

'AHAKHAV WILDERNESS PRESERVE

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'AHAKHAV WILDERNESS PRESERVE

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**COLORADO RIVER INDIAN TRIBES
EDUCATION DEPARTMENT
DENNIS PATCH, DIRECTOR**

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EXECUTIVE SUMMARY

The proposal for the establishment of 'Ahakhav Wilderness Preserve on the Colorado River Indian Reservation includes plans for both dredging operations and riparian revegetation. The preserve consists of 1042 acres in and around the Deer Island backwater complex. This includes 133 acres of open deep water and another 196 acres of shallow water vegetated primarily with cattails and bulrush. There are 19 species of fish, nine species of amphibians, 23 species of reptiles, over 250 species of birds, and 32 species of mammals that may utilize this site. Additionally 29 endangered, threatened, or candidate species including the Yuma clapper rail, southwest willow flycatcher, and razorback sucker, may benefit from habitat protection and enhancement in this area.

This project will replace wildlife habitat lost from channelization and flood-caused siltation in the Colorado River below Headgate Rock Dam. Sandbars block inlets and outlets to the river, historically deep channels are now shallow, and historically shallow areas are often covered in dense cattails. The existing habitat has a lower diversity of fish and wildlife. It is important that these backwaters be rehabilitated in order to maximize their value to the fish and wildlife and people who wish to enjoy this exceptional area.

GOALS OF THE DREDGE PLAN:

1. *Dredging and opening of the historical backwater channels.*
2. *Improvement of the hydrology of the backwater.*
3. *Utilization of spoil piles in a manner that will maximize their revegetation potential and minimize their impact on quality riparian habitat.*
4. *Creation and enhancement of fish and wildlife habitat in the backwater.*
5. *Reduction of future maintenance requirements.*

The dredge plan will consist of dredging to deepen historical channels, opening the backwater to the flow of the river through a series of percolation dikes, revegetation of dredge spoil with native riparian trees and shrubs, and the addition of fish habitat structures in the backwaters. Dredging operations would be conducted by the U.S. Bureau of Reclamation.

Riparian areas surrounding the backwaters have also been drastically altered during the last century. Native stands and bosques of Cottonwood, Willow, and Honey and Screwbean Mesquite have been largely overrun with the exotic Saltcedar. Saltcedar often out competes native plants for water and space, and it has a lower wildlife habitat value than most native species. Many wildlife populations, especially migratory birds, are known to be declining as a direct result of the loss of suitable habitat. Revegetation should be extremely successful in the managed preserve, and is vital for the wildlife of the area.

GOALS OF THE REVEGETATION PLAN:

1. *To establish stands of native vegetation, including cottonwood, willow and mesquite, in areas of low wildlife habitat value, primarily saltcedar stands.*
2. *Stabilization of dredge spoil piles and sensitive lowland site adjacent to the backwater.*
3. *To maximize the successful establishment of these species and minimize the amount of future maintenance required.*
4. *To utilize these stands for environmental education, recreation and the arts.*
5. *To maintain the stands for the future benefit of both wildlife and humans.*

Revegetation will be conducted over a ten year period on areas no larger than 70 acres each year. Extensive soil analysis will be conducted prior to planting in order to best ensure successful revegetation. Trees will be irrigated until they are well established and the sites will be monitored to ensure the success of the Program.

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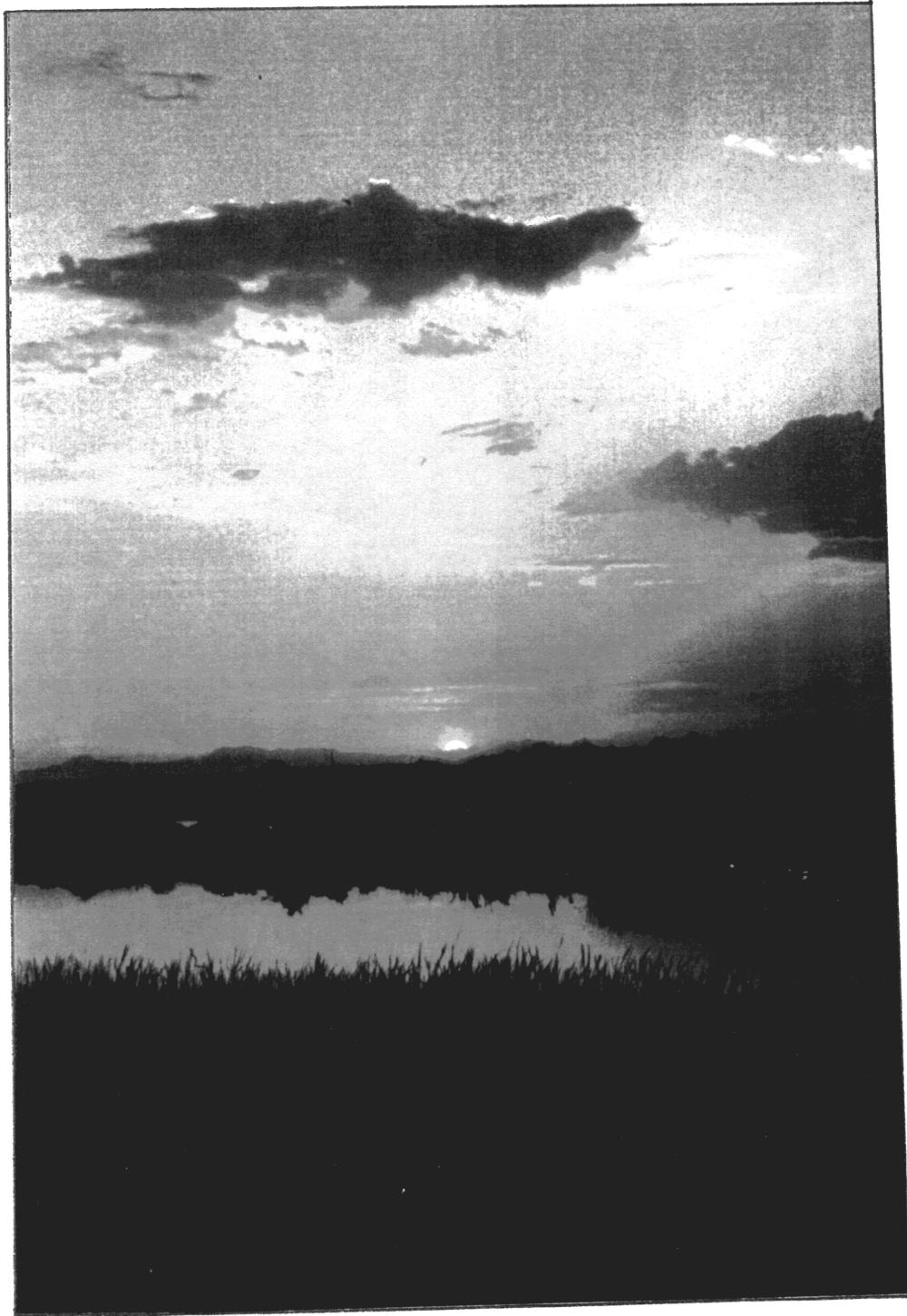
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1.0 INTRODUCTION



A. HISTORY:

The backwaters along the lower Colorado River provide wildlife habitat that has been lost due to the damming and channelization of the river. These areas support an array of plant and wildlife species. Some are residents, staying year-round, others are migratory, staying for a season or two, and still others only pass through, utilizing the rich valley of the Colorado River as they travel across the arid Southwest. For all of them, however, the river and its backwaters are vital to their survival. The diversity of life forms are a reflection of the myriad ways in which plants and animals are capable of meeting the challenges of their environment.

Recently, even the backwaters have been placed in jeopardy. Within the last century, most native stands and bosques of mesquite, willow, and cottonwood have been cleared or, burned, and most of these areas have been overrun with the exotic saltcedar. Many wildlife populations are dwindling due to habitat loss, as well as increasing disturbance caused by high-impact recreation such as motorboating.

B. NEED:

The backwaters are becoming increasingly vital to wildlife, while at the same time, becoming less useful to wildlife. It is important that these areas be restored and preserved as a refuge and reminder of the natural heritage for which we are responsible. Areas such as this are invaluable for the education and experience of future generations.

The need for the preservation of the backwaters is not solely for wildlife. The river and backwaters are extremely popular with both the Tribes and visitors for recreational purposes. The backwater's seclusion from river traffic and roads offers a refuge from the ever-growing influx of development along the river.

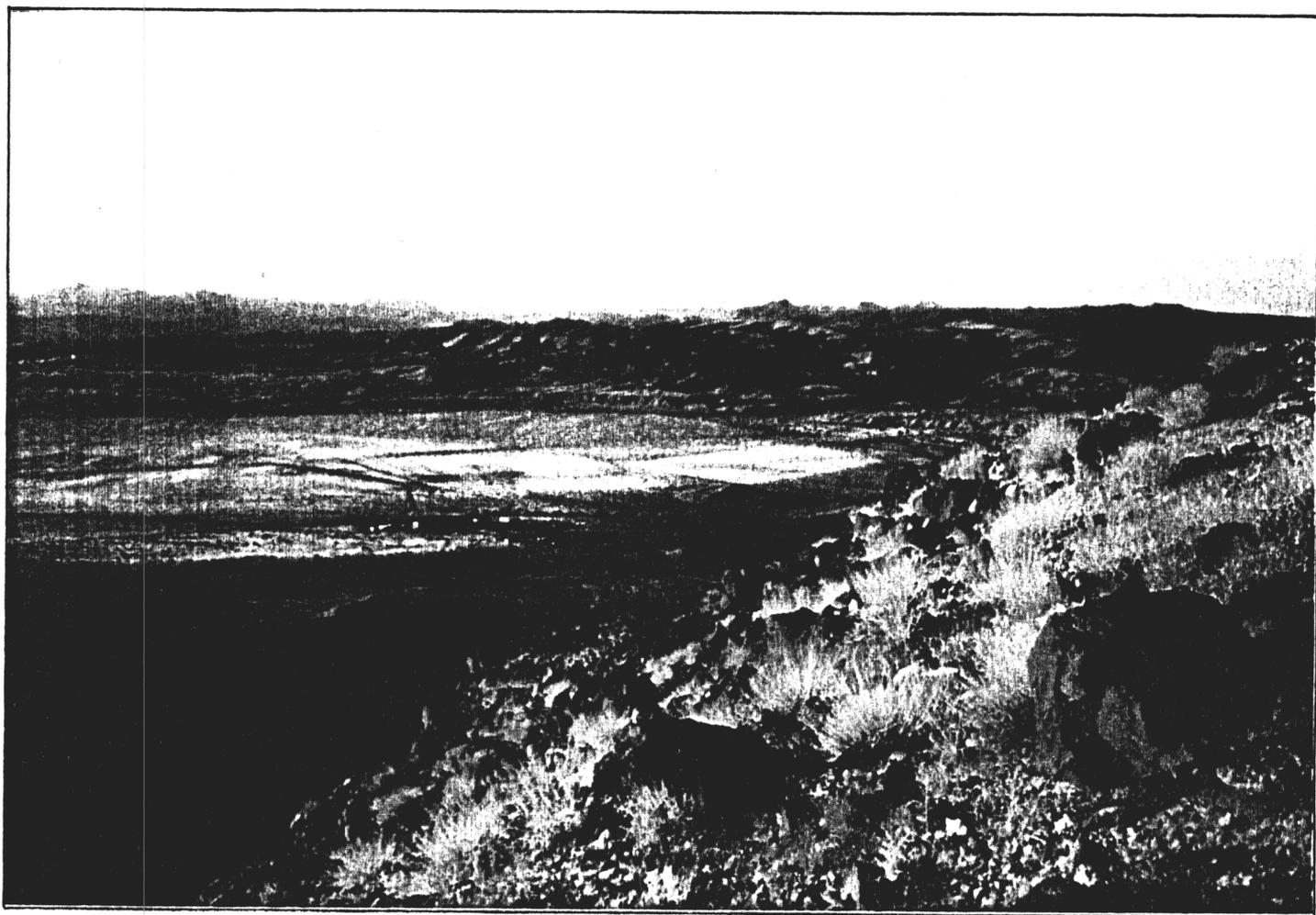
C. GOALS:

Our goal in this proposal is to create a plan for the restoration of the Deer island and 'Ahakhav Backwaters. Specifically, this proposal provides:

1. A plan for the restoration of the open water areas of the backwater.
2. A plan for the revegetation of much of the area with native species.
3. A plan to provide habitat for the diversity of wildlife species along The Lower Colorado River that are being lost due to damming, agriculture, and the channelization of the river.
4. Maintain the natural integrity of the backwaters.

The following proposal includes the plans, details, costs, and a time frame of the work required to successfully implement the restoration of The 'Ahakhav Wilderness Preserve backwater areas.

2.0 EXISTING ENVIRONMENT -- 'AHAKHAV WILDERNESS PRESERVE



A. LOCATION:

The maps (Figures 2.1 and 2.2) and aerial photograph (Figure 2.3) of the proposed site indicate the location of 'Ahakhav Wilderness Preserve. The 'Ahakhav Wilderness Preserve includes two backwater areas -- Deer Island and 'Ahakhav. For clarity, 'Ahakhav backwater and Deer Island will be referred to separately when differences in the two areas arise. However, the words 'site' or 'preserve' will be used in reference to the entire 'Ahakhav Wilderness Preserve.

Total acreage of the site is 1042 acres, with Deer Island totaling 738.5 acres, and 'Ahakhav totaling 303.5 acres.

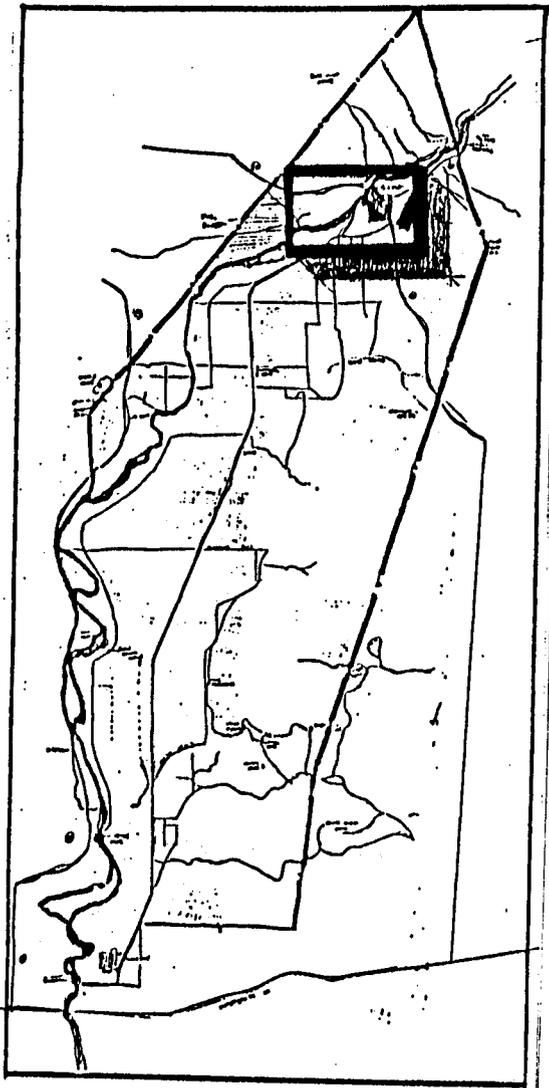


FIGURE 2.1 *Colorado River Indian Reservation:*
The map illustrates the location of the site in relation to the rest of the Colorado River Indian Reservation. Figures 2.2 and 2.3 illustrate the area of detail indicated on this map.

