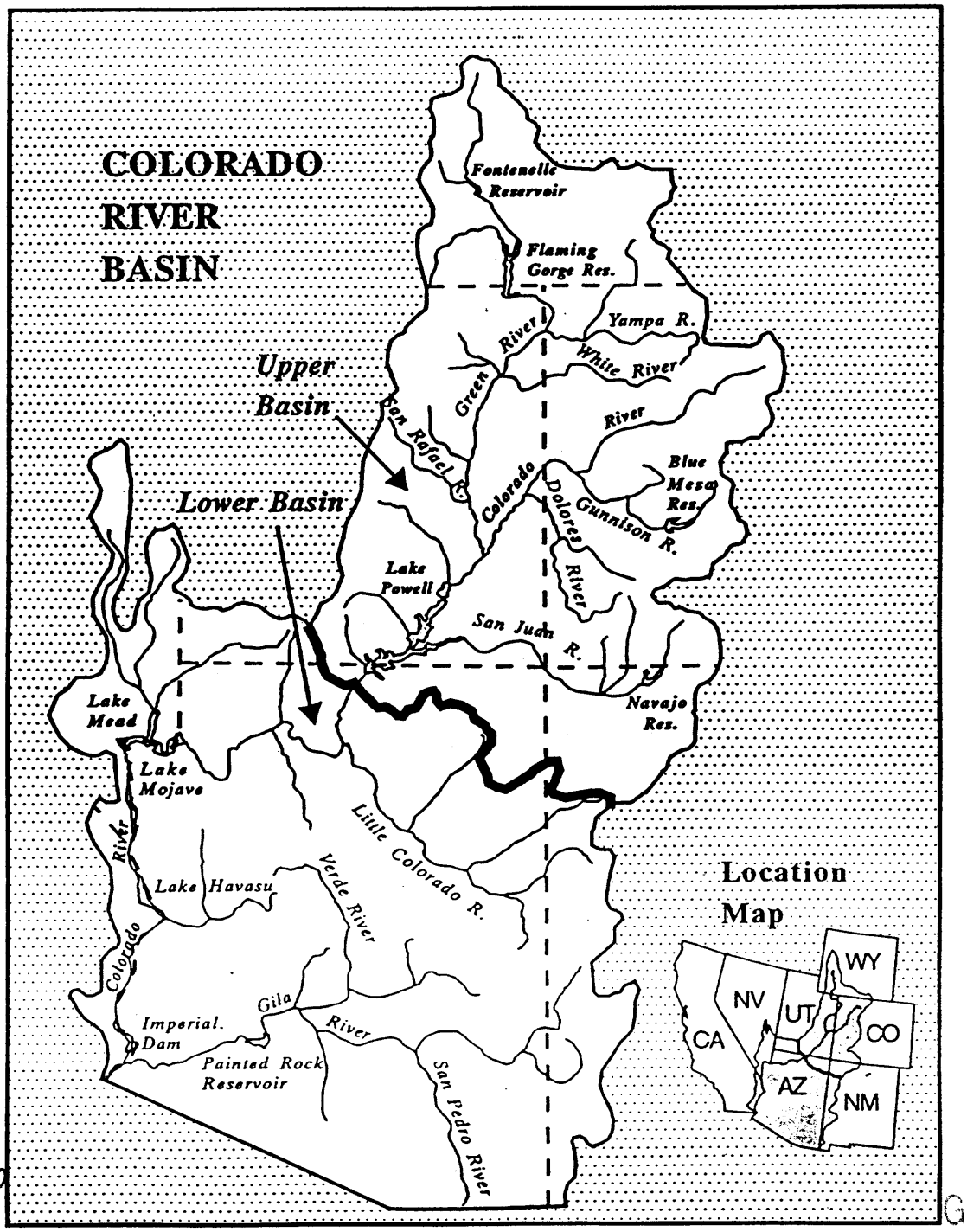
28th ANNUAL REPORT
AND
1999 ANNUAL OPERATING PLAN

FOR

COLORADO RIVER SYSTEM RESERVOIRS



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INTRODUCTION

Authority

This 1999 annual operating plan (AOP) was developed in accordance with Section 602 of *The Colorado River Basin Project Act* (Public Law 90-537), and the *Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs Pursuant to the Colorado River Basin Project Act of September 30, 1968* (Operating Criteria), promulgated by the Secretary of the Interior pursuant thereto and other applicable statutes. In accordance with *The Colorado River Basin Project Act* and the Operating Criteria, the AOP must be developed and administered consistent with applicable Federal laws, *The Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Treaty Between the United States of America and Mexico*, signed February 3, 1944 (1944 Mexican Water Treaty), interstate compacts, court decrees, and other documents relating to the use of the waters of the Colorado River, which are commonly and collectively known as "The Law of the River."

The Operating Criteria and Section 602 of *The Colorado River Basin Project Act* mandates consultation with representatives of the Governors of the seven Basin States and such other parties as the Secretary may deem appropriate in preparing the annual plan for operation of the Colorado River reservoirs. In addition, *The Grand Canyon Protection Act of 1992* (Title XVIII of Public Law 102-575) requires consultation to include the general public and others. Accordingly, the 1999 AOP was prepared by the Bureau of Reclamation (Reclamation) in consultation with the seven Basin States Governors' representatives; the Upper Colorado River Commission; appropriate Federal agencies; representatives of the academic and scientific communities, environmental organizations, and the recreation industry; water delivery contractors; contractors for the purchase of Federal power; others interested in Colorado River operations; and the general public; through the Colorado River Management Work Group.

Purpose

The purposes of the AOP are to determine: (1) the projected operation of the Colorado River reservoirs to satisfy project purposes under varying hydrologic and climatic conditions; (2) the quantity of water considered necessary as of September 30, 1999, to be in storage in the Upper Basin reservoirs as required by Section 602(a) of *The Colorado River Basin Project Act*; (3) water available for delivery pursuant to the 1944 Mexican Water Treaty and Minute No. 242 of the International Boundary and Water Commission, United States and Mexico (IBWC); (4) whether the reasonable consumptive use requirements of mainstream users in the Lower Division States will be met under a "normal," "surplus," or "shortage" condition as outlined in Article III of the Operating Criteria; and (5) whether water apportioned to, but unused by one or more Lower Division States exists and can be used to satisfy beneficial consumptive use requests of mainstream users in other Lower Division States as provided in the 1964 U.S. Supreme Court decree in *Arizona v. California*.

Consistent with the above determinations and in accordance with other provisions of "The Law of the River," the AOP was developed with "appropriate consideration of the uses of the reservoirs for all purposes, including flood control, river regulation, beneficial consumptive uses, power production, water quality control, recreation, enhancement of fish and wildlife, and other environmental factors" (Operating Criteria, Article I(2)).

Since the hydrologic conditions of the Colorado River Basin can never be completely known in advance, the AOP addresses the operations resulting from three different hydrologic scenarios: the probable maximum, most probable, and probable minimum reservoir inflow conditions. River operations under the plan are modified during the year as runoff predictions are adjusted to reflect existing snowpack, basin storage, and flow conditions.

Summary

Upper Basin Delivery. Storage equalization and the avoidance of spills will control the annual releases from Glen Canyon Dam in accordance with Article II(3) of the Operating Criteria unless the minimum objective release criterion in Article II(2) is controlling. Downstream Lower Basin deliveries and/or flood control parameters are expected to control the releases from Hoover Dam.

Lower Basin Uses. Taking into account (1) the existing water storage conditions in the basin, (2) the most probable near-term water supply conditions in the basin, and (3) that the beneficial consumptive use requirements of Colorado River mainstream users in the Lower Division States are expected to be more than 9,250 MCM (7.5 MAF), the surplus condition is the criterion governing the operation of Lake Mead for calendar year 1999 in accordance with Article III(3)(b) of the Operating Criteria and Article II(B)(2) of the decree in *Arizona v. California.*

Any Lower Division State will be allowed to utilize water apportioned to, but unused by, another Lower Division State, in accordance with Article II(B)(6) of the decree in *Arizona v. California.*

1944 Mexican Water Treaty Delivery. A volume of 2,097 MCM (1.7 MAF) of water will be allowed to be scheduled for delivery to Mexico during calendar year 1999 in accordance with Article 15 of the 1944 Mexican Water Treaty and Minute No. 242 of the International Boundary and Water Commission.

1998 OPERATIONS SUMMARY AND RESERVOIR STATUS

Water year 1998 observed near normal hydrologic conditions in the basin with near normal precipitation translating into average snowpack. At the beginning of the runoff season the basin wide snowpack was near normal. Great media and public attention focused on the strong El Niño Southern Oscillation (ENSO) anomaly present in the equatorial region of the Pacific Ocean and the potential effect this might have on the Colorado River Basin. Reservoir drawdowns in the winter of 1997-98 were slightly greater than normal in a conservative attempt to prepare for potential high spring runoff. However, water year 1998 did not have the spring precipitation, cold temperatures, and extreme runoff that characterized water year 1983 (another strong ENSO year) and the spring runoff did not cause significant operational problems.

