interpretation proposals for the South Rim would be similar to those described for alternative 2.

NORTH RIM

Visitors would use their own vehicles to experience most of the developed park areas. Areas designated for transit service only would be conveniently and regularly served, and hiking and biking trails would be provided. The focus on private vehicular access would be convenient for visitors, but it would make many rim areas noisier and less relaxing than under the other alternatives.

The sequence for visitors would be significantly improved, as described for alternative 2.

Visitor services (lodging, camping, food service, gift shops, and restrooms/toilets) would be significantly expanded on the North and South Rims and camping would be expanded at Tuweep. This would allow the most visitors of any alternative to obtain desired services without leaving the park.

■ **Visitor Access and Convenience**

Allowing unlimited visitation and all sizes of vehicles would make the North Rim more accessible to visitors, with more people likely to visit this area at any one time on a peak day. This could lead to a loss of the relaxed, uncrowded feeling of the North Rim over the long term. The addition of interpretive and visitor service facilities would help distribute visitors and ensure that certain areas did not become overcrowded.

Visitors would be able to drive near any developed point of interest. In addition, a public transit service would be provided on Bright Angel Point. Since private vehicles would be allowed on Bright Angel Point, the area would probably be more crowded, congested, and noisy than under any other alternative. Visitors with oversized vehicles would be allowed to drive throughout Bright Angel Point and the Walhalla Plateau, and they would be allowed to camp at the North Rim campground, but they would be required to park at CC Hill.

Separated bike/pedestrian trails and rim pedestrian trails would improve the visitor experience, as described for alternative 2.

The sequence of visitor events will be improved the same as alternative 2.

■ **Parking**

Parking on the North Rim would be increased by about 25% to meet anticipated demands. Parking on Bright Angel Point would be increased from 386 to 563; however, parking areas on Walhalla Plateau would be sized to meet anticipated demands in the year 2010, resulting in a net loss of 33 spaces. Because transit use would not be required on Bright Angel Point, an overflow parking area would be developed at the ballfield area on the point instead of on CC Hill; the size of the CC Hill area would be reduced from about 400 parking spaces under alternative 2 to 67 spaces under this alternative. Drivers of oversized vehicles would have to park at CC Hill, but they would be permitted to drive on all North Rim roads.

Overnight visitors could drive to their lodging. Some designated overnight parking would be provided at Grand Canyon Lodge. However, during peak use times, parking at the lodge might not be available until later in the day. In those instances, overnight visitors would have to park at the ballfield parking area until space became available at the lodge.

■ **Visitor Services**

An orientation center on CC Hill would have the same amenities as described for alternative 2, plus a limited food service so visitors wishing to go directly to the Walhalla Plateau or hike away from Bright Angel Point could easily obtain supplies. The CC Hill center would have fewer people at any one time than under alternative 2 because visitors would not have to leave their private vehicles here and use public transit on Bright Angel Point. The contact station on the point would continue to provide visitor information the same as alternative 1.

This alternative would provide more visitor services than any other alternative, and more visitors would be able to remain overnight in the park with the addition of 120 rooms and 50 campsites. Visitors would also have the convenience of a new dining facility in the inn area. The gas station would also be retained as a visitor convenience, the same as alternative 1. Enlarging and redesigning the campground would improve the camping experience and allow more visitors to camp inside the park than any other alternative.

■ **Orientation and Interpretation**

All impacts on information proposals for the North Rim would be the same as alternative 2.

The development of a self-sustaining museum at Point Imperial would benefit visitors by providing more in-depth interpretation of themes relating to the canyon and Walhalla Plateau. Visitors would be encouraged to explore sites along the plateau related to these themes, resulting in better distribution during the peak summer season.

All other impacts on orientation and interpretation proposals for the North Rim would be the same as for alternative 2.

TUWEEP

■ **Visitor Access and Convenience**

Visitor information, day use restrictions, and campground reservations would be the same as alternative 2. Providing about five additional campsites would allow for about 30 more people in the campground at any one time, which could diminish the quiet, remote feeling of the site.

While visitors would be able to park next to the overlook, this convenience would diminish the quietness and remote feeling at the overlook. Parked cars would be visible from several different areas of the overlook.

Additional trails would improved visitor distribution and provide more access around the Toroweap overlook, the same as alternative 2.

■ **Orientation and Information**

All impacts on information, orientation, and interpretation proposals for Tuweep would be the same as described for alternative 2.

CORRIDOR TRAILS

■ **Visitor Access and Convenience**

The number of hikers on all the main corridor trails would continue to be unrestricted, with congestion likely. Adding a loop trail to the Battleship would help relieve crowded conditions, along with a new pedestrian only trail off the South Kaibab Trail. In addition, encouraging a few more visitors to use the Hermit and Grandview Trails would also help distribute visitor use (the same as alternative 2).

Conflicts between hikers and mule riders would be eliminated on the North Kaibab Trail by moving mules to a different trail, however, mule-riders will have a much longer ride on the rim before actually getting into the canyon, which may frustrate some riders. The addition of a mule trail along the South Rim would provide the most opportu-

nities of any alternative for visitors to take mule rides. However, many visitors would still continue to experience disappointment at not being able to take a mule ride into the canyon because of the need to make reservations well in advance, but they will at least know that it is necessary to call ahead, giving them some options for trip adjustments. The addition of east rim mule rides on the South Rim would allow more visitors an opportunity to view the canyon by mule. Hiker-mule rider conflicts on the North Kaibab Trail will be eliminated by having separate trails, .

Phantom Ranch lodging, camping, food service, and restroom facilities would continue (the same as alternative 1).

■ Orientation and Information

All impacts on information, orientation, and interpretation proposals for the corridor trails would be the same as described for alternative 2.

Conclusions

Visitors would have better access to accurate information about Grand Canyon and other tourist attractions in the area on an international, national, regional, and local level.

Alternative 4 would increase the opportunities for visitors to obtain both gateway and in-park orientation and interpretation of primary themes. Orientation facilities would be located at key points in the visitor experience, and visitors would be well prepared to enjoy the park in an efficient, safe, and environmentally conscientious manner. Interpretive facilities would be resource based and large enough to provide in-depth coverage of key park themes. Both short- and long-term visitors would have opportunities to understand and appreciate park resources and their significance.

However, the anticipated increase in visitation under this alternative would gradually diminish opportunities for solitude. A continued reliance by visitors on private vehicles for access and circulation would intrude on the natural setting in adjacent areas.

Because of the increase in development inside the park, including parking areas and housing, alternative 4 would result in more impacts on natural quiet and solitude, and on natural resources, than any other alternative.

Cumulative Effects

Information facilities and systems would contribute to regional and national efforts to expand public knowledge about the Grand Canyon. Orientation proposals would contribute to regional efforts to disperse tourists throughout the area. Cooperative activities would contribute to regional and national efforts to expand interpretive and educational opportunities for the public. Additional educational resources would be available for regional, national and a large number of international visitors.

This alternative would set a precedent for the continued expansion of visitor facilities at the park in order to provide for visitor convenience. If this trend continued, more and more of the natural qualities of the Grand Canyon would be degraded by increased development and use.

Also, addressing the need for additional food services and more accommodations would have a beneficial cumulative effect on the visitor's experience.

Impacts on the Socio-economic Environment

Alternative 4 would fully accommodate projected increases in visitation to Grand Canyon National Park, and all visitors would be allowed to drive their vehicles into the park. Public transit services would be provided on both the North and South Rims. The area between Yaki Point and Hermits Rest would only be accessible by transit service; therefore, most South Rim visitors would use the transit system to tour at least a major portion of this area. Personal vehicles would remain the primary mode for touring North Rim. The numbers of people visiting the Tuweep area would not be limited.

More construction would be undertaken in the park under alternative 4 than any other alternative. To provide more convenient access, a new park entrance would be established at Grandview, and USFS Road 302/307 would be upgraded to a paved all-weather road to provide year-round access. The new road would be redesignated as Arizona 64, which would provide a continuous travel route outside the park.

Alternative 4 would substantially expand South Rim parking and transit facilities and authorize major improvements to existing park roads. Concession services would be expanded more than any other alternative.

Regional Effects

The economies of northern Arizona and southwestern Utah are expected to benefit from a management alternative that would not limit park visitation. Permanent increases in employment by the Park Service and the transit service would also have positive long-term impacts on area economies. In addition, local and regional economies would experience substantial short-term economic benefits from earnings and purchases associated with $156 million in construction expenditures in the park area.

■ Short-Term Effects

All construction activities would occur in Coconino County. Most park construction jobs would be filled by area residents. Coconino County businesses would also benefit from purchases of building materials, supplies, and services. Construction employment would begin in 1996 and continue through 2002, with peak construction employment from 1997 through 2001.

■ Long-Term Effects

Alternative 4 would allow for maximum growth in jobs and earnings among businesses adjacent to the park catering to Grand Canyon visitors. A negative aspect of growth in the area's tourism economy is that many of the new jobs would be seasonal or part-time, and most would be low paying.

The Coconino County economy would also benefit from increases in NPS and transit service employment. Year-round NPS and transit jobs are expected to provide average or above average earnings, while some seasonal jobs would be low paying.

More overall economic growth would occur in Coconino County than what is predicted by baseline projections. From 1993 to 2010 direct and induced employment attributable to park operations and visitor services would increase by 74% (by 5,148 jobs to 12,071). In 2010 the county's economy would support about 300 more jobs and generate $6.7 million more in personal earnings than predicted by the no-action alternative (see table 56). During the late 1990s and early 2000s, NPS construction projects would cause noteworthy increases in county employment and earnings.

■ Coconino County Population Effects

Alternative 4 would result in slightly more population growth than is predicted by the county's growth projections. From 1993 to 2010 park-related population effects would add 8,750 persons to Coconino County. This alternative is predicted to increase Coconino's 2010 population from 141,353 to 141,694, a net increase of 341 people above the no-action alternative projections. Park-related population effects would account for about 23% of the county's projected growth from 1993 to 2010. Alternative 4 would further increase the demand for public and private services in the Grand Canyon area.

Parkwide Effects

Under alternative 4 nearly 6.9 million visitors are projected by 2010, 58% more visitors than in 1993, the same as the no-action alternative. From 1993 through 2010 a total of 110,983,000 visitors are projected. This alternative would not affect the number of foreign tourists visiting the southwestern United States or the Grand Canyon, nor would it substantially change the number of U.S. residents visiting the Grand Canyon area.

By accommodating all potential visitors, alternative 4 would not limit the amount of money spent in the Grand Canyon area

Table 55: Estimated Construction Employment and Earnings - Alternative 4

	Construction Employment	Direct Earnings
1996	185	$5.1
1997	283	7.5
1998	294	8.1
1999	239	6.6
2000	386	10.2
2001	357	9.2
2002	109	3.0
Total	**1,853 ***	**$ 47.7**

NOTE: Construction employment is presented as full-time equivalent jobs. Earnings are in millions of dollars (1993).

* Total construction employment is in person-years.

by park tourists. In 2010 tourists are predicted to spend $697.6 million during their Grand Canyon visits, 73% greater than in 1993. From 1993 through 2010 Grand Canyon visitors would spend $9.9 billion, the same as the no-action alternative (see table 56).

The transition from auto touring to bus touring inside the park is likely to cause some changes in visitor purchasing patterns. Persons touring the park on buses would be less inclined to carry heavy or bulky items and could be expected to adjust their in-park purchases accordingly. Park concessioners are expected to adapt to changes in consumer behavior. If no charge (or a minimal charge) is made for parking and use of the transit system, visitors would have more disposable income to spend on eating, drinking, lodging, gifts, and personal services. The inconvenience of transporting items on in-park buses could encourage visitors to purchase heavy or bulky items outside the park.

Alternative 4 proposes an estimated $156 million in park area construction expenditures between 1996 and 2002, more than any other alternative. Projects would include construction of a major new road, entryway, parking area, and transit facilities; improvements to existing roads and parking areas; construction of information centers, new commercial buildings, and housing; and demolition, maintenance, rehabilitation, and reconstruction of existing buildings and housing. Approximately $154 million of park improvements would be constructed on the South Rim and $2 million on the North Rim. Approximately $20 million of the South Rim construction would occur in Tusayan. In addition, construction associated with upgrading USFS Road 302/307 would occur outside the park.

From 1996 through 2001 park-related construction activities are predicted to create an average of 265 construction jobs. Construction workers are expected to live outside the park.

By 2010, NPS, transit, and concession employment is predicted to increase the park area population by an average of 970 residents and create demand for about 475 additional housing units.

The effects on concessioners would be similar to alternative 2, with an increase in sales due to the proposed additional rooms and food services. The level and types of concessioner services and facilities would grow somewhat, providing additional income to the concessioners on both rims. Increased and replacement employee housing on the South Rim would be a major expense for the primary concessioner. Project funding for both revenue-producing and non-revenue-producing facilities (housing, maintenance, offices, etc.) would not come from funds appropriated by Congress, but rather from funds provided through concession contract provisions, such as investment requirements and funds set aside by concessioners in capital improvement accounts. Set-aside funds would be based on a percentage of the concessioner's gross receipts to be determined in the concession contracting process. Initial feasibility analyses indicate the proposed visitor facility changes are feasible. Additional, updated feasibility analyses would be conducted prior to the development of specific design proposals, including actions involving support facilities such as employee housing.

SOUTH RIM

Between 1993 and 2010 South Rim visitation is predicted to grow by 2.4 million visitors (+62%), the same as all alternatives except alternative 1. From 1993 through 2002 both the south and east entrance would experience substantial increases in visitor use. The projected opening of the Grandview entrance in 2003 would help disperse visitors within the park.

Once on the South Rim, the majority of visitors are expected to tour the Grand Canyon by transit system. Providing an in-park bus service would not substantially change visitor travel patterns to and from the park. This alternative would still allow through-travel on East Rim Drive.

Alternative 4 would allow local and regional businesses to fully benefit from increases in demand to visit the South Rim of the Grand Canyon. Visitor expenditures would increase by 78%, increasing $258.7 million to 590 million. From 1993 through 2010 park visitors would spend nearly $8.3 billion in Coconino County. These projected expenditures would be the same as all alternatives except alternative 1.

From 1993 through 2010 the total number of jobs attributable to the direct, indirect, and induced effects of South Rim operations and visitor expenditures would increase by 80% to 11,364 full-time equivalent jobs (an increase of 5,043 jobs). In 2010 an estimated 279 more people would be employed than predicted under the no-action alternative. During the same period park-related earnings would increase by $85 million to $192 million, also an 80% increase. Alternative 4 would allow area residents to earn $6 million more in 2010 than is predicted by the no-action alternative. Local economies would be the major beneficiaries of the employment and earnings effects of NPS construction projects on the South Rim, with substantial positive effects.

Under alternative 4 all visitors desiring to make through-park trips on East Rim Drive would be able to do so. USFS Road 302/307, which would be redesignated as Arizona 64, would provide an alternate travel route to northern Arizona and southern Utah. Upgrading USFS 302/307 to a year-round road and developing a new Grandview entrance would not prompt changes in regional travel patterns. It is possible that USFS 302/307 would become a travel corridor from Tusayan to proposed Navajo economic development projects east of the park, thus increasing the likelihood for tourists staying in Tusayan to visit the Navajo cultural center or a gambling casino in the Cameron area. Businesses located on Arizona 64 south and east of the park would experience approximately the same mix and volume of drive-by traffic as predicted in the no-action alternative.

TABLE 56: PROJECTED PARKWIDE VISITATION, EXPENDITURES, AND EMPLOYMENT - ALTERNATIVE 4

	Predicted Visitation (in thousands)	Annual Visitor Expenditures (in millions)
1993	4,355	$402.6
2010	6,865	697.5
Net Change	+ 2,510	+ $294.9
Percentage Change	+ 57.6%	+ 73.2%
Total 1993–2010	100,983	$9,901.4
Compared to No-Action Alternative		
Net Change	0	0
Percentage Change	0	0
Total 1993–2010	0	0
Percentage Change	0	0

	Average Park-Related Jobs			Annual Park-Related Earnings (in millions)		
	Direct	Indirect/Induced	Total	Direct	Indirect/Induced	Total
1993	4,180	2,743	6,923	$ 68.1	$ 49.4	$117.6
2010	7,280	4,791	12,071	118.3	86.4	204.7
Net Change	3,100	2,048	5,148	$ 50.2	$ 37.0	$ 87.1
Percentage Change			+ 74.4%			+ 74.1%
Total 1993–2010			174,777*			$2,989.1
Compared to No-Action Alternative						
Net Change			+ 309			+ 6.7
Percentage Change			+ 2.6%			+ 3.4%
Total 1993–2010			+ 6,747*			+ $152.0
Percentage Change			+ 4.0%			+ 5.3%

NOTE: Park-related jobs and earnings are projected for Coconino County.
* Total employment in person-years.

- **Distribution of Economic and Population Effects**

Alternative 4 proposes more expansion of in-park overnight lodging and other visitor services than the other alternatives. More sales to tourists would occur inside the park than would occur under the other management alternatives. However, proposed expansion of in-park concessions would still be modest in comparison to the market created by projected increases in park visitation. The unmet demand for visitor services would need to be accommodated in communities

outside the park, fostering considerable employment and population growth in these communities. The development of a major parking and transit staging area in the Mather Point area would have minimal effects on travel routes to the park.

Alternative 4 would not affect the volume of drive-by traffic for businesses outside the park, nor would improvements to USFS 302/307 or the development of a Grandview entrance. Because USFS 302/307 intersects Arizona 64 in Tusayan, travelers would have opportunities to stop and shop in Tusayan before exiting the main highway. Improvements to USFS 302/307 would not adversely affect Navajo craft businesses located outside the east entrance to the park. The craft stands are not permanent structures. If the improvement of USFS 302/307 reduced the amount of traffic through the east entrance, the craft stands could be moved to more favorable locations.

The Tusayan economy would benefit from the development of a park information center within the townsite, which would increase the number of tourists stopping in the community. Business and employment growth in Tusayan would be greater than predicted under the no-action alternative; because alternative 4 allows for greater expansion of park concessions, economic growth in Tusayan would be less than under the other alternatives.

Flagstaff, Valle, and Williams would also experience net increases in employment and population as a result of alternative 4. As in Tusayan, Valle and Williams businesses would benefit from increased drive-by traffic. These two economies would also probably undergo population growth as a result of employment increases in the park as well as in Tusayan.

The Flagstaff, Williams, and Valle economies would benefit from general increases in drive-by traffic. Because park concessions would expand under this alternative, these communities would also experience slightly less direct employment and earnings growth in tourism businesses than is predicted under the other alternatives.

Flagstaff would also be the major beneficiary of most of the indirect and secondary economic effects of park-related construction, increased NPS and transit service employment, and the general business and employment growth attributable to tourist expenditures. If Williams and Valle became staging and worker housing areas for South Rim construction projects, these communities would experience notable short-term economic and population growth. residents east of the park would also likely be employed in park-related construction projects.

Economic Effects with the Expansion of Tusayan: The expansion of existing businesses and extensive new business development that would be possible with an enlarged townsite would allow Tusayan to capture much of the unmet demand for goods and services inside the park. Townsite expansion would foster competition for the established Tusayan business district, and it could also slow the growth of tourist-related businesses and employment in other South Rim communities.

The expansion of Tusayan to the south would foster new business development that would be well-positioned to compete with the existing Tusayan businesses. Business development south of the junction of Arizona 64 (south) and USFS 302/307 would not be adversely affected by the diversion of traffic to the Grandview entrance. If Tusayan was expanded to the north, tourists entering the park through the new Grandview entrance would turn onto USFS 302/307 before passing through the commercial area.

One objective for expanding Tusayan is to provide land for housing that would be affordable to Tusayan workers. Such housing development would allow for substantial increases in the number of people living in the town. However, there are no guarantees that townsite expansion would result in substantial new housing development. If housing was not developed, Williams and Valle would likely serve as bedroom communities for Tusayan employees. Other rural subdivisions would also experience population growth.

Economic Effects without the Expansion of Tusayan: Effects would be the same as alternative 3, except that East Rim Drive and USFS 302/307 would allow for through-park traffic, so not expanding Tusayan would probably foster business and employment growth in other communities more than alternative 3.

■ **Communities East of the Park**

By allowing continued through-park travel on East Rim Drive or USFS Road 302/307, alternative 4 would foster business growth development along Arizona 64 and U.S. 89 east of the park. Alternative 4 would contribute to the expansion of Navajo craft businesses along the Arizona 64 corridor. Upgrading USFS 302/307 would also improve the economic viability of a Navajo cultural center or gambling casinos at Cameron or Page.

The development of a Navajo cultural center or a gambling casino near the east entrance to the park could cause more people to enter the park from the east. An increase in tourist expenditures in eastern communities could draw sales away from businesses along the south entrance travel corridors.

North Rim and Tuweep

Alternative 4 would not limit the number of visitors on the North Rim or in the Tuweep area. This alternative would increase NPS and transit service employment, and it would not constrain the overall growth of business sales to North Rim and Tuweep visitors. Alternative 4 proposed some $2 million in construction projects on the North Rim.

From 1993 to 2010 North Rim visitation would grow by an estimated 17% (an increase of 77,000 visitors to 524,000) and Tuweep by 44% (an increase of 4,900 to 16,000). During the 18-year period over 8.7 million people would visit the two park areas, the same as the no-action alternative projection.

In 2010 North Rim and Tuweep visitors are predicted to spend about $37.7 million in Coconino, Mohave, Washington, and Kane Counties, an increase of about 22%. From 1993 through 2010, North Rim and Tuweep visitors are predicted to spend $619 million (the same as the no-action alternative). Providing an in-park public transit service and a new transit staging and parking area at the North Rim are not expected to affect visitor expenditures or regional travel patterns, nor would communities or businesses where tourist expenditures occur be affected. Expanding park concession employment would increase the capacity of park tourist services and would create additional competition for tourist businesses outside the park.