B. VEGETATION

Maps of the existing vegetative coverage on the site are given in Figures 2.4 and 2.5. These indicate upland, lowland, riparian, open land, and open water habitat. There are approximately 57 acres of open land, areas with little or no vegetation and a corresponding lack of wildlife diversity. Open water areas will be dealt with in a later section concerning water resources on the site. Upland, lowland, and riparian areas are discussed below.

1. UPLAND: Areas of the site that are at least eight feet above the high water level of the backwater will be designated as upland. While not true desert uplands, these areas are the driest on the site, and have a mix of vegetation characteristic of both desert and riparian habitats. There are approximately 373 acres of upland at Deer Island, and 64 acres of upland at 'Ahakhav.

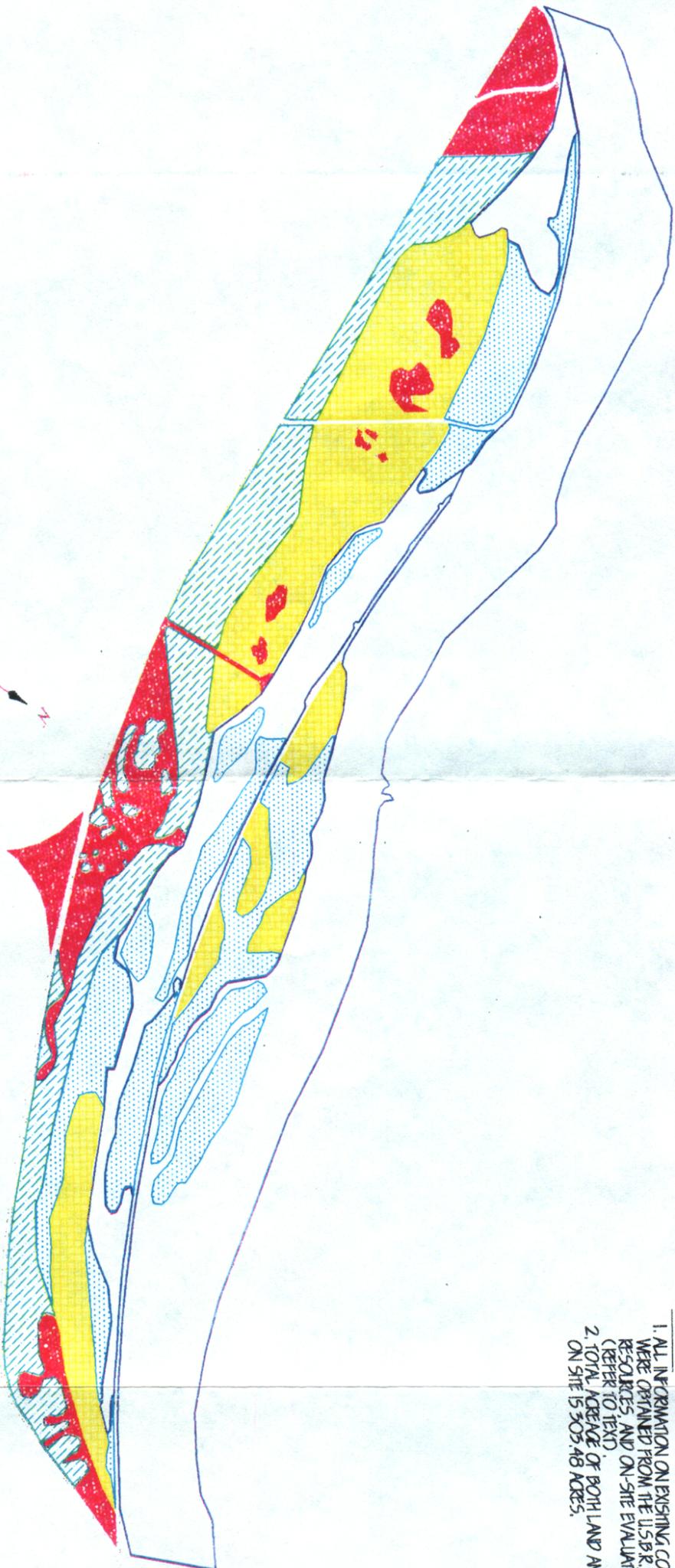
Upland areas of the site are dominated by saltcedar (*Tamarix chinensis*), an exotic species introduced from Eurasia during the 19th century. The saltcedar is known as a "well-plant," having deep roots and high water use. It is widely naturalized in the southwest United States, and has proven difficult to eradicate because of its habit of both root sprouting and spreading by seed. Saltcedar often outcompetes native plants for water and space, and it has a lower wildlife habitat value than most native plants. Additionally, saltcedar secretes so much salt that soils where it has grown are often unsuitable for replacement with native vegetation. Saltcedar accounts for approximately 80 percent of the vegetative coverage on upland portions of the site.

There are a number of other species common on the site, including honey mesquite (*Prosopis glandulosa*), and screwbean mesquite (*P. pubescens*). The understory is dominated by plants such as arrowweed (*Pluchea sericea*), quailbush (*Atriplex lentiformis*), and four-wing saltbush (*Atriplex canescens*). These species are native to the site and, while not present at the levels exhibited by saltcedar, most provide important habitat for a variety of wildlife species. Arrowweed, perhaps the most dominant shrub, has a very low wildlife habitat value, and is often considered a pest. The mesquite are an especially valuable component of the area, providing both food and cover for a variety of wildlife species. However, it cannot be said that there is an intact community of either honey or screwbean mesquite on the site. The native trees are usually separated by dense saltcedar, and there are few areas with enough mature mesquite to shade out the saltcedar.

FIGURE 2.4 Existing Vegetation -- 'Ahakhav Backwater:

'AHAKHAV WILDERNESS PRESERVE
EXISTING VEGETATION

SCALE 1" = 400'

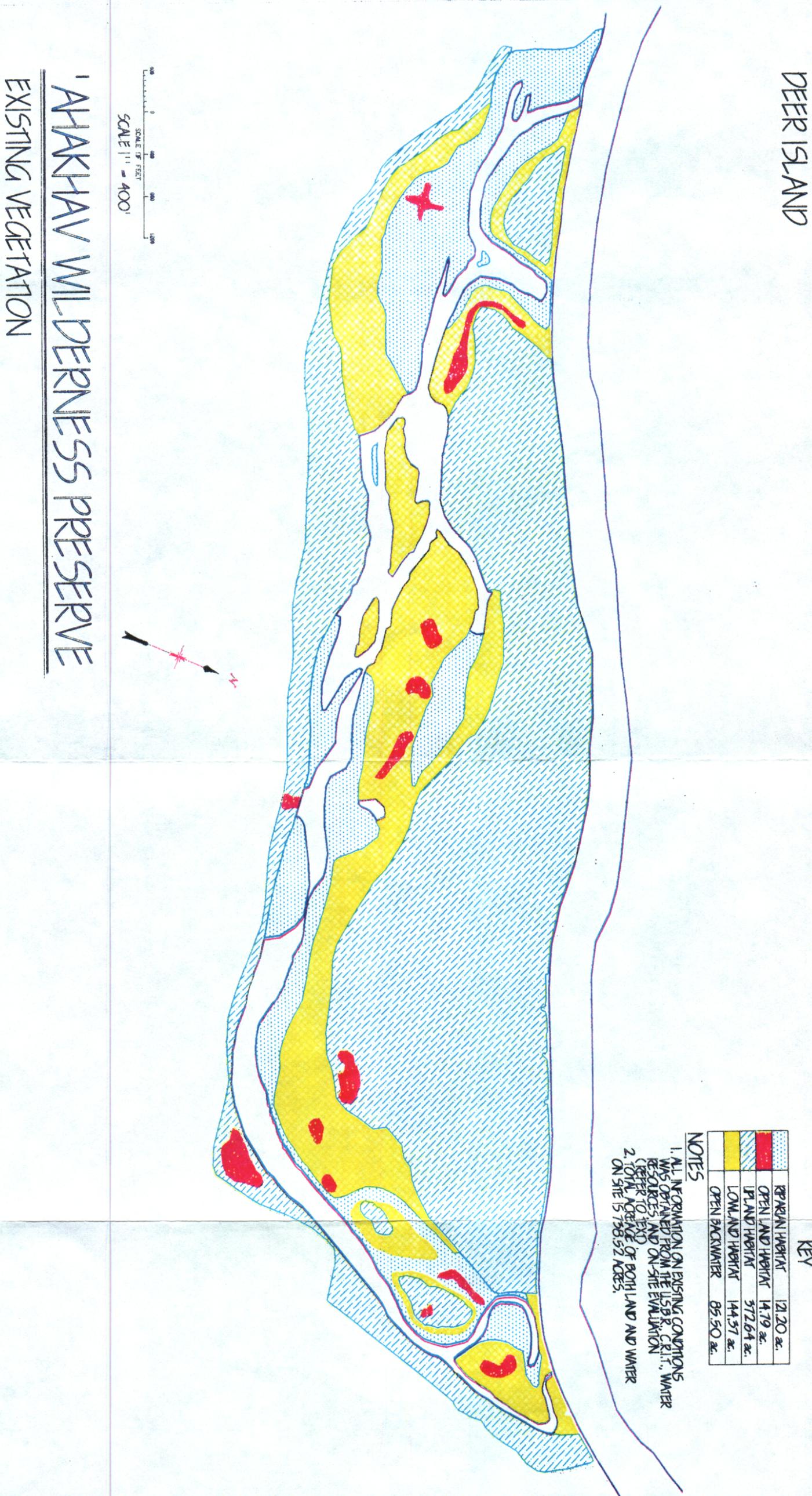


'AHAKHAV

KEY	
	RP RAIN HABITAT 74.94 ac.
	OPEN LAND HABITAT 42.62 ac.
	LP LAND HABITAT 64.29 ac.
	LOWLAND HABITAT 74.51 ac.
	OPEN BACKWATER 47.51 ac.

- NOTES
1. ALL INFORMATION ON EXISTING CONDITIONS WERE OBTAINED FROM THE LISBR, C.R.I.T., WATER RESOURCES, AND ON-SITE EVALUATION (REFER TO TEXT)
 2. TOTAL AGEAGE OF BOTH LAND AND WATER ON SITE 15,505.48 ACRES.

FIGURE 2.5 Existing Vegetation -- Deer Island:



2. **LOWLAND:** Lowland areas of the site lie between the backwater itself and the higher, upland portions of the site (Figure 2.6). This portion of the site is characterized by periodic flooding and plant species requiring a substantial amount of available water. There are approximately 144 acres of lowland at Deer Island, and 77 acres of lowland at 'Ahakhav.

These areas were, at one time, dominated by large cottonwood (*Populus fremontii*) (Figure 2.7), and willows (*Salix sp.*). Today, however, there remain only a few of the large trees, and small, scattered patches of younger trees. Saltcedar dominates these areas as well, often growing right down to the riparian areas in standing water.

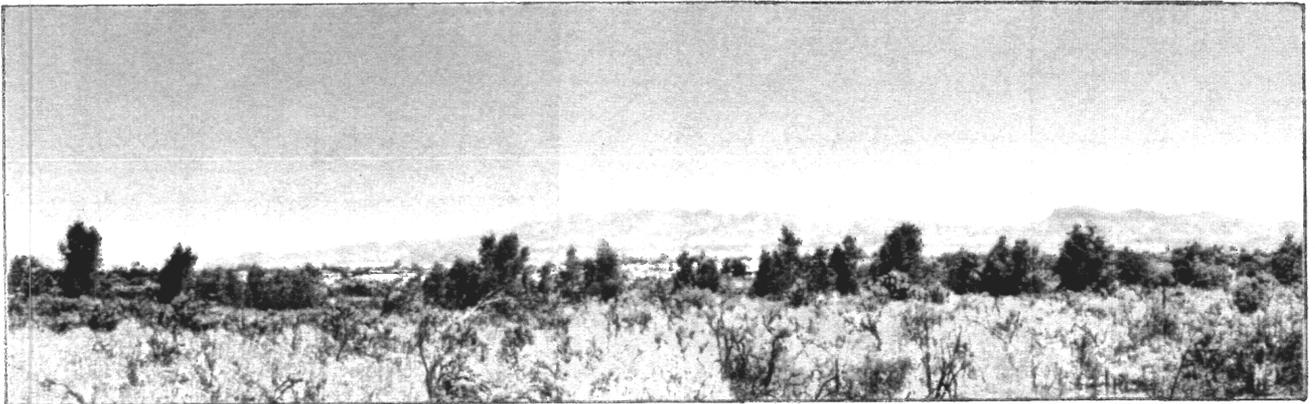


FIGURE 2.6 *Lowland Habitat:*

Lowland areas are periodically flooded and were at one time dominated by cottonwood and willow, such as this young stand. Today they are primarily dominated by saltcedar.

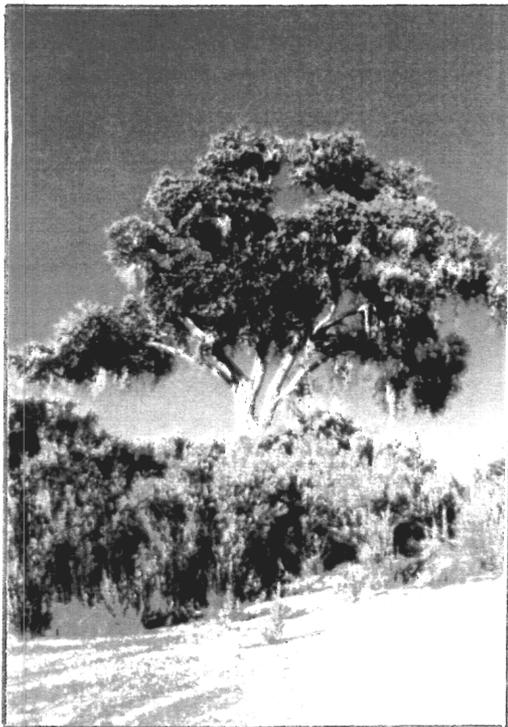


FIGURE 2.7 *Cottonwood (Populus fremontii):*

Cottonwoods provide important habitat for birds requiring tall trees or cavities for nesting purposes. There are no large cottonwoods, such as this one, on the site, but there are still a few stands of young trees.