Unregulated inflow into Lake Powell was 16,850 MCM (13.660 MAF) in water year 1998, approximately 116 percent of average. Releases in response to this inflow resulted in a drop of approximately 491 MCM (0.398 MAF) of storage in Lake Powell. Approximately 418 MCM (0.339 MAF) of storage was lost in upstream reservoirs, approximately 1,723 MCM (1.397 MAF) was gained in Lower Basin reservoirs, and the total Colorado storage system gained approximately 814 MCM (0.660 MAF) during water year 1998. It is estimated that with average inflow during 1999, the system will remain relatively full. During 1998, all deliveries of water to meet obligations pursuant to "The Law of the River" were maintained.

Tables 1(a) and 1(b) list the October 1, 1998 reservoir vacant space, live storage, water elevation, percent of capacity, change in storage, and change in water elevation during water year 1998.

Table 1(a). Reservoir Conditions on October 1, 1998 (Metric Units)

Reservoir	Vacant Space (MCM)	Live Storage (MCM)	Water Elevation (meters)	Percent of Capacity (percent)	Change in Storage* (MCM)	Change in Elevation* (meters)
Fontenelle	43	382	1982	90	-25	-0.81
Flaming Gorge	208	4,416	1840	95	-23	-0.14
Blue Mesa	254	770	2285	75	-169	-5.00
Navajo	390	1,702	1848	81	-201	-3.63
Lake Powell	2,367	27,634	1124	92	-491	-0.80
Lake Mead	2,777	30,993	370	92	+1674	2.73
Lake Mohave	100	2,133	196	96	+68	0.61
Lake Havasu	67	697	136	91	-19	-0.23
Totals	7,391	67,540	--	92	+814	--

Table 1(b). Reservoir Conditions on October 1, 1998 (English Units)

Reservoir	Vacant Space (MAF)	Live Storage (MAF)	Water Elevation (feet)	Percent of Capacity (percent)	Change in Storage* (MAF)	Change in Elevation* (feet)
Fontenelle	.035	.310	6501	90	-0.020	-2.66
Flaming Gorge	.169	3.580	6036	95	-0.019	-0.46
Blue Mesa	.206	.624	7495	75	-0.137	-16.39
Navajo	.316	1.380	6063	81	-0.163	-11.90
Lake Powell	1.919	22.403	3688	92	-0.398	-2.61
Lake Mead	2.251	25.126	1215	92	+1.357	8.97
Lake Mohave	.081	1.729	644	96	+0.055	+2.01
Lake Havasu	0.054	.565	447	91	-0.015	-0.77
Totals	5.992	54.756	--	92	+0.660	--

* from October 1, 1997 to September 30, 1998

1999 WATER SUPPLY ASSUMPTIONS

For 1999 operations, three reservoir unregulated inflow scenarios were developed and analyzed and are labeled as probable maximum, most probable, and probable minimum. The attached graphs show these inflow scenarios and associated release patterns and end of month contents for each reservoir.

Although there is considerable uncertainty associated with streamflow forecasts and reservoir operating plans made a year in advance, these projections are valuable in analyzing possible impacts on project uses and purposes. The most probable inflow in water year 1999 is projected to be near normal. Therefore, the magnitude of inflows in each of the three inflow scenarios are near the historical upper decile, mean, and lower decile (10 percent exceedance, 50 percent exceedance, and 90 percent exceedance, respectively) for each reservoir for water year 1999. The three inflow scenarios for Lake Powell are shown in Tables 2(a) and 2(b).

The volume of inflow resulting from these assumptions was used as input into Reclamation's monthly reservoir simulation model. This model is used to plan reservoir operations for the upcoming 24-month period. Projected water year 1999 inflow and October 1, 1998 reservoir storage conditions were used as input to this model and monthly releases were adjusted until release and storage levels accomplished project purposes.

Table 2(a). Projected Unregulated Inflow
Into Lake Powell for Water Year 1999
(Metric Units: MCM)

Time Period		Probable Maximum	Most Probable	Probable Minimum
10/98 -	12/98	2,552	1,752	1,511
1/99 -	3/99	2,588	1,697	1,481
4/99 -	7/99	15,803	9,541	4,199
8/99 -	9/99	1,394	1,342	797
10/99 -	12/99	1,850	1,850	1,850
WY	1999	22,337	14,332	7,988
CY	1999	21,635	14,430	8,327

Table 2(b). Projected Unregulated Inflow
Into Lake Powell for Water Year 1999
(English Units: MAF)

Time Period		Probable Maximum	Most Probable	Probable Minimum
10/98 -	12/98	2.069	1.420	1.225
1/99 -	3/99	2.098	1.376	1.201
4/99 -	7/99	12.812	7.735	3.404
8/99 -	9/99	1.130	1.088	0.646
10/99 -	12/99	1.500	1.500	1.500
WY	1999	18.109	11.619	6.476
CY	1999	17.540	11.699	6.751

1999 RESERVOIR OPERATIONS

Minimum instream flow levels and annual operating strategies have been established at several locations in the Upper Basin which are intended to protect the aquatic resources downstream of specific dams. The regulation of the Colorado River has had both positive and negative effects on aquatic resources. Controlled cool water releases from dams have provided for increased productivity of some aquatic resources and the development of significant introduced sport fisheries. However, the same releases may be detrimental to endangered and other native species of fishes.

Consultations with the Fish and Wildlife Service in compliance with Section 7 of the Endangered Species Act (Section 7 consultations) on the operation of the Aspinall Unit on the Gunnison River, Navajo Dam on the San Juan River, and Flaming Gorge on the Green River will continue in 1999. Studies associated with these consultations will be used to better understand the flow related needs of endangered and other native species of fish.

Modifications to planned operations may be made based on changes in forecast conditions. However, due to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin, Section 7 consultations, and other downstream concerns, modification to the monthly operation plans may be based on other factors in addition to changes in streamflow forecasts. Decisions on spring peak releases and downstream habitat target flows may be made midway through the runoff season. Reclamation and the Fish and Wildlife Service will initiate meetings with interested parties, including representatives of the Basin States, to facilitate the decisions necessary to finalize site specific operations plans. All operations will be undertaken subject to the primary water storage and delivery requirements established by "The Law of the River" and other applicable statutes, including water quality control, recreation, enhancement of fish and wildlife, and other environmental factors.

Reclamation completed Section 7 consultation with the Fish and Wildlife Service in April 1997 on current and projected discretionary routine lower Colorado River operations and maintenance activities for a period of up to 5 years. Reclamation and the Fish and Wildlife Service have also formed a partnership with other Federal, State and private agencies to develop the Lower Colorado River Multi-Species Conservation Program. This program permits both non-Federal and Federal parties to participate under Sections 7 and 10 of the Endangered Species Act.

The following paragraphs discuss the operation of each of the reservoirs with respect to compact, decree and statutory water delivery obligations, and instream flow needs for maintaining or improving aquatic resources, where appropriate.

Fontenelle Reservoir

April through July runoff into Fontenelle during water year 1998 was 1205 MCM (0.977 MAF) or 115 percent of normal. Inflow peaked at 220 cubic meters per second (8,783 cfs) on June 17.

Releases above 113 cubic meters per second (4,000 cfs) were made during much of June. No flooding occurred in the city of Green River, Wyoming, located 60 river miles below the dam. The flood stage is exceeded when flows at Green River exceed 354 cubic meters per second (12,500 cfs). Fontenelle Reservoir essentially filled in July of 1998 when the elevation of the reservoir came within 0.12 meters (0.4 feet) of reaching the crest of the spillway.

Because the mean annual inflow of 1,516 MCM (1.229 MAF) far exceeds Fontenelle's storage capacity of 426 MCM (.345 MAF), significant power plant bypasses are expected under the most probable and maximum probable inflow scenarios. Additionally, there is little chance that the reservoir will not fill during water year 1999. In order to minimize spring high releases, and to maximize downstream resources and power production, the reservoir will probably be drawn down to minimum pool elevation, 1970.0 meters (6463 feet) which corresponds to a volume of 115 MCM (0.093 MAF) of live storage.

Flaming Gorge Reservoir

Unregulated April through July inflow into Flaming Gorge in water year 1998 was 1,800 MCM (1.459 MAF) or 122 percent of normal. Summer inflow was unusually high with July and August inflows being 163 and 144 percent of average respectively. Flaming Gorge Reservoir reached a peak elevation of 6037.9 feet on August 12. The last time the reservoir reached this level was in 1984.

During the operation of the powerplant in 1997, a failure occurred in one of the bypass tubes, causing flooding of the powerplant and a shutdown of the generators. While electrical damage to the generators was quickly repaired, the steel liner and surrounding concrete of the outlet tube suffered significant damage. Repairs were not completed until June 1998, and the spring operation of Flaming Gorge had only the powerplant and the spillway available for use. Since spillway release temperatures in the months following June would have been much higher than powerplant release temperatures, potential emergency actions were closely coordinated with natural resource management interests to minimize adverse ecological impacts should the powerplant generators cease to function. Fortunately, no spillway releases were required during water year 1998.