Alternative 4 would cause greater overall employment and earnings growth in the North Rim and Tuweep area communities than predicted under the no-action alternative. Increases in visitor expenditures and additional NPS and transit service employment would positively affect local and regional employment and earnings. Under alternative 4 average annual park-related employment is predicted to increase by 155 jobs (about 26%) to 757 in 2010; this is about 23 more jobs (+3.1%) than under the no-action alternative. Job-related earnings would grow by $2.8 million to $13.2 million (a 27% increase); this alternative would result in $500,000 more in personal earnings than under the no-action alternative (+3.9%).

Alternative 4 would result in increased employment by concessioners and allow in-park businesses to expand their proportional share of the visitor market. Business expansion inside the park would limit business growth in other northern Arizona and southwestern Utah communities. Areas outside the park would still experience net increases in jobs and population attributable to park visitation increases, but growth would be less than if the market share served by park concessioners remained at its current level. Overall growth in park-related employment and earnings would increase the park's indirect and induced earnings and employment effects in Fredonia, Page, Kanab, Cedar City, and Flagstaff. In 1998 the construction of park improvements would have positive short-term economic impacts on these same community economies.

Conclusions

Under alternative 4 an estimated 6,865,000 people are predicted to visit the Grand Canyon in 2010, which is the total demand projected under the no-action alternative. Park visitors would spend $697.5 million in the Grand Canyon region in 2010, also the same as the no-action alternative. Alternative 4 would not limit the growth in employment and earnings by tourist business catering to Grand Canyon visitors. Alternative 4 would also provide for 280 more jobs in NPS and transit service employment than predicted under the no-action alternative.

Alternative 4 would foster greater employment and population growth in the Grand Canyon

region than would the no-action alternative or alternatives 1 and 3, but would allow for slightly less long-term economic and population growth than would occur under alternative 2.

Most economic, population, and land use impacts would occur in Coconino County. From 1993 through 2010 the direct, indirect, and induced economic effects attributable to the park would cause Coconino County's average annual employment to grow by 5,148 jobs and countywide personal earnings to grow by $87.1 million. Total employment and earnings growth would support about 8,746 additional county residents in 2010. Park economic effects would be responsible for 23% of the county's projected population growth between 1993 and 2010. The county economy would provide 309 more jobs and support 532 more people than predicted under the no-action alternative.

Alternative 4 would provide for more substantial construction activities than are provided for under the other alternatives, causing notable short-term increases in area employment and earnings between 1996 and 2002.

Alternative 4 would allow for more expansion of in-park concessions and community services than under any of the other alternatives except no action. However, proposed expansion of in-park concessions would still be modest in comparison to the market created by projected increases park visitation. Communities outside the park would experience considerable new business development. Business and population growth in these communities would burden community infrastructures and services and would add to shortfalls in affordable housing. Additional NPS and transit service employees would also be expected to reside in communities outside the park, contributing to small town economies, but also adding to housing shortages and infrastructure and public service deficiencies.

This alternative addresses the need to increase accommodations to meet more of the current and expected increased growth in park use. It increases the effective use of present concession facilities while adding services for adaptive reuse of historic buildings. Concessioners would benefit from increased visitor services and facilities; however, some of this benefit would be offset by construction of employee housing on the South Rim, as well as some other support facilities.

Cumulative Effects

Effects would be the same as the no-action alternative except that by allowing for the free flow of drive-through traffic between the south and east entrances, this alternative would best facilitate Grand Canyon visitor access to the Navajo economic development projects (the same as the no-action alternative).

Impacts on Transportation, Parking, and Transit

South Rim

■ Access and Circulation

Outside the Park: All vehicles would be allowed to access the park through the south entrance at all times and to drive to a major staging area near Mather Point. The east entrance and East Rim Drive would be open for travel at all times.

A new park access road would be constructed near Grandview on the East Rim and connecting with USFS Road 302/307. The road would be improved and paved, making it an all-weather road. This additional entrance would alter traffic patterns outside the park. It is estimated that traffic on USFS 302/307 would increase by about 1,000 vehicles on a peak day in the year 2010.

Grand Canyon Village: The south entrance road, between the entrance and Mather Point, would continue to serve as the main access route into the park. This route would operate at LOS E in the year 2010; this poor level of service is expected during the peak hours of the day in summer months.

No private vehicles would be allowed on roads in the village or on the south entrance road between Mather Point and Hermits Rest (the same as alternative 2). Center Road is expected to operate at LOS C/D. All other village roads would operate at LOS B or better.

The following new roads would provide more direct access for visitors:

- A new two-lane road between Center Road and the Maswik transportation center would provide direct access for cars and buses carrying overnight guests to their lodging.
- A new road between Mather Point and the business center would serve visitors staying at the campground and Yavapai Lodge.
- A new road between the south entrance road and the Mather Point parking area would provide visitors more direct access to the center and the canyon rim than under alternative 2.
- A new two-lane road between the residential area and the business center would provide direct access for employees and residents to the business center and remove this traffic from roads used for visitor access (the same as alternative 2).

West Rim: A new road would be constructed from the Abyss to the West Rim interchange to create a one-way transit loop on the eastern section of West Rim Drive, offering a shorter option for visitors wanting to see only some of the West Rim overlooks.

East Rim: A new park access road would be constructed near Grandview on the East Rim. It is estimated that 5% of the South Rim traffic (about 440 vehicles/day) would enter at this point.

Visiting the East Rim would remain a vehicle-oriented experience. Private vehicle access would continue at all overlooks except at the South Kaibab trailhead and Yaki Point. The use of these areas would be restricted to public transit and concessioner tour buses only. Parking areas along East Rim Drive would be expanded to meet anticipated parking demands. Roadside parking would not be allowed.

East Rim Drive would be expected to operate at LOS C in the year 2010 under this alternative.

Desert View: East Rim Drive at Desert View would moved back from the rim, and a single access road would be provided into Desert View, as described under alternative 2. These changes would greatly reduce the impacts of drive-through traffic in the Desert View developed area, and traffic volumes on the access road are expected to be well below the capacity of the road. Circulation patterns within the Desert View area would also be improved because the internal loop circulation pattern of the proposed road would allow buses to travel within Desert View without causing traffic congestion.

■ Parking

Outside the Park: A small joint information center and parking area would be provided in Tusayan. The demand for this facility is unknown. Parking for 100 vehicles would initially be provided, requiring 0.75 acre of paved parking area (0.95 acres with landscaping). The parking demand would be reevaluated after the center was open and the lot enlarged if necessary.

The use of other parking areas outside the park would not be affected under this alternative.

Grand Canyon Village: In the year 2010 the demand for parking at the Mather Point staging area is estimated to be 3,262 vehicles (2,936 cars, 203 RVs, and 123 buses).

Parking for overnight guest vehicles would be provided at lodges off the rim (the same as alternative 2). Guests of the Yavapai and Maswik Lodges would park at those lodges; all other overnight lodge guests would park at the Maswik transportation center or the Maswik Lodge. The Maswik transportation center parking area would also be used for loading and unloading tour buses during the day, and short-term bus parking would be allowed at this site. This parking area would not have to be expanded to accommodate this shared use, although the parking area might have to be restriped to improve operational characteristics.

All long-term bus parking would be at the designated bus parking area at the Mather Point staging area.

West Rim: There would be no parking demands on the West Rim. Parking would only be required for a few concession tour buses, and existing parking areas would eventually be downsized and revegetated (the same as alternative 2).

East Rim: There are currently 384 parking spaces on the East Rim, not including those at the South Kaibab trailhead, Yaki Point, Moran Point, and Desert View. An additional 144 parking spaces would be required to meet the projected parking demands in the year 2010 (see table 57). In most cases the additional parking would be provided adjacent to East Rim Drive and not near the rim, requiring visitors to walk to the rim. This would be true at Grandview, the Tusayan museum, and Lipan Point, and possibly other overlooks.

Desert View: A portion of the existing parking area at Desert View would be used for a transit stop and for loading and unloading tour buses (the same as alternative 2). The remainder of the parking would be removed and replaced by a new parking

TABLE 57: EAST RIM PARKING - ALTERNATIVE 4

Area	Existing	Proposed	Additional Required
Pulloff A	66	66	0
Pulloff B	125	125	0
Grandview	45	144	99
Tusayan Museum	70	72	2
Lipan Point	37	80	43
Navajo Point	41	41	0
Total	**384**	**528**	**144**

area on disturbed land adjacent to the lodging area south of the existing parking area. To meet the expected parking demand in the year 2010, parking for 359 vehicles (330 cars, 18 RVs, and 11 buses) would be needed.

■ Transit

No NPS transit would be provided outside the park as part of this alternative.

Grand Canyon Village: The area between Yaki Point and Hermits Rest would only be accessible by year-round public transit, or hiking and biking (the same as alternative 2). The example transit system for the village in alternative 4 includes 40 transit vehicles on 8 routes, whereas the example for alternative 2 includes 41 vehicles on 5 routes. Visitor vehicles would not be allowed on the major transit routes. This separation of the transit vehicles and the visitor/employee vehicles would enable the transit system to operate smoothly and efficiently, which would not be true if they all used the same roads.

NPS-provided transit service would be available from the Mather Point staging area as shown below. All transit routes would operate with relatively small headways (less than 15 minutes between buses) to be very responsive to the transportation needs of the visitor. The Mather/village shuttle and the village loop shuttle would both have headways of less than 5 minutes because these routes are expected to be used by the majority of the visitors entering and exiting the village area.

An example of how the proposed transit service in the village area could be implemented is shown below. The system that is actually implemented may differ from the example as a result of more detailed planning.

Mather Staging Area Tram
- Stops: Mather parking area, Mather orientation center
- Demand: 1,050 rides/hour
- Vehicles: Three 100-passenger trams *
- Headway: 6 minutes

* Trams would consist of a power unit pulling several passenger trailer units. These vehicles load easily and quickly and can be equipped with clear plastic rain curtains for inclement weather conditions.

Mather/Yaki Shuttle
- Stops: Mather Point, South Kaibab trailhead, Yaki Point
- Demand: 450 rides/hour
- Vehicles: Five 50-passenger buses
- Headway: 5 minutes

Mather/Village Shuttle
- Stops: Mather Point, former visitor center, Bright Angel Lodge, Maswik transportation center
- Demand: 2,100 rides/hour
- Vehicles: Fourteen 100-passenger buses
- Headway: 3 minutes

Mather/Yavapai Observation Station Shuttle
- Stops: Mather, Yavapai observation station
- Demand: 500 rides/hour
- Vehicles: Two 100-passenger buses
- Headway: 10 minutes

Business Center Loop
- Stops: Business center, Maswik Lodge, campground, camper services, former visitor center
- Demand: 250 rides/hour
- Vehicles: Three 50-passenger buses
- Headway: 10 minutes

Village Loop Shuttle
- Stops: Maswik transportation center, community building, general offices, El Tovar, Bright Angel, West Rim interchange, Maswik Lodge
- Demand: 1225 rides/Hour
- Vehicles: Eight 50-passenger buses
- Headway: 3 minutes

Valet Shuttle
- Stops: Maswik transportation center, Maswik Lodge, all rim lodges
- Demand: 100 rides/hour
- Vehicles: Two 25-passenger buses
- Headway: 15 minutes

Employee Shuttle
- Stops: Residential areas, work areas in the village area
- Demand: 225 rides/hour
- Vehicles: Three 25-passenger buses
- Headway: Based on demand

Employees living in Tusayan would be encouraged to ride the NPS-provided visitor transit system from Tusayan into the Park. An NPS-provided dial-a-ride service, using one of the 25-passenger buses, would be available for employees living in Tusayan during the hours when the visitor transit is not operating.

Tour buses would be allowed to enter the Park through the South Entrance and travel directly to Mather Point then to the Maswik transportation center along the Maswik Road. Short-term bus parking would be allowed at the Maswik transportation center. The concessioner would remain the only company authorized to provide guided tours on the South Rim. All buses operating in the park would be required to meet emissions standards.

Buses with overnight guests would be allowed to drive to the lodge to drop off guests and their luggage. They must then return to the staging area in Tusayan and park the bus.

West Rim: The West Rim shuttle would operate on a one way loop between the West Rim interchange and the Abyss. The most efficient transit service would be for the transit bus to only stop at overlooks when traveling westbound (the shuttle currently stops when traveling both westbound and eastbound). This means that all visitors would have to ride to the Abyss before being able to return to the village on the shuttle.

A new transit transfer facility would be developed at the Abyss for visitors to transfer between the West Rim shuttle and the Hermits Rest shuttle. An example transit system for the West Rim could be as follows:

West Rim Shuttle (West Rim Interchange to Abyss)
- Stops: West Rim interchange, Trailview overlooks 1 and 2, Powell Memorial, Hopi Point, Mojave Point
- Demand: 915 rides/hour
- Vehicles: Five 100-passenger buses
- Headway: 6 minutes

Hermits Rest Loop (Abyss to Hermits Rest)
- Stops: Abyss, Pima Point, Hermits Rest, Pima Point, Abyss
- Demand: 550 rides/hour
- Vehicles: Four 100-passenger buses
- Headway: 10 minutes

East Rim / Desert View: NPS transit services would be provided on the East Rim from Mather Point to Desert View. An example of the proposed transit services are identified below:

Mather Point / Grandview Shuttle
- Stops: Mather Point, Pull-offs A and B, Grandview
- Demand; 50 rides/hour
- Vehicles: One 50-passenger bus
- Headway: 60 minutes

Grandview / Desert View Shuttle
- Stops: Desert View, Tusayan museum, Lipan Point, Navajo Point, Grandview
- Demand: 50 rides/hour
- Vehicles: One 50-passenger bus
- Headway: 60 minutes

Concession tours and private tour buses would continue to serve the East Rim, similar to current conditions.

■ Winter Use

All access into the park would remain the same as in the summer. Parking demand is estimated to be about 40% of the summer parking demand, so there would be no problem in meeting demand. All NPS transit services would continue to operate year-round. The transit service would be reduced during the winter to correspond to lower ridership demands. The winter transit demand is estimated to be about 40% of the summer demand.

NORTH RIM

■ Access and Circulation

The effects outside the park would be the same as alternative 2.

Bright Angel Point: All visitors in private vehicles would be allowed access to Bright Angel Point. Buses and RVs would be able to drive to the lodge area, but the only parking for these vehicles would be provided at CC Hill.

A new road would be provided for access from the north entrance road to the overflow parking area at the ballfield.

All North Rim roads would operate at LOS B or better under this alternative.

Walhalla Plateau: All visitors in private vehicles of any size would be allowed access onto Walhalla Plateau. This would require that the scenic roads be improved by cutting back roadside vegetation to provide better sight distance and by widening the pavement in curved sections.

■ Parking

This alternative would not impact parking areas or demands for parking at locations outside the park.

Bright Angel Point: During the day, 50 of the 270 spaces at the lodge would be available for use only by overnight guests, and the other 220 spaces would be available for use by day visitors and overnight guests. Overflow parking for 183 vehicles would occur in a new parking area at the existing ballfield site.

A parking area at CC Hill would accommodate all overflow parking from the North Kaibab trailhead and all bus and RV parking from Bright Angel Point. This facility would be provide parking for 40 cars, 21 RVs, and 6 buses. The access road leading from the existing parking area to the new parking area would have to be improved and paved.

Walhalla Plateau: Parking areas on Walhalla Plateau would be sized to meet the anticipated demands for parking in the year 2010, as shown in table 58. In some cases, the number of parking spaces could be reduced and the abandoned areas revegetated.

■ Transit

The effects outside the park would be the same as alternative 2.

Bright Angel Point: The National Park Service would provide the following shuttle services on Bright Angel Point under this alternative.

Bright Angel Shuttle
- Stops: All visitor-related developed areas on Bright Angel Point, including the North Kaibab and Widforss trailheads
- Demand: 200 rides/hour
- Vehicles: Three 25-passenger buses
- Headway: 7 minutes

Employee Shuttle
- Stops: All employee residential areas, all employment areas on Bright Angel Point
- Demand: 50 rides/hour
- Vehicles: Two 12-passenger vans
- Headway: Based on demand

Tour buses would be allowed to drop off their passengers and overnight guests at the lodge and park at CC Hill.

The concessioner would continue to provide guided tours of the North Rim, with tours originating from the lodge.

Walhalla Plateau: The Park Service would not provide shuttle service on Walhalla Plateau under this alternative (the same as alternative 2).

Guided tours of the North Rim would continue to be provided by the concessioner. Private tour buses would be allowed to access all areas of the Walhalla Plateau.

TABLE 58: WALHALLA PLATEAU PARKING - ALTERNATIVE 4

Overlooks	Existing	Proposed	Net Change
Point Imperial	50	44	-6
Vista Encantadora	27	7	-20
Indian Country	6	4	-2
Walhalla Overlook	46	13	-33
Cape Royal	60	88	+28
Total	**189**	**156**	**-33**

TUWEEP

No access changes would be made at Tuweep, and no transit service would be provided.

The parking area at the Toroweap overlook would be expanded to accommodate 50 vehicles, including 35 cars and 15 RVs.

CONCLUSIONS

All vehicles would be allowed into the park at all times. As a result, new parking areas would have to be constructed, and most existing parking areas would have to be expanded.

Paving USFS 302/307 south of the park and developing a new park entrance at Grandview would affect traffic patterns outside the park by increasing the amount of traffic passing through this portion of Kaibab National Forest.

The transit-only concept for the village would eliminate most of the parking problems and traffic congestion that currently occurs in this area, the same as alternative 2.

Major parking expansions adjacent to East Rim Drive would be required to accommodate the anticipated demand. At Grandview 99 additional parking spaces would be required (total of 144 spaces).

Allowing all vehicles onto the North Rim would require that new parking areas be constructed. Allowing unrestricted access for vehicles on Walhalla Plateau would require these scenic roads be widened and improved for safety reasons.

All park roads and parking areas, as described in this alternative, would function effectively.

CUMULATIVE EFFECTS

No cumulative impacts have been identified.

The NPS transit service proposed in this alternative produces an energy benefit by trading private vehicle miles for transit miles. The transit service would result in a reduction of 35.7 million miles of private vehicle travel each year within the park. Taking into account the fuel used in the transit vehicles, the net fuel savings would be approximately 1.2 million gallons of gasoline each year.

The transit service also produces an air quality benefit by trading 35.7 million private vehicle miles/year in gasoline-burning cars for 1.5 million transit miles/year driven in clean natural gas-burning buses. This trade-off would produce a net reduction in vehicle generated pollutants and have a positive impact on the air quality the park.

IMPACTS ON AREA OPERATIONS

HOUSING

Under alternative 4 about 2,600 park employees would be required, more than any other alternative, which would result in a total need for 1,870 housing units (see table 59). Except for a joint NPS/USFS community in Tusayan that would provide some 331 units, the majority of employee housing would be provided within the park, primarily in disturbed areas.

■ Regional Effects

Employees: This alternative would require three new employees to work at the Tusayan joint orientation center and two new employees at the Jacob Lake joint orientation center. The two Jacob Lake employees would live in housing in the current USFS housing area at that site. The three new employees at Tusayan would be provided housing in the new planned community in Tusayan.

The majority of new employees on the South Rim would also be housed in the new Tusayan community.

No employees would be relocated to regional communities under this alternative.

Housing Needs: A total of 331 new housing units on 39.1 acres would be provided in a joint NPS/USFS community in Tusayan. This housing area would contain a mix of duplexes, apartments, and trailer pads.

Community Structure/Social Characteristics: Assimilation into community structure, the effects on employees of separate park communities, and separating residential units from park visitor use areas would have the same effects as described for alternative 2.

Employee access to the workplace and the park would be improved under this alternative. Separate entrances for residential and service traffic would have the same impacts as alternative 2, and employees could still walk, drive, or bike to work.

■ South Rim

Grand Canyon Village:

• *Employees* — This alternative would require 395 new employees to work in Grand Canyon Village, 123 of whom would be needed for the transit system and the remainder for expanded lodging, food and gifts, interpre-

tive, orientation, maintenance, and ranger functions.

A total of 456 employees would be relocated from existing housing units. New housing units would better meet their needs for privacy, room, and comfort, helping reduce employee turnover due to inadequate housing conditions in the park.

Relocating employees from existing dorms into new dorms and apartments would have the same benefits as alternative 2.

• *Housing Needs* — A total of 678 new housing units would be provided on 25.1 acres in Grand Canyon Village — 113 substandard units would be replaced, 424 units would be converted to higher density units, and 141 additional units would be provided on 15.9 fewer acres than currently occupied.

• *Community Structure/Social Characteristics* — The concentration, relocation, and construction of new employee housing would have the same impacts as alternative 2. Separating housing from visitor use areas would have the same impact as alternative 2.

Eliminating private cars from the village center, providing employee shuttles, separating employee traffic and parking from visitor traffic and parking, expanding trail systems, and increasing employee accessibility to the East Rim would have the same impacts as described for alternative 2.

Hermits Rest: No new employees would be assigned to Hermits Rest. Relocating one employee residence to Grand Canyon Village would have the same impacts as alternative 2.

Desert View:

• *Employees* — A total of 38 new employees would be needed at Desert View under this alternative. The employee increases result from additional staff needed for expanded operations at the campground, gift shop, deli, store, gas station, Tusayan museum, and new orientation center.

This alternative would require the relocation of 61 employees from existing housing units. Over 22 employees would be moved from substandard units, and the remainder would be relocated from housing that would either be removed and converted to visitor use areas. New housing would be provided in existing disturbed areas in the NPS housing area. Relocated employees would benefit from upgraded living quarters, thus increasing their privacy and contributing to less turnover caused by substandard housing conditions.

• *Housing Needs* — A total of 74 new housing units on 5.7 acres would be needed under this alternative. The net increase would be 42 units, and the housing area would increase by 3.4 acres. All new housing would be provided in and immediately adjacent to the existing NPS housing and administrative area.

• *Community Structure/Social Characteristics* — Effects would be the same as described for alternative 2, including a strong sense of community, reduced conflicts between employee and visitor traffic and parking, and employee access to Arizona 64.