3. RIPARIAN: Riparian areas are those that contain water during non-drought periods (Figure 2.8). There are approximately 121 acres of riparian habitat at Deer Island, and 74 acres at 'Ahakhav. Most of the shallow water area is dominated by cattails (*Typha latifolia*), with some areas of bulrush (*Scirpus acutus*). Additionally, there are patches of cane, or giant reed, (*Arundo donax*), another exotic species that is thriving in the backwater area. Unlike the saltcedar, the cane is not yet outcompeting native species but it is spreading rapidly, and may prove problematic in the future. Saltcedar is present as well, often in very dense patches. In addition to shallow, vegetated areas, there are 85 acres of open water at Deer Island, and 47 acres at 'Ahakhav.

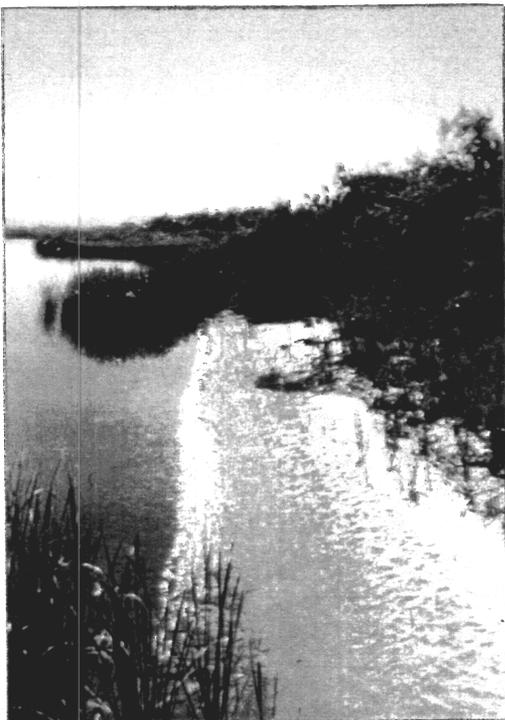
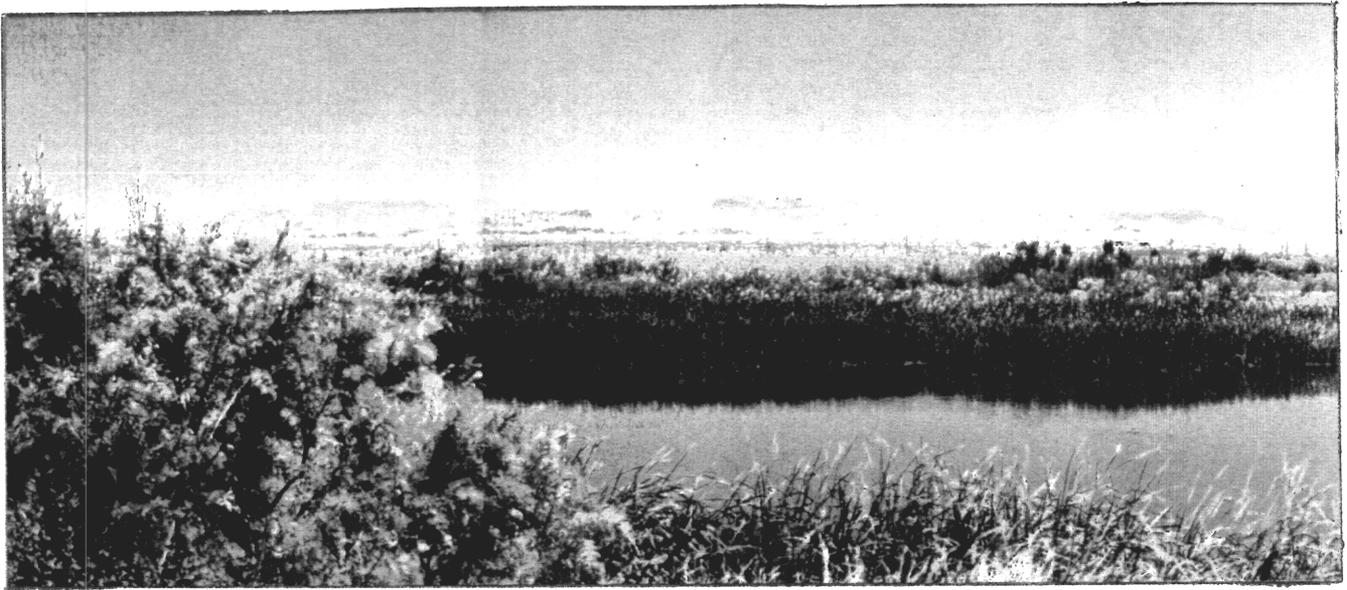


FIGURE 2.8 *Riparian Habitat:*

Riparian vegetation is important as food and cover for a number of wildlife species, and the water in these areas is vital for the survival of many animals living in this arid region.

C. WILDLIFE:

Backwaters of the lower Colorado River support at least 14 species of fish, and riparian woodlands provide habitat for over 250 species of birds, 9 species of amphibians, 23 species of reptiles, and 33 mammal species. With the exception of birds, a list of vertebrate species that are found in this part of the lower Colorado River valley is provided in Appendix A. For a complete list of birds that may be found in this area, see Rosenberg et al (1991) and Ohmart et al (1988).

1. UPLAND and LOWLAND: Higher elevations of the site are populated by a number of wildlife species, including many economically important game species. Mature saltcedar (over 17 feet in height) is used by nesting mourning doves (*Zenaida macroura*) and white-winged doves (*Z. asiatica*), as well as several species of songbirds. However, while saltcedar is used by wildlife, native plants are clearly more valuable. High winter densities of Gambel's quail (*Callipepla californica*) are supported only in honey mesquite communities, and they prefer screwbean mesquite communities in the summer and fall. Screwbean mesquite also supports the highest density of nesting mourning doves and white-winged doves. In addition to game birds, desert cottontails (*Sylvilagus audubonii*) are extremely common.

Game animals are not the only species present, many non-game species utilize this area as well. Reptiles such as rattlesnakes (*Crotalus sp.*), common kingsnakes (*Lampropeltis getulus*), western whiptail lizards (*Cnemidophorus tigris*), banded geckos (*Coleonyx variegatus*), and the side-blotched lizard (*Uta stansburiana*) may be found here, as well as dozens of other reptiles.

The presence of taller trees, such as honey and screwbean mesquite, attracts birds to the site that would normally only use trees such as cottonwood for nesting purposes. Yellow-billed cuckoos (*Coccyzus americanus*), Gila woodpeckers (*Melanerpes uropygialis*), and the gilded flicker (*Colaptes auratus mearnsi*) are such species. Additionally, songbirds such as Abert's towhees (*Pipilo aberti*), Western kingbirds (*Tyrannus verticalis*), and Crissal thrashers (*Toxostoma crissale*) utilize the site for nesting purposes, and belted kingfishers (*Ceryle alcyon*), American robins (*Turdus migratorius*), and phainopepla (*Phainopepla nitens*) migrate here in the winter.

Raptors such as Harris hawks (*Parabuteo unicinctus*), red-tailed hawks (*Buteo jamaicensis*), and American kestrels (*Falco sparverius*) once nested in large numbers in the mature cottonwood, willow, and mesquite. Today, however, the Harris hawk is virtually extinct in the Colorado River Valley, and the red-tailed hawk and American kestrel find only a few suitable nesting sites. Many raptors, such as the Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), and endangered southern bald eagle (*Haliaeetus leucocephalus leucocephalus*) winter in the area. Others, such as the peregrine falcon (*Falco peregrinus*) and the osprey (*Pandion haliaetus*) utilize the area during their migrations.

2. RIPARIAN: The slowly moving, nutrient-rich backwaters are essential for the survival of many wildlife species that would otherwise not be found in the arid Southwest. These riparian areas provide important habitat for a number of fish species, primarily smaller and younger ones. Fish such as the carp (*Cyprinus carpio*), bluegill (*Lepomis macrochirus*), and largemouth bass (*Micropterus salmoides*) are commonly found here. However, none of the fish that are found in any numbers in these areas are native species. Species such as the endangered bonytail chub (*Gila elegans*) and the endangered razorback sucker (*Xyrauchen texanus*) have been essentially extirpated from the area.

The backwater area also provides important habitat for the amphibians known to occur on the Colorado River Indian Reservation. All are dependent on nearby water for both survival and reproduction. The most commonly encountered amphibians include the Great Plains toad (*Bufo cognatus*), red-spotted toad (*B. punctatus*), Woodhouse's toad (*B. woodhousii*), and the bullfrog (*Rana catesbeiana*).

Birds that utilize the upland portion of the site will also generally inhabit the lowland areas. In addition to birds mentioned above, shorebirds such as American coots (*Fulica americana*), black-necked stilts (*Himantopus mexicanus*), killdeer (*Charadrius vociferus*), black-crowned night-herons (*Nycticorax nycticorax*), great egrets (*Casmerodius albus*), and great blue herons (*Ardea herodias*) nest in the riparian areas. Winter and transient visitors include northern pintails (*Anus acuta*), sandhill cranes (*Grus canadensis*), Canada geese (*Branta canadensis*), and the common snipe (*Gallinago gallinago*).

Mammals such as beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), striped skunk (*Mephitis mephitis*), cotton rats (*Sigmodon hispidus*), harvest mice (*Reithrodontomys megalotis*), cactus mice (*Peromyscus eremicus*), and the introduced house mouse (*Mus musculus*) inhabit the riparian areas as well.

3. ENDANGERED, THREATENED, and CANDIDATE SPECIES: A number of federally, tribally, and state listed species may occur on the site. A complete list of endangered, threatened, and candidate species that *may* utilize this site is provided in Appendix B. Most of the species are considered transients, visitors during migrations or the non-breeding season, or occurred in this area historically but are no longer found here.

The endangered Yuma clapper rail (*Rallus longirostris yumanensis*) is the only federally listed species considered a resident on the Colorado River Indian Reservation, arriving in April to breed, and leaving again in September. The species migrates to Mexico during the winter, complicating protective measures. It inhabits shallow, freshwater marshes with low-density stands of cattails and bulrushes, and is found along the lower Colorado River from Arizona and California into Mexico, as well as the Salton Sea in Imperial County, California. Crayfish, isopods, small fish, clams, insects, and seeds are the primary food sources of the rail. The Yuma clapper rail is threatened by loss of habitat due to human-caused river flooding, reclamation projects, and mosquito abatement activities.

While this portion of the lower Colorado River has been designated as critical habitat for the federally endangered razorback sucker, it is rare or absent from all of the lower Colorado River except Lake Mohave. All known wild populations, including those that may inhabit this site, consist of large, old adults. There has been no known recruitment of young into the population for over twenty years. It is believed that the population decline of the razorback sucker has been caused by the predation of young by non-native fish in the Colorado and other rivers. The species reproduces successfully and the young grow rapidly when isolated from these non-native predators.

The federally endangered Southwestern willow flycatcher (*Empidonax traillii*) historically nested in the lower Colorado River Valley, although it no longer appears to. It is a cottonwood-willow obligate species that declined dramatically in the area, presumably due to a loss of habitat. Today it is considered a transient in this area, appearing in willows near water. Formerly, breeding was restricted to areas containing willow.

D. WATER:

Water resources on the site include the backwater (196 acres of riparian vegetation and 133 acres of open water), totaling 329 acres in surface area, and the Colorado River, providing the western boundary for the site. The Colorado River is used extensively for recreation, primarily boating. The river is fast-flowing, and the water level changes frequently due to dams both upstream and downstream.

The backwater is characterized by open water, most of which is shallow, and vegetated marsh areas. The marsh areas range from damp with a dense cover of cattails (Figure 2.9), to sandbars covered in vegetation (Figure 2.10), to small patches of cattails and bulrushes along the edges of the open water (Figure 2.11). In the densely vegetated areas, little or no open water is visible, and cattails generally dominate. The water that is there tends to be rather stagnant, with little or no flow of water through the area. These are areas that are beginning to fill in with deposited sediment and will eventually become uplands. The less densely vegetated areas tend to be dissected by small channels of flowing water and have a higher diversity of both plants and wildlife.

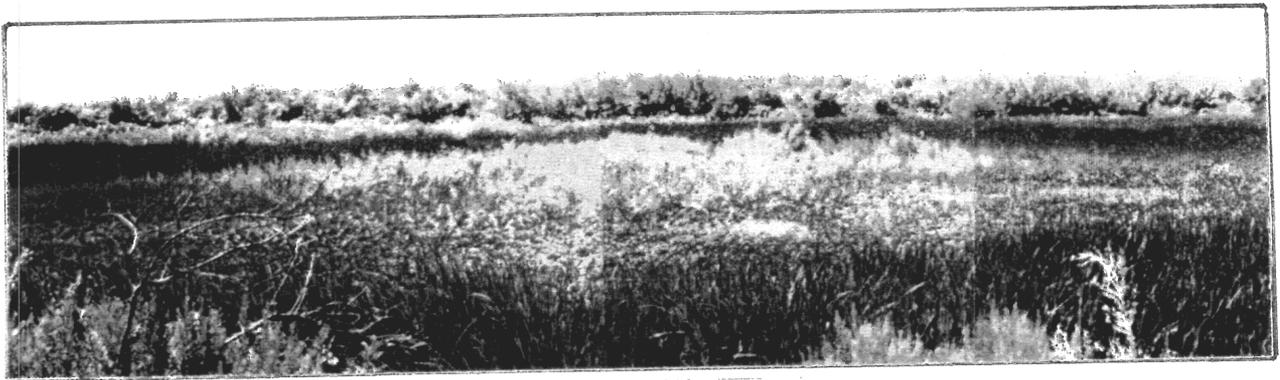


FIGURE 2.9 *Dense Cattail Cover:*

Areas such as this contain very shallow water that is usually stagnant. There are few wildlife species that use such dense cover.



FIGURE 2.10 *Sandbar:*

Sandbars, many of which are old dredge spoils, tend to have a less dense coverage of cattails, and are usually more useful to wildlife.



FIGURE 2.11 *Riparian Edge:*

Cattails and bulrush growing along the edge of the backwater provide important brood cover for nesting birds, as well as cover for smaller fish.

E. SOILS:

A soil survey map of this site is given in Figure 2.12. There are five soil types on the site, all of which have a very low available water capacity, slow runoff, slight hazard of water erosion, and very high hazard of soil erosion. They are also all subject to flooding and moderately suited to riparian vegetation (cottonwood, willow, etc.). The five primary soil types are outlined in Figure 2.15.