In 1998, Flaming Gorge was operated in accordance with the Biological Opinion on the Operation of Flaming Gorge (BOFG), issued in November 1992. The BOFG outlines the reservoir operations which may provide an improved habitat for endangered endemic species of fish. Accordingly, a 3-week release of the maximum powerplant capacity of 130 cubic meters per second (4,600 cfs) was made during late-May through mid-June. This was expected to be followed by gradually decreasing releases until mid-summer flows of 34 cubic meters per second (1,200 cfs) were reached. However, the unexpected high flows in July and August required the release of 82 cubic meters per second (2,900 cfs) through early August and 68 cubic meters per second (2,400 cfs) for the remainder of the water year.

In water year 1999, Flaming Gorge will again be operated in accordance with the BOFG. A revised biological opinion on the operation of Flaming Gorge Dam is due out in December 1998. This revised opinion will likely describe specific constraints during the spring and winter seasons, but may also refine the constraints for the entire year.

Blue Mesa, Morrow Point, and Crystal Reservoirs (Aspinall Unit)

In water year 1998 the April through July unregulated runoff into Blue Mesa Reservoir was 697 MCM (0.565 MAF) or 81 percent of average. Water year 1998 unregulated inflow was 1,105 MCM (0.895 MAF) or 92 percent of average. Water year 1998 power plant bypasses were approximately 133 MCM (0.108 MAF) at Crystal, the result of annual system maintenance and spring runoff exceeding powerplant capacity. Releases and spills up to 113 cms (4,000 cfs) occurred at Crystal with flows in the river below the tunnel in excess of 85 cms (3,000 cfs). Blue Mesa filled easily during water year 1998.

Section 7 consultation with the Fish and Wildlife Service on the operation of the Aspinall Unit continued in 1998. As part of this consultation, a five-year effort to study the effect of various release patterns on habitat, reproductive success, and reintroduction of endangered fish in the Gunnison River is underway.

Additionally, the Aspinall Unit was operated as if the draft contract between Reclamation, the National Park Service, and the State of Colorado to deliver water from the Aspinall Unit to the Black Canyon of the Gunnison National Monument were in place. The operation was also coordinated with the Fish and Wildlife Service and others interested in the operation of the Aspinall Unit.

For water year 1999 operations, Blue Mesa Reservoir will be drawn down to at least an elevation of 2,283 meters (7490 feet) by December 31, 1998, in order to minimize icing problems in the Gunnison River. Blue Mesa will continue to be drawn down through April 1999 to a level that will accommodate the current most probable inflow scenario and accomplish the release objectives with minimal power plant bypasses at Crystal.

The minimum release objective of the Aspinall Unit is to meet the delivery requirements of the Uncompahgre Valley Project and to keep a minimum of 8.5 cms (300 cfs) flowing through the Black Canyon of the Gunnison National Monument and to maintain a minimum of 8.5 cms (300 cfs) below the diversion structure at Redlands (at the confluence of the Gunnison and Colorado Rivers) during the summer months. Under all three inflow scenarios, Blue Mesa is expected to fill in the summer of 1999 and flows through the Black Canyon of the Gunnison National Monument are expected to be above the minimum release objective during the summer months. Filling of the reservoir in water year 1999 will ensure that reasonable specific releases required to study the protection and improvement of habitat for endangered fish can be accommodated. The forecasted runoff for the spring of 1999 will be closely monitored to achieve these objectives. To protect both the blue ribbon trout fishery in the Black Canyon and recreation

potential, releases during 1999 will be planned to minimize large fluctuations in the daily and monthly flows in the Gunnison River below the Uncompahgre Tunnel Diversion.

Navajo Reservoir

The April through July unregulated inflow into Navajo Reservoir in water year 1998 was 639 MCM (0.518 MAF) or 76 percent of average. Water year 1998 regulated inflow was 1,046 MCM (0.848 MAF) or 85 percent of average. Navajo Reservoir did not fill in 1998.

Section 7 consultation with the Fish and Wildlife Service on the operation of Navajo Dam continued in 1998. Water year 1997 was the seventh year of a seven-year study to evaluate alternative operations of Navajo Reservoir to benefit endangered fish, and a biological opinion on the operation of Navajo Dam is expected in 1999. During the spring large releases of up to 142 cms (5,000 cfs) were made during May and June to coincide with the peak flows of the Animas River. This resulted in peak flows of 223 cms (7,885 cfs) at Bluff, Utah. After the completion of the large spring releases, releases were gradually reduced to approximately 17 cms (600 cfs) for the remainder of the year.

In water year 1999, Navajo Reservoir is expected to nearly fill under the probable maximum inflow scenario. The reservoir should fill above 80 percent of full under the most probable and probable minimum scenarios. Releases from the reservoir will be held near 17 cms (600 cfs) through the fall and winter months and large releases will likely be made in May and June in order to improve the habitat and provide better spawning conditions for endangered fish in the San Juan River.

Lake Powell

The April through July unregulated inflow into Lake Powell in water year 1998 was 10,639 MCM (8.625 MAF) or 112 percent of average. Water year 1998 unregulated inflow was 16,850 MCM (13.660 MAF) or 116 percent of average. Lake Powell ended the water year 12 feet from full.

During water year 1999, releases greater than the minimum release objective of 10,152 MCM (8.230 MAF) likely will be made to avoid anticipated spills and/or to equalize the storage between Lakes Powell and Mead. Under the most probable inflow conditions, releases of 13,322 MCM (10.800 MAF) would be made, while under the maximum probable inflow scenario, approximately 21,340 MCM (17.300 MAF) will be released. This maximum probable inflow would require releases of about 708 cms (25,000 cfs) for a lengthy period of time. With current full reservoir system conditions, releases above powerplant capacity are possible in 1999. Such releases would be made consistent with the 1956 Colorado River Storage Project Act, the 1968 Colorado River Basin Project Act, the 1992 Grand Canyon Protection Act, and the Secretary of the Interior's agreement for managing spills from Glen Canyon Dam contained in the 1996, 1997, and 1998 AOP's. This agreement provides for the use of reservoir releases in excess of power plant capacity required for dam safety purposes during high reservoir conditions to

accomplish the objectives of the Beach/Habitat Building Flow described in the Record of Decision for the Glen Canyon Dam Final EIS (GCDFEIS).

Releases from Lake Powell in water year 1999 will continue to reflect consideration of the uses and purposes identified in the 1970 Operating Criteria and the 1992 Grand Canyon Protection Act, including ecological impacts to the Grand Canyon. Daily and hourly releases will continue to be made according to the parameters of the Record of Decision for the GCDFEIS preferred alternative, and published in the Glen Canyon Dam Operating Criteria (62 Fed. Reg. 9447, Mar. 3,1997), as shown in the following table:

Table 3. Glen Canyon Dam release restrictions

Parameter	(cms)	(cfs)	conditions
Maximum flow [1]	708.0	25,000	
Minimum flow	141.6	5,000	nighttime
	226.6	8,000	7:00 am to 7:00 pm
Ramp rates			
ascending	113.3	4,000	per hour
descending	42.5	1,500	per hour
Daily fluctuations [2]	141.6 / 226.6	5,000 / 8,000	

[1] to be evaluated and potentially increased as necessary and in years when delivery to the Lower Basin exceeds 10,152 MCM (8.23 MAF)

[2] Daily fluctuations limit is 141.6 cms (5,000 cfs) for months with release volumes less than 740 MCM (.600 MAF); 169.9 cms (6,000 cfs) for monthly release volumes of 740 to 987 MCM (.600 to .800 MAF); and 226.6 cms (8,000 cfs) for monthly volumes over 990 MCM (.800 MAF)

Lake Mead

For calendar year 1998 the surplus condition was the criterion governing the operation of Lake Mead in accordance with Article III(3)(b) of the Operating Criteria and Article II(B)(2) of the decree in *Arizona v. California*. On February 28, 1998, Reclamation informed the International Boundary and Water Commission (IBWC) that there existed for calendar year 1998 surplus waters of the Colorado River within the provisions of Article 10(b) of the 1944 Mexican Water Treaty. On March 27, 1998, the IBWC sent Reclamation a revised delivery schedule for Mexico with total deliveries of 2,096 MCM (1.7 MAF).

Lake Mead began water year 1998 at elevation 368 meters (1205.81 feet), with 29,319 MCM (23.769 MAF) in storage, 94% of the conservation capacity of 31,919 MCM (25.877 MAF). During the year, Lake Mead reached its maximum elevation of 370 meters (1214.64 feet) at the end of December, with 30,967 MCM (25.105 MAF) in storage, 97% of capacity. Lake Mead reached its minimum elevation of 369 meters (1209.98 feet) at the end of June.