■ North Rim

Employees: This alternative would require 125 new employees for transit system operations, expanded visitor lodging, the orientation center, and operations of expanded ranger, maintenance, and interpretive operations.

The impact of adding 44 concessioner employees, allowing a change from a six-day workweek to a five-day workweek, would have the same impacts as described for alternative 1.

This alternative would displace 158 existing employees from current housing units as a result of replacing substandard units or converting housing to visitor lodging. The benefits of new housing away from visitor use areas would have the same impacts as described for alternative 2.

Housing Needs: A total of 263 new housing units would be needed, occupying 16.9 acres. The net increase over existing conditions would be 147 additional housing units, with 11.8 acres of new disturbance. The units would be located in and immediately adjacent to existing NPS housing and concessioner housing areas.

New housing would not be replaced in disturbed areas just south of the entrance road in the NPS housing area to prevent intrusion on visitor views (the same as alternative 2).

Community Structure/Social Characteristics: Separating employee residential areas from visitor use areas, maintaining separate housing areas for NPS and concessioner employees, providing employee shuttles, and reducing employee traffic and

TABLE 59: HOUSING SUMMARY, 2010 - ALTERNATIVE 4

Area	Existing Units	Substandard Units to be Replaced	Standard Units to be Converted or Replaced	Total Remaining Standard Units	New Units Needed to Meet Standards*				Additional Units Needed for New Employees				Total New Units Needed		Total Units Needed This Alternative	Net Change over Existing	
					NPS		Concessioner		NPS		Concessioner						
					Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.	Units	Ac.		Units	Ac.
South Rim Region																	
• Tusayan	0	0	0	0	33	3.8	53	8.5	22	2.8	223	24.0	331	39.1	331	331	39.1
• Flagstaff, Valle, or Williams	9	0	0	9	0		0		0		0		0		9	0	
• East Rim/ Outside Park	0	0	0	0	0		0		0		0		0		0	0	
Subtotal	9	0	0	9	33	3.8	53	8.5	22	2.8	223	24.0	331	39.1	340	331	39.1
South Rim																	
• Grand Canyon Village	958	113	424	421	48	1.7	227	10.3	36	1.2	367	11.9	678	25.1	1,099	141	-15.9
• Hermits Rest	2	1	0	1	0		0		0		0		0		1	-1	-0.1
• Desert View	40	11	21	8	13	1.1	13	1.1	15	1.1	33	2.4	74	5.7	82	42	3.4
Subtotal	1,000	125	445	430	61	2.8	240	11.4	51	2.3	400	14.3	752	30.8	1,182	183	-12.6
North Rim																	
• Jacob Lake	0	0	0	0	0		0		2	0.3	0		2	0.3	2	2	0.3
• North Rim	173	22	94	57	29	2.2	89	5.2	26	1.7	119	7.8	263	16.9	320	147	11.8
• Tuweep	2	1	0	1	0		0		1	0.3	0		1		2	1	0.3
	175	23	94	58	29	2.2	89	5.2	29	2.3	119	7.8	266	17.2	324	150	12.4
Other Park Areas																	
• Corridor Trails	22	4	0	18	4		0		0		0		4		22	0	
• Lees Ferry	2	1	0	1	1		0		0		0		1		2	0	
Total	**1,208**	**153**	**539**	**516**	**128**	**8.8**	**382**	**25.1**	**102**	**7.4**	**742**	**46.1**	**1,354**	**87.4**	**1,870**	**663**	**38.9**

* Includes replacement of substandard units and additional units to eliminate double and triple bunking.

TABLE 60: PROJECTED EMPLOYEES, 2010 - ALTERNATIVE 4

Area	Park Employees							
	National Park Service			Concessioner			Total	Net Change
	Existing	New	Total	Existing	New	Total		
South Rim								
• Tusayan	0	3	3	0	0	0	3	3
• Flagstaff, Valle, or Williams	3	0	3	0	0	0	3	0
• Grand Canyon Village	286	120	406	1,318	275	1,593	1,999	395
• Hermits Rest	0	0	0	3	0	3	3	0
• Desert View	22	18	40	44	20	64	104	38
• East Rim/Outside Park	0	0	0	0	0	0	0	0
Subtotal	311	141	452	1,365	295	1,660	2,112	436
North Rim								
• Jacob Lake	0	2	2	0	0	0	2	2
• North Rim	67	25	92	230	100	330	422	125
• Tuweep	1	1	2	0	0	0	2	1
Subtotal	68	28	1,000	230	100	330	426	128
Other Park Areas								
• Corridor Trails	12	0	12	17	0	17	29	0
• Lees Ferry	2	0	2	0	0	0	2	0
Subtotal	14	0	14	17	0	17	31	0
Total	**393**	**169**	**1,014**	**1,612**	**395**	**2,007**	**2,569**	**564**

parking needs would have the same impacts as described for alternative 2.

■ Tuweep

One new seasonal employee would be required, the same as alternative 2. The removal and replacement of the substandard trailer would have the same beneficial impact as alternative 2. No changes would be made to access routes under this alternative, the same as alternative 1. The addition of the seasonal employee would reduce the work pressure on the full-time ranger (the same as alternative 2).

■ Corridor Trails

Eliminating double-bunking in dorm rooms and replacing four substandard housing units would have the same impacts as alternative 2. No significant changes to community structure would occur as a result of this alternative.

■ Lees Ferry

No new employees would be required under this alternative. Providing upgraded housing in the present disturbed area would have the same impact to the relocated employee as alternative 2. No significant changes to community structure would occur.

■ Conclusion

Accommodating increased levels of visitor use and access under this alternative would create a demand for more park staff, in turn creating a demand for new housing, in addition to replacement housing for employees living in substandard housing or being displaced from areas and units that would be converted to visitor use. The emphasis on providing for visitor convenience would place a great emphasis on providing for employee housing as well.

This alternative requires the clearing of significant amounts of undisturbed or minimally disturbed land in and around the park to provide housing. This acreage, the most of any alternative, would affect not only vegetation, but air quality, noise, and utility needs for the park and its nearby communities.

■ Cumulative Effects

The lack of restrictions on visitor use would promote growth in visitation. This growth would have ripple effects to surrounding communities, placing pressure on them to expand facilities, contributing to the overall regional growth of communities associated with tourism at the Grand Canyon. Unrestricted park visitor access would have the potential for significant impacts to park and regional resources.

COMMUNITY SERVICES

■ Region

Facility and Space Needs: This alternative would have little impact to regional communities other than Tusayan. Staffing of regional information centers in communities such as Cameron, Flagstaff, Williams, Kanab, or Fredonia would have the same impacts upon those communities as alternative 1. Those remote communities would continue to serve park resident needs for major services, the same as alternative 1.

Tusayan would experience significant impacts with regard to community services in this alternative. Since no visitor limitations would be required to restrict visitors from entry into the park, Tusayan would continue to offer alternative modes of transit to the park and more major visitor services such as hotels, restaurants, gift shops, and the like, and would continue to require an increasing amount of community services to support the growing population of park and Tusayan employees and residents. The proposed community in Tusayan could become a fairly large community composed of park, concessioner, and Tusayan residents. Community services would be required to expand to support the resident population as visitation growth at the park would continue to occur.

Conflicts with Visitors: Separate access routes and community developments away from visitor use areas would reduce the potential for conflicts between residents and visitors, the same as alternative 2.

Community Characteristics: This alternative would have little impact on regional community characteristics except for the town of Tusayan. Under alternative Tusayan would experience a change in employee and resident population, similar to alternative 2.

■ South Rim

Grand Canyon Village:

• *Facility and Space Requirements* — Residents of Grand Canyon Village would benefit and experience the same impacts as alternative 2. The increased potential for in-park residential population could place more pressure on in-park community facilities, requiring them to be somewhat larger than those found in alternative 2.

• *Conflicts with Visitors* — This alternative would greatly reduce potential conflicts with visitors related to community services. The separation of employee/community centers from visitor use areas would reduce conflicts between residents and visitors, the same as alternative 2.

• *Community Characteristics* — The duplication of some community services in the park and in Tusayan would have the same impacts upon the park and local region community as alternative 2.

Desert View:

• *Facility and Space Needs* — Enlargingt and improving community facilities and providing limited recreation opportunities would have the same impacts on Desert View residents as alternative 2. Dependence on Grand Canyon Village and remote communities would be the same as alternative 2.

• *Conflicts with Visitors* — The separation of employee use areas from visitor use areas would have the same impacts as alternative 2.

• *Community Characteristics* — This alternative would strengthen the strong social character, improve morale, and reduce employee turnover, the same as alternative 2.

■ North Rim

Facility and Space Needs: This alternative would improve conditions for community services on the North Rim, particularly with relation to NPS operations. The addition of new management support facilities and the expansion of existing facili-

ties would have the same impact as alternative 2.

The open area southwest of the TWRS/ARAMARK administration area proposed as parking would eliminate a desirable employee recreation facility, having a negative impact upon employees in their ability to enjoy an array of off-duty recreational opportunities.

TWRS/ARAMARK employees would continue to have their own recreational opportunities, the same as alternative 2. Remote communities would continue to offer employees with alternative services and facilities, the same as alternative 1.

Conflicts with Visitors: Consolidating all housing and community services into existing administrative areas, away from visitor use areas, would have the same impacts as alternative 2.

There would be a slight potential for conflicts with visitor traffic near the proposed parking area because the access skirts the TWRS/ARAMARK employee housing and administration area, resulting in noise, dust, and some interaction between off-duty employees and visitors.

Community Characteristics: This alternative would continue the segregated character of the North Rim community, with the same impacts as alternative 2.

■ **Tuweep**

No changes to the Tuweep community services would occur (the same as alternative 1).

■ **Corridor Trails**

No changes to the inner canyon community services would occur (the same as alternative 1).

■ **Lees Ferry**

No changes to the Lees Ferry community services would occur (the same as alternative 1).

■ **Conclusion**

This alternative would greatly improve community services to the residents of Grand Canyon National Park. Inadequate facilities would be expanded and new facilities would be provided that are desired by park residents, having the same impacts as alternative 2. The lack of visitation limits would necessarily require more employees which in turn would require larger facilities than other alternatives.

■ **Cumulative Effects**

Since no visitor restrictions are imposed, continued resource degradation would occur as a result of developing more and expanded community facilities in response to a growing workforce required to meet visitor needs and expectations.

Management Support Facilities

■ **Region**

This alternative would have the same impact as alternative 1 on the communities of Flagstaff, Valle, Williams, Fredonia, and Kanab. The introduction of the visitor information center in Jacob Lake would be the same as alternative 2, and Tusayan would experience similar, but reduced magnitudes of impact compared to alternative 3. The USFS would assume the primary responsibility for operations in Tusayan, requiring more human and financial resources than in alternative 3.

■ **South Rim**

Grand Canyon Village:

• *Facility and Space Needs* — As indicated in table 4, this alternative would require slightly more management support space than in alternative 2 as a result of more visitor services being provided in the park. The greatest needs in this alternative would be for the NPS maintenance division (over 403,000 square feet, a 70% increase over baseline), GCNPL food and beverage (86,330 square feet, 50% increase over baseline), and GCNPL transportation units (212,366 square feet, 67% increase over baseline). The addition of an expanded restaurant in the Mather Point orientation center, more hotel rooms with the Kachina and Thunderbird Lodges, as well as the Yavapai Lodge units, and more retail outlets on the rim and in the old powerhouse building would require slightly larger support facilities for GCNPL food and beverage, maintenance, and rooms units to supply, service, and maintain those functions than in alternative 2.

All GCNPL operations would experience the same impacts as alternative 2 except for the following:

Maintaining the personnel building in its current location would have the same impact as alternative 1.

The new mule operations facility to be located at the South Kaibab trailhead would remove one of the oldest continually operating mule operations in the national park system from its original structures. The change from the historical structures would have a negative impact on the historic character of the operations, but relocation to another area would improve conflicts between visitors and mules in an increasingly busy visitor use area.

All NPS operations would experience the same impacts as alternative 2.

• *Operational Relationships* — All operational relationships would have the same impact as alternative 2 except for the following:

Maintaining the personnel building in its current location would cause some inconvenience to employees because they would no longer be able to drive and park there, requiring them to take alternative modes of transportation or walk to the personnel offices.

The new mule operations facility at the South Kaibab trailhead would have a negative impact on their operations. They would be removed from housing areas, requiring employee shuttles to work rather than walking as is now the case. They would also be out of the public eye, potentially reducing their business through exposure to the public. The remote location would also require the construction of new facilities, having a negative impact on GCNPL operations in new construction costs.

Keeping the GCNPL reservations clerks in the park would help maintain close communications between that function and the unit manager. There would be some negative impact associated with keeping them in the General Offices building, possibly creating conflicts between them and NPS ranger operations in that building. Parking at that location would also be a problem, requiring expansion in undisturbed areas or at remote locations, presenting some inconvenience to workers in having to take alternative modes of transportation or walk to work.

• *Conflicts with Visitors* — All impacts related to this would be the same as alternative 2.

Desert View: All impacts related to management support facilities are the same as alternative 2, except that minor additional expansion of some facilities, as shown in figure 20, would be required to support operations serving increasing numbers of visitors.

■ **North Rim**

All functional impacts related to management support facilities are the same as alternative 2, except for the following:

The gas station would remain a visitor gas station, having the same impacts with visual character and visitor convenience as alternative 1.

The relocation of the mule staging area to six rock meadows would have a negative effect on the mule operations. There would be significant increases in operating costs associated with transporting mules that distance rather than having close-in accessibility to trails and corrals.

■ **Tuweep**

All impacts related to management support facilities would be the same as alternative 2.

■ **Corridor Trails**

All impacts related to management support facilities would be the same as alternative 1.

■ **Conclusion**

This alternative would have similar impacts as alternative 2, except that some minor expansion of support facilities would be required to accommodate additional personnel and equipment that were not needed in alternative 2. Park operations would improve significantly over baseline conditions because of new and expanded facilities in the park for many operations. Efficiencies would be enhanced by consolidating many operations into single facilities. Some minor inefficiencies would be experienced by locating some new uses in disturbed areas of the park rather than in areas more suitable for functional efficiency, but those inefficiencies might be offset by the construction of more efficient facilities than are currently being utilized.

■ **Cumulative Effects**

The lack of a visitor reservation or limitation system would require expansion of all operations at a later point in time as visitation would require growth of services, particularly in Tuweep and on the North Rim where visitor limits in Alternatives 2 and 3 limit the need for facility expansion. The support facilities would need to be designed to accommodate future expansion or easy renovation for different uses. The cumulative inefficiencies of operation would have significant costs associated with operations, potentially reducing the ability of the park or concessioner operations to upgrade systems or facilities to meet future demand.

UTILITIES

■ Water Supply

South Rim: Improvements to visitor lodging facilities, increased housing, a Mather Point major orientation complex, and increased visitation would result in increased water use on the South Rim. Water conservation as well as the use of reclaimed water, where available, would be implemented in all new facilities. Major expansion of the reclaimed water system is not considered. Retrofitting existing facilities with low-flow plumbing fixtures and reclaimed water is also not considered.

The responsible provision of water to facilities such as NPS housing, restrooms, and information centers in Tusayan is included in the water usage calculations.

Waterline extensions would be made to service new or rehabilitated facilities within the park. The decision to provide line extensions to these facilities would be made as a separate study.

Water usage would increase by 25%. An adequate supply of potable water is available to meet the demands of the proposed changes. Potable water use and Roaring Springs pumping times would be slightly higher than in alternative 2.

Approximately 5.5 million gallons of additional potable water storage would be required to meet fire protection and emergency storage requirements for facilities within the park at the end of the planning period.

North Rim: New housing, increased visitation, new campsites, restrooms, and the orientation center are CC Hill would contribute to increased water consumption. Low-flow plumbing fixtures and reclaimed water, where available, would be used in all new or rehabilitated facilities. Waterlines would be extended to new facilities and service taps reconfigured for the housing to be replaced or converted into lodging.

The USFS/NPS orientation center would acquire water from the U.S. Forest Service.

Approximately a 35% increase in potable water consumption would occur with the proposed changes, slightly higher than under alternative 2 or 3. Adequate water supply is available with the Roaring Springs pumps operating 20 hours per day during peak season months. Additional water storage would not be required.

Main waterline extension (approximately 3,000 lineal feet) would be required to the CC Hill orientation center. Waterline service taps would be required to the campsites, and service taps would require reconfiguration for rehabilitated housing, housing converted to lodging, and new restrooms at Grand Canyon Lodge.

Corridor Trails. Effects would be the same as the no-action alternative.

Tuweep. Effects would be the same as the no-action alternative.

■ Wastewater

South Rim: Only wastewater generated in the park would be treated at the South Rim wastewater treatment plant.

The South Rim wastewater treatment facilities would operate at 91% capacity during peak visitation months, slightly lower than under alternative 2. Plant expansion would not be required to meet the projected demand.

At Desert View additional wastewater treatment must be provided to meet projected demands (the same as alternative 2). This could be through an expanded lagoons system or alternate types of treatment (determined by separate study).

North Rim: The North Rim wastewater treatment plant would require expansion by approximately 40,000 gallons per day, 10,000 gallons per day additional capacity more than required in alternative 3. Expansion would impact approximately 1 additional acre.

Corridor Trails: Impacts would be the same as alternative 1.

Tuweep: Impacts would be the same as alternative 1.

■ Power Supply

South Rim: Housing, conversion of the powerhouse, new visitor services (such as a laundry, expanded lodging, and orientation center), and the use of 12 to 15 electrical buses would be the primary impacts on the power supply system.

Line extensions to the housing, laundry facility, and Desert View orientation center would increase the demand. Adequate capacity is available to support the changes without any required expansion.

North Rim: Major contributing factors to increased power is the CC Hill orientation center, new housing, and increased lodging.

Adequate power supply capacity is available to meet the need of the proposed changes. Secondary power line extensions would be required for the new orientation center, and a few electrical services would have to be reconfigured for new housing and visitor lodging.

Corridor Trails: Inner canyon developments and Tuweep would not be affected by this alternative.

■ Telephone Service

The proposed addition of new facilities and relocation of the lodging reservation system would affect the telephone system. Moving the reservation system outside the park would eliminate many phone calls. Phone service would have to be extended to new housing. As indicated in the "Affected Environment" section, the park's telephone system needs repair, which should be done during the life of the general management plan.

Telephone service, by microwave, to the North Rim would remain the same. However, telephone service lines must be extended to support the new lodging and visitor services.

Patapsco Park, Tanner Campsite

CONSULTATION AND COORDINATION, APPENDIXES, SELECTED REFERENCES, PLANNING TEAM AND CONSULTANTS

DEVELOPMENT OF THE PROPOSAL AND PREPARATION OF THE DRAFT DOCUMENT

March 7–9 and June 12–13: A South Rim strategic planning work session was undertaken with the Grand Canyon National Park staff, members of the NPS Western Regional Office, members of the NPS Washington Office, and the management team from the Denver Service Center. The purpose of the work session was to begin developing a planning process for the *General Management Plan,* with an emphasis on problem identification and management assumptions for decision-making.

June 22, 1990: A draft management philosophy statement for Grand Canyon National Park was completed. The statement was intended to set the tone for future planning.

November 15, 1990: The National Park Service met with the Sierra Club, Babbitt Brothers Trading Company, Grand Canyon National Park Lodges, Verkamp's, Inc., Grand Canyon Clinic, the Grand Canyon Association (formerly the Grand Canyon Natural History Association), Grand Canyon Trust, Coconino County, the National Parks and Conservation Association, the Arizona Department of Game and Fish, the Forest Service, U.S. Department of Agriculture, Grand Canyon Unified Schools, and representatives of the United States and Arizona legislatures. The purpose of having the meeting before scoping began was to solicit information about issues affecting park neighbors.

December 1990 to December 1991: A year-round visitor use survey was conducted at the park. Visitors in 1,242 cars and RVs were contacted in an exit survey at the three main entrances to the park. Tour bus passengers were asked to return a mail-back questionnaire, of which 200 were completed.

July 8-12, 1991: The general management planning team participated in a team orientation and initial scoping trip to the park.

July 10 and July 11, 1991: By letter, the National Park Service invited the Arizona state historic preservation officer and the Advisory Council on Historic Preservation to participate in the planning of the *General Management Plan / Environmental Impact Statement.*

July 29–August 2, 1991: Some members of the planning team traveled to the park to continue scoping issues related to concessions management, utilities, the inner canyon corridor trails, the backcountry, the Colorado River corridor, and land use issues among park neighbors near the South Rim. Members of the team also met with the Flagstaff Chamber of Commerce, Verkamp's, Fred Harvey, Babbitt's, the Grand Canyon Railway, and the Arizona state historic preservation officer to solicit concerns and issues for scoping purposes.

September 3, 1991: Notice of intent to prepare a general management plan and environmental impact statement for Grand Canyon National Park was printed in the *Federal Register.*

September 20, 1991: Public meetings were announced in the *Federal Register.*

September 23-27, 1991: The team met with the Northern Arizona Council of Governments, the Grand Canyon Trust, the Coconino County Planning Department, the Sierra Club, Park West Developments, the city of Flagstaff, and the Forest Service to scope issues.

September 24, 1991: The Arizona state historic preservation officer sent a letter expressing the office's concerns about cultural resources in the park.

October 4, 1991: A letter announcing public meetings was sent to individuals and organizations on the park mailing list.

October 22, 1991: A community meeting was conducted on the North Rim of the Grand Canyon. The focus of the meeting was concerns of people living and working in the park. A total of 26 people attended.

October 23, 1991: The North Rim workgroup met to scope issues.

October 24, 1991: Public meetings to scope issues were held in Kaibab, Utah, with 23 attendees. Scoping meetings were also held with eight members of the Hopi tribe and the staff of the Hopi Cultural Preservation Office at Kykotsmovi, Arizona, and with the president of the San Juan Southern Paiute tribe in Tuba City, Arizona.

October 25, 1991: A meeting to scope issues was held with three tribal officials of the Kaibab Paiute tribe in Fredonia, Arizona.