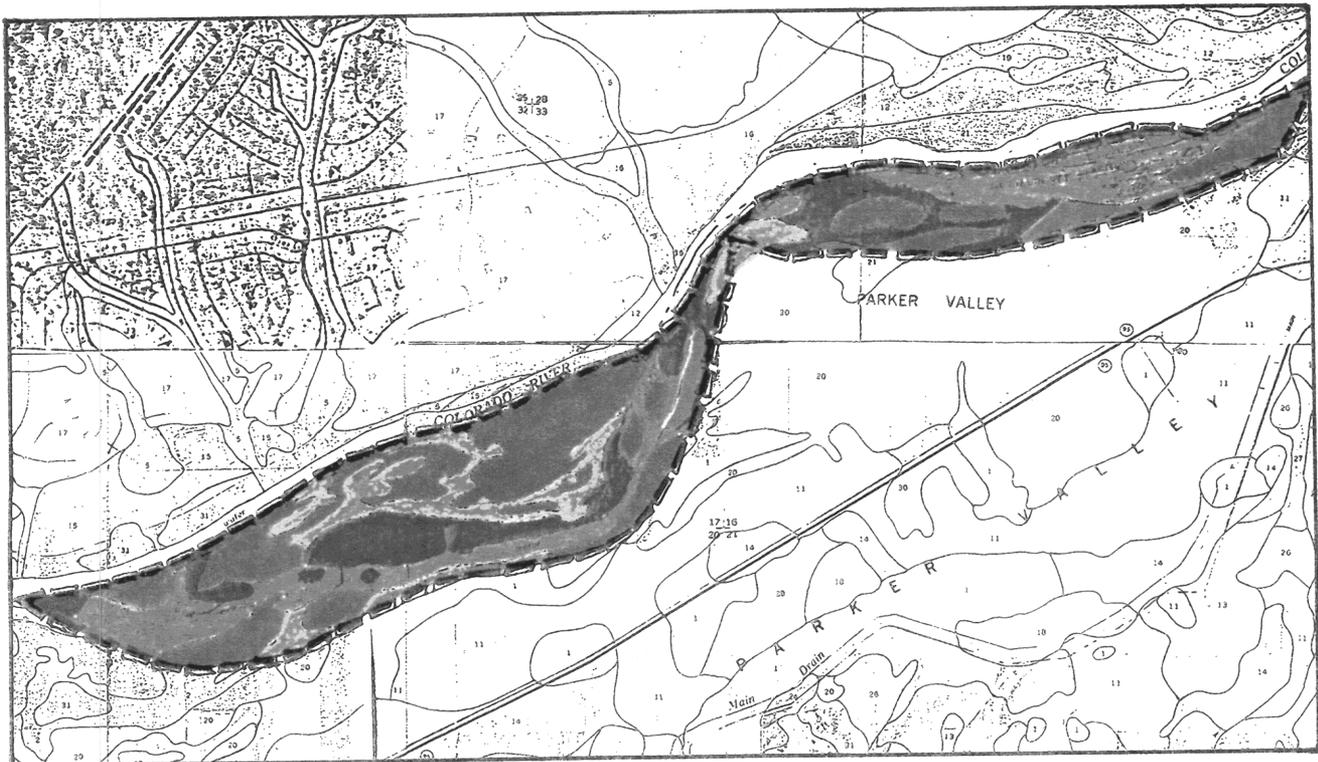


FIGURE 2.12 *Soil Survey Map:*

This map indicates the major soil types found on the site. Soil factors are important in determining the best locations for individual planning elements. They are especially important in determining the suitability of a location for specific species during the revegetation process.

- Water
- 2 Agualt-Cibola: strongly saline, sandy loam, moderately slow permeability, salt tolerant vegetation with extremely deep taproots (up to 30 feet), natural plant community of saltcedar, mesquite, arrowweed, and saltbush.
- 5 Carrizo: gravelly coarse sand, rapid permeability, natural plant community of creosotebush, paloverde, ironwood, big galletta, and mesquite.
- 20 Lagunita: loamy sand, used primarily for agriculture, despite not being truly suited for agriculture.
- 21 Lagunita: strongly saline, loamy sand, rapid permeability, vegetation similar to type 2 areas
- 22 Lagunita variant: moderately saline, loamy sand, rapid permeability, high soil erosion hazard in unponded areas, vegetative community of cattails, bulrush, mesquite, saltcedar, and arrowweed.

F. TOPOGRAPHY:

Topography is important in planning revegetation sites, dredge spoil locations, drainage patterns, and the location of elements of the recreation area. A topographic map of the preserve, Figure 2.13, indicates the main river channel, areas that are within the 100 year flood plain, and upland areas outside the 100 year floodplain.

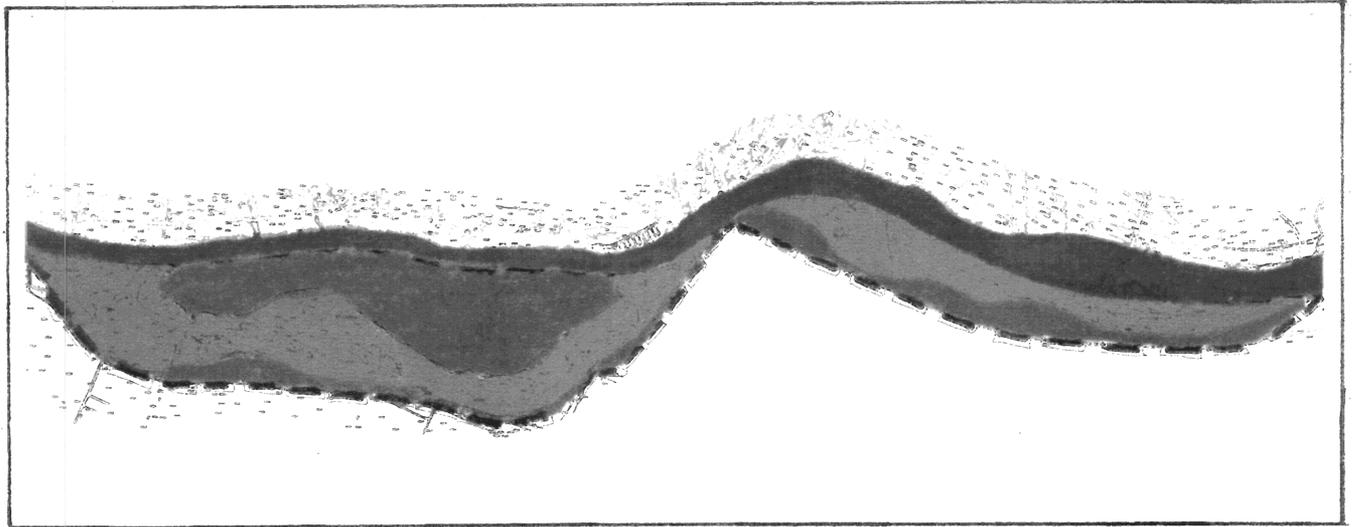


FIGURE 2.13 *Topographic Map of 'Abakhav Wilderness Preserve*

-  MAIN RIVER FLOODWAY
-  100 YEAR FLOODPLAIN
-  UPLAND AREAS (OUTSIDE 100 YEAR FLOODPLAIN)

G. RECREATION:

Hunting and fishing are currently the major forms of recreation on the site. Cottontail, quail, and doves are the primary game animals, and bass, sunfish, carp, and catfish are some of the fish commonly caught. There are bag and possession limits on many fish and game species, and a permit is required from the C.R.I.T. Fish and Game Department for both hunting and fishing. Additionally, camping permits are issued by the Fish and Game Department, and there are a few existing stone fire circles (Figure 2.14) on the site. While the area is patrolled by Fish and Game, most activity on the site is unmonitored.

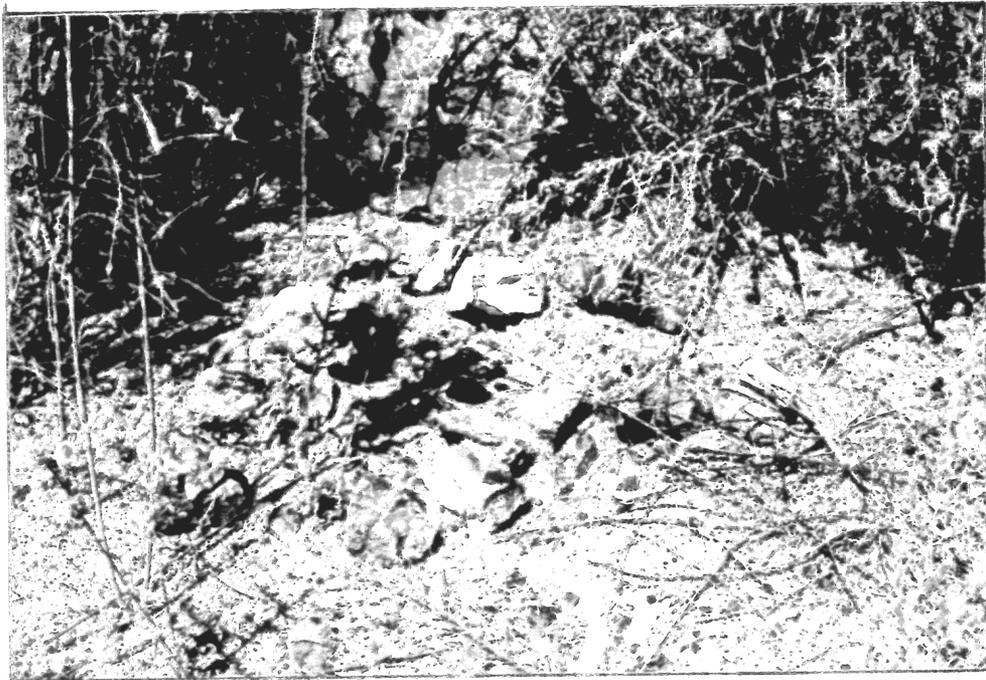


FIGURE 2.14 *Fire Pits:*
Camping occasionally occurs on the site, as the stone fire pit illustrates. Additional recreation in the area includes hunting and fishing.

H. POLLUTION:

There are a number of areas on the site that have been used for illegal dumping purposes (Figure 2.15). Automobiles, furniture, appliances, and trash are found, usually near roads. Most of the dumping sites are small, under 50 square feet, although there is at least one that is over one quarter acre. There are no known toxic substances on the site.



FIGURE 2.15 *Dump Sites:*

These pictures illustrate some of the illegal dump sites at 'Ahakhav Wilderness Preserve

3.0 PROPOSED ACTION FOR ENHANCEMENT



A. BACKWATER DREDGING:

1. **BACKWATER HISTORY:** The backwater areas on the site provide fish and wildlife habitat that was lost to the damming and channelization of the Colorado River. These areas require periodic dredging and other maintenance operations in order to encourage water flow and prevent sedimentation. The habitat has slowly deteriorated since the 1960's, with deeper channels having been sedimented during flooding, a reduction in wildlife species diversity and productivity, siltation problems, and poor circulation of water through the area. Sandbars block inlets and outlets to the River. Historically deep channels are now shallow, and historically shallow areas are often filled in completely and covered with dense cattails. Dense cattails generally have a lower value to wildlife than medium to low density cattails, and a lack of deep water areas limits the diversity of fish to be found in the backwater. It is important that these backwaters be maintained in order to maximize their value to fish and wildlife, and therefore, people.

2. GOALS OF DREDGE PLAN:

- a. Dredging and opening of the historical backwater channels created in the 1960's.
- b. Improvement of the hydrology of the backwater.
- c. Utilization of spoil piles in a manner that will maximize their revegetation potential and minimize their impact on quality riparian habitat.
- d. Creation and enhancement of fish and wildlife habitat in the backwater.
- e. Reduction of future maintenance requirements.

3. **PROPOSED DREDGE PLAN:** The plan would consist of dredging to deepen historical channels, opening the backwater to the flow of the river through a series of percolation dikes, revegetation of dredge spoil with native riparian trees and shrubs, and the addition of fish habitat structures in the backwaters.

The backwater area will be opened to water flow from the river through a series of percolation dikes, located as shown in Figures 3.1 and 3.2. Percolation dikes would be constructed by excavating sections of the existing dikes to a depth of at least 2 feet below the river bottom. The lower sections of the dikes would be large rocks to allow permeability, and the upper gravel roads would be rebuilt for authorized access to the site. Construction of the dikes would occur during the winter when river levels are low.

Areas that are to be deepened will be dredged with a hydraulic dredge supplied by the U.S. Bureau of Reclamation. At 'Ahakhav, approximately 3931 linear feet of channel with an average width of 40 feet and an average depth of 15 feet at low river flow would be dredged as shown in Figure 3.1. These deep channels would be located in areas that have been fully sedimented, in the water near the percolation dikes, and at the mouth of the backwater (Figures 3.1 and 3.2). Approximately 11,686 linear feet of channel with an average width of 30 feet and an average depth of 10 feet at low river flow would be dredged in areas of shallow water (Figure 3.1). These shallow channels would connect the deep channels and other areas of the backwater that are not to be dredged (Figures 3.1 and 3.2).

Dredging at Deer Island would be similar, with 6817.5 linear feet of deeper channels, and 25,338 linear feet of shallow channels. These channels would be located as shown in Figure 3.2.

The location of dredge spoil piles was carefully considered, as there are areas of both high and low wildlife habitat value. Spoil piles will be placed first and foremost on upland areas with no vegetation or on old spoil piles. They will also be located on other upland areas with little vegetation and low value to wildlife (Figures 3.1 and 3.2). Upland spoil piles will be contained by a basin formed by excavating material from the middle of the pile with caterpillar tractors and pulling it to the edge to create a containment berm (Figure 3.3). This berm will prevent turbidity caused by spoil returning to the water.

When spoil piles are located in the riparian area, it will be on the least valuable habitat, usually mucky areas with little or no vegetation (Figures 3.1 and 3.2). A shallow shelf with an average width of 25 feet will be left around riparian spoil piles in order to allow for the growth of emergent vegetation (Figure 3.3). Higher areas of these spoil piles will create islands in the backwater, and will be used for revegetation with cottonwood, willow, and other riparian vegetation. Spoil piles in riparian areas will not be higher than 6 to 8 feet above the water table in order to increase the possibility of successful revegetation.

Spoil piles will be located in areas with low value to wildlife, such as saltcedar or arrowweed vegetation types. When cottonwood, willow, or mesquite trees are located within a spoil pile site, individual trees will be avoided. Dredge spoil can be successfully revegetated if soil type, depth to groundwater, species used, and other factors are suitable. If areas of low value to wildlife are replaced with successful revegetation projects, their value to wildlife will be enhanced. Numbers and species used for revegetation will need to be decided after dredging operations have been completed so that soil and water factors may be analyzed to better ensure the success of the project. Whenever possible, cottonwood and willow will be planted on the lower areas and mesquite will be planted on higher areas.

The total area of spoil coverage would be 32.68 acres at 'Ahakhav, and 67 acres at Deer Island, with an average depth of 4 feet. A floating plastic pipe will be used to transport spoil from the dredge to the disposal areas. A dredge platform will be graded and filled with gravel for storage of the dredger and other earth-moving equipment.

Fish habitat structures will generally be placed in the deeper dredged channels of both backwaters (Figure 3.5). These structures will consist of dead trees and brush obtained during dredging operations, as well as from upland revegetation projects, anchored to the bottom of the channels.

Figures 3.4 and 3.5 are cross-section drawings illustrating the historical, existing, dredged, and restored state of the backwaters. Such drawings are required by the Army Corps of Engineers during the permitting process in order to demonstrate that dredging operations will bring these areas closer to their historical status.