Flood control releases were required for January, February, and March of 1998. With the reservoirs being near full, the potential threat of El Niño, and showing required flood control releases in 1999, releases were made from Hoover Dam starting on December 26, 1997, and ending the second week of April 1998. Releases averaged about 20,000 cfs. In total, 2,122 MCM (1.72 MAF) was released above downstream requirements during these months. The total release from Lake Mead through Hoover Dam during water year 1998 was 14,760 MCM (11.966 MAF) with an additional 283 MCM (0.229 MAF) being diverted from Lake Mead by the Robert Griffith Water Project.

Under the most probable inflow conditions during water year 1999, Lake Mead is expected to rise to elevation 371 meters (1216.6 feet) by the end of December, 1998, with 31,341 MCM (25.408 MAF) in storage, 98% of conservation capacity. Lake Mead will drop to 367 meters (1204.43 feet) by the end of June, 1999, with 29,066 MCM (23.564 MAF) in storage, 91% of conservation capacity.

Flood control releases are projected under the most probable scenario in January, February, and March 1999 at the 19,000 cfs level. Hoover Dam is expected to release 14,186 MCM (11.501 MAF) during water year 1999. Downstream demands are expected to be about 12,504 MCM (10.137 MAF) for water year 1999.

No flood control releases are anticipated in 1999 under the minimum probable scenario. Under the maximum probable, flood control releases are required January through June, 1999, all above the 19,000 cfs level. Space building is required from August through December, 1999 under the maximum probable scenario.

Drawdown during the peak largemouth bass spawning period in April and May is planned to be near the limits of decline recommended in the July 1982 final report of a five-year study by the Arizona Game and Fish Department and the Nevada Department of Wildlife.

As Lake Mead remains near capacity and flood control releases are required by the Hoover Dam Flood Control Regulations, consideration will be given to making these releases over the fall and winter months to avoid high flow releases during the January through July runoff season. This distribution of water reduces the chance of bypassing hydroelectric powerplants below Hoover Dam and avoids the adverse impacts of higher flood control releases on fish and wildlife, recreation, water quality, and river stabilization.

Lakes Mohave and Havasu

At the beginning of water year 1998, Lake Mohave was at elevation 196 meters (642.10 feet) with an active storage of 2,065 MCM (1.674 MAF). The water level of Lake Mohave was regulated as needed between elevation 194 meters (635 feet) and 197 meters (645 feet) throughout the water year ending at elevation 196 meters (644 feet) with 2,133 MCM (1.729 MAF) in storage. Lake Mohave released 14,274 MCM (11.572 MAF) of water for downstream water use requirements, flood control, and space building.

Lake Havasu started water year 1998 at elevation 136.6 meters (447.99 feet) with 715 MCM (0.580 MAF) in storage. During the year, 11,230 MCM (9.104 MAF) were released from Parker Dam. In addition to these releases, 1,663 MCM (1.348 MAF) was diverted from Lake Havasu by CAP and 1,330 MCM (1.078 MAF) by MWD.

Mohave and Havasu Reservoirs are scheduled to be drawn down in the late summer and winter months to provide storage space for local storm runoff and will be filled in the spring to meet higher summer water needs. This drawdown will also correspond with maintenance at both Davis and Parker Powerplants which is scheduled for September through February. The normal filling pattern of these two reservoirs coincides well with the fishery spawning period. Since lake elevations will be typical of previous years, normal conditions are expected for boating and other recreational uses.

Reclamation is the lead agency in the Native Fish Work Group, a multi-agency group of scientists attempting to augment the aging stock of the endangered razorback sucker in Lake Mohave. Larval suckers are captured by hand in and around spawning areas in late winter and early spring for rearing at Willow Beach Fish Hatchery below Hoover Dam. The following year, one year old suckers are placed into predator-free, lake-side backwaters for rearing through the spring and summer. When the lake is normally drawn down during the fall, these fish are harvested from these rearing areas and then released to the lake. The suckers grow very quickly, usually exceeding ten inches in length by September.

Senator Wash and Laguna Reservoirs

Operations at Senator Wash Reservoir allow regulation of water deliveries to United States water users and Mexico downstream at Imperial Dam. The reservoir is operated to meet water user demands when necessary and to prevent Colorado River flows from exceeding Mexican Treaty requirements at Morelos Dam. This includes excess flows in the river caused by water user

cutbacks and sidewash inflows. Operational objectives at and below Imperial Dam are to meet water user demands, to conserve water, to control sediment, and to maintain the river channel.

Releases from Imperial Dam are regulated by Laguna Reservoir to conserve water, to meet all or part of Mexico's water demands, and to maintain river flows downstream near Yuma. Laguna releases combined with agricultural seepage and drainage provide a continuous live stream serving recreational and fish and wildlife purposes. Larger releases from Laguna Dam are generally due to excess water from rain, flooding upstream, or from rejected water orders due to rain. These higher releases serve to maintain the river channel capacity. This occasional practice reduces channel maintenance expense without impairment of water conservation or power production.

Yuma Desalting Plant

The Yuma Desalting Plant was not operated in 1998, and will not be operated in 1999 as funding is currently not available for full-scale operation. Most of the damage to the Main Outlet Drain (MOD), the Main Outlet Drain Extension (MODE), and the Bypass Drain from the 1993 Gila River flood has been repaired. Some damage to the MODE near the Gila River confluence will be repaired at a later date. All Wellton-Mohawk Irrigation and Drainage District drainage flows should be diverted into the MODE in 1999.

The Water Quality Improvement Center (WQIC), formerly referred to as the test train but recently added on to, used for research and the building's water service, will be run throughout 1999. The WQIC uses about one million gallons per day of drainage water taken from the MODE or pumped from an on-site well.

Colorado River Channel Aggradation below Gila River Confluence

The 1993 Gila River flood deposited large amounts of sediment in the lower Colorado River above and below Morelos Dam. This has substantially reduced the river's capacity to carry flood flows, raised groundwater levels (levels that are expected to be further elevated by the anticipated flood control releases planned during the next two years), and has caused operational problems with the delivery of Treaty water to Mexico above Morelos Dam.

The Yuma Area Office has been working with local irrigation districts, the International Boundary and Water Commission, Native American Tribes, local environmental organizations, local governments, and other State and Federal agencies to develop a project proposal to solve the problems created by the channel aggradation.

The overall project is being phased. The first phase of the work, consisting of partial clearing of a flow path through the Limitrophe Division and the construction of a training structure at River Mile 31, was completed in late 1997. The three additional phases of work are in planning, awaiting permitting, and in the contracting system. The initial work on the final phases is scheduled to begin in the fall of calendar year 1998.

1999 DETERMINATIONS

The AOP provides guidance regarding reservoir storage and release conditions during the upcoming year, based upon Congressionally mandated storage, release, and delivery criteria and determinations. After meeting these requirements, specific reservoir releases may be modified within these requirements as forecast inflows change in response to climatic variability and to provide additional benefits coincident to the projects' multiple purposes.

Upper Basin Reservoirs

The Operating Criteria provide that the annual plan of operation shall include a determination of the quantity of water considered necessary to be in Upper Basin storage at the end of the water year. Taking into consideration all relevant factors required by the Operating Criteria, it has been determined that the active storage in Upper Basin reservoirs forecast for September 30, 1999, exceeds the storage required under Section 602(a) of the *Colorado River Basin Project Act* under any reasonable range of assumptions which might be applied. Therefore, "602(a) Storage" is not the criterion controlling the release of water from Glen Canyon Dam during water year 1999.

Section 602(a)(3) of the *Colorado River Basin Project Act* provides for the storage of Colorado River water in Upper Basin reservoirs that the Secretary of the Interior finds necessary to assure deliveries to comply with Articles III(c) and III(d) of the 1922 *Colorado River Compact*, without impairment to the annual consumptive use in the Upper Basin. The Secretary is required to make this determination after consultation with the Upper Colorado River Commission and representatives from the three Lower Division States, and after taking into consideration all relevant factors including, historic stream flows, the most critical period of record, the probabilities of water supply, and estimated future depletions. Water not required to be so stored will be released from Lake Powell:

- to the extent it can be reasonably applied in the States of the Lower Division to the uses specified in Article III(e) of the 1922 *Colorado River Compact*, but these releases will not be made when the active storage in Lake Powell is less than the active storage in Lake Mead,

- to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and

- to avoid anticipated spills from Lake Powell.

Spill avoidance and/or storage equalization criterion in accordance with Article II(3) of the Operating Criteria will control the releases from Glen Canyon Dam during water year 1999 unless the minimum objective release criterion in Article II(2) is controlling. Under the most probable inflow scenario Glen Canyon Dam will release 13,322 MCM (10.800 MAF).

Lower Basin Reservoirs

Water shall be released or pumped from Lake Mead to meet the following requirements:

(a) 1944 Mexican Water Treaty obligations;
(b) Reasonable beneficial consumptive use requirements of mainstream users in the Lower Division States;
(c) Net river losses;
(d) Net reservoir losses;
(e) Regulatory wastes.
(f) Flood control.