November 4, 1991: The South Rim Community work group (40 attendees) and the South Rim work group met on the South Rim to scope issues. Sixty representatives of six American Indian tribes attended a work group meeting.

November 5, 1991: Public scoping meetings were held in Tusayan, Arizona. A total of 33 persons attended.

November 6, 1991: Public scoping meetings in Flagstaff, Arizona were attended by 29 people. National Park Service personnel met with the mayor of Williams, Arizona to scope issues, solicit solutions, and gather information about Williams city planning efforts. A community meeting was held on the South Rim of the Grand Canyon to focus on the concerns of people living and working in the park. There were 33 attendees.

November 7, 1991: Public scoping meetings in Phoenix, Arizona, were attended by 27 people.

November 20, 1991: NPS personnel met with 15 members and staff of the Hualapai Tribe at Peach Springs, Arizona.

December 4, 1991: A scoping meeting was held at Window Rock, Arizona, with 13 tribal members and staff of the Navajo Nation.

December 5, 1991: The National Park Service met with five council members and the tribal governor of the Zuni Tribe in Zuni, New Mexico.

December 6, 1991: A total of 69 letters had been received from members of the public listing issues of concern to be taken into account during public scoping.

December 12, 1991: A scoping meeting was held with the governor of Arizona and council members and staff of the Pueblo of Zuni in Zuni, New Mexico.

December 28, 1991: NPS personnel met with 30–40 chapter members at the Gap-Bodoway Chapter meeting of the Navajo Nation to explain the planning process, to scope issues, and to solicit input.

January 12, 1992: The National Park Service met with 25 chapter members at the Cameron Chapter meeting of the Navajo Nation to explain the planning process, to scope issues, and to solicit input.

January 13, 1992: The National Park Service initiated formal consultation with the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department, requesting information on species listed as or candidates for endangered, threatened or other special status.

January 17, 1992: The National Park Service conducted a scoping meeting with the 6 members and the tribal chairman of the Havasupai Tribal Council, in Supai, Arizona.

January 27, 1992: The U.S. Fish and Wildlife Service responded to the NPS request for lists of endangered, threatened and other species of special concern.

January 30, 1992: The Cameron Chapter of the Navajo Nation passed a resolution requesting that they be allowed to have input into the *General Management Plan* and outlining six points of concern.

March 17, 1992: The Arizona Game and Fish Department responded to a NPS request for lists of endangered, threatened and other species of special concern.

April 21-22, 1992: The NPS planning team met in a workshop to develop the purpose and significance statement for the park.

May 7, 1992: The *Federal Register* published a notice of termination of the EIS process for the development concept plan and draft supplemental environmental impact statement for North Rim visitor facilities. The notice informed the public that issues on the North Rim would be incorporated into a parkwide general management plan / environmental impact statement.

June 8–12, 1992: A workshop was held at the South Rim of the Grand Canyon to consider how to manage high visitor use areas.

June 12, 1992: The *General Management Plan / Environmental Impact Statement Scoping Summary: Grand Canyon National Park* was made available to the public. More than 1,000 copies were distributed at meetings or mailed to interested parties and government agencies.

July 13, 1992: The Arizona state historic preservation officer commented on the visitor use management workshop information document.

June 29, 1992: The Arizona state historic preservation officer commented on the scoping summary.

August 11–13, 1992: A visitor survey was undertaken at the North Rim entrance and at overlooks on the canyon rim.

August 29-31, 1992: A visitor survey was undertaken at the South Rim entrances and at overlooks on the canyon rim.

October 23–30, 1992: The National Park Service met with the following agencies and interested parties: TW Recreation Services, to better understand concessioner-related issues; Kaibab National Forest representatives, to discuss each agency's planning efforts on the North Rim; Gaylord Stavley, owner of Kaibab Lodge, to discuss his plans for the lodge and impacts of his plans on future visitation; the Grand Canyon Trust, to begin scoping issues.

October 24, 1992: The Cameron Chapter of the Navajo Nation prepared a formal paper and presented it to the National Park Service. The 15-page statement documented the chapter's traditional use of the park lands and its grievances, as well as offering solutions to some of the issues listed.

November 15-19, 1992: NPS personnel met with representatives of the Kaibab National Forest to discuss the coordination of NPS and Forest Service planning efforts. The National Park Service also met with representatives of the Grand Canyon Trust, the Sierra Club and the Wilderness Society, and Kaibab National Forest to discuss resource protection-related issues and proposed solutions.

January 14, 1993: The final visitor use management workshop findings were made available to the public.

February 23, 1992: NPS personnel met with 170 members of the Cameron Chapter of the Navajo Nation.

April 16, 1993: The *Newsletter: Grand Canyon National Park, Arizona, General Management Plan* made available through a mailing to all entities on the general management plan mailing list. The newsletter outlined the planning process and the proposed alternatives and informed the public on the progress of the plan.

July 13, 1993: The Forest Service commented on the draft *Preliminary Alternatives Workbook.*

September 1, 1993: The Grand Canyon Trust, the Wilderness Society, the Sierra Club, the National Parks And Conservation Association, and the Northern Arizona Audubon Society requested a special meeting with the National Park Service and the Forest Service to discuss the interrelationship of the *General Management Plan* and plans for the Tusayan railroad spur and the Tusayan land exchange.

September 21, 1993: The *Preliminary Alternatives Workbook: Grand Canyon National Park, Arizona, General Management Plan* was made available to the public. Comments were solicited through public meetings. Approximately 2,000 copies were distributed at public meetings or through the mail. The public response period was from September 21 to November 15, 1993, a total of 56 days. The National Park Service received 285 written responses.

October 4, 1993: The *Preliminary Alternatives Workbook: Grand Canyon National Park, Arizona, General Management Plan* was sent to the Arizona State Historic Preservation Office and the Advisory Council on Historic Preservation, soliciting their comments.

October 18–November 5, 1993: The National Park Service held a series of public meetings to discuss the *Preliminary Alternatives Workbook: Grand Canyon National Park, Arizona, General Management Plan.* A total of 61 people attended a meeting at the North Rim; at Arizona cities, 32 attended a meeting at Kanab, 103 at Tusayan 141 at Flagstaff and 79 at Phoenix. The Native American, North Rim, South Rim Community, and South Rim workgroups had formal meetings; members of the groups are listed in the "Preparers" section.

November 24, 1993: The National Park Service wrote to the U.S. Fish and Wildlife Service requesting an update to a consultation under the Endangered Species Act. No answer was received.

December 1, 1993: The National Park Service officially requested participation of the Forest Service in several workshops during the public review period on the *Preliminary Alternatives Workbook: Grand Canyon National Park, Arizona, General Management Plan.*

December 2, 1993: The Kaibab National Forest responded to the *Preliminary Alternatives Workbook: Grand Canyon National Park, Arizona, General Management Plan.*

March 2, 1994: The National Park Service wrote to the Arizona Game and Fish Department requesting an update to a consultation under the Endangered Species Act.

April 5, 1994: The Arizona Game and Fish Department responded to the NPS request for an update to a consultation under the Endangered Species Act.

August 24, 1994: A preliminary draft of the *General Management Plan / Environmental Impact Statement* was sent to the Kaibab National Forest.

September 7, 1994: A preliminary draft of the *General Management Plan / Environmental Impact Statement* was sent to the Arizona state historic preservation officer and the Advisory Council on Historic Preservation for their review and comment. No reply was received from the Advisory Council.

October 11, 1994: The Arizona state historic preservation officer commented on the preliminary draft *General Management Plan / Environmental Impact Statement.*

October 26, 1994: The Kaibab National Forest commented on the draft *General Management Plan / Environmental Impact Statement.*

To ensure that people understand the planning process and have ample opportunities to provide input, a planning team liaison has been in the park from the beginning of the plan. This individual has met with interest groups as needed and has responded to people's questions and concerns. The liaison has also served on several boards and committees that have a direct relationship to the *General Management Plan.* The committees and boards are as follows: the Coconino County Planning and Zoning Commission, the Tusayan Planning Committee (advisory member only), the Regional Transportation Planning Committee, the Regional Transportation Steering Committee, and as an advisory team member for the Forest Service Tusayan Land Exchange. As a member of these boards and committees, the liaison is constantly working with the public at large to provide information and respond to questions.

Reviewers of the Document

Copies of this document will be sent to the following agencies and organizations for review.

Arizona Congressional Delegation

Representative J. D. Hayworth
Representative Bob Stump
Senator Jon Kyl
Senator John McCain

Federal Agencies

Advisory Council on Historic Preservation
U.S. Army Corps of Engineers
U.S. Department of Agriculture
  Forest Service
    Coconino National Forest
    Kaibab National Forest
U.S. Department of Energy
  Western Area Power Administration
U.S. Department of the Interior
  Bureau of Indian Affairs
  Bureau of Land Management
  Bureau of Reclamation
  U.S. Bureau of Mines
  U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency
U.S. Postal Service

American Indian Groups

Havasupai Tribe
Hopi Tribe
Hualapai Tribe
Navajo Nation
San Juan Northern Paiute Tribe
San Juan Southern Paiute Tribe
Zuni Tribe

Arizona State Agencies

Commission on the Arts
Department of Environmental Quality
Department of Game and Fish
Department of State Parks
Department of Tourism
Department of Transportation
Land Department
Office of Governor Fife Symington
State Historic Preservation Office

Local Agencies

City of Flagstaff
City of Fredonia
City of Kanab
City of Williams

Coconino County Government
Mojave County Government

Northern Arizona Council of Governments
Southern Utah Council of Governments

Grand Canyon Unified Schools

Others

Arizona Public Service
Babbitt Brothers Trading Company
BANK ONE
Garkane Power
Grand Canyon Association
Grand Canyon National Park Lodges
Grand Canyon Railway
Grand Canyon Trail Rides
Grand Canyon Trust
Kaibab Lodge
Museum of North Arizona
National Parks and Conservation Association
Samaritan Health Services
Sierra Club
TW Recreation Services/ARAMARK
Verkamp's
U.S. West Communications
Wilderness Society

LEGISLATIVE HISTORY

Initial efforts in the 1880s to create a national park at the Grand Canyon failed. On February 20, 1893, President Benjamin Harrison established by proclamation the Grand Canyon Forest Reserve, exempting this area from all homestead and other public laws except those involving mineral claims.

President Theodore Roosevelt approved an act to protect wild animals in the forest reserve on June 29, 1906, and on the following November 28 he designated the area as the Grand Canyon Game Preserve. On January 11, 1908, President Roosevelt — using the power granted him by the Antiquities Act — established the Grand Canyon National Monument. The area, which included all lands previously part of the game preserve, as well as additional federal lands, was managed by the Forest Service.

Efforts in the early 1910s to establish a national park again failed. National park legislation was finally introduced to both houses of Congress in 1917, and on February 26, 1919, President Woodrow Wilson signed the act establishing Grand Canyon National Park, under the administration of the National Park Service (NPS). On February 25, 1927 President Calvin Coolidge approved an act to enlarge the boundaries of the park to 1,009 square miles (645,760 acres).

On December 22, 1932, President Herbert Hoover created the Grand Canyon National Monument. The new monument was west of the park and encompassed over 300 square miles, extending 40 miles along the Colorado River. On May 28, 1962, Public Law 87-457 permitted the acquisition of the Orphan Mine, the only mine operating inside park boundaries at that time. On January 20, 1969, President Lyndon B Johnson created Marble Canyon National Monument.

On January 3, 1975, the Grand Canyon National Park Enlargement Act (PL 93-620) was signed by President Gerald Ford. The act was intended to "further protect the outstanding scenic, natural, and scientific values of the Grand Canyon by enlarging the Grand Canyon National Park." It abolished Grand Canyon and Marble Canyon National Monuments and added those areas to Grand Canyon National Park. Also added to the park were lands in the western Grand Canyon, as well as lands along park boundaries that belonged to the U.S. Forest Service and Bureau of Land Management. The new park boundary stretched from the mouth of the Paria River to the Grand Wash Cliffs and included over 1 million acres.

GRAND CANYON NATIONAL PARK ESTABLISHING ACT

An Act To establish the Grand Canyon National Park in the State of Arizona, approved February 26, 1919 (40 Stat. 1175)

Grand Canyon National Park, Ariz. Land set apart for.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States and dedicated and set apart as a public park for the benefit and enjoyment of the people, under the name of the "Grand Canyon National Park", the tract of land in the State of Arizona particularly described by and included within metes and bounds as follows, to wit:

Description. (Amended by 44 Stat. 1238. See p. 211.)

Beginning at a point which is the northeast corner of township thirty north, range one east, of the Gila and Salt River meridian, Arizona; thence west on township line between townships thirty and thirty-one north, range one east, to section corner common to sections one and two, township thirty north, range one east, and thirty-five and thirty-six, township thirty-one north, range one east; thence north on section lines to the intersection with Tobocobya Spring-Rowe Well Road; thence northwesterly along the southwesterly side of said Tobocobya Spring-Rowe Well Road, passing and in relation to United States Geological Survey bench marks stamped "Canyon" and numbered 6340, 6235, 6372, 6412, 6302, 6144, and 6129, through townships thirty-one and thirty-two north. ranges one east and one and two west, to its intersection with the section line between sections nine and sixteen in township thirty-two north, range two west; thence west along the section lines through township thirty-two north, ranges two and three west, to its intersection with upper westerly rim of Cataract Canyon; thence northwesterly along upper rim of Cataract Canyon, crossing Hualapai Canyon and continuing northwesterly along said upper rim to its intersection with range line, township thirty-three north, between ranges four and five west; thence north on said range line, townships thirty-three and thirty-four north, ranges four and five west, to north bank of the Colorado River; thence northeasterly along the north bank of the Colorado River to junction with Tapeats Creek; thence easterly along north bank of Tapeats Creek to junction with Spring Creek; thence easterly along the north bank of Spring Creek to its intersection with Gila and Salt River meridian, township thirty-four north, between ranges one east and one west and between section six, township thirty-four north, range one east, and section one, township thirty-four north, range one west; thence south on range line between ranges one east and one west to section corner common to sections seven and eighteen, township thirty-four north, range one east, and sections twelve and thirteen, township thirty-four north, range one west; thence east on section lines to section corner common to sections seven, eight, seventeen, and eighteen, township thirty-four north, range two east; thence south on section lines to township line between townships thirty-three and thirty-four north, range two east. at section corner common to sections thirty-one and thirty-two, township thirty-four north, range two east, and sections five and six, township thirty-three north, range two east; thence east on township line to section corner common to sections thirty-one and thirty-two, township thirty-four north, range three east, and sections five and six, township thirty-three north, range three east; thence south on section lines to section corner common to sections seventeen, eighteen, nineteen. and twenty, township thirty-three north, range three east; thence east on section lines to section corner common to sections thirteen, fourteen, twenty-three, and twenty-four, township thirty-three north, range three east; thence north on section lines to section corner common to sections one, two, eleven, and twelve, township thirty-three north, range three east; thence east on section lines to the intersection with upper rim of Grand Canyon; thence northerly along said upper rim of Grand Canyon to main hydrographic divide north of Nankoweap Creek; thence easterly along the said hydrographic divide to its intersection with the Colorado River, approximately at the mouth of Nankoweap Creek; thence easterly across the Colorado River and up the hydrographic divide nearest the junction of Nankoweap Creek and Colorado River to a point on the upper east rim of the Grand Canyon; thence by shortest route to an intersection with range line. townships thirty-three and thirty-four north, between ranges five and six east; thence south on said range line, between ranges five and six east, to section corner common to sections eighteen and nineteen, township thirty-three north, range six east, and sections thirteen and twenty-four, township thirty-three north, range five east; thence east on section lines to section corner common to sections sixteen, seventeen, twenty, and twenty-one, township thirty-three north, range six east; thence south on section lines to section corner common to sections eight, nine, sixteen, and seventeen, township thirty-one north, range six east; thence west on section line to section corner common to sections seven, eight, seventeen, and eighteen, township thirty-one north, range six east; thence south on section lines to township line between townships thirty and thirty-one north at section corner common to sections thirty-one and thirty-two, township thirty-one north, range six east, and sections five and six, township thirty north, range six east; thence west on township line to section corner common to sections thirty-four and thirty-five, township thirty-one north, range five east, and sections two and three, township thirty north, range five east; thence south on section line to section corner common to sections two, three, ten, and eleven, township thirty north, range five east; thence west on section lines to range line, township thirty north, between ranges four and five east, at section corner common to sections six and seven, township thirty north, range five east, and one and twelve, township thirty north, range four east; thence south on range line, township thirty north, between ranges four and five east, to section corner common to sections seven and eighteen, township thirty north,

range five east, and sections twelve and thirteen, township thirty north, range four east; thence west on section line to section corner common to sections eleven, twelve, thirteen, and fourteen, township thirty north, range four east; thence south on section line to section corner common to sections thirteen, fourteen, twenty-three, and twenty-four, township thirty north, range four east; thence west on section lines to section corner common to sections fifteen, sixteen, twenty-one, and twenty-two, township thirty north, range four east; thence south on section line to section corner common to sections twenty-one, twenty-two, twenty-seven, and twenty-eight, township thirty north, range four east; thence west on section lines to range line, township thirty north, between ranges three and four east, at section corner common to sections nineteen and thirty, township thirty north, range four east, and sections twenty-four and twenty-five, township thirty north, range three east; thence north on range line to section corner common to sections eighteen and nineteen, township thirty north, range four east, and sections thirteen and twenty-four, township thirty north, range three east; thence west on section lines to section corner common to sections fourteen, fifteen, twenty-two, and twenty-three, township thirty north, range three east; thence north on section line to section corner common to sections ten, eleven, fourteen, and fifteen, township thirty north, range three east; thence west on section lines to range line at section corner common to sections seven and eighteen, township thirty north, range three east, and sections twelve and thirteen, township thirty north, range two east; thence north on range line to section corner common to sections six and seven, township thirty north, range three east, and sections one and twelve, township thirty north, range two east: thence west on section line to section corner common to sections one, two, eleven, and twelve, township thirty north, range two east; thence north on section line to township line at section corner common to sections thirty-five and thirty-six, township thirty-one north, range two east, and sections one and two, township thirty north, range two east; thence west on township line to the northeast corner of township thirty north, range one east, the place of beginning. (U.S.C., title 16, sec. 221.)

Administration by National Park Service.

Vol. 39, p. 535. See p. 9.

Proviso.

Concessions to highest bidder.

SEC. 2. That the administration, protection, and promotion of said Grand Canyon National Park shall be exercised, under the direction of the Secretary of the Interior, by the National Park Service, subject to the provisions of the Act of August twenty-fifth, nineteen hundred and sixteen, entitled "An Act to establish a National Park Service, and for other purposes": *Provided*, That all concessions for hotels, camps, transportation, and other privileges of every kind and nature for the accommodation or entertainment of visitors shall be let at public bidding to the best and most responsible bidder. (U.S.C., title 16, sec. 222.)

Rights of Havasupai Indians not abridged.

SEC. 3. That nothing herein contained shall affect the rights of the Havasupai Tribe of Indians to the use and occupancy of the bottom lands of the Canyon of Cataract Creek as described in the Executive order of March thirty-first, eighteen hundred and eighty-two, and the Secretary of the Interior is hereby authorized, in his discretion, to permit individual members of said tribe to use and occupy other tracts of land within said park for agricultural purposes. (U.S.C., title 16, sec. 223.)

Existing rights not affected.

SEC. 4. That nothing herein contained shall affect any valid existing claim, location, or entry under the land laws of the United States, whether for homestead, mineral, right of way, or any other purpose whatsoever, or shall affect the rights of any such claimant, locator, or entryman to the full use and enjoyment of his land and nothing herein contained shall affect, diminish, or impair the right and authority of the county of Coconino, in the State of Arizona, to levy and collect tolls for the passage of live stock over and upon the Bright Angel Toll Road and Trail, and the Secretary of the Interior is hereby authorized to negotiate with the said county of Coconino for the purchase of said Bright Angel Toll Road and Trail and all rights therein, and report to Congress at as early a date as possible the terms upon which the property can be procured. (U.S.C., title 16, sec. 224.)

Bright Angel Toll Road and Trail.

Purchase authorized. See 43 Stat. 423, p. 209 below.

Rights of way authorized. Vol. 31, p. 790.

SEC. 5. That whenever consistent with the primary purposes of said park the Act of February fifteenth, nineteen hundred and one, applicable to the locations of rights of way in certain national parks and the national forests for irrigation and other purposes, and subsequent Acts shall be and remain applicable to the lands included within the park. The Secretary of the Interior may, in his discretion and upon such conditions as he may deem proper, grant easements or rights of way for railroads upon or across the park. (U.S.C., title 16, sec. 225.)

For railroads.

Mineral prospecting permitted. (Amended by 46 Stat. 1043. See p. 214.)

SEC. 6. That whenever consistent with the primary purposes of said park, the Secretary of the Interior is authorized, under general regulations to be prescribed by him, to permit the prospecting, development, and utilization of the mineral resources of said park upon such terms and for specified periods, or otherwise, as he may deem to be for the best interests of the United States. (U.S.C., title 16, sec. 226.)

Irrigation projects.

SEC. 7. That, whenever consistent with the primary purposes of said park, the Secretary of the Interior is authorized to permit the utilization of areas therein which may be necessary for the development and maintenance of a Government reclamation project. (U.S.C., title 16, sec. 227.)

Building, etc., restrictions on private lands.

SEC. 8. That where privately owned lands within the said park lie within three hundred feet of the rim of the Grand Canyon no building, tent, fence, or other structure shall be erected on the park lands lying between said privately owned lands and the rim. (U.S.C., title 16, sec. 228.)

Grand Canyon National Monument vacated.

Park lands excluded from game preserve. Vol. 34, p. 607.

SEC. 9. The Executive order of January eleventh, nineteen hundred and eight, creating the Grand Canyon National Monument, is hereby revoked and repealed, and such parts of the Grand Canyon National Game Preserve, designated under authority of the Act of Congress, approved June twenty-ninth, nineteen hundred and six, entitled "An Act for the protection of wild animals in the Grand Canyon Forest Reserve," as are by this Act included with the Grand Canyon National Park are hereby excluded and eliminated from said game preserve.