4. REGULATIONS and TIME FRAME: A regional general permit number 22 will be required from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act of 1899. This permit can usually be obtained in 30-60 days and is valid for 3 years from the date issued. Once the permit is issued, a timeline for dredging, construction, and revegetation will be developed.

5. IMPACTS:

- a. **Hydrology and Water Quality:** Construction of percolation dikes and deepening of the channels would improve water circulation through the backwaters, especially during low river flows, while still allowing the water level to fluctuate freely. The increased water flow would tend to prevent siltation at the openings of the backwaters. Water quality parameters such as salinity, dissolved oxygen, and temperature would be expected to improve with increased circulation and depth. Turbidity would be expected to increase in the immediate area of the dredge, but the sandy material would tend to settle out rapidly in the slow current. Turbidity caused by upland spoil piles will be prevented by earthen berms
- b. **Vegetation:** Spoil piles would be placed on areas of low habitat value and constructed to maximize the successful revegetation potential. Spoil piles will also avoid individual trees deemed valuable to wildlife (such as mesquite and cottonwood). Shallow ledges along spoil piles placed in the riparian area will allow the successful establishment of emergent vegetation such as cattail and bulrush.
- c. **Wildlife:** Disturbance of wildlife would be expected in the immediate area of dredging operations, including during the placement of spoil. However, wildlife habitat would ultimately be enhanced by replacing low value saltcedar stands with native riparian habitat. Revegetation efforts would be concentrated around the most disturbed areas in order to allow the wildlife habitat value to increase rapidly.
- d. **Fisheries:** Fish habitat would be disturbed during dredging operations, but would ultimately be enhanced by the improved water quality and circulation. The fish habitat structures, variety of water depths, and improved access to and from the river would be expected to increase fish species diversity.
- e. **Recreation:** Opportunities for recreation would be expected to increase because of dredging operations. Game hunting would be expected to improve with the increased habitat available to ducks and other waterfowl. Dredging operations at 'Aha Quin indicate that the number and size of fish caught will improve. Improved water flow and depth will make swimming in the backwater more enjoyable, and boating in small, unmotorized craft will be possible.

6. **COST:** Please refer to Table 3.1 and Table 3.2 for the costs of activities associated with dredging.

FIGURE 3.1 Proposed Dredge Plan -- 'Ahakhav Backwater':

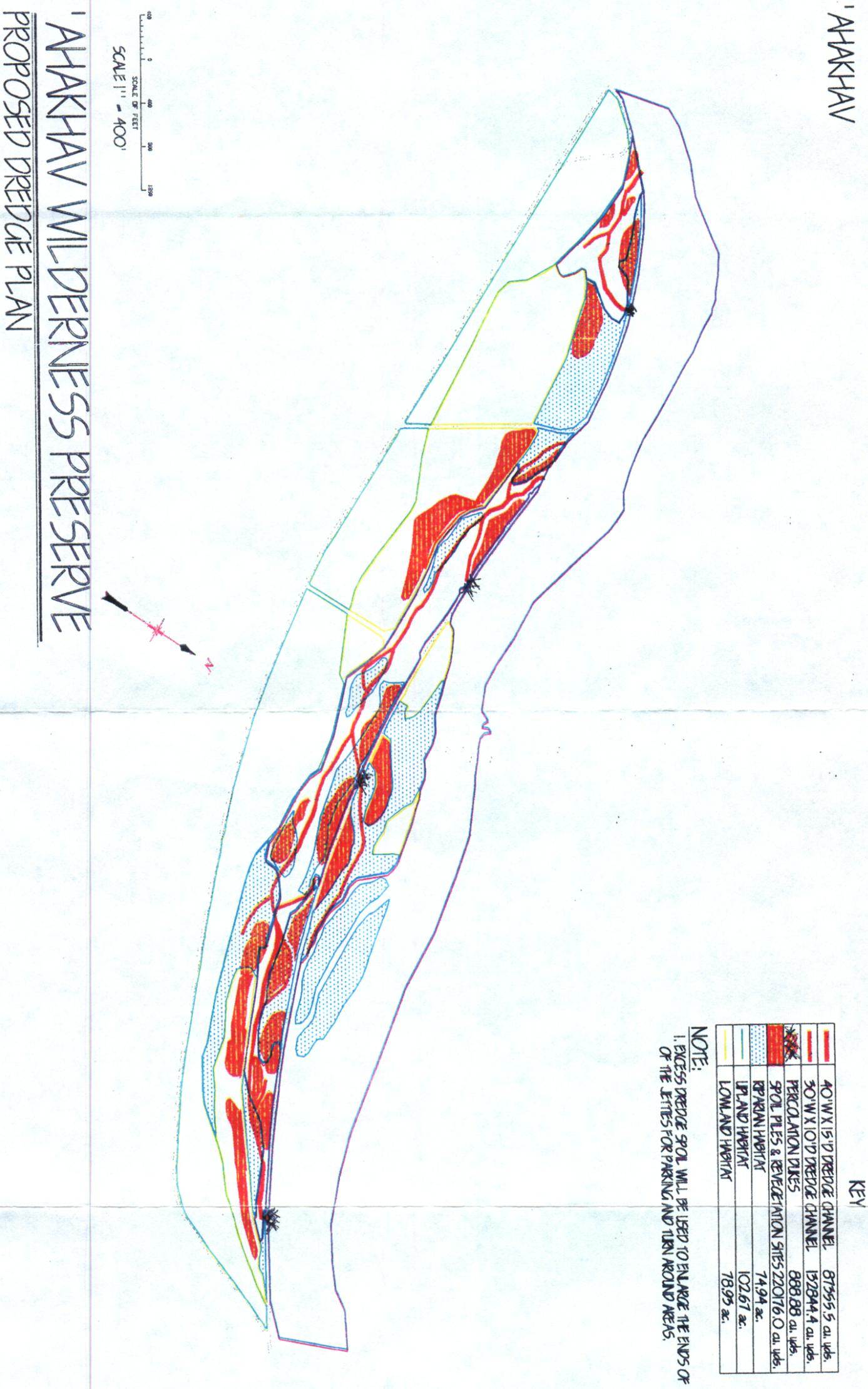


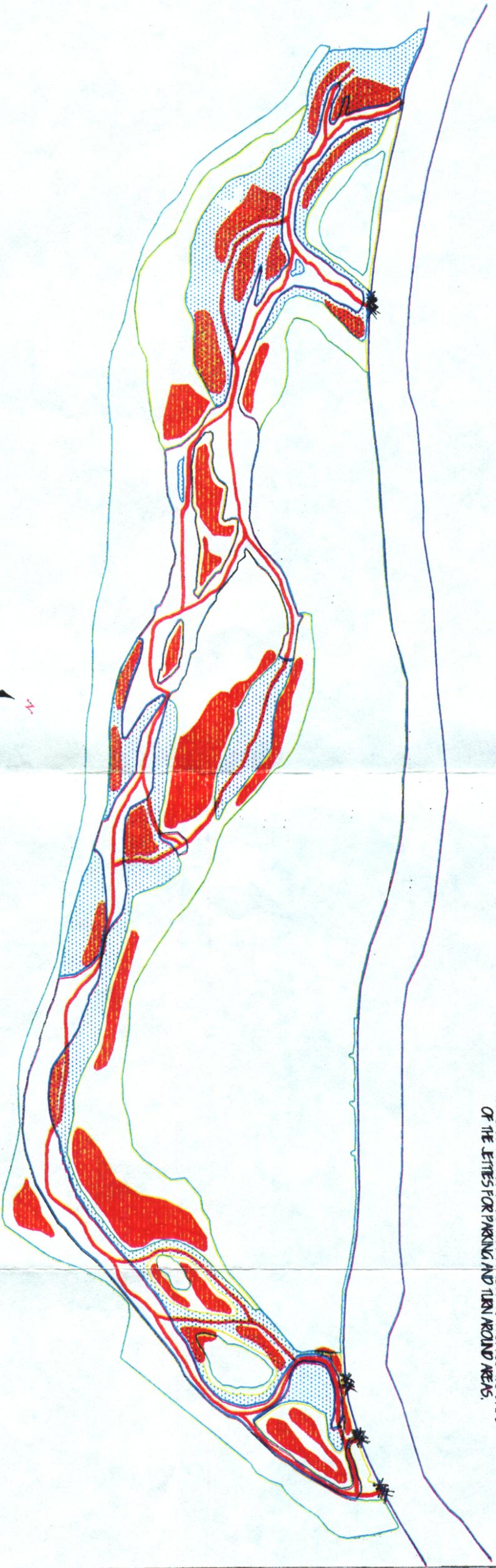
FIGURE 3.2 Proposed Dredge Plan -- Deer Island:

DEER ISLAND

KEY

	40' W X 15' D DREDGE CHANNEL	151501.77 ac. 1465
	30' W X 10' D DREDGE CHANNEL	281537.66 ac. 1465
	PERCOLATION DRES	995.69 ac. 1465
	SPOIL PILES & REVEGETATION SITES	433041.85 ac. 1465
	BEACH HABITAT	97.05 ac.
	ISLAND HABITAT	377.95 ac.
	LOWLAND HABITAT	151.70 ac.

NOTE:
 1. EXCESS DREDGE SPOL WILL BE USED TO ENLARGE THE ENDS OF THE ISLANDS FOR PARKING AND TURN AROUND AREAS.



SCALE OF FEET
 0 200 400 600 800
 SCALE 1" = 400'

AHAKHAV WILDERNESS PRESERVE
 PROPOSED DREDGE PLAN

FIGURE 3.3 Dredging Details:



FIGURE 3.4 Historical and Existing Backwater Cross-sections:

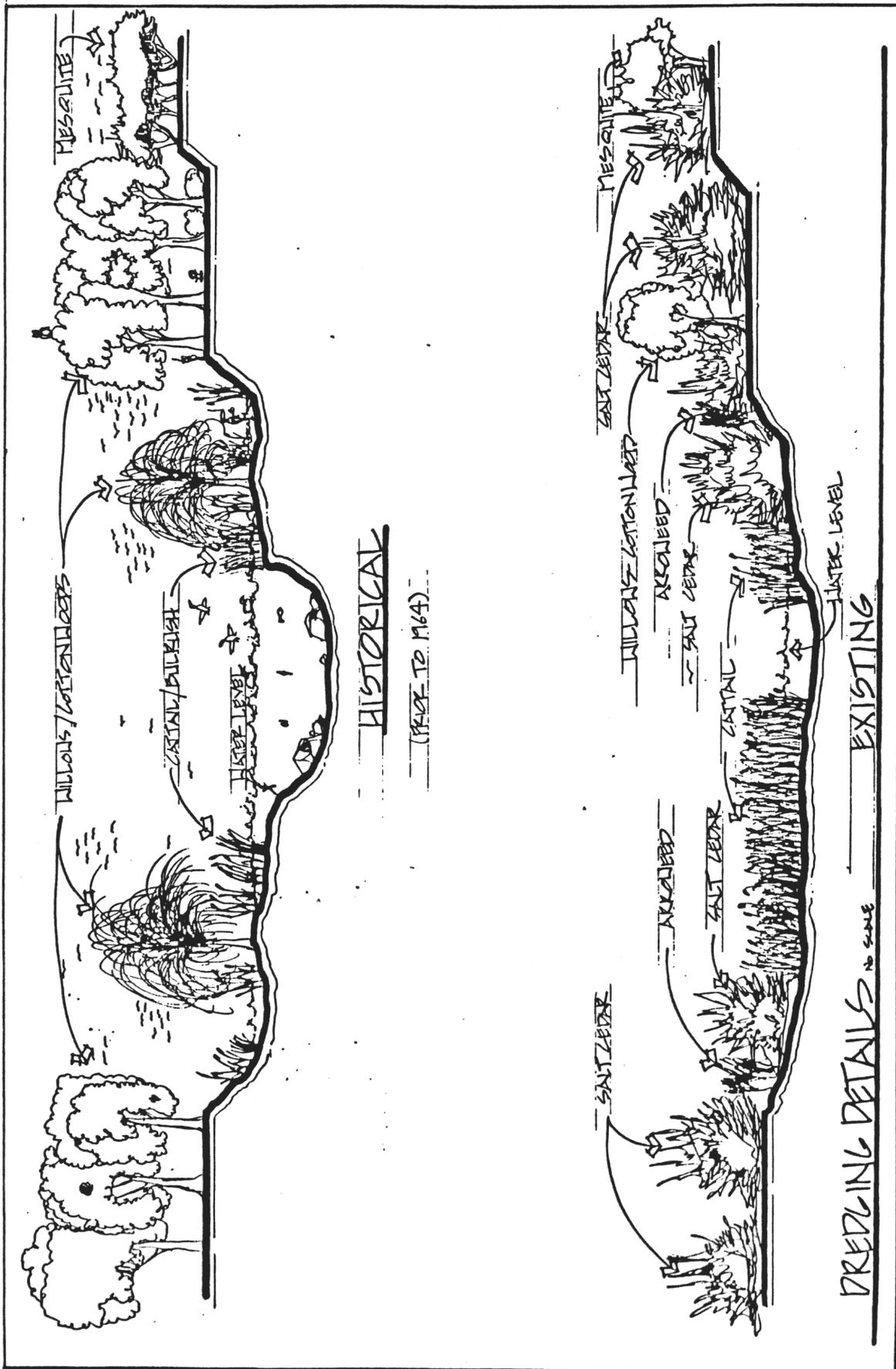


FIGURE 3.5 Dredged and Restored Backwater Cross-sections:

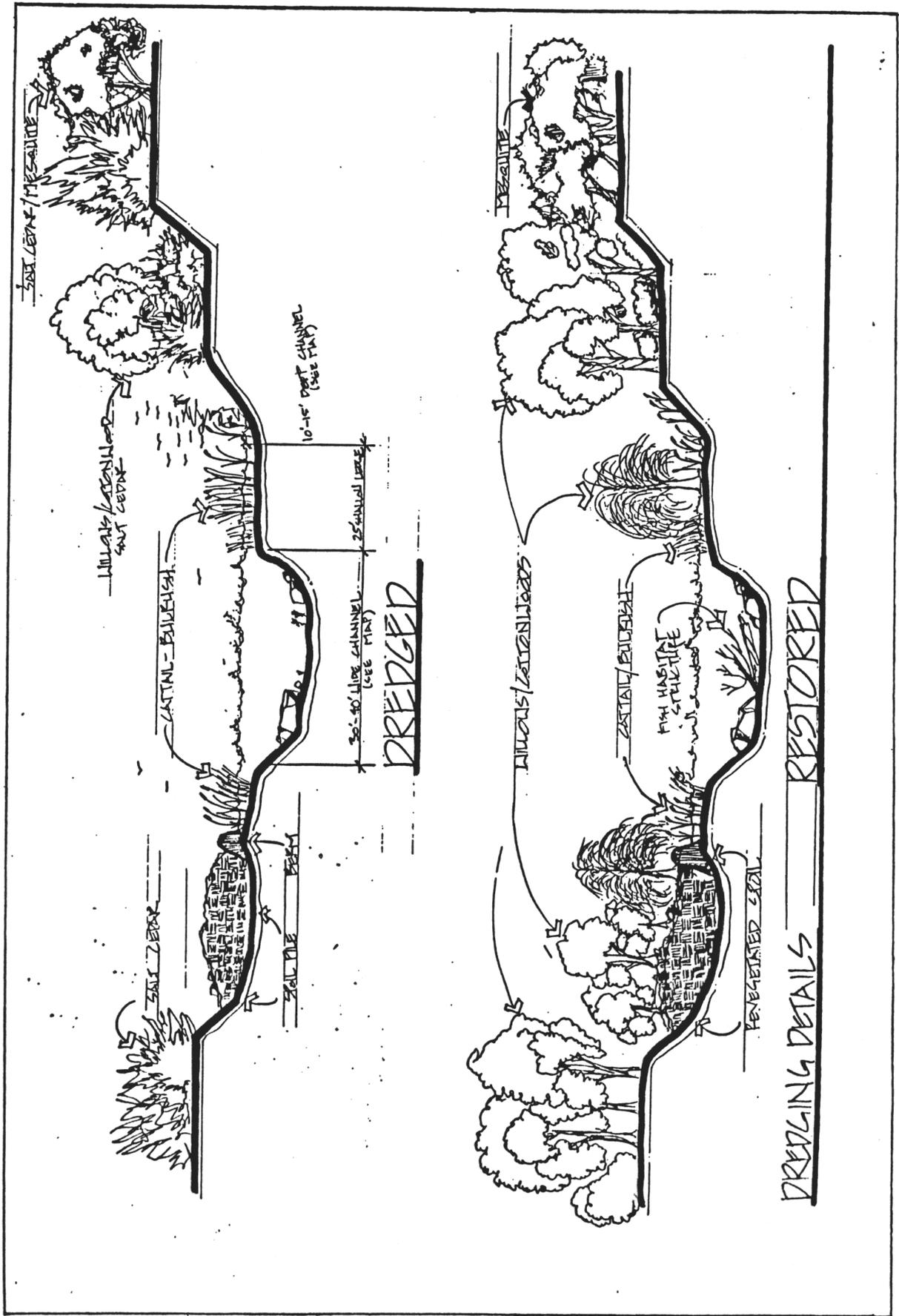


TABLE 3.1: Proposed Dredge Cost Estimate -- 'Ahakhav Wilderness Preserve

<i>ITEM</i>	<i>SIZE</i>	<i>QUANTITY</i>	<i>UNIT</i>	<i>UNIT PRICE</i>	<i>TOTAL</i>
'AHAKHAV:					
Channel Dredge	40'W X 15'D	87355.55	cu. yds.	\$ 2.60	\$ 227,124.43
Channel Dredge	30'W X 10'D	132844.44	cu. yds.	\$ 2.60	\$ 345,395.54
DEER ISLAND:					
Channel Dredge	40'W X 15'D	151501.77	cu. yds.	\$ 2.60	\$ 393,904.60
Channel Dredge	30'W X 10'D	281537.66	cu. yds.	\$ 2.60	\$ 731,997.92
ENTIRE SITE:					
Turnaround and Boat Accesses (4)	20X20X20 Each	8400	cu. yds.	\$ 20.00	\$ 168,000.00
Equipment Storage Platforms (2)	40X20 Each	3200	sq. ft.	\$ 0.50	\$ 1,600.00
TOTAL DREDGE: 'AHAKHAV					\$ 742,119.97
TOTAL DREDGE: DEER ISLAND					\$1,295,502.52
TOTAL DREDGE: BOTH SITES					\$1,868,022.49

* All construction and labor costs are inclusive in estimate.

B. REVEGETATION:

1. EXPLANATION AND GOALS: We are proposing that much of the site be revegetated with native tree and shrub species. Specifically, we wish to:

- a. Establish stands of native vegetation, including cottonwood, willow, and mesquite, in areas with low wildlife habitat value, primarily saltcedar stands.
- b. Maximize the successful establishment of these species and minimize the amount of future maintenance required.
- d. Maintain the stands for the future benefit of both wildlife and humans.

Revegetation will occur on one site per year, each consisting of not more than 70 acres. This plot size allows the trees and shrubs to be monitored, assuring that they are receiving the water and tillage they need. As mentioned earlier, saltcedar often exudes so much salt that the soil on which it grows may be unsuitable for revegetation with some species. It becomes vital, therefore, that the revegetation site be thoroughly tested before planting begins. Insufficient site analysis, especially measurement of the depth to the water table, is the most common cause of revegetation failure. It is for this reason that it is not possible to accurately predict how many acres of the site are suitable for revegetation, nor what species may be successfully planted, until detailed soil analysis is conducted. However, priority will be given to planting on dredge spoil piles in order to stabilize them. Dredge spoil, if sandy and low in salt content, is often one of the best soil mediums for revegetation projects. Priority will also be given to planting lowland sites adjacent to the backwater.

Figures 3.6 and 3.7 are potential revegetation areas on both 'Ahakhav and Deer Island. These are preliminary drawings illustrating the possibilities for the area, and should not be used as a planting guide.

2. PROPOSED REVEGETATION PROCEDURE: We are recommending that the suggested Revegetation Method be followed in order to establish healthy and vigorous trees and shrubs. This Revegetation Method was developed in order to reestablish habitat with maximum wildlife value in the shortest time possible. The suggested method was taken from several different sources including the information covered in the Vegetation Management Study for The Lower Colorado River (U.S. Bureau of Reclamation, 1995). This requires maximizing growth rates and minimizing mortality rates. The proposed Revegetation Method is as follows:

1. **Preliminary Soil Analysis:** Two soil samples will be collected at one sample point per acre. The first sample will be taken near the surface and the other will be taken just above the water table, or 6-8 feet below the surface. For each sample the soil type, pH, electroconductivity, and surface-to-water-table depth are determined. Whenever possible, a water sample will be taken and its pH and electroconductivity determined. This analysis reveals the range of variation for each variable tested and allows an assessment of the success that might be expected for a planting on the site.

2. **Propagules:** Cuttings of local genetic stock will be taken, treated with *Rootone*, and started in one-gallon pots. Potting material will consist of equal portions of sandy soil from the revegetation area, and vermiculite and peat moss to encourage the growth of micorrhizal fungi. Micorrhizal fungi assist in the uptake of nutrients from the soil. Propagules will be watered daily and kept in a temporary greenhouse for 8-12 weeks before planting.
3. **Site Preparation:** The revegetation area will be cleared and leveled with a D-8 or D-7 Caterpillar dozer (or the equivalent). The clearing will be selective, saving any valuable trees already on the site.
4. **Intensive Soil Sampling:** Soil samples will be taken from 19 percent of all planting holes on 20 foot centers. Sample analysis allows mapping of the distribution of nutrients, salts, soil types, pH values, and depth to water table throughout the site. A planting design is formulated which places appropriate plants in areas where they can be expected to grow at or near their maximum rate. It is because of the need for this intensive sampling that a planting design cannot be produced until the site is nearly ready for planting.
5. **Tillage:** Holes at least 18 inches in diameter and 8 feet deep (or to the water table) will be augered where each propagule is to be planted. This vertical tillage allows for rapid root penetration to the water table.
6. **Irrigation System:** The irrigation system will consist of commercially available 1/2 inch black polyethylene drip tubing emanating from a 2 inch diameter black polyethylene main line. Each lateral drip tube will have a filter and ball shut-off valve at every 15-20 feet and 2 gallon pressure compensating emitters will be installed in the line. The irrigation system will be buried to prevent vandalism. Water will be pumped from the backwater or from a 6 inch line leading off the Mohave Road water main. Details of the irrigation system will be drawn after intensive soil sampling is complete.
7. **Planting:** Larger trees, such as cottonwood, will be planted on 20 foot centers. Smaller trees, such as willow and mesquite, will be planted on 15 foot centers, and patches of shrubs, such as sandbar willow and mulefat, will be planted on 10 foot centers. Fertilizer will be added as needed, in a manner that does not contribute to weed competition. Trees planted on 20 foot centers will yield 100 percent ground cover in 3-4 years. Planting at higher densities promotes intraspecific competition and is wasteful. Propagules will be approximately 15-20 inches tall at the time of planting, and will be planted at the rate of approximately 300 per day. *Tubex*, a protective tubing, will protect propagules from browsing, slow competitor growth, and increase water use efficiency.
8. **Irrigation and Weeding:** Approximately 8 gallons of water per day per tree will be delivered through two-gallon per hour pressure compensating emitters for 5 days a week for 18 weeks. Cottonwood and willow will not be planted where the permanently available water source (water table, perched water table, or wet soil) is greater than 8 feet deep. Weeding will be done as needed during the irrigation period.
9. **Monitoring and Reports:** Monitoring will begin when trees are planted and will continue until irrigation is halted. Trees that will be monitored are those that were planted in the sample holes from the intensive soil analysis. Sample size of the trees monitored will be at least 30 individuals of each species. Each tree will be measured from the base of the trunk to the top of the tallest upstretched leaf throughout the first season. Ground cover (crown diameter) and foliage volume can be calculated from this measurement. Growth is analyzed in the context of differences in the variables measured during the intensive soil sampling. Less frequent monitoring will be conducted during both the second and third seasons. Average growth during the first season is expected to be 1/2 inch per day. At the end of the third season, a cumulative mortality of less than 5 percent can be expected, and this will likely be compensated for by natural germination of cottonwood and willow. Substantive reports with quantified data will be provided at the end of each growing season.

While both black willow (*Salix nigra*) and sandbar willow (*Salix exigua*) will be planted, the sandbar willow will be especially important as a source of the willow branches used in basket weaving. It is becoming increasingly difficult to locate suitable stands of these willows, but branches from the revegetation site will be open for careful collection after the trees are established.

A Bureau of Indian Affairs woodlands Grant of \$10,000 was received last year in order for a small area to be revegetated with native species. A 2-acre site has been chosen as the most likely possibility for successful revegetation, and a cost estimate from Bertin Anderson (Table 3.2) indicates that this would be a financially feasible area as well. If this area is approved for revegetation, work could begin this summer on preparing the site for revegetation next spring.

3. IMPACTS:

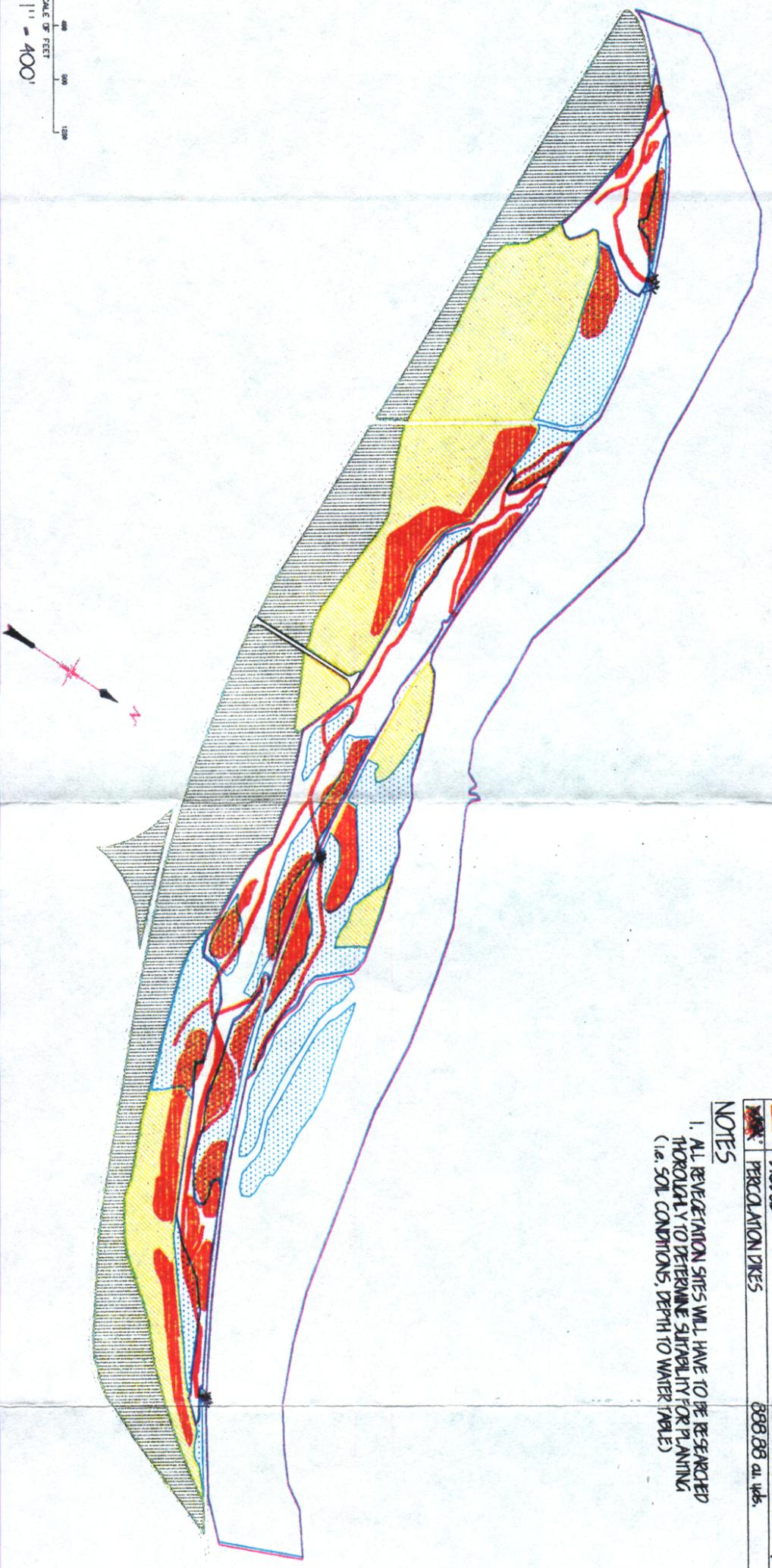
- a. **Vegetation:** Selective clearing of the revegetation site would prevent the removal of species deemed valuable to wildlife, while allowing low value species (primarily saltcedar and arrowweed) to be removed quickly and efficiently.
- b. **Wildlife:** Wildlife disturbance would be expected in the revegetation area, especially during bulldozing, installation of the irrigation system, and planting operations. Until the end of the monitoring period, wildlife disturbance would consist of additional maintenance on the site and human presence during monitoring activities. Ultimately, however, wildlife habitat would be dramatically improved by the planting of native species and removal of low wildlife habitat value species.
- c. **Water Usage:** Irrigation of the newly planted trees will increase water use on the site for the first summer season. However, after the trees are established, water usage can be expected to be similar to or slightly lower than current levels. This is because most native vegetation uses less water than the existing saltcedar.
- d. **Recreation and Education:** Native vegetation will provide habitat for many game species, and much-needed shaded areas for comfort during hiking and camping. This area will also provide an important visual aid for educational programs concerning native ecosystems, wetlands and wilderness preservation.