The Operating Criteria provide that after the commencement of delivery of mainstream water by means of the CAP, the Secretary of the Interior will determine the extent to which the reasonable beneficial consumptive use requirements of mainstream users are met in the Lower Division States. The reasonable beneficial consumptive use requirements are met depending on whether a normal, surplus, or shortage condition has been determined. The normal condition is defined as annual pumping and release from Lake Mead sufficient to satisfy 9,251 MCM (7.500 MAF) of consumptive use in accordance with Article III(3)(a) of the Operating Criteria and Article II(B)(1) of the U.S. Supreme Court decree in *Arizona v. California.* The surplus condition is defined as annual pumping and release from Lake Mead sufficient to satisfy in excess of 9,251 MCM (7.500 MAF) of consumptive use in accordance with Article III(3)(b) of the Operating Criteria and Article II(B)(2) of the U.S. Supreme Court decree in *Arizona v. California.*

The current water supply conditions forecast mandatory flood control releases that are projected to be above downstream requirements in January, February, and March 1999. Using a most probable inflow forecast for 1999, flood control releases are also projected in the beginning of calendar year 2000. Therefore, taking into account (1) the existing water storage conditions in the basin, (2) the most probable near-term water supply conditions in the basin, and (3) that the beneficial consumptive use requirements of Colorado River mainstream users in the Lower Division States are expected to be more than 9,250 MCM (7.5 MAF), the surplus condition is the criterion governing the operation of Lake Mead for calendar year 1999 in accordance with Article III(3)(b) of the Operating Criteria and Article II(B)(2) of the decree in *Arizona v. California.* While there still is no agreed upon long term strategy for the determination of surplus conditions, the making of this determination, based on flood control and spill avoidance considerations, does not preclude the Secretary from adopting other determination criteria in future years.

Nothing in the decree in *Arizona v. California* prohibits the Secretary of the Interior from releasing water apportioned, but unused, in any Lower Division State for that year for consumptive use in any other Lower Division State. No rights to the recurrent use of such water accrue by reason of the use of such water. In light of this provision and in accordance with

Article II(B)(6) of the decree, any Lower Division State will be allowed to utilize water apportioned to, but unused by, another Lower Division State in calendar year 1999.

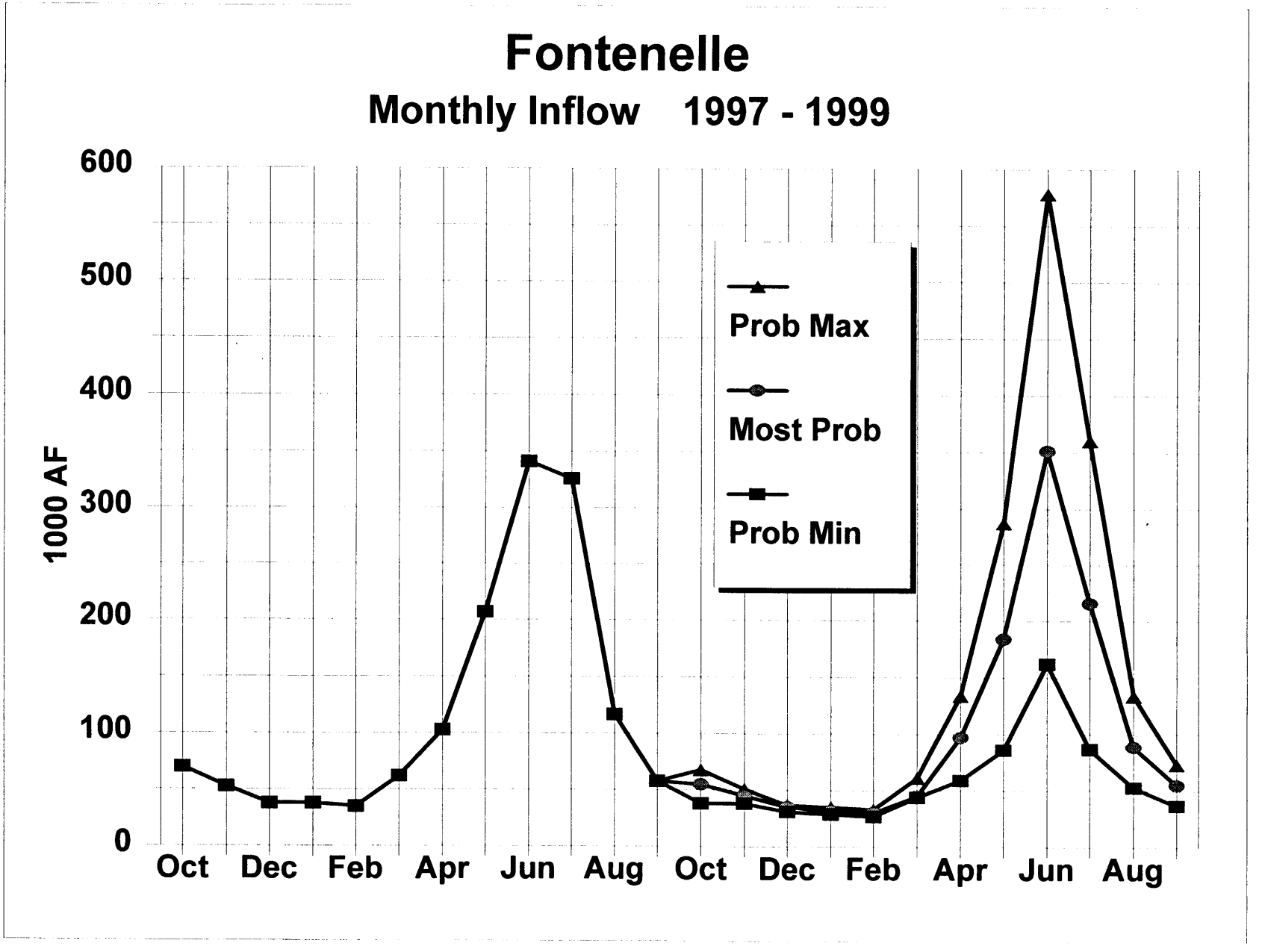
1944 Mexican Water Treaty

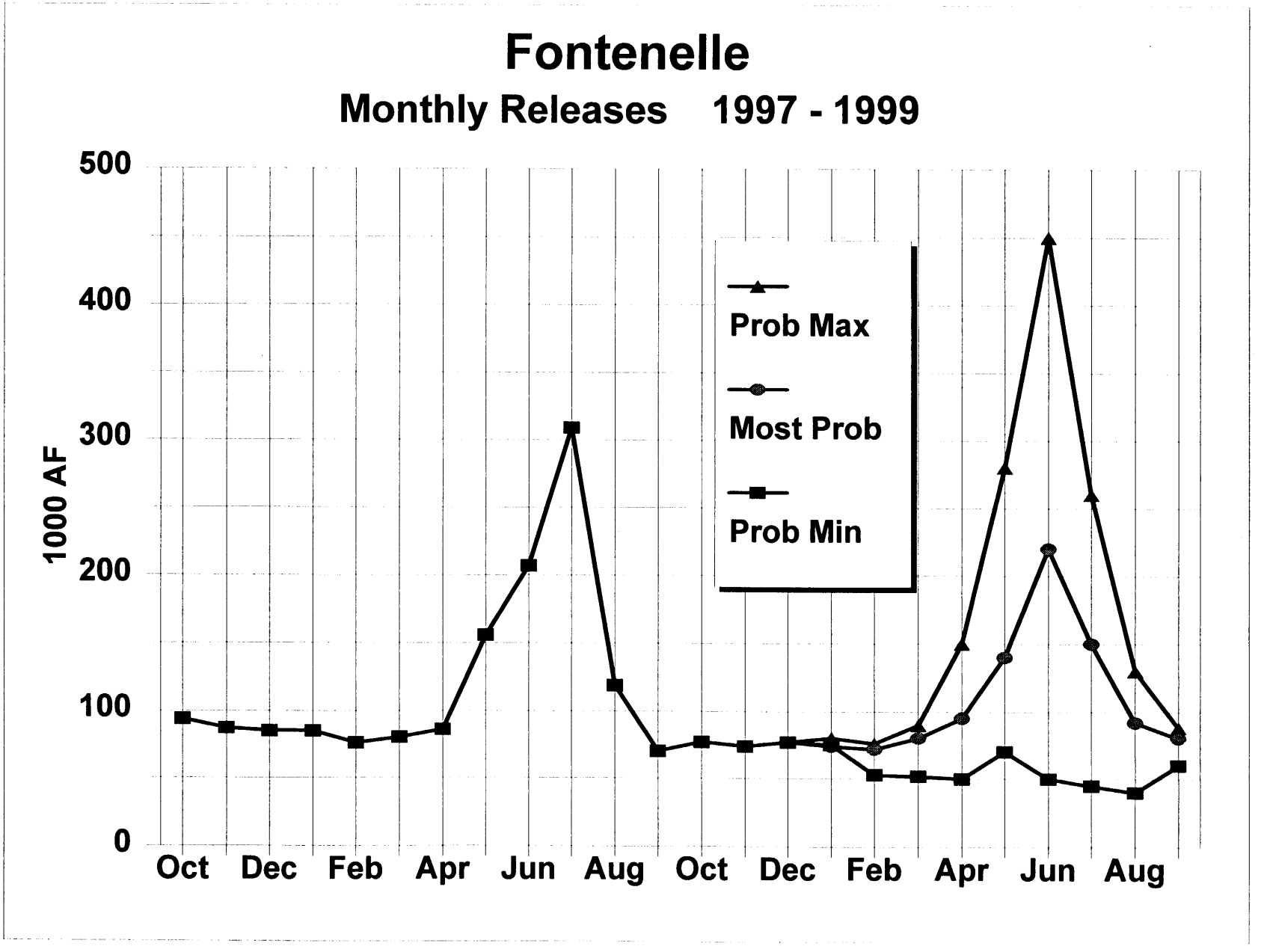
Pursuant to the 1944 Mexican Water Treaty it has been determined that under most probable inflow conditions, water in excess of that required to supply uses in the United States will be available. Therefore, a volume of 2,096 MCM (1.7 MAF) of water will be allowed to be scheduled for delivery to Mexico during calendar year 1999 in accordance with Article 15 of the 1944 Mexican Water Treaty and Minute No. 242 of the International Boundary and Water Commission. Calendar year schedules of monthly deliveries of Colorado River water are formulated by the Mexican Section of the IBWC and presented to the United States Section before the beginning of each calendar year.