GRAND CANYON NATIONAL PARK ENLARGEMENT ACT

An Act to further protect the outstanding scenic, natural, and scientific values of the Grand Canyon by enlarging the Grand Canyon National Park in the State of Arizona, and for other purposes. (88 Stat 2089) (P.L. 93–620)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

SEC. 1. This Act may be cited as the "Grand Canyon National Park Enlargement Act".

DECLARATION OF POLICY

SEC. 2. It is the object of this Act to provide for the recognition by Congress that the entire Grand Canyon, from the mouths of the Paria River to the Grand Wash Cliffs, including tributary side canyons and surrounding plateaus, is a natural feature of national and international significance. Congress therefore recognizes the need for, and in this Act provides for, the further protection and interpretation of the Grand Canyon in accordance with its true significance.

ENLARGEMENT OF GRAND CANYON NATIONAL PARK BOUNDARIES

SEC. 3. (a) In order to add to the Grand Canyon National Park certain prime portions of the canyon area possessing unique natural, scientific, and scenic values, the Grand Canyon National Park shall comprise, subject to any valid existing rights under the Navajo Boundary Act of 1934, all those lands, waters, and interests therein, constituting approximately one million two hundred thousand acres, located within the boundaries as depicted on the drawing entitled "Boundary Map, Grand Canyon National Park," numbered 113–20, 021 B and dated December 1974, a copy of which shall be on file and available for public inspection in the offices of the National Park Service, Department of the Interior.

(b) For purposes of this Act, the Grand Canyon National Monument and the Marble Canyon National Monument are abolished.

(c) The Secretary of the Interior shall study the lands within the former boundaries of the Grand Canyon National Monument commonly known as the Tuckup Point, Slide Mountain, and Jensen Tank areas to determine whether any portion of these lands might be unsuitable for park purposes and whether in his judgment the public interest might be better served if they were deleted from the Grand Canyon National Park. The Secretary shall report his findings and recommendations to the Congress no later than one year from the date of enactment of this Act.

ACQUISITION OF LANDS BY DONATION OR EXCHANGE

SEC. 4. (a) Within the boundaries of the Grand Canyon National Park, as enlarged by this Act, the Secretary of the Interior (hereinafter referred to as the "Secretary") may acquire land and interest in land by donation, purchase with donated or appropriated funds, or exchange.

(b) Federal lands within the boundaries of such park are hereby transferred to the jurisdiction of the Secretary for the purposes of the Act.

PROHIBITION AGAINST TAKING OF STATE OR INDIAN LANDS

SEC. 5. Notwithstanding any other provision of this Act (1) land or interest in land owned by the State of Arizona or any political subdivision thereof may be acquired by the Secretary under this Act only by donation or exchange and (2) no land or interest in land, which is held in trust for any Indian tribe or nation, may be transferred to the United States under this Act or for purposes of this Act except after approval by the governing body of the respective Indian tribe or nation.

COOPERATIVE AGREEMENTS FOR UNIFIED INTERPRETATION OF GRAND CANYON

SEC. 6. In the administration of the Grand Canyon National Park, as enlarged by this Act, the Secretary is authorized and encouraged to enter into cooperative agreements with other Federal, State, and local public departments and agencies and with interested Indian tribes providing for the protection and interpretation of the Grand Canyon in its entirety. Such agreements shall include, but not be limited to, authority for the Secretary to develop and operate interpretative facilities and programs on lands and waters outside of the boundaries of such park, with the concurrence of the owner or administrator thereof, to the end that there will be a unified interpretation of the entire Grand Canyon.

PRESERVATION OF EXISTING GRAZING RIGHTS

SEC. 7. Where any Federal lands within the Grand Canyon National Park, as enlarged by this Act, are legally occupied or utilized on the effective date of this Act for grazing purposes, pursuant to a Federal lease, permit, or license, the Secretary shall permit the persons holding such grazing privileges to continue in the exercise thereof during the term of the lease, permit, or license, and periods of renewal thereafter: *Provided*, That no such renewals shall be extended beyond the period ending ten years from the date of enactment of this Act, except that any present lease, permit, or license within the boundaries of the Grand Canyon National Monument as abolished by subsection 3(b) of this Act may be renewed during the life of the present holder which renewals shall terminate upon the death of the present holder.

AIRCRAFT REGULATION

SEC. 8. Whenever the Secretary has reason to believe that any aircraft or helicopter activity or operation may be occurring or about to occur within the Grand Canyon National Park, as enlarged by this Act, including the airspace below the rims of the canyon, which is likely to cause an injury to the health, welfare, or safety of visitors to the park or to cause a significant adverse effect on the natural quiet and experience of the park, the Secretary shall submit to the Federal Aviation Agency, the Environmental Protection Agency pursuant to the Noise Control Act of 1972, or any other responsible agency or agencies such complaints, information, or recommendations for rules and regulations or other actions as he believes appropriate to protect the public health, welfare, and safety or the natural environment within the park. After reviewing the submission of the Secretary, the responsible agency shall consider the matter, and after consultation with the Secretary, shall take appropriate action to protect the park and visitors.

PRESERVATION OF EXISTING RECLAMATION PROVISIONS

SEC. 9. (a) Nothing in this Act shall be construed to alter, amend, repeal, modify, or be in conflict with the provisions of sections 601 to 606 of the Colorado River Basin Project Act, approved September 30, 1968 (82 Stat. 885, 901).

(b) Section 7 of the Act of February 26, 1919 (40 Stat. 1175, 1178), is amended to read as follows:

"Whenever consistent with the primary purposes of such park, the Secretary of the Interior is authorized to permit the utilization of those areas formerly within the Lake Mead National Recreation Area immediately prior to enactment of the Grand Canyon National Park Enlargement Act, and added to the park by such Act, which may be necessary for the development and maintenance of a Government reclamation project."

HAVASUPAI INDIAN RESERVATION

SEC. 10. (a) For the purpose of enabling the tribe of Indians known as the Havasupai Indians of Arizona (hereinafter referred to as the "tribe") to improve the social, cultural, and economic life of its members, the lands generally depicted as the "Havasupai Reservation Addition" on the map described in section 3 of this Act, and consisting of approximately one hundred and eighty-five thousand acres of land and any improvements thereon, are hereby declared to be held by the United States in trust for the Havasupai Tribe. Such map, which shall delineate a boundary line generally one-fourth of a mile from the rim of the outer gorge of the Grand Canyon of the Colorado River and shall traverse Havasu Creek from a point on the rim at Yumtheska Point to Beaver Falls to a point on the rim at Ukwalla Point, shall be on file and available for public inspection in the Offices of the Secretary, Department of the Interior, Washington, District of Columbia.

(b) The lands held in trust pursuant to this section shall be included in the Havasupai Reservation, and shall be administered under the laws and regulations applicable to other trust Indian lands: *Provided*, That—

(1) the lands may be used for traditional purposes, including religious purposes and the gathering of, or hunting for, wild or native foods, materials for paints and medicines;

(2) the lands shall be available for use by the Havasupai Tribe for agricultural and grazing purposes, subject to the ability of such lands to sustain such use as determined by the Secretary;

(3) any areas historically used as burial grounds may continue to be so used;

(4) a study shall be made by the Secretary, in consultation with the Havasupai Tribal Council, to develop a plan for the use of this land by the tribe which shall include the selection of areas which may be used for residential, educational, and other community purposes for members of the tribe and which shall not be inconsistent with, or detract from, park uses and values; *Provided further*, That before being implemented by the Secretary, such plan shall be made available through his offices for public review and comment, shall be subject to public hearings, and shall be transmitted, together with a complete transcript of the hearings, at least 90 days prior to implementation, to the Committees on Interior and Insular Affairs of the United States Congress; and *Provided further*, that any subsequent revisions of this plan shall be subject to the same procedures as set forth in this paragraph;

(5) no commercial timber production, no commercial mining or mineral production, and no commercial or industrial development shall be permitted on such lands: *Provided further*, That the Secretary may authorize the establishment of such tribal small business enterprises as he deems advisable to meet the needs of the tribe which are in accordance with the plan provided in paragraph (4) of this section;

(6) nonmembers of the tribe shall be permitted to have access across such lands at locations established by the Secretary in consultation with the Tribal Council in order to visit adjacent parklands, and with the consent of the tribe, may be permitted

(i) to enter and temporarily utilize lands within the reservation in accordance with the approved land use plan described in paragraph (4) of this section for recreation purposes or (ii) to purchase licenses from the tribe to hunt on reservation lands subject to limitations and regulations imposed by the Secretary of the Interior; and

(7) except for the uses permitted in paragraphs 1 through 6 of this section, the lands hereby transferred to the tribe shall remain forever wild and no uses shall be permitted under the plan which detract from the existing scenic and natural values of such lands.

(c) The Secretary shall be responsible for the establishment and maintenance of conservation measures for these lands, including, without limitation, protection from fire, disease, insects, or trespass and reasonable prevention or elimination of erosion, damaging land use, overgrazing, or pollution. The Secretary of the Interior is authorized to contract with the Secretary of Agriculture for any services or materials deemed necessary to institute or carry out any such measures. Any authorized Federal programs available to any other Indian tribes to enhance their social, cultural, and economic well-being shall be deemed available to the tribe on these lands so long as such programs or projects are consistent with the purposes of this Act. For these purposes, and for the purpose of managing and preserving the resources of the Grand Canyon National Park, the Secretary shall have the right of access to any lands hereby included in the Havasupai Reservation. Nothing in this Act shall be construed to prohibit access by any members of the tribe

to any sacred or religious places or burial grounds, native foods, paints, materials, and medicines located on public lands not otherwise covered in this Act.

(d) The Secretary shall permit any person presently exercising grazing privileges pursuant to Federal permit or lease in that part of the Kaibab National Forest designated as the "Raintank Allotment", and which is included in the Havasupai Reservation by this section, to continue in the exercise thereof, but no permit or renewal shall be extended beyond the period ending ten years from the date of enactment of this Act, at which time all rights of use and occupancy of the lands will be transferred to the tribe subject to the same terms and conditions as the other lands included in the reservation in paragraph (b) of this section.

(e) The Secretary, subject to such reasonable regulations as he may prescribe to protect the scenic, natural, and wildlife values thereof, shall permit the tribe to use lands within the Grand Canyon National Park which are designated as "Havasupai Use Lands" on the Grand Canyon National Park boundary map described in section 3 of this Act, and consisting of approximately ninety-five thousand three hundred acres of land, for grazing and other traditional purposes.

(f) By the enactment of this Act, the Congress recognizes and declares that all right, title, and interest in any lands not otherwise declared to be held in trust for the Havasupai Tribe or otherwise covered by this Act is extinguished. Section 3 of the Act of February 26, 1919 (40 Stat. 1177; 16 U.S.C. 223), is hereby repealed.

AUTHORIZATION OF APPROPRIATIONS

SEC. 11. There are authorized to be appropriated such sums as may be necessary to carry out the provisions of this Act, not to exceed, however, $1,250,000, in the aggregate for the period of the five fiscal years beginning with the fiscal year ending June 30, 1974, for the acquisition of lands and property, and not to exceed $49,000 for the fiscal year ending June 30, 1974, $255,000 for the fiscal year ending June 30, 1975, $265,000 for the fiscal year ending June 30, 1976, and $235,000 for the fiscal year ending June 30, 1977, for development, plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indexes applicable to the types of construction involved herein. The sums authorized in this section shall be available for acquisition and development undertaken subsequent to the date of enactment of this Act.

Approved January 3, 1975.

Legislative History:

House Reports: No. 93-1374 (Comm. on Interior and Insular Affairs) and No. 93-1611 (Comm. of Conference).
Senate Report No. 93-406 (Comm. on Interior and Insular Affairs).
Congressional Record:
Vol. 119 (1973): Sept. 24, considered and passed Senate.
Vol. 120 (1974): Oct. 10, considered and passed House, amended.
Dec. 18, House and Senate agreed to conference report.

U.S. FISH AND WILDLIFE SERVICE

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
3616 W. Thomas, Suite 6
Phoenix, Arizona 85019

2-21-92-I-204

January 27, 1992

MEMORANDUM

To: Regional Director, National Park Service, Denver, Colorado
(Attention: R. Ernenwein)

From: Field Supervisor

Subject: General Management Plan for Grand Canyon National Park in Arizona

This is in response to your letter [D50-19 (DSC-TWE) GRCA-903-02], January 13, 1992, requesting a Federal list of endangered, threatened, proposed, and candidate species in the Grand Canyon National Park in Arizona. Your proposed project area contains no designated critical habitat.

Our data indicate the following listed and candidate species may occur within the area described in the subject letter:

Endangered Species

Humpback chub	*Gila cypha*
Razorback sucker	*Xyrauchen texanus*
American peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*
Brady pincushion cactus	*Pediocactus bradyi*
Sentry milk vetch	*Astragalus cremnophylax* var. *cremnophylax*
Welsh's milkweed	*Asclepias welshii*

Proposed Threatened Species

Mexican spotted owl	*Strix occidentalis lucida*

Category 1 Species

Southwestern willow flycatcher	*Empidonax traillii extimus*
Tusayan rabbitbrush	*Chrysothamnus molestus*
Arizona leather flower	*Clematis hirsutissima* var. *arizonica*

Category 2 Species

Grand Canyon cave pseudoscorpion	*Archeolarca cavicola*
Lowland leopard frog	*Rana yavapaiensis*
Chuckwalla	*Sauromalus obesus*
Roundtail chub	*Gila robusta*
Northern goshawk	*Accipiter gentilis*
Arizona shrew	*Sorex arizonae*
Spotted bat	*Euderma maculatum*
Coconino pocket mouse	*Perognathus amplus ammodytes*
Prospect Valley pocket gopher	*Thomomys umbrinus muralis*
Marble Canyon kangaroo rat	*Dipodomys microps leucotis*
Navaho Mountain Mexican vole	*Microtus mexicanus navaho*
Yellow-flowered desert poppy	*Arctomecon californica*
Roaring Springs prickly poppy	*Argemone arizonica*
Cliff milk vetch	*Astragalus cremnophylax* var. *myriorraphis*
no common name	*Camissonia confertiflora*
no common name	*Camissonia specuicola* spp. *hesperia*
Kaibab paintbrush	*Castilleja kaibabensis*
Kaibab bladderpod	*Lesquerella kaibabensis*
Mt. Trumbull beard tongue	*Penstemon distans*
North Rim primrose	*Primula hunnewellii*
Grand Canyon rose	*Rosa stellata* ssp. *abyssa*
Grand Canyon catchfly	*Silene rectiramea*

Threatened and endangered species must be considered prior to project initiation. Candidate species are those which may in the future be considered for listing as endangered or threatened species. Category 1 candidates are those for which the Fish and Wildlife Service (FWS) has substantial information to support proposing to list the species as threatened or endangered. Category 2 candidates are those for which such information is not available and we are seeking conclusive data on their biological vulnerability and the threats. Although candidate species have no legal protection, we would appreciate your consideration of them in the development of the project.

The FWS is concerned for the well-being of the humpback chub in the Grand Canyon National Park. The Little Colorado River is the only documented spawning area for the endangered humpback chub in the Grand Canyon. Spawning may occur during the period March through June, with the peak of activity varying among seasons. Humpback chubs moving from the Colorado River into the Little Colorado River may stage at the confluence of the two rivers before ascending further. One action to protect the species, taken by the National Park Service (NPS) and Arizona Game and Fish Department, has been the year-round restriction on fishing in the vicinity of the confluence of the Little Colorado River. We support this continued restriction.

The influence of other recreational activity in the lower reach of the Little Colorado River during concentration periods of the humpback chub is unknown. This area is a popular attraction site for most river trips, with swimmers enjoying the warmer water temperatures of the Little Colorado River. Present studies of the humpback chub in the Grand Canyon related to the operation of Glen Canyon Dam will assist our understanding of the species, but to our knowledge, no work is being directed at the question of recreational use of the lower reach of the Little Colorado River. Presently, we have no documented impacts to the humpback chub from recreational use; however, the potential exists. If the NPS were to address this question now, the study could be combined with the on-going studies of the species in the Grand Canyon.

The FWS is currently working with NPS on the the development of an Environmental Impact Statement for the Grand Canyon National Park. Other issues and management concerns may develop during this evaluation. The FWS will keep NPS informed of any new developments concerning Federally listed species.

Thank you for assisting the conservation of biodiversity. In future written communications on this project, please refer to consultation number 2-21-92-F-204. If you have any questions, please contact Jay Slack, Ren Lohoefener, or me (Telephone: 602/379-4720 or FTS/261-4720).

for Sam F. Spiller

cc: Regional Director, Fish and Wildlife Service, Albuquerque, New Mexico (AWE)
Director, Arizona Game and Fish Department, Phoenix, Arizona
Superintendent, Grand Canyon National Park, National Park Service, Grand Canyon, Arizona

ARIZONA STATE PARKS

1300 W. WASHINGTON
PHOENIX, ARIZONA 85007
TELEPHONE 602-542-4174

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KENNETH E. TRAVOUS
EXECUTIVE DIRECTOR

CHARLES R. EATHERLY
DEPUTY DIRECTOR

October 11, 1994

Stanley T. Albright
Regional Director, Western Region
National Park Service
600 Harrison Street, Suite 600
San Francisco, CA 94107-1372

RE: Grand Canyon National Park; Draft General Management Plan/Environmental Impact Statement; DOI-NPS

Dear Mr. Albright:

Thank you for consulting with us on the above draft document. We have reviewed the cultural resources sections of the report and find it to be thorough; we agree that the agency's proposed alternative would have the least impact, and the best benefit, to the cultural resources of the Park.

With regard to the proposed alternative, we note that efforts will be made to avoid significant cultural resources and traditional cultural properties during all National Park Service (NPS) undertakings; in addition, a synthetic research plan would be generated to allow archaeologists to place any necessary mitigation projects within a historic context for research, in consultation with this office and the Advisory Council on Historic Preservation. Also, a monitoring and preservation program is part of the preferred alternative and would enable archaeologists to assess the nature and extent of cumulative impacts to sites and thus develop appropriate avoidance or mitigation methods. We also note that an ethnographic survey program is a component of this alternative and would be crucial in allowing planners to identify and avoid sensitive areas.

It is our opinion that all of these components combined should enable the agency to manage an effective and sensitive cultural resources management program with regard to the undertakings associated with the proposed alternative. We appreciate your continued cooperation with this office in complying with the historic preservation requirements for federal undertakings. If you have any questions or concerns, please feel free to contact me at 602/542-7138.

Sincerely,

Ann Valdo Howard
Public Programs Manager/Archaeologist
State Historic Preservation Office

RECEIVED 10/21
Western Regional Office

	Regional Director	
	Dep. Reg. Dir.	
	Operations	
✓	Res. Mgmt & Plan	10/24
	Administration	
	Operations Eval	
	Public Affairs	
	EO	
	Budget	

Action Taken

APPENDIX C: COSTS FOR ALTERNATIVES AND PHASING FOR THE PROPOSED ACTION

ALTERNATIVE 1

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
SOUTH RIM				
Visitor Services/Information/ Orientation				
*Jointly use regional information centers				
existing structure in Flagstaff	200 sq ft for NPS	no cost	no cost	no cost
new structure in Flagstaff	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
existing structure in Williams	200 sq ft for NPS	no cost	no cost	no cost
new structure in Cameron	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
Establish regional information office	1,400 sq ft	$316,800	$60,500	$377,300
Establish day use reservation system	$98,300	$18,800	$117,100	
Establish private vehicle reservation system		$131,000	$25,000	$156,000
Create telecommunication systems (2 at airports, 4 at regional centers, 2 at gateway centers, 5 at regional area parks)	14 units	$91,700	$17,500	$109,200
Provide multilingual information center	1,800 sq ft	$382,000	$72,900	$454,900
Transportation				
*Help construct Tusayan gravel parking for alternate mode service to park	940 spaces, 8.1 acres NPS provides 470 spaces, 4 acres	$902,000	$172,200	$1,074,200
Construct gravel parking lot at Desert View quarry	54 spaces = 50 car, 3 RV, 1 bus 0.5 acre	$98,900	$18,900	$117,800
Add bus	1 bus	$325,000	$25,000	$350,000
Add gravel parking at Desert View	85 spaces	$106,900	$20,400	$127,300
Management Support				
Add temporary office trailers	5 trailers	$242,400	$46,300	$288,700
Add new or rehabilitate existing sewage lagoons at Desert View	3 acres	$589,500	$112,500	$702,000
Add composting toilets	5 toilets	$720,500	$137,500	$858,000
Housing				
Remove substandard housing and revegetate in village and Desert View	113 units in village 11 units at Desert View	$1,182,300	$225,700	$1,408,000

ALTERNATIVE 1 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Add NPS housing units in Grand Canyon Village	59 units, 17.8 acres	$13,912,200	$2,655,000	$16,567,200
*Add concessioner housing units at Grand Canyon Village	226 units, 25.3 acres	$53,290,800	$10,170,000	$63,460,800
Add NPS housing units at Desert View	15 units, 1.4 acres	$3,537,000	$675,000	$4,212,000
*Add concessioner housing units at Desert View	13 units, 1.5 acres	$3,065,400	$585,000	$3,650,400
NORTH RIM				
Visitor Services/Information/ Orientation				
No changes				
Transportation				
Add gravel parking lot at CC Hill	30 spaces = 20 car, 10 RV or bus	$56,600	$10,800	$67,400
Add graded road at CC Hill	0.25 mile	$131,000	$25,000	$156,000
Housing				
Remove substandard housing	22 units	$173,000	$33,000	$206,000
Add NPS housing units	29 units, 3.5 acres	$6,838,200	$1,305,000	$8,143,200
*Add concessioner housing units	88 units, 6.2 acres	$20,730,400	$3,956,200	$24,686,600
Rehabilitate unit at entry	1,026 sq ft	$107,600	$20,600	$128,200
Upgrade septic system at entry house	1,000 gallons	$26,200	$5,000	$31,200
Management Support				
Add temporary trailers	2 trailers	$116,400	$22,200	$138,60
Construct composting toilets at Walhalla and Widforss	3 toilets	$453,300	$86,500	$539,800
Expand wastewater treatment plant	2 acres	$393,000	$75,000	$468,000
CORRIDOR TRAILS				
Reconstruct transcanyon waterline	8 miles	$33,405,000	$6,375,000	$39,780,000
Construct composting toilets along trails	4 toilets	$691,700	$132,000	$823,700
Replace toilets along North Kaibab Trail	2 toilets	$345,900	$66,000	$411,900

ALTERNATIVE 1 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
TUWEEP				
Add seasonal ranger trailer	1 trailer	$58,200	$11,100	$69,300
Add septic system for seasonal ranger	1,000-1,200 gallons	$13,100	$2,500	$15,600
Expand existing water catchment and cistern	9,000 gallon cistern now	$13,100	$2,500	$15,600
Rehabilitate ranger residence septic system	1,500-2,000 gallons now	$10,000	$1,900	$11,900
Add composting toilet	1 toilet	$144,100	$27,500	$171,600
NPS TOTAL		$65,161,900	$12,398,700	$77,560,600
CONCESSIONER TOTAL		$78,543,800	$14,989,300	$93,533,100
TOTAL		**$143,705,700**	**$27,388,000**	**$171,093,700**

The following cost was not included as it will be an ongoing cost:

Provide gateway information (in existing facility – rent space)	3,000 sq ft	$2,500/month	($30,000/year)

* Either partial or full concessioner costs.