4. **COSTS:** Please refer to Table 3.3 for projected costs associated with the revegetation plan.

FIGURE 3.6 Potential Revegetation Plan -- 'Ahakhav Backwater:

'AHAKHAV
'AHAKHAV WILDERNESS PRESERVE
 POTENTIAL REVEGETATION PLAN

SCALE 1" = 400'



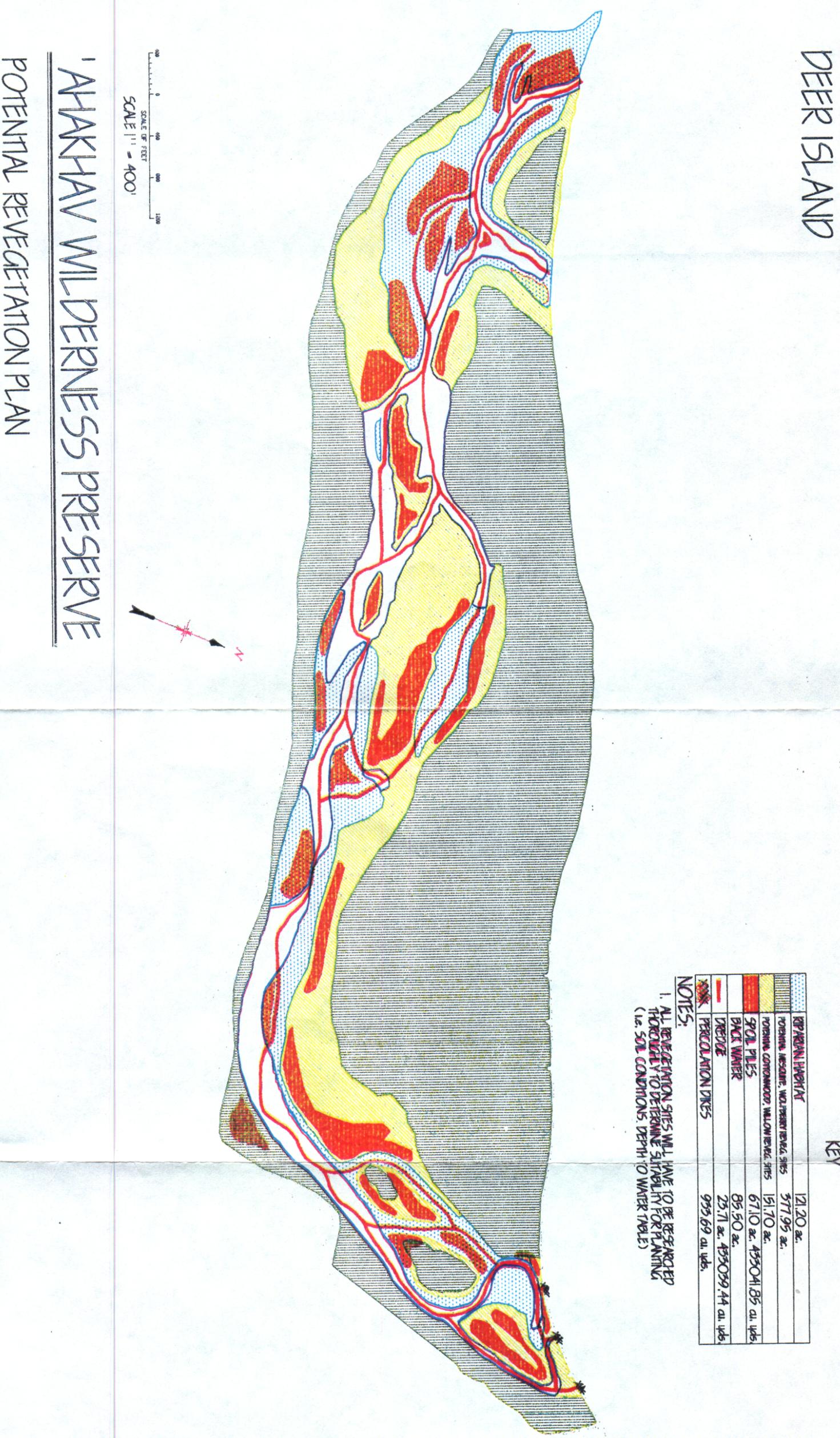
KEY

	RIPIARIAN HABITAT	74.94 ac.
	POTENTIAL WETLAND, WILLOW RIPARIAN SITES	102.67 ac.
	POTENTIAL WETLAND, WILLOW RIPARIAN SITES	78.95 ac.
	SOIL PILES	54.11 ac. 220176.07 cu yds.
	BACKWATER	47.51 ac.
	DREDGE	11.84 ac. 220200 cu yds.
	PERCOLATION DIKES	888.88 cu yds.

NOTES

1. ALL REVEGETATION SITES WILL HAVE TO BE RESEARCHED THOROUGHLY TO DETERMINE SALINITY FOR PLANTING (I.E. SOIL CONDITIONS, DEPTH TO WATER TABLE)

FIGURE 3.7 Potential Revegetation Plan -- Deer Island:



C. RAPTOR HUNTING PERCHES:

1. USE and PLACEMENT: In addition to providing natural habitat for wildlife, we are proposing that temporary measures be taken to provide hunting perches for raptors. These hunting perches are necessary in order for many species to utilize the site for feeding purposes. Perches were, at one time, provided by the large cottonwood, willow, and mesquite. Until the newly planted trees mature, artificial perches may be placed on the site to attract owls, hawks, and eagles. These perches will be utilized year-round by migrating, wintering, and nesting birds. 40 perches will be made from telephone poles at least 10 m tall, planted 1 m deep (Figure 3.8), and placed at a ratio of 2 per every hectare of the Wilderness Preserve. The artificial perches will be removed as the trees mature and provide natural perches.

2. IMPACTS: Impacts on the site and wildlife would be minor. Perches would be placed in areas with little or no vegetation, including spoil piles after dredging operations. Wildlife would be disturbed only during the placement of the perches, during any maintenance work thereafter, and during removal.

3. COSTS: Purchase and installation of the perches is estimated to cost approximately \$100 per perch, totalling \$4000.

FIGURE 3.8 *Raptor Perch Detail:*

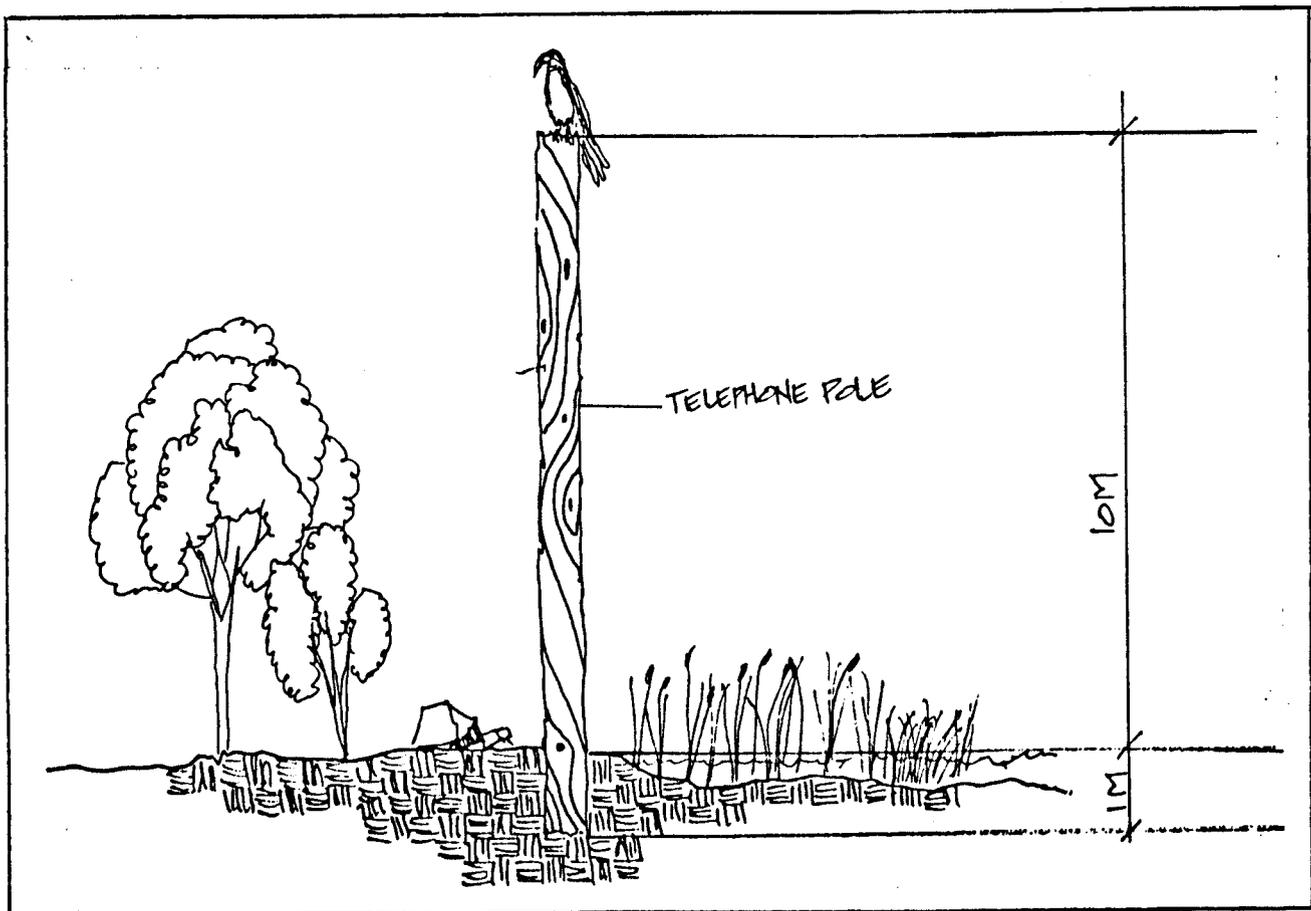


Table 3.2 2 Acre Revegetation Cost Estimate

Estimated Cost of 2 Acre Project

<u>Item</u>	<u>Cost</u>
<i>Preliminary Sampling of Site</i>	
14 points @40.....	\$ 560
Truck 1 Day @\$40.....	40
<u>Overhead</u>	<u>168</u>
Sub-Total	\$ 768
 <i>Revegetation</i>	
<i>Irr. System Installation 2Ac @\$225.....</i>	<i>\$ 450</i>
<i>Propagules 270 @ \$3.....</i>	<i>810</i>
<i>Intensive Soil Sampling 75 @ \$30.....</i>	<i>2250</i>
<i>Planting 270 @ \$1.....</i>	<i>270</i>
<i>Augering (tillage) 210 Holes @\$2.....</i>	<i>420</i>
<u><i>Monitering (28 Times@\$175).....</i></u>	<u><i>4900</i></u>
Sub-Total	\$ 8400
 <i>Overhead \$6550 x .3.....</i>	 <i>\$ 1965</i>
 <i>Truck 20 days @\$40.....</i>	 <i>\$ 800</i>
<i>Irrigation System.....</i>	<i>1317</i>
<u><i>Summary of Monitering Results.....</i></u>	<u><i>800</i></u>
Sub-Total	\$ 2917
 Grand Total Of Two Acre Revveg Proj. \$ 1450.00	

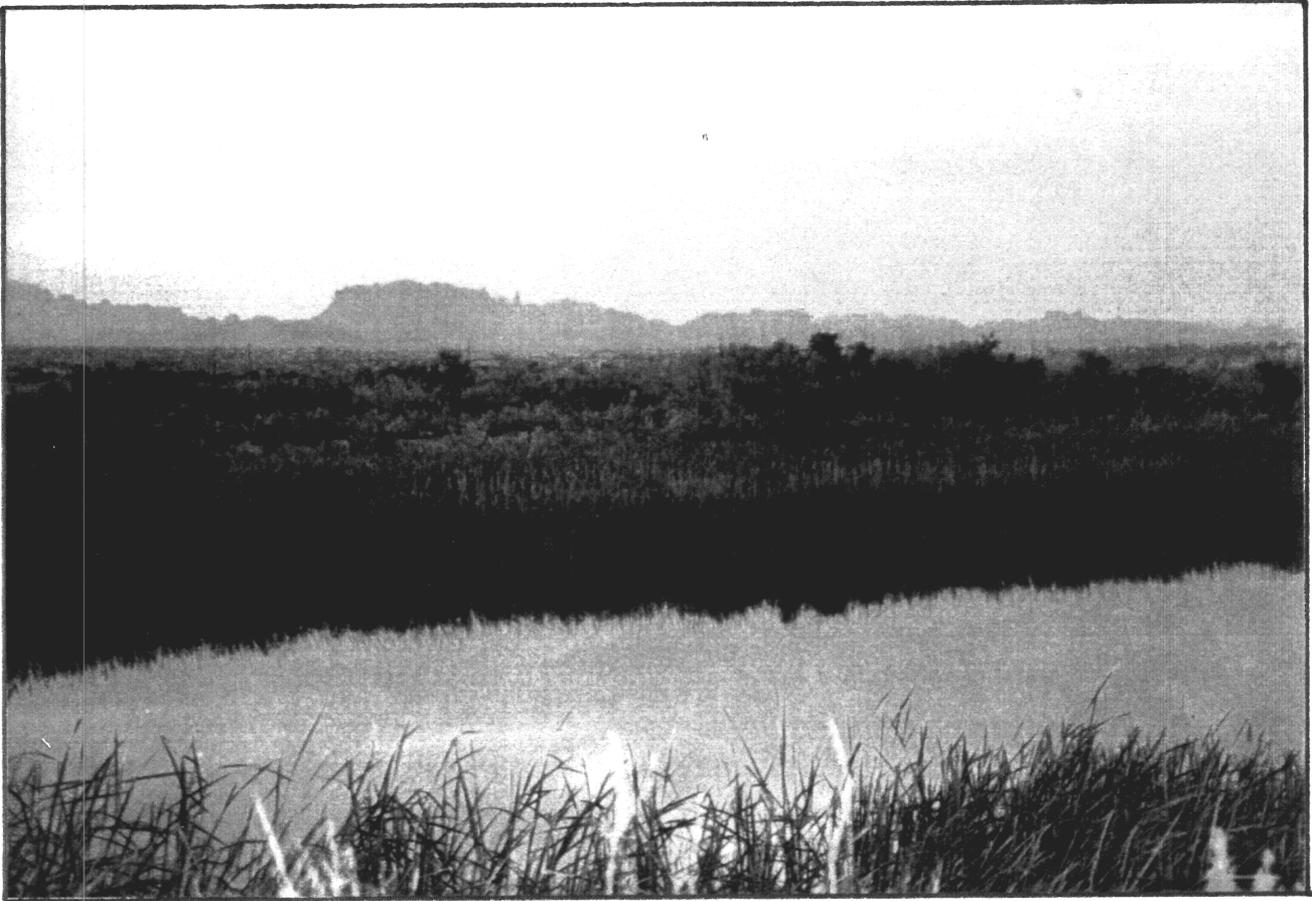
**TABLE 3.3: Proposed Revegetation Cost Estimate -- 'Ahakhav
Wilderness Preserve**

<i>TIME</i>	<i>LOCATION</i>	<i>ITEM</i>	<i>QUANTITY</i>	<i>UNIT</i>	<i>UNIT PRICE</i>	<i>TOTAL</i>
Year 1	'Ahakhav	Revegetation	30	Acre	\$7,000.00	\$ 210,000.00
	Deer Island	Revegetation	40	Acre	\$7,000.00	\$ 280,000.00
Year 2	'Ahakhav	Revegetation	30	Acre	\$7,000.00	\$ 210,000.00
	Deer Island	Revegetation	40	Acre	\$7,000.00	\$ 280,000.00
Year 3	'Ahakhav	Revegetation	30	Acre	\$7,000.00	\$ 210,000.00
	Deer Island	Revegetation	40	Acre	\$7,000.00	\$ 280,000.00
Year 4	'Ahakhav	Revegetation	30	Acre	\$7,000.00	\$ 210,000.00
	Deer Island	Revegetation	40	Acre	\$7,000.00	\$ 280,000.00
Year 5	'Ahakhav	Revegetation	30	Acre	\$7,000.00	\$ 210,000.00
	Deer Island	Revegetation	40	Acre	\$7,000.00	\$ 280,000.00
Year 6	Deer Island	Revegetation	70	Acre	\$7,000.00	\$ 490,000.00
Year 7	Deer Island	Revegetation	70	Acre	\$7,000.00	\$ 490,000.00
Year 8	Deer Island	Revegetation	70	Acre	\$7,000.00	\$ 490,000.00
Year 9	Deer Island	Revegetation	60	Acre	\$7,000.00	\$ 420,000.00
Year 10	Deer Island	Revegetation	60	Acre	\$7,000.00	\$ 420,000.00

**TOTAL REVEGETATION FOR BOTH
SITES IN TEN YEARS: \$ 4,760,000.00**

* All construction, irrigation, material, and labor costs are inclusive in estimate.