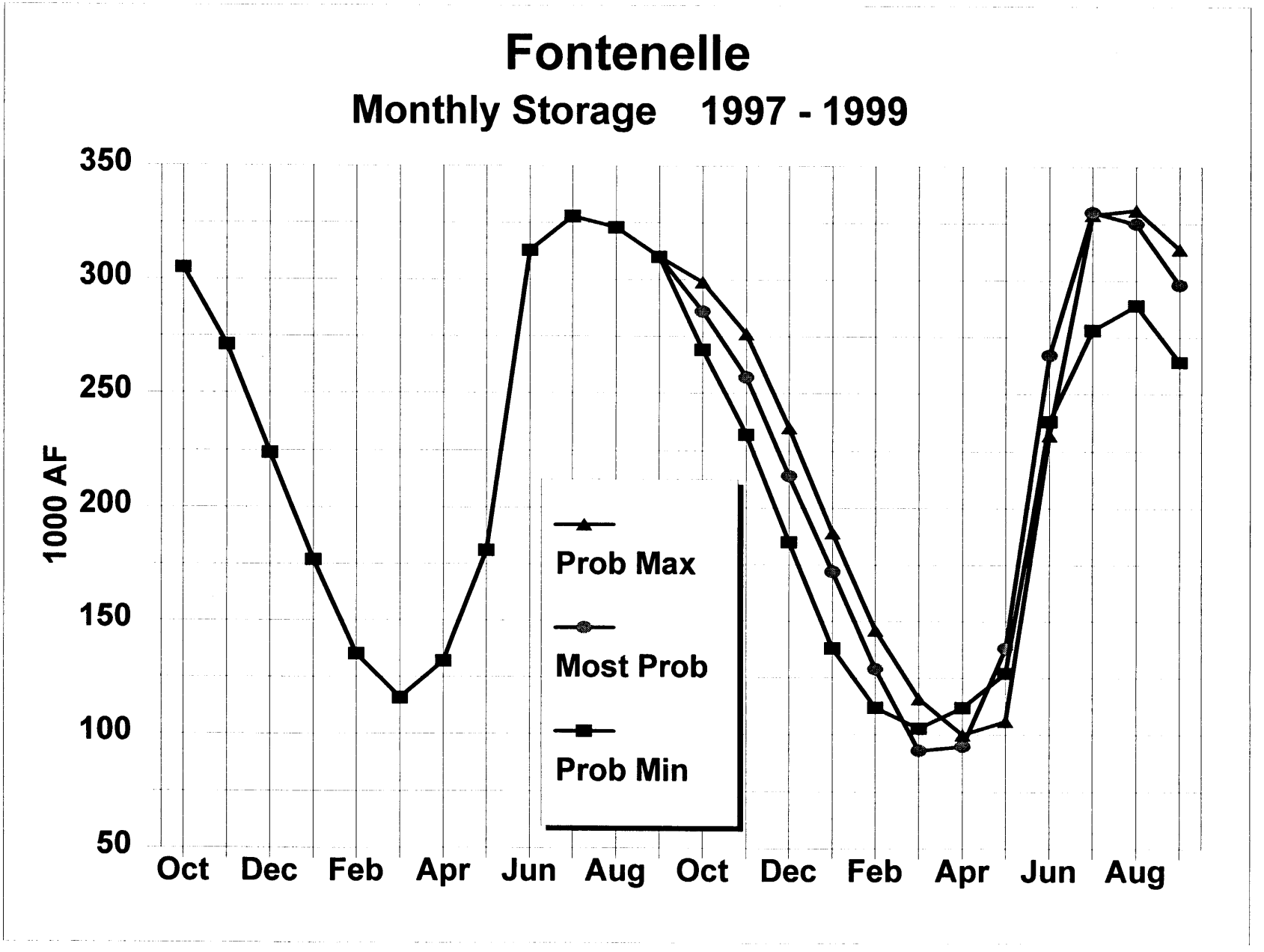
DISCLAIMER

Nothing in this Annual Operating Plan is intended to interpret the provisions of *The Colorado River Compact* (45 Stat. 1057), *The Upper Colorado River Basin Compact* (63 Stat. 31), *The Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Treaty Between the United States of America and Mexico* (Treaty Series 994, 59 Stat. 1219), the United States/Mexico agreement in Minute No. 242 of August 30, 1973, (Treaty Series 7708; 24 UST 1968), the Decree entered by the Supreme Court of the United States in *Arizona v. California* et al. (376 U.S. 340), as amended and supplemented, *The Boulder Canyon Project Act* (45 Stat. 1057), *The Boulder Canyon Project Adjustment Act* (54 Stat. 774; 43 U.S.C. 618a), *The Colorado River Storage Project Act* (70 Stat. 105; 43 U.S.C. 620), *The Colorado River Basin Project Act* (82 Stat. 885; 43 U.S.C. 1501), *The Colorado River Basin Salinity Control Act* (88 Stat. 266; 43 U.S.C. 1951), *The Hoover Power Plant Act of 1984* (98 Stat. 1333), *The Colorado River Floodway Protection Act* (100 Stat. 1129; 43 U.S.C. 1600), or *The Grand Canyon Protection Act of 1992* (Title XVIII of Public Law 102-575, 106 Stat. 4669).

Attachment. Monthly inflow, monthly release, and end of month contents for Colorado River reservoirs (October 1997 through September 1999) under the probable maximum, most probable, and the probable minimum inflow scenarios, and historic end of month contents.