ALTERNATIVE 2: PROPOSED ACTION

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
SOUTH RIM				
Visitor Services/Information/ Orientation				
*Jointly use regional information centers (same as alt. 1)				
existing structure in Flagstaff	200 sq ft for NPS	no cost	no cost	no cost
new structure in Flagstaff	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
existing structure in Williams	200 sq ft for NPS	no cost	no cost	no cost
new structure in Cameron	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
Create telecommunication systems (same as alt. 1)	14 units	$91,700	$17,500	$109,200
Provide multilingual information brochures	2 million year	$78,600	$15,000	$93,600
*Construct Tusayan gateway information center	15,000 sq ft total 7,500 sq ft for NPS	$4,716,000	$900,000	$5,616,000
Construct Mather Point orientation center	18,000 sq ft	$5,659,200	$1,080,000	$6,739,200
Adaptively reuse powerhouse (education center)	17,632 sq ft	$5,543,500	$1,058,000	$6,601,500
*Adaptively reuse historic laundry (restaurant)	6,375 sq ft	$2,296,600	$438,300	$2,734,900
*Adaptively reuse GCNPL maintenance building (gift shop)	3,870 sq ft	$1,166,100	$222,600	$1,388,700
Adaptively reuse historic community building (NPS theater/performance space)	5,738 sq ft	$1,728,900	$330,000	$2,058,900
Adaptively reuse horse barn (children's museum, artist-in-park space) (minimum changes)	6,500 sq ft	$1,490,200	$284,400	$1,774,600
Adaptively reuse mule barn (American Indian cultural center) (50% matching outside funds)	10,000 sq ft	$2,358,000	$450,000	$2,808,000
*Adaptively reuse blacksmith shop (bike rental or other visitor service)	2,267 sq ft	$519,800	$99,200	$619,000
*Adaptively reuse magistrate building (ATM, post office)	2,101 sq ft	$578,000	$110,300	$688,300

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Landscape powerhouse area (ground surfaces, benches, amphitheater, trees/shrubs, stairway to rim)	28.6 acres	$3,746,600	$715,000	$4,461,600
*Replace historic Babbitt's store (grocery, supplies, deli)	10,354 sq ft	$2,577,200	$491,900	$3,069,100
Construct Desert View orientation center	10,000 sq ft	$3,144,000	$600,000	$3,744,000
*Remove one-story Yavapai West units	160 rooms	$209,600	$40,000	$249,600
*Construct two-story Yavapai West units	265 rooms	$7,637,300	$1,457,500	$9,094,800
*Remove Kachina and Thunderbird Lodges	104 rooms	$136,300	$26,000	$162,300
*Convert Kachina/Thunderbird space to outdoor picnic, program, dining	2.2 acres	$432,300	$82,500	$514,800
*Rehabilitate Maswik cabins	27 cabins	$530,600	$101,300	$631,900
*Remove Maswik plywood cabins	10 cabins	$78,600	$15,000	$93,600
Redesign the RV campground	78 sites before 108 sites after	$1,080,000	$206,100	$1,286,100
*Convert Victor, Victor Annex, Colter, Brandt, and Rouzer dorms to visitor lodging	194 rooms	$4,472,900	$853,600	$5,326,500
*Remodel Hermits Rest, Watchtower, Lookout Studio (interior renovation, minimal exhibits)	6,305 sq ft	$1,734,500	$331,100	$2,065,600
Clean up Orphan Mine and remove headframe	3 acres (upper mine) 1 acre (lower mine)	$524,000	$100,000	$624,000
Add entry station at Desert View; remove existing station and revegetate	800 sq ft (new station) 100 sq ft (old station)	$923,600	$176,300	$1,099,900
Add campsites at Desert View	50 sites 392 sq ft restrooms, no showers	$256,300	$48,900	$305,200
*Remove Desert View gift shop/ deli and replace; remove restrooms	3,819 sq ft	$1,100,700	$210,100	$1,310,800
*Convert Bright Angel gift shop/ ice cream shop to restaurant	2,580 sq ft	$676,000	$129,000	$805,000
Construct Yavapai observation station outdoor exhibits	3 kiosks	$117,900	$22,500	$140,400

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Transportation				
Construct gateway transit center	3,000 sq ft lighted enclosed area; 15,000 sq ft lighted outdoor waiting/loading area (roughly 75% of outdoor should be shaded)	$1,084,800	$207,000	$1,291,800
Construct gateway parking lot	2,522 spaces = 2,313 car, 148 RV, 61 bus; 25.3 acres	$6,523,200	$1,244,900	$7,768,100
Construct Mather Point transit center	3,000 sq ft lighted enclosed area; 15,000 sq ft lighted outdoor waiting/loading area (roughly 75% of outdoor should be shaded)	$1,084,800	$207,000	$1,291,800
Construct Mather Point parking lot	1,195 spaces = 1,021 car, 81 RV, 93 bus; 12.4 acres	$3,149,800	$601,200	$3,751,000
Construct Mather Point orientation center access road	1.5 miles	$1,437,800	$274,400	$1,712,200
Construct access road to link RV campground with south entrance road	0.4 mile	$393,000	$75,000	$468,000
Construct new road (Center Road to Maswik link)	1.4 miles	$1,375,600	$262,500	$1,638,100
Construct community road to business center	0.4 mile	$393,000	$75,000	$468,000
Reduce scale of business center parking and add pedestrian amenities (picnic tables, program seating, screen/projection space, landscaping)	150 car spaces 2.5 acres	$797,800	$152,300	$950,100
Construct Desert View bypass; realign access road to Desert View	0.5 mile	$491,300	$93,800	$585,100
Build Desert View transit shelter/ waiting area and bus dropoff	1,000 sq ft lighted enclosed area; 1,200 sq ft lighted outdoor waiting/loading area (roughly 75% of outdoor should be shaded)	$438,600	$83,700	$522,300
Remove existing Desert View parking lot/revegetate (revegetate about 60%)	144 spaces = 139 car, 5 bus 1 acre	$144,100	$27,500	$171,600
Construct Desert View parking lot	438 spaces = 398 car, 25 RV, 15 bus; 4.5 acres	$1,042,200	$198,900	$1,241,100
Add buses	77 buses (includes spares)	$31,425,000	$300,000	$31,725,000

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Add bus shelters	35 lighted shelters = 27 small, 4 medium, 4 large (small = 300 sq ft weatherproof space & 460 sq ft loading space) (medium = 600 sq ft weatherproof space & 820 sq ft loading space) (large = 1,000 sq ft weatherproof space & 1,300 sq ft loading space)	$5,712,600	$1,090,200	$6,802,800
Construct bike trails	50 miles	$8,253,000	$1,575,000	$9,828,000
Construct pedestrian rim trails and community pedestrian trails	20 miles	$2,620,000	$500,000	$3,120,000
Remove most of parking in village parking lots	650-750 parking spaces (roughly 3.5 acres of striped parking, est is side of road parking)	$245,700	$46,900	$292,600
Management Support				
Expand public transit maintenance facility	38,500 sq ft enclosed 69,300 sq ft paved lot	$6,420,000	$1,225,400	$7,645,400
Rent office space in Flagstaff	7,000 sq ft		costs unknown at this time	
Remove backcountry office and revegetate area	1,440 sq ft	$79,300	$15,100	$94,400
*Build concessioner mule barn and blacksmith shop	45,867 sq ft	$1,802,600	$344,000	$2,146,600
Build NPS mule/horse barns and blacksmith shop at Southgate	9,000 sq ft	$353,700	$67,500	$421,200
Move dry dump to Southgate		$13,100	$2,500	$15,600
Redesign sewage lagoons and build helicopter base	12 acres for lagoons 5 acres for helicopter	$949,800	$181,300	$1,131,100
Construct NPS maintenance/ purchasing headquarters	60,000 sq ft	$11,790,000	$2,250,000	$14,040,000
*Construct concession transportation maintenance facility	15,600 sq ft enclosed 21,600 sq ft paved lot	$3,121,500	$595,700	$3,717,200
*Build joint fire/safety building (GCNPL and NPS)	6,000 sq ft total 4,500 sq ft for NPS	$2,063,200	$393,900	$2,457,100
*Rehabilitate NPS maintenance/ warehouse for GCNPL	32,400 sq ft	$3,395,600	$648,000	$4,043,600
*Rehabilitate historic schoolhouse for GCNPL	3,094 sq ft	$608,000	$116,100	$724,100
*Remodel general office building for GCNPL	25,998 sq ft	$851,500	$162,500	$1,014,000
Rehabilitate visitor center for NPS administration	22,066 sq ft	$722,700	$138,000	$860,700

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Remove GCNPL personnel building and other noncontributing buildings in Village Historic District and revegetate	5,000 sq ft	$275,100	$52,500	$327,600
Expand or build new boat shop at Lees Ferry	3,300 sq ft	$432,300	$82,500	$514,800
Expand sewage treatment at Desert View	1-3 acres	$373,400	$71,300	$444,700
Add composting toilets (same as alt. 1)	5 toilets	$720,500	$137,500	$858,000
Add restrooms at Yavapai observation station and S. Kaibab trailhead	1,268 sq ft	$368,000	$70,200	$438,200
*Remove Bright Angel salon and convert to women's restrooms	140 sq ft	$41,300	$7,900	$49,200
Construct Desert View ranger operations building	2,116 sq ft	$374,300	$71,500	$445,800
Construct NPS maintenance building at Desert View	7,329 sq ft	$1,200,200	$229,100	$1,429,300
*Construct GCNPL maintenance building at Desert View	3,500 sq ft	$573,200	$109,400	$682,600
Housing				
Remove substandard housing and revegetate at Grand Canyon Village and Desert View (same as alt. 1)	113 units in village 11 units at Desert View	$1,182,300	$225,700	$1,408,000
Add NPS housing units in village	84 units, 2.9 acres	$3,886,000	$741,600	$4,627,600
Add NPS housing units at Desert View	22 units, 1.8 acres	$2,223,100	$424,300	$2,647,400
Add NPS housing units outside park	54 units, 6.6 acres	$6,318,400	$1,205,800	$7,524,200
*Add concession housing units in village	594 units, 22.2 acres	$19,060,700	$3,637,600	$22,698,300
*Add concession housing units at Desert View	48 units, 3.7 acres	$4,316,600	$823,800	$5,140,400
*Add concession housing outside park	249 units, 30.7 acres	$27,473,400	$5,243,000	$32,716,400
Add NPS housing unit at Lees Ferry	1 unit	$131,000	$25,000	$156,000

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Community Services				
Adaptively reuse historic NPS maintenance buildings for exercise, meeting, recreational, work space; buildings include:	13,678 sq ft	$2,508,400	$478,700	$2,987,100
GCNPL fire station	2,200 sq ft			
boat shop	1,160 sq ft			
main warehouse	2,592 sq ft			
lumber warehouse	1,500 sq ft			
horse barn	960 sq ft			
mule barn	1,500 sq ft			
paint shop	816 sq ft			
blacksmith shop	670 sq ft			
storage behind warehouse	1,400 sq ft			
jail	250 sq ft			
coal shed	630 sq ft			
Construct outdoor park at historic NPS maintenance area (basketball, volleyball, playground)	0.9 acre	$196,500	$37,500	$234,000
NORTH RIM				
Visitor Services/Information/Orientation				
Add building space to Kaibab Plateau visitor center	4,000 sq ft	$1,509,200	$288,000	$1,797,200
Establish day use reservation system		$52,400	$10,000	$62,400
Add CC Hill orientation center	6,000 sq ft	$1,886,400	$360,000	$2,246,400
Add picnic areas	5 acres (25 tables)	$327,500	$62,500	$390,000
Redesign the campground	83 sites before 78 sites after	$204,400	$39,000	$243,400
Construct camper services facility in campground	2,000 sq ft	$288,200	$55,000	$343,200
Construct Point Imperial outdoor exhibits	5 kiosks	$196,500	$37,500	$234,000
*Add portable winter huts (concession or park)	3 huts	$39,300	$7,500	$46,800
*Convert lodge cabins to visitor lodging	16 cabins	$419,200	$80,000	$499,200
Adaptively reuse six historic frame cabins and remove the remainder	6 cabins	$157,200	$30,000	$187,200

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Transportation				
Add parking spaces at Kaibab Plateau visitor center at Jacob Lake	65 spaces	$144,800	$27,700	$172,500
Add CC Hill parking lot	397 spaces = 377 car, 16 RV, 4 bus; 3.75 acres	$927,000	$177,000	$1,104,000
Construct CC Hill parking lot access road	0.25 mile	$245,700	$46,900	$292,600
Construct CC Hill transit center/ staging area	1,000 sq ft lighted enclosed area; 1,200 sq ft lighted outdoor waiting/loading area (roughly 75% of outdoor should be shaded)	$182,400	$34,800	$217,200
Add North Rim bus system	11 buses (includes spares)	$1,175,000	$125,000	$1,300,000
Add bus shelters	10 lighted shelters = 8 small, 1 medium, 1 large (small = 300 sq ft weatherproof space & 460 sq ft loading space) (medium = 600 sq ft weatherproof space & 820 sq ft loading space) (large = 1,000 sq ft weatherproof space & 1,300 sq ft loading space)	$1,926,200	$367,600	$2,293,800
*Add rim mule trails	3 miles	$294,800	$56,300	$351,100
Add rim pedestrian trails	10 miles	$943,200	$180,000	$1,123,200
Add bike paths	50 miles	$8,253,000	$1,575,000	$9,828,000
Remove and revegetate North Kaibab trailhead parking lot	40 spaces 0.3 acre	$101,600	$19,400	$121,000
Management Support				
*Build joint concessioner/NPS transit maintenance facility	6,000 sq ft enclosed 10,800 sq ft paved lot	$1,240,000	$236,800	$1,476,800
Expand wastewater treatment plant	115,000-120,000 gpd 2-3 acres	$2,796,900	$533,800	$3,330,700
Clear and relocate helipad	225 sq ft	$55,800	$10,700	$66,500
Construct composting toilets at Walhalla and Widforss (same as alt. 1)	3 toilets	$453,300	$86,500	$539,800
*Remove and replace mule staging area	4,000 sq ft	$262,000	$50,000	$312,000
Construct NPS maintenance building	6,500 sq ft	$1,226,900	$234,200	$1,461,100
Convert gas station to bike rental facility	1,213 sq ft	$95,400	$18,200	$113,600
Rehabilitate existing structures	18,000 sq ft	$2,718,000	$518,700	$3,236,700

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Housing				
Remove substandard housing (same as alt. 1)	22 units	$173,000	$33,000	$206,000
*Add concessioner new and replacement housing units	201 units, 12.6 acres	$13,007,000	$2,482,300	$15,489,300
Add NPS new and replacement housing units	46 units, 3.3 acres	$3,327,400	$635,000	$3,962,400
CORRIDOR TRAILS				
*Cobble sections of North and South Kaibab and Bright Angel Trails (25%NPS, 75%concessions)	7.8 miles	$1,226,300	$234,000	$1,460,300
Construct composting toilets along trails (same as alt. 1)	4 toilets	$691,700	$132,000	$823,700
Replace toilets along N. Kaibab Trail (same as alt. 1)	2 toilets	$345,900	$66,000	$411,900
Convert Indian Gardens storage building to residence	599 sq ft	$102,000	$19,500	$121,500
Convert Indian Gardens storage building to contact station	672 sq ft	$114,500	$21,900	$136,400
Add Indian Gardens amphitheater	30 seats/rustic	$78,600	$15,000	$93,600
TUWEEP				
Add regional information signs	3 signs	$33,400	$6,400	$39,800
Add composting toilet (same as alt. 1)	1 toilet	$144,100	$27,500	$171,600
Remove rim campsites and replace	2 campsites	$13,100	$2,500	$15,600
Add radio communication to Pipe Springs, NM		$32,800	$6,300	$39,100
Remove and replace parking lot/ revegetate existing lot	22 spaces; 4,400 sq ft (new lot) 10 spaces; 1,800 sq ft (old lot)	$99,200	$19,000	$118,200
Purchase airstrip and adjacent private lands	3,200 acres	$2,096,000	$400,000	$2,496,000
Add loop trail from new parking lot to connect Saddle Horse Canyon Trail and Toroweap overlook	1.5 miles	$137,600	$26,300	$163,900

ALTERNATIVE 2: PROPOSED ACTION (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Add seasonal ranger trailer (same as alt. 1)	1 trailer	$58,200	$11,100	$69,300
Add septic system for seasonal ranger (same as alt. 1)	1,000-1,200 gallons	$13,100	$2,500	$15,600
Expand existing water catchment and cistern (same as alt. 1)	9,000 gallon cistern now	$13,100	$2,500	$15,600
Rehabilitate ranger residence septic system (same as alt. 1)	1,500-2,000 gallons now	$10,000	$1,900	$11,900
NPS TOTAL		$172,784,800	$27,179,400	$199,964,200
CONCESSIONER TOTAL		$104,103,700	$19,867,700	$123,971,400
TOTAL		**$276,888,500**	**$47,047,100**	**$325,935,600**

* Either partial or full concession costs.

ALTERNATIVE 3

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
SOUTH RIM				
Visitor Experience/Information/ Orientation				
*Jointly use regional information centers (same as alt. 1)				
existing structure in Flagstaff	200 sq ft for NPS	no cost	no cost	no cost
new structure in Flagstaff	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
existing structure in Williams	200 sq ft for NPS	no cost	no cost	no cost
new structure in Cameron	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
*Construct joint gateway orientation/information center in Tusayan (includes all South Rim orientation/information plus backcountry and interpretive offices)	25,000 sq ft total 18,750 sq ft for NPS	$7,074,000	$1,350,000	$8,424,000
*Construct joint gateway orientation/information center at Desert View	10,000 sq ft total 7,500 sq ft for NPS	$2,829,600	$540,000	$3,369,600
Adaptively reuse powerhouse (same as alt. 2)	17,632 sq ft	$5,543,500	$1,058,000	$6,601,500
*Adaptively reuse historic laundry (same as alt. 2)	6,375 sq ft	$2,296,600	$438,300	$2,734,900
*Adaptively reuse GCNPL maintenance building (same as alt. 2)	3,870 sq ft	$1,166,100	$222,600	$1,388,700
Adaptively reuse historic community building (same as alt. 2)	5,738 sq ft	$1,728,900	$330,000	$2,058,900
Adaptively reuse horse barn (same as alt. 2)	6,500 sq ft	$1,490,200	$284,400	$1,774,600
*Adaptively reuse magistrate building (same as alt. 2)	2,101 sq ft	$578,000	$110,300	$688,300
Landscape powerhouse area (same as alt. 2)	28.6 acres	$3,746,600	$715,000	$4,461,600
*Replace historic Babbitt's store (same as alt. 2)	10,354 sq ft	$2,577,200	$491,900	$3,069,100
*Remodel Hermits Rest, Watchtower, Lookout Studio (same as alt. 2)	6,305 sq ft	$1,734,500	$331,100	$2,065,600
Restore Orphan Mine headframe and clean up area so safe	3 acres (upper mine) 1 acre (lower mine)	$524,000	$100,000	$624,000

ALTERNATIVE 3 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
*Convert Bright Angel gift shop/ ice cream shop to restaurant (same as alt. 2)	2,580 sq ft	$676,000	$129,000	$805,000
Remove bank and post office at business center and revegetate	6,743 sq ft	$176,700	$33,800	$210,500
*Remove Kachina and Thunderbird Lodges (same as alt. 2)	104 rooms	$136,300	$26,000	$162,300
*Convert Kachina/Thunderbird space to outdoor picnic, program, dining (same as alt. 2)	2.2 acres	$432,300	$82,500	$514,800
*Remove plywood cabins at Maswik (same as alt. 2)	10 cabins	$78,600	$15,000	$93,600
*Convert Maswik cabins to lodging (same as alt. 2)	27 cabins	$530,600	$101,300	$631,900
*Remove and revegetate Desert View GCNPL gift shop/deli and Babbitts store	9,819 sq ft	$139,400	$26,600	$166,000
Transportation				
Construct Tusayan area gateway parking lot	3,512 spaces = 3,186 car, 203 RV, 123 bus; 34.5 acres	$6,675,700	$1,274,000	$7,949,700
Construct Desert View gateway parking lot	879 spaces = 797 car, 51 RV, 31 bus; 8.6 acres	$1,641,500	$313,300	$1,954,800
Construct Tusayan Area gateway transit center	5,000 sq ft enclosed area 25,000 sq ft lighted outdoor waiting/loading area (roughly 75% of outdoor should be shaded)	$1,901,200	$362,900	$2,264,100
Construct Desert View gateway transit center	2,000 sq ft enclosed area 5,000 sq ft lighted outdoor waiting/loading area (roughly 75% of outdoor should be shaded)	$512,500	$97,800	$610,300
Add buses	104 buses (includes spares)	$43,250,000	$400,000	$43,650,000
Add bus shelters	35 lighted shelters = 27 small, 4 medium, 4 large (small = 300 sq ft weatherproof space & 460 sq ft loading space) (medium = 600 sq ft weatherproof space & 820 sq ft loading space) (large = 1,000 sq ft weatherproof space & 1,300 sq ft loading space)	$5,712,600	$1,090,200	$6,802,800
Remove or reduce scale of all village rim parking lots, business center lot, Desert View lot, Tusayan museum lot, and all East and West Rim lots	650-750 parking spaces (roughly 3.5 acres of striped parking, rest is side of road parking)	$245,700	$46,900	$292,600