4.0 IMPLEMENTATION



A. CULTURAL RESOURCES:

Although much of the Colorado River Indian Reservation is rich in archaeological and historical sites, no such areas are expected to be found on the site. Years of flooding, erosion, and human disturbance have probably eliminated any cultural resources lying within the floodplain. At present there is an Archaeological Walk Through Evaluation being done by the C.R.I.T. Museum.

B. ECONOMICS:

1. **TOTAL INITIAL COSTS:** Please see Table 4.1 for costs associated with the establishment of 'Ahakhav Wilderness Preserve. More detailed costs for each aspect of the proposed plan are given in their respective sections, in Tables 3.1 and 3.2.

TABLE 4.1: Proposed Total Cost -- 'Ahakhav Wilderness Preserve

Item		
Phase Cost Breakdown		
<i>PROPOSED REVEGETATION COST:</i>		
Year 1	\$	490,000.00
Year 2	\$	490,000.00
Year 3	\$	490,000.00
Year 4	\$	490,000.00
Year 5	\$	490,000.00
Year 6	\$	490,000.00
Year 7	\$	490,000.00
Year 8	\$	490,000.00
Year 9	\$	420,000.00
Year 10	\$	420,000.00
TOTAL PROPOSED REVEGETATION COST	\$	4,760,000.00
<i>PROPOSED DREDGE COST:</i>		
Total Dredge Cost for 'Ahakhav	\$	572,519.97
Total Dredge Cost for Deer Island	\$	1,125,902.00
Total Boat Access and Equipment Storage		\$169,000.00
TOTAL PROPOSED DREDGE COST	\$	1,867,421.97
<i>PROPOSED RAPTOR PERCH COST:</i>		
40 Perches	\$	4,000.00
TOTAL PROPOSED RAPTOR PERCH COST	\$	4,000.00
TOTAL FOR REVEGETATION	\$	4,970,000.00
TOTAL FOR DREDGE	\$	1,867,421.97
TOTAL FOR RAPTOR PERCHES	\$	4,000.00
<i>PROPOSED 10 YEAR CONSTRUCTION COST -- 'AHAKHAV WILDERNESS PRESERVE</i>		
	\$	6,841,421.97

5.0 CONCLUSION



CONCLUSION

Historically The 'Ahakhav Wilderness Preserve supported wide variety of wildlife species. Through the channelization and sedimentation of the Colorado River, much of this habitat and has been lost. In turn, the wildlife that once thrived in this habitat has been seriously reduced.

Reversal of the sedimentation caused by the 1983 flooding requires a substantial amount of dredging and revegetation of riparian habitat. The revegetation of cottonwood, willow, and mesquite trees, along with the deepening and widening of historic channels, would provide suitable habitat for the wildlife species that exist along the Lower Colorado River.

APPENDIX A: Vertebrate Species Utilizing Backwater and Riparian Areas of the Lower Colorado River Valley.

FISH:

Bonytail chub (*Gila elegans*)
Colorado River squawfish (*Ptychocheilus lucius*)
Razorback sucker (*Xyrauchen texanus*)
Threadfin shad (*Dorosoma petenense*)
Carp (*Cyprinus carpio*)
Red shiner (*Notropis lutrensis*)
Flathead catfish (*Pilodictis olivaris*)
Yellow bullhead (*Ictalurus natalis*)
Mosquitofish (*Gambusia affinis*)
Sailfin molly (*Poecilia latipinna*)
Largemouth bass (*Micropterus salmoides*)
Striped bass (*Morone saxatilis*)
Warmouth (*Chaenobryttus gulosus*)
Green sunfish (*Chaenobryttus cyanellus*)
Bluegill (*Lepomis macrochirus*)
Redear sunfish (*Lepomis microlophus*)
Black crappie (*Pomoxis nigromaculatus*)
Zill's tilapia (*Tilapia zilli*)
Blue tilapia (*Tilapia aurea*)

AMPHIBIANS:

Tiger salamander (*Ambystoma tigrinum*)
Couch's spadefoot toad (*Scaphiopus couchii*)
Sonoran Desert toad (*Bufo alvarius*)
Great Plains toad (*Bufo cognatus*)
Red-spotted toad (*Bufo punctatus*)
Woodhouse's toad (*Bufo woodhousei*)
Bullfrog (*Rana catesbeiana*)
Lowland leopard frog (*Rana yavapaiensis*)
Rio Grande leopard frog (*Rana berlandieri*)

REPTILES:

Sonoran mud turtle (*Kinosternon sonoriense*)
Spiny softshell turtle (*Trionyx spiniferus*)
Western banded gecko (*Coleonyx variegatus*)
Desert iguana (*Dipsosaurus dorsalis*)
Zebra-tailed lizard (*Callisaurus draconoides*)
Mohave fringe-toed lizard (*Uma scoparia*)
Desert spiny lizard (*Sceloporus magister*)
Side-blotched lizard (*Uta stansburiana*)
Tree lizard (*Urosaurus ornatus*)
Western whiptail (*Cnemidophorus tigris*)
Western blind snake (*Leptotyphlops humilis*)
Spotted leaf-nosed snake (*Phyllorhynchus decurtatus*)
Coachwhip snake (*Masticophis flagellum*)

REPTILES (CONTINUED):

Western patch-nosed snake (*Salvadora hexalepis*)
Gopher snake (*Pituophis melanoleucus*)
Common kingsnake (*Lampropeltis getulus*)
Long-nosed snake (*Rhinocheilus lecontei*)
Checkered garter snake (*Thamnophis marcianus*)
Mexican garter snake (*Thamnophis eques*)
Groundsnake (*Sonora episcopa*)
Western diamondback rattlesnake (*Crotalus atrox*)
Sidewinder (*Crotalus mitchelli*)
Mohave rattlesnake (*Crotalus scutulatus*)

MAMMALS:

California leaf-nosed bat (*Macrotus californicus*)
Cave myotis (*Myotis velifer*)
Yuma myotis (*Myotis yumanensis*)
Western pipistrelle (*Pipistrellus hesperus*)
Big brown bat (*Eptesicus fuscus*)
Hoary bat (*Lasiurus cinereus*)
Raccoon (*Procyon lotor*)
Badger (*Taxidea taxus*)
Striped skunk (*Mephitis mephitis*)
Coyote (*Canis latrans*)
Gray fox (*Urocyon cinerargenteus*)
Bobcat (*Felis rufus*)
Round-tailed ground squirrel (*Spermophilus tereticaudus*)
Botta's pocket gopher (*Thomomys bottae*)
Little pocket mouse (*Perognathus longimembris*)
Desert pocket mouse (*Perognathus amplus*)
Desert kangaroo rat (*Dipodomys deserti*)
Merriam's kangaroo rat (*Dipodomys merriami*)
Beaver (*Castor canadensis*)
Western harvest mouse (*Reithrodontomys megalotis*)
Cactus mouse (*Peromyscus eremicus*)
Deer mouse (*Peromyscus maniculatus*)
Southern grasshopper mouse (*Onychomys torridus*)
White-throated woodrat (*Neotoma albigula*)
Arizona cotton rat (*Sigmodon arizonae*)
Hispid cotton rat (*Sigmodon hispidus*)
Muskrat (*Ondatra zibethicus*)
House mouse (*Mus musculus*)
Porcupine (*Erethion dorsatum*)
Black-tailed jackrabbit (*Lepus californicus*)
Desert cottontail (*Sylvilagus audubonii*)
Mule deer (*Odocoileus hemionus*)

APPENDIX B: Federal, State, and Tribally Listed Species Which May Occur On the Site.

	<i>LISTING</i>		
	<i>Federal</i>	<i>State</i>	<i>C.R.I.T.</i>
Lowland leopard frog (<i>Rana yavapaiensis</i>)		Candidate	
Mexican garter snake (<i>Thamnophis eques</i>)		Candidate	
Mohave fringe-toed lizard (<i>Uma scoparia</i>)		Candidate	
Bonytail chub (<i>Gila elegans</i>)			Endangered
Humpback chub (<i>Gila robusta</i>)			Endangered
Colorado River squawfish (<i>Ptychocheilus lucius</i>)			Endangered
Razorback sucker (<i>Xyrauchen texanus</i>)	Endangered	Endangered	Endangered
White-faced ibis (<i>Plegadis chihi</i>)	Candidate 2		
Long-billed curlew (<i>Numenius americanus</i>)	Candidate 2		
Yuma clapper rail (<i>Rallus longirostris yumanensis</i>)	Endangered	Threatened	Endangered
California black rail (<i>Laterallus jamaicensis</i>)	Candidate 2	Endangered	
Blackcrowned night heron (<i>Nycticorax nycticorax hoactle</i>)		Threatened	
Least bittern (<i>Ixobrychus exilis</i>)		Candidate	
Snowy egret (<i>Egretta thula brewsteri</i>)		Threatened	
Great egret (<i>Casmerodius albus egretta</i>)		Endangered	
American bittern (<i>Botaurus lentiginosus</i>)		Candidate	
Mountain plover (<i>Charadrius montanus</i>)	Candidate 2		
Brown pelican (<i>Pelecanus occidentalis</i>)	Endangered		
American peregrine falcon (<i>Falco peregrinus anatum</i>)	Endangered	Endangered	
Osprey (<i>Pandion haliaetus carolinensis</i>)		Threatened	
Zone-tailed hawk (<i>Buteo albonotatus</i>)		Threatened	
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Endangered	Endangered	

APPENDIX B, continued.

	LISTING		
	<i>Federal</i>	<i>State</i>	<i>C.R.I.T.</i>
Western yellow-billed cuckoo (<i>Coccyzus americanus</i>)	Candidate 3	Threatened	
Loggerhead shrike (<i>Lanius ludovicianus</i>)	Endangered		
Southwestern willow flycatcher (<i>Empidonax traillii extimus</i>)	Endangered		
California leaf-nosed bat (<i>Macrotus californicus</i>)	Candidate 2	Candidate	
Cave myotis (<i>Myotis velifer</i>)	Candidate 2		
Yuma myotis (<i>Myotis yumanensis</i>)	Candidate 2		
Yuma cotton rat (<i>Sigmodon arizonae</i>)	Candidate 2		

Definitions:

Endangered – species threatened with extinction.

Threatened – species threatened with endangerment if protective measures are not taken.

State Candidate – species being considered for listing as threatened or endangered.

Federal Candidate 2 – species being considered for listing as threatened or endangered

Federal Candidate 3 – more information needed before considered for listing.

**APPENDIX C: Agencies and Individuals Contacted for Information
Regarding This Proposal.**

<i>AGENCY</i>	<i>CONTACT</i>	<i>DATE</i>	<i>TOPICS OF DISCUSSION</i>	<i>INFORMATION RECEIVED</i>
Arizona Game & Fish Department	Nancy Olson	6/27/95	Wildlife, endangered species	State protected species information
California Department of Fish and Game	Gerald Mulcahy	6/95	Revegetation and habitat analysis	Revegetation and habitat information
C.R.I.T. Fish and Game Department	Ray Aspa	6/95-7/95	Site selection, wildlife	
C.R.I.T. Fish and Game Department	David Martinez	7/95	Tribal endangered species	Tribal endangered species list
C.R.I.T. Museum	Robert Milazzo	7/95	Archaeological information	
C.R.I.T. Water Resources Department	Grant Buma	6/95-7/95	Site selection, contacts, vegetation	Contact information
La Paz County Public Works	Marcus Fuller	6/95-7/95	Plotting AutoCAD maps	AutoCAD plots
Revegetation and Wildlife Management Center, Inc.	Bertin W. Anderson	7/95	Revegetation, wildlife	Species lists, revegetation plan
U.S. Army Corps of Engineers	Marjorie Blaine	6/27/95	Permitting procedure	Permit needed to proceed
U.S. Bureau of Reclamation	Jeff Sanderson	6/27/95	Maps	Maps, AutoCAD surveys
U.S. Bureau of Reclamation	Gary Ferrier	6/95-7/95	Revegetation, grants, environmental assessments	assessments, grant information
U.S. Bureau of Reclamation	Bill Weisenborn	6/95	Information requested	Draft, vegetation study
U.S. Bureau of Indian Affairs	Shelley Ward	6/95-7/95	Site selection, maps	Wildlife species list, maps
U.S. Bureau of Indian Affairs	Rhonda Flores	6/95-7/95	Plotting AutoCAD maps	AutoCAD plots

APPENDIX C, continued.

<i>AGENCY</i>	<i>CONTACT</i>	<i>DATE</i>	<i>TOPICS OF DISCUSSION</i>	<i>INFORMATION RECEIVED</i>
U. S. Fish and Wildlife Service	Don Henry	6/29/95	Information requested	
U.S. Fish and Wildlife Service	Chuck Minckley	6/29/95	Wetland grants, razorback sucker	Razorback sucker and grant information
N/A	Sue Clark	6/95	Native vegetation, wildlife	

APPENDIX D: References.

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