ALTERNATIVE 3 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Add attached bike lanes as needed (both sides of visitor use roads and major neighborhood roads)	50 miles	$8,253,000	$1,575,000	$9,828,000
Construct pedestrian trails where social trails occurring	1 mile	$131,000	$25,000	$156,000
Management Support				
Add composting toilets (same as alt. 1)	5 toilets	$720,500	$137,500	$858,000
Construct many management support facilities in Tusayan area:	246,800 sq ft total (not all enclosed)	$36,375,900	$6,942,000	$43,317,900
- backcountry offices, some interp. offices at gateway center	5,000 sq ft			
- NPS administrative headquarters	9,000 sq ft			
- NPS maintenance/purchasing facility	60,000 sq ft			
- *concession transit maintenance facility	15,600 sq ft enclosed 21,600 sq ft paved lot			
- NPS transit maintenance facility	46,500 sq ft enclosed 89,100 sq ft paved lot			
Build NPS transit maintenance facility at Desert View	5,500 sq ft enclosed 9,900 sq ft paved lot	$1,293,600	$246,400	$1,540,000
Adaptively reuse following facilities:	78,858 sq ft total	$8,845,200	$1,688,100	$10,533,300
- historic superintendents house minor changes)	3,424 sq ft			
- Albright Training Center	10,600 sq ft			
- *general office building	25,998 sq ft			
- NPS maintenance/ purchasing complex	32,400 sq ft			
- *basement of El Tovar (minor changes)	6,436 sq ft			
Remove and revegetate back--country office and visitor center/ administration complex	25,366 sq ft	$1,395,700	$266,400	$1,662,100
Construct NPS ranger operations building at Desert View (same as alt. 2)	2,116 sq ft	$374,300	$71,500	$445,800
Construct NPS maintenance building at Desert View (same as alt. 2)	7,329 sq ft	$1,200,200	$229,100	$1,429,300
Expand Desert View sewage lagoons	2 acres	$393,000	$75,000	$468,000
Build wastewater treatment facility at Desert View staging center	1-3 acres	$1,965,000	$375,000	$2,340,000

ALTERNATIVE 3 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Community Services				
Adaptively reuse historic NPS maintenance buildings for exercise, meeting, recreational, work space; buildings include:	10,548 sq ft	$1,934,500	$369,200	$2,303,700
GCNPL fire station	2,200 sq ft			
boat shop	1,160 sq ft			
main warehouse	2,592 sq ft			
lumber warehouse	1,500 sq ft			
paint shop	816 sq ft			
storage behind warehouse	1,400 sq ft			
jail	250 sq ft			
coal shed	630 sq ft			
Construct outdoor park at historic NPS maintenance area (basketball, volleyball, playground)	0.6 acre	$131,000	$25,000	$156,000
Rehabilitate existing ranger operations building for library and meeting rooms	2,600 sq ft	$425,800	$81,300	$507,100
Housing				
Remove substandard housing and revegetate in village and Desert View (same as alt. 1)	113 units in village 11 units at Desert View	$1,182,300	$225,700	$1,408,000
Add NPS housing units outside park in Tusayan	99 units, 6.6 acres	$7,417,300	$1,415,500	$8,832,800
*Add concessioner housing units outside park in Tusayan	549 units, 36.9 acres	$36,794,000	$7,021,800	$43,815,800
Add NPS housing units at Desert View	21 units, 1.5 acres	$1,630,300	$311,200	$1,941,500
*Add concessioner housing units at Desert View	17 units, 1.1 acres	$1,547,800	$295,400	$1,843,200
Add NPS housing units outside park at Desert View	5 units, 0.3 acre	$507,700	$96,900	$604,600
*Add concessioner housing units outside park at Desert View	17 units, 1.1 acres	$1,105,000	$210,900	$1,315,900

ALTERNATIVE 3 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
NORTH RIM				
Visitor Services/Information/Orientation				
Add building space to Kaibab Plateau visitor center (same as alt. 2)	4,000 sq ft	$1,509,200	$288,000	$1,797,200
Establish day use reservation system (same as alt. 2)		$52,400	$10,000	$62,400
*Convert lodge units to visitor lodging	16 cabins	$419,200	$80,000	$499,200
*Convert historic frame cabins to visitor lodging	27 cabins	$707,400	$135,000	$842,400
Redesign the campground (same as alt. 2)	83 campsites before 78 campsites after	$204,400	$39,000	$243,400
Transportation				
Add North Rim bus system	7 buses (includes spares)	$550,000	$125,000	$675,000
Add bus shelters	9 lighted shelters = 6 small, 2 medium (small = 300 sq ft weatherproof space & 460 sq ft loading space) (medium = 600 sq ft weatherproof space & 820 sq ft loading space)	$1,251,400	$238,800	$1,490,200
Add bike lanes as needed on all paved roads	36 miles	$5,942,200	$1,134,000	$7,076,200
Management Support				
Remove and revegetate mule staging and convert mule barn to storage/management support (no/minor changes to barn)	12,000 sq ft corrals 4,320 sq ft barns	$465,900	$88,900	$554,800
Construct composting toilets at Walhalla and Widforss (same as alt. 1)	3 toilets	$453,300	$86,500	$539,800
Rehabilitate existing structures (same as alt. 2)	18,000 sq ft	$2,718,000	$518,700	$3,236,700
Construct NPS maintenance building (same as alt. 2)	6,500 sq ft	$1,226,900	$234,200	$1,461,100
*Construct joint concessioner/ NPS transit maintenance facility	3,500 sq ft enclosed 6,300 sq ft paved lot	$733,600	$140,000	$873,600
Expand wastewater treatment plant	30,000 gpd; 3 acres	$373,400	$71,300	$444,700
Housing				
Remove substandard housing (same as alt. 1)	22 units	$173,000	$33,000	$206,000
Add NPS housing units	46 units, 3.3 acres	$3,670,700	$700,500	$4,371,200
*Add concessioner housing units	185 units, 11.7 acres	$12,553,800	$2,395,800	$14,949,600

ALTERNATIVE 3 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
CORRIDOR TRAILS				
Visitor Services/Information/ Orientation				
*Cobble sections of S. Kaibab Trail	1 mile	$157,200	$30,000	$187,200
Construct composting toilets along trails (same as alt. 1)	4 toilets	$691,700	$132,000	$823,700
Replace toilets along N. Kaibab Trail (same as alt. 1)	2 toilets	$345,900	$66,000	$411,900
TUWEEP				
Add regional information signs (same as alt. 2)	3 signs	$33,400	$6,400	$39,800
Add composting toilet (same as alt. 1)	1 toilet	$144,100	$27,500	$171,600
Establish day use reservation system		$52,400	$10,000	$62,400
Remove rim campsites and revegetate	2 campsites	$13,100	$2,500	$15,600
Add radio communication to Pipe Springs, NM (same as alt. 2)		$32,800	$6,300	$39,100
Remove and replace parking lot/ revegetate existing lot	10 spaces (existing lot) 1,800 acres	$45,100	$8,600	$53,700
Purchase state airstrip and all adjacent private lands (same as alt. 2)	3,200 acres	$2,096,000	$400,000	$2,496,000
Add seasonal ranger trailer if needed (same as alt. 1)		$58,200	$11,100	$69,300
Add septic system for seasonal ranger (same as alt. 1)	1,000-1,200 gallons	$13,100	$2,500	$15,600
Expand existing water catchment and cistern (same as alt. 1)	9,000 gallon cistern now	$13,100	$2,500	$15,600
Rehabilitate ranger residence septic system (same as alt. 1)	1,500-2,000 gallons now	$10,000	$1,900	$11,900
NPS TOTAL		$167,068,400	$24,049,900	$191,118,300
CONCESSIONER TOTAL		$77,670,100	$14,822,900	$92,493,000
TOTAL		**$244,738,500**	**$38,872,800**	**$283,611,300**

* Either partial or full concession costs.

ALTERNATIVE 4

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
SOUTH RIM				
Visitor Services/Information/ Orientation				
*Jointly use regional information centers (same as alt. 1)				
existing structure in Flagstaff	200 sq ft for NPS	no cost		
new structure in Flagstaff	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
existing structure in Williams	200 sq ft for NPS	no cost		
new structure in Cameron	2,000 sq ft building 20 parking spaces, 6,000 sq ft	$503,100	$96,000	$599,100
Create telecommunication systems (same as alt. 1)	14 units	$91,700	$17,500	$109,200
Provide multilingual information brochures (same as alt. 2)	2 million year	$78,600	$15,000	$93,600
*Jointly construct Tusayan gateway information center	8,000 sq ft total 2,000 sq ft for NPS	$2,513,200	$479,700	$2,992,900
Construct Mather Point orientation center	25,000 sq ft	$7,860,000	$1,500,000	$9,360,000
Adaptively reuse powerhouse (same as alt. 2)	17,632 sq ft	$5,543,500	$1,058,000	$6,601,500
*Adaptively reuse historic laundry (same as alt. 2)	6,375 sq ft	$2,296,600	$438,300	$2,734,900
*Adaptively reuse GCNPL maintenance building (same as alt. 2)	3,870 sq ft	$1,166,100	$222,600	$1,388,700
Adaptively reuse historic community building (same as alt. 2)	5,738 sq ft	$1,728,900	$330,000	$2,058,900
Adaptively reuse horse barn (same as alt. 2)	6,500 sq ft	$1,490,200	$284,400	$1,774,600
*Adaptively reuse blacksmith shop (same as alt. 2)	2,267 sq ft	$519,800	$99,200	$619,000
*Adaptively reuse magistrate building (same as alt. 2)	2,101 sq ft	$578,000	$110,30	$688,300
*Adaptively reuse mule barn (interpretive or visitor services)	10,000 sq ft	$2,358,000	$450,000	$2,808,000
Landscape powerhouse area (same as alt. 2)	28.6 acres	$3,746,600	$715,000	$4,461,600

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
*Replace historic Babbitt's store (same as alt. 2)	10,354 sq ft	$2,577,200	$491,900	$3,069,100
*Convert Bright Angel gift shop/ ice cream shop and employee dining into restaurant	4,526 sq ft	$676,000	$129,000	$805,000
Construct Desert View orientation center	11,000 sq ft	$3,458,400	$660,000	$4,118,400
*Remove one-story Yavapai West units (same as alt. 2)	160 rooms	$209,600	$40,000	$249,600
*Construct two-story Yavapai West units (double what were one-story units)	320 rooms	$9,222,400	$1,760,000	$10,982,400
*Provide new facades for Kachina and Thunderbird Lodges	47,776 sq ft	$5,007,000	$955,600	$5,962,600
*Rehabilitate Maswik cabins (same as alt. 2)	27 cabins	$530,600	$101,300	$631,900
*Convert Victor, Victor Annex, Colter, Brandt, and Rouzer dorms to visitor lodging (same as alt. 2)	194 rooms	$4,472,900	$853,600	$5,326,500
Clean up Orphan Mine and remove headframe (same as alt. 2)	3 acres (upper mine) 1 acre (lower mine)	$524,000	$100,000	$624,000
*Construct laundry/showers/ restrooms at business center	4,672 sq ft	$1,285,300	$245,300	$1,530,600
Increase size of RV campground	from 78 RV campsites to 160	$163,500	$31,200	$194,700
Add campsites at Desert View (same as alt. 2)	50 sites 392 sq ft restrooms, no shower	$256,300	$48,900	$305,200
*Remove Desert View gift shop/ deli and replace; remove restrooms (replaced in orientation center)	3,819 sq ft	$1,100,700	$210,100	$1,310,800
Add entry station at Desert View; remove existing station and revegetate (same as alt. 2)	800 sq ft (new station) 100 sq ft (old station)	$923,600	$176,300	$1,099,900
Construct entry station at Grandview	300 sq ft	$346,400	$66,100	$412,500
Construct additional museum at Tusayan museum	3,000 sq ft	$864,600	$165,000	$1,029,600

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Provide exhibits to interpret archeological dig at Tusayan museum	3 kiosks	$117,900	$22,500	$140,400
Transportation				
Construct gateway parking lot	100 parking spaces 0.95 acre	$338,900	$64,700	$403,600
Construct Mather Point transit center (same as alt. 2)	3,000 sq ft lighted enclosed area; 15,000 sq ft lighted outdoor waiting/loading area (roughly 75% of outdoor should be shaded)	$1,084,800	$207,000	$1,291,800
Construct Mather Point parking lot	3,262 spaces = 2936 car, 203 RV, 123 bus; 32.25 acres	$8,571,600	$1,635,800	$10,207,400
Construct access road to link RV campground and south entrance road (same as alt. 2)	1.5 miles	$1,437,800	$274,400	$1,712,200
Construct Mather Point parking lot access road (same as alt. 2)	0.4 mile	$393,000	$75,000	$468,000
Construct new road (same as alt. 2)	1.4 miles	$1,375,600	$262,500	$1,638,100
Construct community road to business center (same as alt. 2)	0.4 mile	$393,000	$75,000	$468,000
Reduce scale of business center parking and add pedestrian amenities (same as alt. 2)	150 car spaces 2.5 acres	$797,800	$152,300	$950,100
Add employee parking (Mather Point orientation center and Maswik)	20 spaces Mather 50 spaces Maswik	$229,300	$43,800	$273,100
Add road from Abyss to Rowe Well road	2.5 miles	$2,456,300	$468,800	$2,925,100
Add parking along East Rim Drive	144 spaces	$471,600	$90,000	$561,600
Construct Desert View bypass; realign road (same as alt. 2)	0.5 mile	$491,300	$93,800	$585,100
Add Desert View parking lot	359 spaces = 330 car, 18 RV, 11 bus; 3.5 acres	$902,400	$172,200	$1,074,600
Build Desert View transit center	300 sq ft lighted enclosed area 460 sq ft lighted outdoor waiting/loading area (small bus shelter)	$118,600	$22,700	$141,300
Remove/revegetate existing Desert View parking lot (same as alt. 2)	144 spaces = 139 car, 5 bus 1 acre	$144,100	$27,500	$171,600
Add buses	62 buses (includes spares)	$23,075,000	$400,000	$23,475,000

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Add bus shelters	25 lighted shelters = 20 small, 2 medium, 3 large (small = 300 sq ft weatherproof space & 460 sq ft loading space) (medium = 600 sq ft weatherproof space & 820 sq ft loading space) (large = 1,000 sq ft weatherproof space & 1,300 sq ft loading space)	$4,048,100	$772,600	$4,820,700
Construct bike trails (same as alt. 2)	50 miles	$8,253,000	$1,575,000	$9,828,000
Construct pedestrian rim and community pedestrian trails (same as alt. 2)	20 miles	$2,620,000	$500,000	$3,120,000
*Add East Rim mule trail (Yaki Pt. .to Shoshone Pt.)	2 miles (one way)	$330,200	$63,000	$393,200
Remove most of parking lots; revegetate in village (same as alt. 2)	650-750 parking spaces (roughly 3.5 acres of striped parking, rest is side of road parking)	$245,700	$46,900	$292,600
Pave Grandview entry road link to East Rim Drive	0.5 mile	$227,400	$43,400	$270,800
Pave USFS 302/307 and add link from 302 to park	28 miles USFS 302/307 1 mile for link	$7,522,700	$1,435,700	$8,958,400
Management Support				
Expand public transit maintenance facility	13,000 sq ft enclosed 18,000 sq ft paved lot	$2,601,200	$496,400	$3,097,600
Remove backcountry office/ camper services and revegetate	6,112 sq ft	$336,300	$64,200	$400,500
*Build concessioner mule barn blacksmith shop near S. Kaibab trailhead	45,867 sq ft	$1,802,600	$344,000	$2,146,600
Clear land and build helicopter base	10 acres	$1,899,600	$362,600	$2,262,200
Construct NPS maintenance/ purchasing headquarters (same as alt. 2)	60,000 sq ft	$11,790,000	$2,250,000	$14,040,000
*Construct concession transportation maintenance facilities	30,000 sq ft enclosed 54,000 sq ft paved lot	$3,121,500	$595,700	$3,717,200
*Build joint fire/safety building (same as alt. 2)	6,000 sq ft total 4,500 sq ft for NPS	$2,063,200	$393,900	$2,457,100
*Rehabilitate existing NPS maintenance/warehouse for GCNPL (same as alt. 2)	32,400 sq ft	$3,395,600	$648,000	$4,043,600
*Rehabilitate historic schoolhouse for GCNPL (same as alt. 2)	3,094 sq ft	$608,000	$116,100	$724,100

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
*Rehabilitate basement of El Tovar for GCNPL	6,436 sq ft	$843,200	$161,000	$1,004,200
Remodel general office building for ranger operations	25,998 sq ft	$851,500	$162,500	$1,014,000
Rehabilitate existing visitor center for NPS administration (same as alt. 2)	22,066 sq ft	$722,700	$138,000	$860,700
Expand or build new boat shop at Lees Ferry (same as alt. 2)	3,300 sq ft	$432,300	$82,500	$514,800
Add water storage tanks	4 million gallons storage	$2,908,200	$555,000	$3,463,200
Expand sewage treatment at Desert View (same as alt. 2)	1-3 acres	$373,400	$71,300	$444,700
Add composting toilets (same as alt. 1)	5 toilets	$720,500	$137,500	$858,000
Add restrooms at Yavapai observation station (same as alt. 2)	634 sq ft	$184,000	$35,100	$219,100
*Remove Bright Angel salon and convert to women's restrooms (same as alt. 2)	140 sq ft	$41,300	$7,900	$49,200
Construct Desert View ranger operations building (same as alt. 2)	2,116 sq ft	$374,300	$71,500	$445,800
Construct NPS maintenance building at Desert View (same as alt. 2)	7,329 sq ft	$1,200,200	$229,100	$1,429,300
Build NPS mule/horse barns and blacksmith shop at Southgate (same as alt. 2)	9,000 sq ft	$353,700	$67,500	$421,200
Move dry dump to Southgate (same as alt. 2)		$13,100	$2,500	$15,600
*Construct GCNPL maintenance building at Desert View (same as alt. 2)	3,500 sq ft	$573,200	$109,400	$682,600
Housing				
Remove substandard housing and revegetate in village and Desert View (same as alt. 1)	113 units in village 11 units at Desert View	$1,182,300	$225,700	$1,408,000
Add NPS housing units in village	84 units, 2.9 acres	$3,886,000	$741,600	$4,627,600
Add NPS housing units at Desert View	28 units, 2.2 acres	$2,859,800	$545,800	$3,405,600
Add NPS housing units outside park	54 units, 6.6 acres	$6,318,400	$1,205,800	$7,524,200

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
*Add concession housing units in village	594 units, 22.2 acres	$19,060,200	$3,637,600	$22,697,800
*Add concession housing units at Desert View	46 units, 3.5 acres	$4,194,000	$800,400	$4,994,400
*Add concession housing units outside park	255 units, 31.1 acres	$30,011,500	$5,727,400	$35,738,900
Community Services				
Adaptively reuse historic NPS maintenance building for exercise, meeting, recreational, work space; buildings include:	13,678 sq ft	$2,508,400	$478,700	$2,987,100
GCNPL fire station	2,200 sq ft			
boat shop	1,160 sq ft			
main warehouse	2,592 sq ft			
lumber warehouse	1,500 sq ft			
horse barn	960 sq ft			
mule barn	1,500 sq ft			
paint shop	816 sq ft			
blacksmith shop	670 sq ft			
storage behind warehouse	1,400 sq ft			
jail	250 sq ft			
coal shed	630 sq ft			
Construct outdoor park at historic NPS maintenance area (basketball, volleyball, playground)	0.9 acre	$196,500	$37,500	$234,000
Rehabilitate existing ranger operations building for library and meeting rooms	2,600 sq ft	$425,800	$81,300	$507,100
NORTH RIM				
Visitor Services/Information/ Orientation				
Add building space to Kaibab Plateau visitor center (smaller than alt. 2, no reservation office/distribution)	2,000 sq ft	$754,600	$144,000	$898,600
Add CC Hill orientation center (same as alt. 2)	6,000 sq ft	$1,886,400	$360,000	$2,246,400
Add picnic areas (same as alt. 2)	5 acres (25 tables)	$327,500	$62,500	$390,000
Construct Point Imperial museum	1,000 sq ft	$377,300	$72,000	$449,300
*Convert cabins to visitor lodging	23 cabins (16 lodge cabins, 7 historic frame cabins)	$602,600	$115,000	$717,600
*Build new lodging units	100 rooms	$4,585,000	$875,000	$5,460,000

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
*Add restaurant	156 seats 108 seats at camper store, 48 seats at lodge	$455,400	$86,900	$542,300
Add campsites	50 campsites	$117,900	$22,500	$140,400
*Add portable winter huts (same as alt. 2)	3 huts	$39,300	$7,500	$46,800
Transportation				
Add parking spaces at Kaibab Plateau visitor center (same as alt. 2)	65 spaces	$144,800	$27,700	$172,500
Remove and revegetate the N. Kaibab trailhead parking lot (same as alt. 2)	40 spaces 0.3 acre	$101,600	$19,400	$121,000
Add CC Hill parking lot	67 spaces = 40 car, 21 RV, 6 bus; 1 acre	$371,800	$71,000	$442,800
Construct CC Hill parking lot access road (same as alt. 2)	0.25 mile	$245,700	$46,900	$292,600
Add ballfield area parking lot	183 car spaces 1.6 acres	$311,700	$59,500	$371,200
Widen portions of paved roads on Walhalla	14.6 miles	$7,650,400	$1,460,000	$9,110,400
Add North Rim bus system	5 buses (includes spares)	$425,000	$125,000	$550,000
Add bus shelters	4 lighted shelters = 3 small, 1 medium (small = 300 sq ft weatherproof space & 460 sq ft loading space) (medium = 600 sq ft weatherproof space & 820 sq ft loading space)	$625,700	$119,400	$745,100
Add bike paths (same as alt. 2)	50 miles	$8,253,000	$1,575,000	$9,828,000
Add rim pedestrian trails (same as alt. 2)	10 miles	$943,200	$180,000	$1,123,200
*Upgrade old Bright Angel trail for mule use	3 miles	$471,600	$90,000	$561,600
Management Support				
*Build joint concessioner/NPS transit maintenance facility	2,500 sq ft enclosed 4,500 sq ft paved lot	$754,600	$144,000	$898,600
Expand wastewater treatment plant	40,000 gpd; 3 acres	$373,400	$71,300	$444,700
Clear and relocate helipad (same as alt. 2)	225 sq ft	$55,800	$10,700	$66,500
Construct composting toilets at Walhalla and Widforss (same as alt. 1)	3 toilets	$453,300	$86,500	$539,800
*Remove mule staging/replace at Six Rock Meadow	4,000 sq ft	$419,200	$80,000	$499,200

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Add NPS maintenance building	8,000 sq ft	$1,310,000	$250,000	$1,560,000
Housing				
Remove substandard housing (same as alt. 1)	22 units	$173,000	$33,000	$206,000
*Add concessioner new and replacement housing units	208 units, 13 acres	$12,683,500	$2,420,500	$15,104,000
Add NPS new and replacement housing units	55 units, 3.9 acres	$4,275,200	$815,900	$5,091,100
CORRIDOR TRAILS				
Reconstruct transcanyon waterline (same as alt. 1)	8 miles	$33,405,000	$6,375,000	$39,780,000
*Cobble sections of N. and S. Kaibab and Bright Angel Trails (same as alt. 2)	7.8 miles	$1,226,300	$234,000	$1,460,300
Construct composting toilets along trails (same as alt. 1)	4 toilets	$691,700	$132,000	$823,700
Replace toilets along N. Kaibab Trail (same as alt. 1)	2 toilets	$345,900	$66,000	$411,900
Convert Indian Garden storage building to residence (same as alt. 2)	599 sq ft	$102,000	$19,500	$121,500
Convert Indian Garden storage building to contact station (same as alt. 2)	672 sq ft	$114,500	$21,900	$136,400
Add Indian Garden amphitheater (same as alt. 2)	30 seats/rustic	$78,600	$15,000	$93,600
Add Battleship pedestrian trail	2 miles	$183,400	$35,000	$218,400
Add Pedestrian Trail off S. Kaibab Trail	4.5 miles	$707,400	$135,000	$842,400
TUWEEP				
Add regional information signs (same as alt. 2)	3 signs	$33,400	$6,400	$39,800
Add composting toilet (same as alt. 1)	1 toilet	$144,100	$27,500	$171,600
Remove rim campsites and replace; plus add four campsites	6 campsites	$39,300	$7,500	$46,800

ALTERNATIVE 4 (cont.)

ITEM	QUANTITY	GROSS CONSTRUCTION COST	CONSTRUCTION PLANNING COST	TOTAL
Add radio communication to Pipe Springs, NM (same as alt. 2)		$32,800	$6,300	$39,100
Purchase airstrip and adjacent private lands (same as alt. 2)	3,200 acres	$2,096,000	$400,000	$2,496,000
Add loop trail connecting east side of overlook to Saddle Horse Canyon Trail (same as alt. 2)	1.5 miles	$137,600	$26,300	$163,900
Add 15 parking spaces to existing parking lot	15 car spaces 3,000 sq ft	$35,400	$6,800	$42,200
Add seasonal ranger trailer (same as alt. 1)	1 trailer	$58,200	$11,100	$69,300
Add septic system for seasonal ranger (same as alt. 1)	1,000-1,200 gallons	$13,100	$2,500	$15,600
Expand existing water catchment and cistern (same as alt. 1)	9,000 gallon cistern now	$13,100	$2,500	$15,600
Rehabilitate ranger residence septic system (same as alt. 1)	1,500-2,000 gallons now	$10,000	$1,900	$11,900
NPS TOTAL		$204,997,400	$35,163,400	$240,160,800
CONCESSIONER TOTAL		$119,753,400	$22,854,400	$142,607,800
TOTAL		**$324,750,800**	**$58,017,800**	**$382,768,600**

* Either partial or full concession costs.

PHASING FOR THE PROPOSED ACTION

This plan uses many existing disturbed areas and proposes substantial adaptive reuse of existing structures. It therefore requires a sequenced phasing plan. Before existing facilities can be reused for new purposes, the existing functions must be relocated. In some cases a relocation must be preceded by three or four other moves to be done most efficiently and ~~in order~~ to keep from disturbing new lands. Three phases are proposed:

Phase 1 — 1995 – 2000, Primarily includes actions related to improving transportation, or is the first move in an important series of adaptive uses.

Phase 2 — 2000 – 2005, Actions that are lower priority or must wait for phase 1 items to be completed before they can be started.

Additional information is also provided with each action item.

- "Sequence" refers to whether this action can be done immediately, meaning it could be done "first", or whether another action must be taken before this action could be accomplished, which would mean it could be done "second," "third," or "fourth."
- "Yr. Est." indicates the year this action could be expected to be completed. This phasing plan anticipates all major actions being completed by 2005.
- "Cost" is a rough estimate of capital cost to complete the action and an estimate of operating costs that would be required to operate and maintain the facility. Operating costs are only given for facilities operated or maintained by the National Park Service.
- "Funding" gives an early indication of where the funding might come from to complete the action.
- "Comp" is an indication of additional compliance required for the specific actions listed. Compliance with both the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA) is considered.

PHASE 1 — SOUTH RIM

Transportation

1. Expand the shuttle bus fleet, season, and area of coverage to provide improved service as soon as possible. This item includes replacing existing rolling stock to improve service (but not to 2010 standards), expand the maintenance facilities and bus shelters, and reduce operating costs.
   Sequence: First
   Yr. Est.: 1998
   Cost: $16,000,000 capital, $2,000,000 annual operations
   Funding: Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

2. Construct the orientation/transit center and a portion of the associated parking lot near Mather Point. This includes all utilities, roads, structures, and trails to make this center operational.
   Sequence: First
   Yr. Est.: 1999
   Cost: $11,243,200 capital, $300,000 annual operations
   Funding: Congress for roads, Congress/private for center
   Comp: Environmental assessment and 106 consultation

3. Construct the gateway information center in Tusayan and a portion of the associated parking lot. This includes all utilities, road changes, structures, and trails to make this facility operational. This facility would be served by a concession-operated shuttle system, privately funded.
   Sequence: First
   Yr. Est.: 1999
   Cost: $10,707,800
   Funding: Private w/portion from Congress
   Comp: Environmental assessment (with U.S. Forest Service) and section 106 consultation or none (if privately constructed on private land)

4. Construct Desert View bypass road, new entrance station, and a portion of the orientation center parking lot.
   Sequence: Second, after relocation of concessioner housing
   Yr. Est.: 1999
   Cost: $2,926,100
   Funding: Congress
   Comp: Environmental assessment and section 106 consultation

When these actions are taken, several parking lots in Grand Canyon Village can be removed, including the gravel lot in the railroad yard, the Bright Angel lot, roadside parking along the rim, and the El Tovar/Verkamp's lot. However, the new road segments required to close the main roads to all automobiles would not yet be built, so some auto traffic would still be competing with transit vehicles on main roads. Also at this time the overlooks on East Rim Drive would need to be closed during high use season and served by buses. The Desert View parking lot can be removed.

Information/Education

1. Improve dissemination of park information by various media. This includes networking with regional visitor centers, getting information in airports, on Internet, and in the mail to potential visitors, and using video and telecommunications as well. It also includes providing better information services to existing information providers such as training, staff in some cases, publications, hardware, etc.
   Sequence: First
   Yr. Est.: 1996
   Cost: $109,200 capital, $100,000 annual
   Funding: Congress/concessioner
   Comp: None

Visitor Services

1. Convert community building to an education center. This includes creating Grand Canyon Field Institute space and space for interpretive programs and group education. Existing uses would be removed.
   Sequence: First
   Yr. Est.: 1995
   Cost: $2,058,900 capital, $50,000 annual operations
   Funding: Private
   Comp: Section 106 consultation

2. Relocate the mule barn, corral, and blacksmith's shop to a new facility on the west edge of the village.
   Sequence: First
   Yr. Est.: 1999
   Cost: $1,802,600
   Funding: Concessioner
   Comp: Environmental assessment and section 106 consultation

3. Rehabilitate mule barn for an American Indian cultural center.
   Sequence: Second, after relocating mule operation
   Yr. Est.: 2000
   Cost: $2,808,000 capital, $100,000 annual operations
   Funding: Undetermined
   Comp: Section 106 consultation

4. Clean up the Orphan Mine site and reopen to visitors.
   Sequence: First
   Yr. Est.: 1996
   Cost: $624,000
   Funding: Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

The above actions, together with construction of the orientation center at Mather Point, would provide improved interpretation, allow removal of the backcountry reservations office (function to be relocated to the orientation center), and permit the existing visitor center to perform as a museum until the powerhouse was rehabilitated in a later phase.

Housing

1. Relocate Pinyon Park trailers to the RV portion of trailer village. Temporarily close RV campground.
   Sequence: First
   Yr. Est.: 1998
   Cost: $500,000
   Funding: Concessioner/private/Congress
   Comp: Categorical exclusion to reconfigure hook-ups and spaces

2. Construct new housing; relocate existing trailers from Desert View concessioner housing area to shared housing area.
   Sequence: First
   Yr. Est.: 1997
   Cost: $2,480,000 capital, $35,000 annual operations
   Funding: Concessioner/Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

3. Construct first phase of apartment and dormitory housing at Pinyon Park.
   Sequence: Second, after relocating Pinion Park trailers
   Yr. Est.: 1999
   Cost: $10,163,400 capital, $160,000 annual operations
   Funding: Concessioner/Congress
   Comp: Environmental assessment and section 106 consultation

4. Construct or encourage construction of housing in the Tusayan area for NPS and concessioner use.
   Sequence: First
   Yr. Est.: 1999
   Cost: $7,200,000 capital, $80,000 annual operations
   Funding: Congress/private/concessioner
   Comp: None if privately built on private lands; otherwise, environmental assessment and section 106 consultation

The above actions would be accompanied by relocation of as many jobs as possible to Flagstaff or Williams.

Management Support

1. Construct joint fire response facility and vacate Fred Harvey fire and safety building, equipment bays in the NPS maintenance shop, YACC camp, and some offices from the ranger operations building.
   Sequence: First
   Yr. Est.: 1997
   Cost: $2,457,100 capital, $40,000 annual operations
   Funding: NPS concession fund
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

2. Redesign emergency lagoons and relocate helibase to lagoon location. This includes road improvements, utilities, hanger, and offices.
   Sequence: First
   Yr. Est.: 1998
   Cost: $1,131,000 capital, $100,000 annual operations
   Funding: Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

3. Relocate dry storage to the former Southgate parking area. Also, create oversized vehicle storage for residents at Southgate.
   Sequence: First
   Yr. Est.: 1995
   Cost: $15,600
   Funding: Congress
   Comp: None

The above actions would make the existing dry storage area available for expanded shuttle maintenance, relocation of concessioner bus operations, and construction of NPS maintenance facilities.

PHASE 2 — SOUTH RIM

Transportation

1. Further expand the shuttle bus fleet and the area of coverage, including further expansion of maintenance facility.
   Sequence: Second, after first expansion of fleet
   Yr. Est.: 2002
   Cost: $11,993,100 capital, $1,500,000 annual operations
   Funding: Congress
   Comp: Covered by phase 1 compliance

2. Construct road segments to remove automobiles from the rim area and main village roads. This includes an entrance off the south entrance road for the Mather campground/RV campground, a road connection from the employee housing area to the business center, and a new road from Center Road to the Maswik area.
   Sequence: First
   Yr. Est.: 2002
   Cost: $2,574,100 capital, $30,000 annual operations
   Funding: Congress
   Comp: Environmental assessment and section 106 consultation

3. Construct bike and pedestrian trails.
   Sequence: First
   Yr. Est.: 2000
   Cost: $12,948,000 capital, $300,000 annual operations
   Funding: Congress/private/concessioner
   Comp: Environmental assessment and section 106 consultation

4. Finish parking lot at Mather Point.
   Sequence: Second, after first phase of parking pot
   Yr. Est.: 2004
   Cost: $2,251,000
   Funding: Congress
   Comp: Covered by phase 1 compliance

The above actions would result in full implementation of the transportation system proposed in this alternative. Additional parking at the gateway information center in Tusayan could happen as needed and would be privately funded. Additional buses would need to be added to the shuttle fleet as visitation increased.

Information/Education

1. Construct Desert View orientation/transit center.
   Sequence: Second, after relocation of parking
   Yr. Est.: 2002
   Cost: $4,266,300 capital, $100,000 ann. operations
   Funding: Congress/private
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

2. Convert powerhouse to education center.
   Sequence: Fourth, after relocating helibase and NPS maintenance and concessioner maintenance/ commissary
   Yr. Est.: 2004
   Cost: $6,601,500 capital, $250,000 annual operations
   Funding: Congress/private
   Comp: Section 106 consultation

3. Convert the horse barn to interpretive uses.
   Sequence: Fourth, same as powerhouse above
   Yr. Est.: 2004
   Cost: $1,774,600 capital, $75,000 annual operations
   Funding: Congress/private
   Comp: Section 106 consultation

The above actions would complete the facility related components of the information/education proposals in this alternative. It would also allow the existing visitor center to be used exclusively as park headquarters.

Visitor Services

1. Replace Yavapai West units with new, two-story units. This includes removal of the existing motel units as well as removal of the Thunderbird and Kachina Lodges.
   Sequence: First
   Yr. Est.: 2001
   Cost: $9,506,700
   Funding: Concessioner
   Comp: Environmental assessment and section 106 consultation

2. Redesign the RV campground at trailer village.
   Sequence: Fourth, after relocating Pinyon Park trailers to trailer village and constructing two phases of new housing at Pinyon Park
   Yr. Est.: 2003
   Cost: $1,080,000
   Funding: Concessioner
   Comp: Categorical exclusion and section 106 consultation

3. Convert historic laundry to food service, convert maintenance shop to gift shop, and convert blacksmith's shop to bike rental shop.
   Sequence: Second for blacksmith shop (after relocating blacksmith); fourth for others, same as powerhouse
   Yr. Est.: 2001 for bike rental, 2004 for the rest
   Cost: $3,982,500
   Funding: Concessioner
   Comp: Section 106 consultation

4. Convert five dormitories to visitor use.
   Sequence: Fourth, after relocating Pinyon Park trailers to trailer village and constructing two phases of housing at Pinion Park.
   Yr. Est.: 2005
   Cost: $4,693,100
   Funding: Concessioner
   Comp: Section 106 consultation

5. Construct new trading post and food service at Desert View. Remove the existing trading post.
   Sequence: Second, after relocation of parking
   Yr. Est.: 2002
   Cost: $1,310,800
   Funding: Concessioner
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

6. Add 50 campsites at Desert View.
   Sequence: First
   Yr. Est.: 2002
   Cost: $305,200
   Funding: Congress
   Comp: Environmental assessment and section 106 consultation

7. Construct a new store where the original Babbitt's store once stood and convert part of the original post office (now the magistrate's building) to community/visitor uses.
   Sequence: First for the store and second for the magistrate's building after relocation of the fee collection function to the gateway information center in Tusayan
   Yr. Est.: 2000
   Cost: $2,577,200
   Funding: Concessioner
   Comp: Categorical exclusion and section 106 consultation

The above items, in addition to some rearranging of spaces at the Bright Angel Lodge, Hermit's Rest, Lookout Studio, and Desert View Watchtower, would complete the visitor services portion of this alternative.

Housing

1. Construct second phase of apartment/dormitory housing at Pinyon Park.
   Sequence: Third, after relocating trailers and first phase of housing
   Yr. Est.: 2001
   Cost: $13,968,600 capital, $160,000 annual operations
   Funding: Congress/concessioner
   Comp: Covered by phase 1 compliance

2. Complete housing at Desert View.
   Sequence: Second, after first phase of housing
   Yr. Est.: 2004
   Cost: $5,307,800 capital, $80,000 annual operations
   Funding: Congress/concessioner
   Comp: Covered by phase 1 compliance

3. Construct second phase of housing in Tusayan.
   Sequence: Second, after first phase
   Yr. Est.: 2002
   Cost: $7,200,000
   Funding: Congress/private/concessioner
   Comp: Covered by phase 1 compliance

The above actions would satisfy the need for housing as depicted in this alternative through 2005. As visitation grew, additional phases of housing could be constructed.

Management Support

1. Construct NPS maintenance/warehouse facility and construct concessioner transportation facility at the existing dry dump. This includes extending utilities.
   Sequence: Second, after relocation of helibase and dry storage materials
   Yr. Est.: 2000
   Cost: $17,757,200
   Funding: Concessioner/Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

2. Rehabilitate NPS maintenance and warehouse for concessioner maintenance and commissary.
   Sequence: Third, after relocation of helibase, and NPS maintenance and warehouse
   Yr. Est.: 2001
   Cost: $3,395,600
   Funding: Concessioner
   Comp: None

3. Construct new NPS maintenance, NPS administration, and concessioner maintenance facilities at Desert View.
   Sequence: First
   Yr. Est.: 2003
   Cost: $2,557,700
   Funding: Congress/concessioner
   Comp: Environmental assessment and section 106 consultation

4. Remove the public garage function from the general offices building and rehabilitate for additional offices.
   Sequence: Third, after relocation of helibase and relocation of concessioner transportation maintenance
   Yr. Est.: 2002
   Cost: $851,500
   Funding: Concessioner
   Comp: Section 106 consultation

The above actions would permit the removal of the concessioner's personnel building and several fourth-in-sequence actions described above in the information/education section and visitor services section.

The actions described above are the most important in alternative 2, either because they are on the critical path or because the action itself is important to achieving the vision of the alternative. Many other actions are not listed here, either because they could happen at almost anytime or because they are less important to the success of implementing this alternative.

NORTH RIM — PHASE 1

Transportation

1. Construct parking area at CC Hill, access road to it, and transit shelter.
   Sequence: First
   Yr. Est.: 1999
   Cost: $1,613,800
   Funding: Congress
   Comp: Environmental assessment and section 106 compliance

2. Establish a shuttle fleet on the North Rim, with bus shelters and a maintenance facility at Lindbergh Hill.
   Sequence: First
   Yr. Est.: 1999
   Cost: $5,070,600 capital, $1,110,900 annual operations
   Funding: Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

   The above actions, in conjunction with expansion of the concessioner's bus service to the Walhalla Plateau, would complete the transit portion of the transportation system proposed in this alternative.

Information/Education

1. Construct the CC Hill orientation center.
   Sequence: First, but concurrent with the roads and parking
   Yr. Est.: 1999
   Cost: $2,246,400 capital, $60,000 annual operations
   Funding: Congress/private
   Comp: Covered by compliance for roads and parking

2. Expand the Kaibab Plateau visitor center at Jacob Lake.
   Sequence: First
   Yr. Est.: 1998
   Cost: $1,969,700 capital, $160,000 annual operations
   Funding: Congress
   Comp: Environmental assessment (with U.S. Forest Service) and section 106 consultation

   The above actions would put the National Park Service in a position to begin better distribution of visitors and consider day use reservations when warranted.

Visitor Services

1. Convert cabins from employee housing to visitor lodging.
   Sequence: Second, after constructing new employee housing
   Yr. Est.: 1999
   Cost: $1,198,100
   Funding: Concessioner
   Comp: Section 106 consultation

2. Redesign campground and construct new shower/laundry facility.
   Sequence: First
   Yr. Est.: 1998
   Cost: $531,600
   Funding: Concessioner/Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

Housing

1. Construct employee housing for both concessioner employees and NPS employees. ~~First phase only.~~
   Sequence: First
   Yr. Est.: 1998
   Cost: $9,100,000 capital, $35,000 annual operations
   Funding: Congress/concessioner
   Comp: Environmental assessment and section 106 consultation

Management Support

1. Construct new NPS maintenance facility. Rehabilitate historic maintenance buildings for additional office space.
   Sequence: First
   Yr. Est.: 1999
   Cost: $4,697,800
   Funding: Congress
   Comp: Environmental assessment or categorical exclusion and section 106 consultation

NORTH RIM — PHASE 2

Transportation

1. Construct bike trails on Bright Angel Point and on the Walhalla Plateau.
   Sequence: First
   Yr. Est.: 2002
   Cost: $9,828,000
   Funding: Congress/concessioner
   Comp: Environmental assessment and section 106 consultation

Information/Education

None

Visitor Services

1. Convert the gas station to a bike rental facility.
   Sequence: Second, after establishing the day use parking lot and closing the gas station
   Yr. Est.: 2002
   Cost: $113,600
   Funding: Concessioner
   Comp: None

Housing

1. Construct remaining housing.
   Sequence: Second, after first housing phase
   Yr. Est.: 2004
   Cost: $10,351,700
   Funding: Congress/concessioner
   Comp: Covered by phase 1 compliance for housing

Management Support

None

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