Fontenelle
Monthly Inflow 1997 - 1999
1000 AF
600
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Fontenelle
Monthly Releases 1997 - 1999
1000 AF
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min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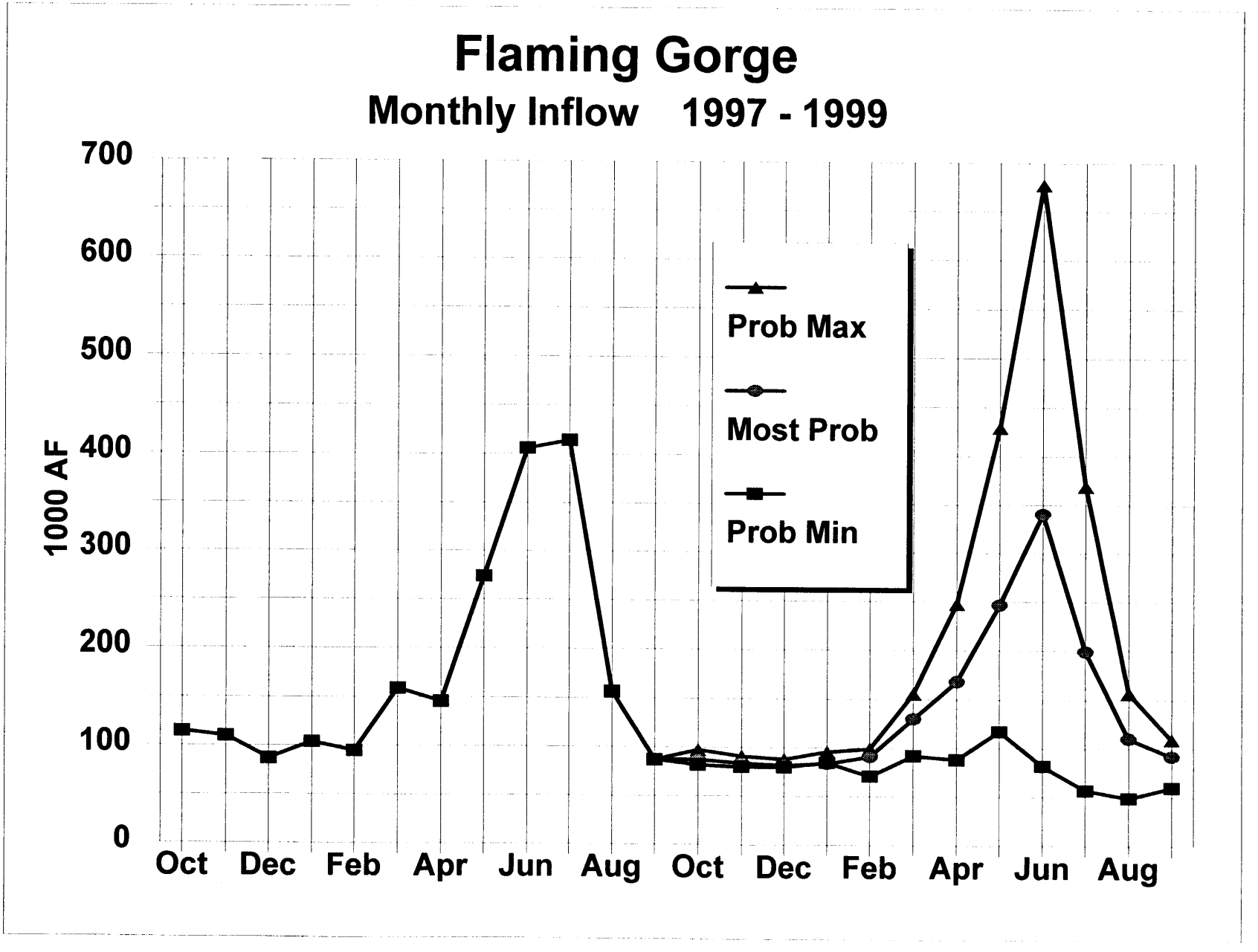
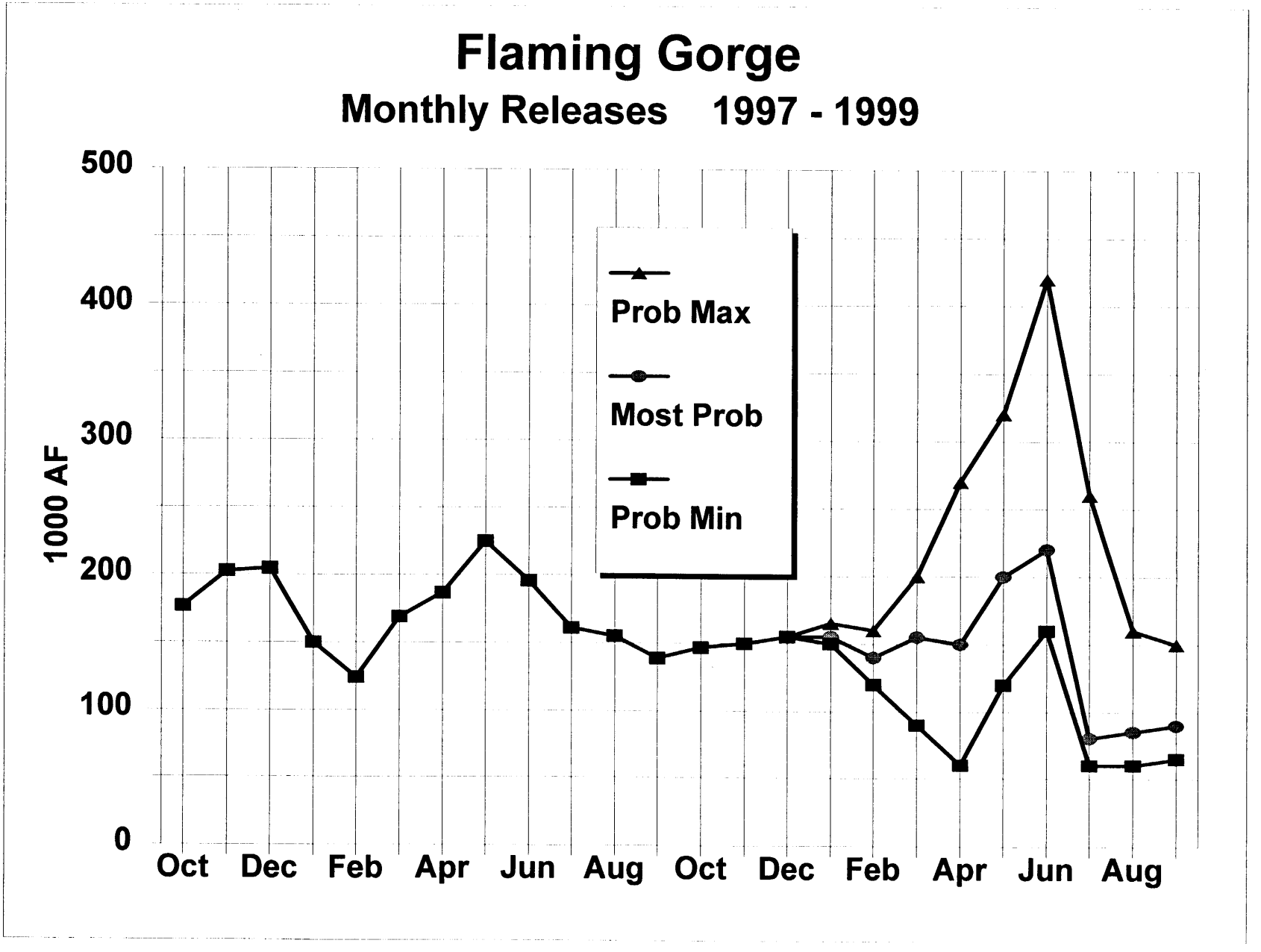
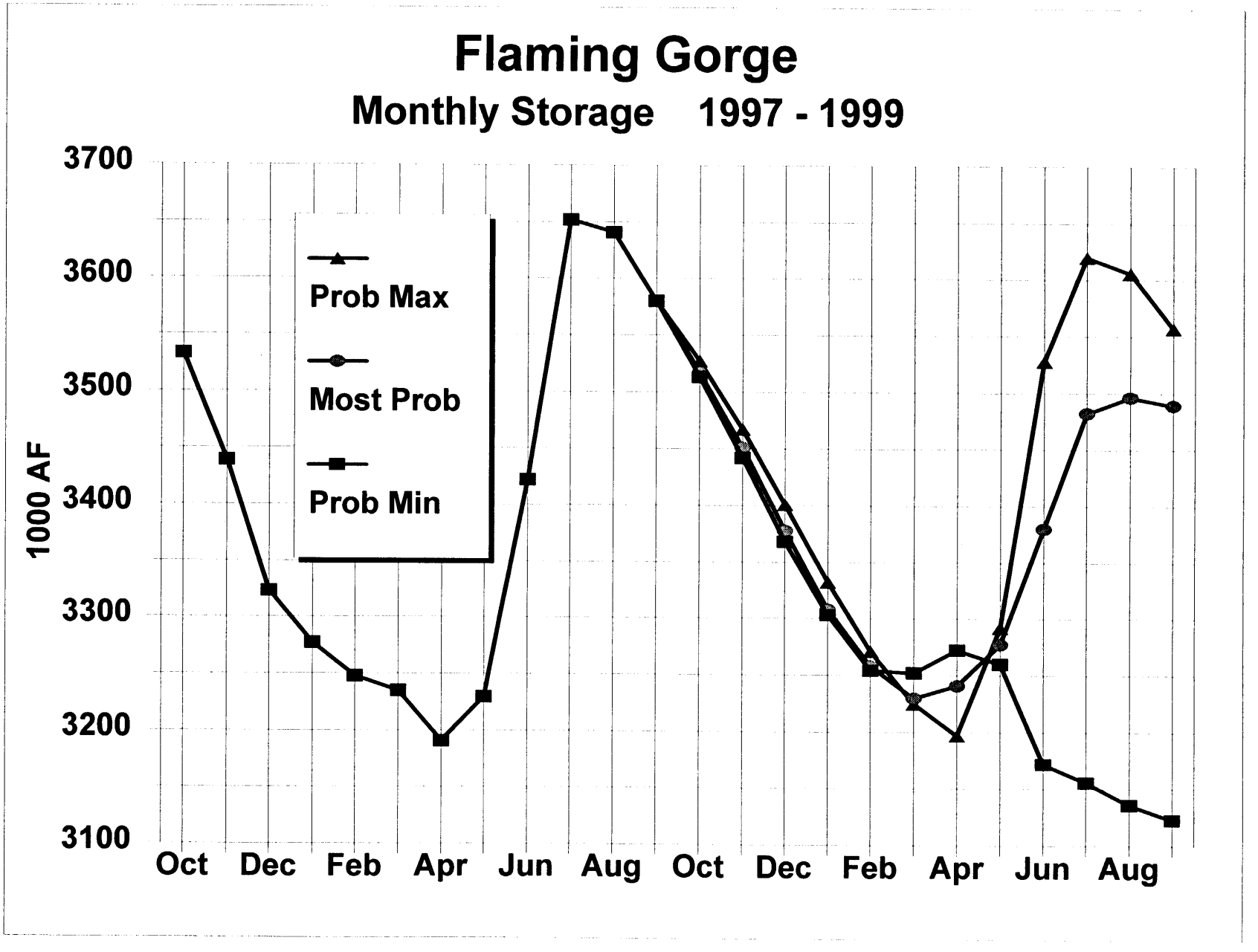
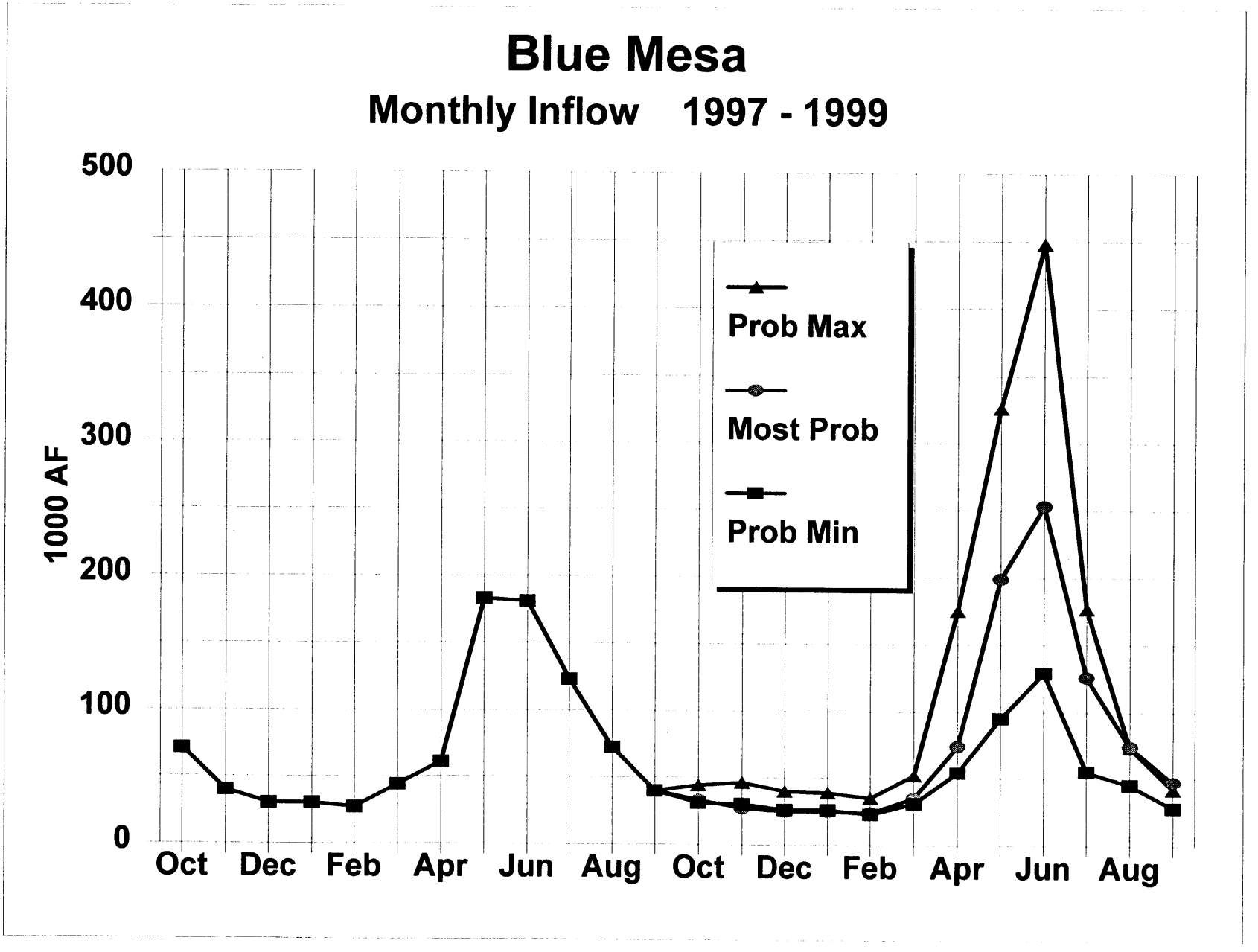
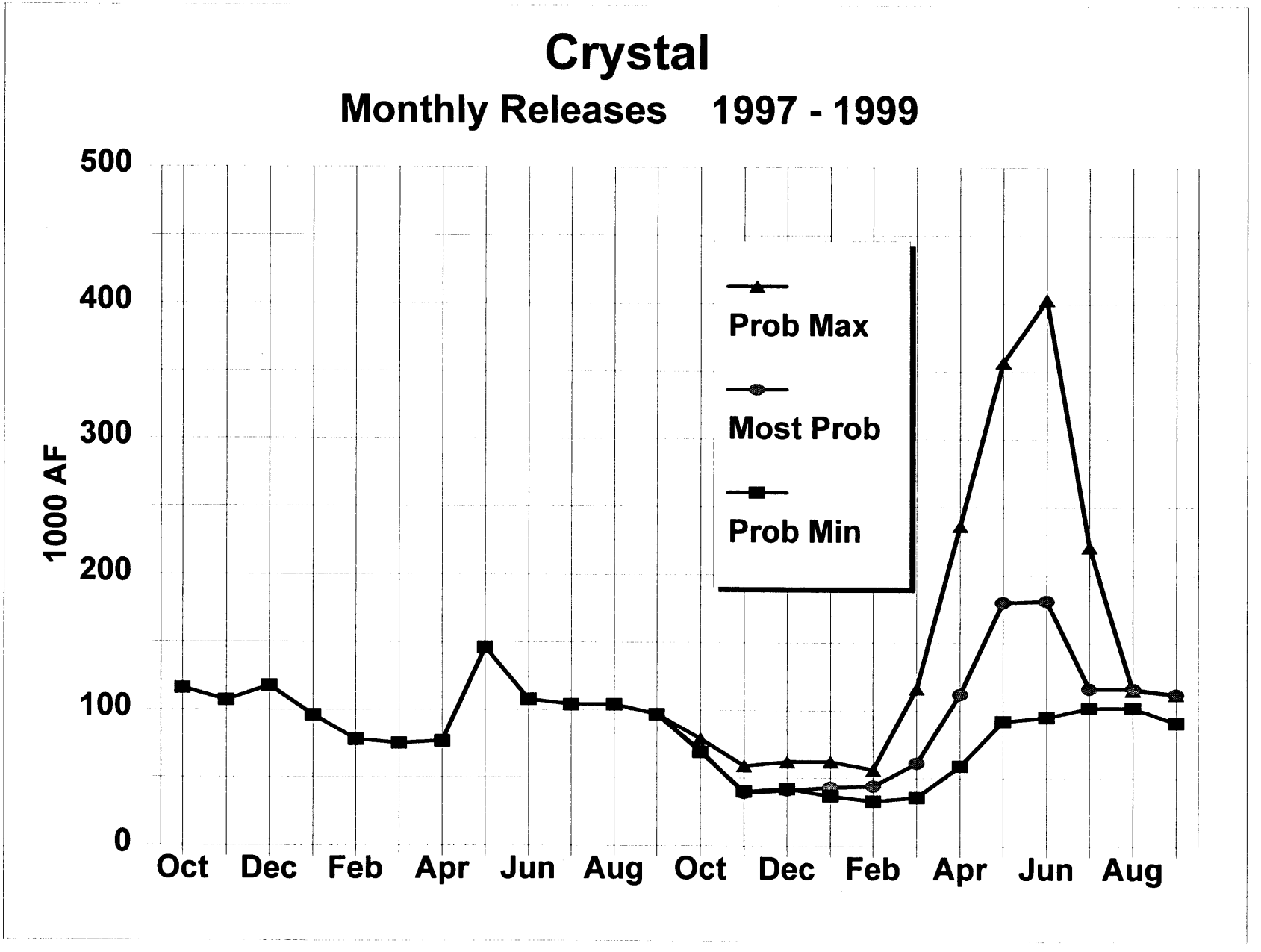
Monthly Storage 1997 - 1999
1000 AF
350
300
250
200
150
100
50
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Flaming Gorge
Monthly Inflow 1997 - 1999
1000 AF
700
600
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Flaming Gorge
Monthly Releases 1997 - 1999
1000 AF
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Flaming Gorge
Monthly Storage 1997 - 1999
1000 AF
3700
3600
3500
3400
3300
3200
3100
Prob Max
Most Prob
Prob Min
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug


Blue Mesa
Monthly Inflow 1997 - 1999
1000 AF
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min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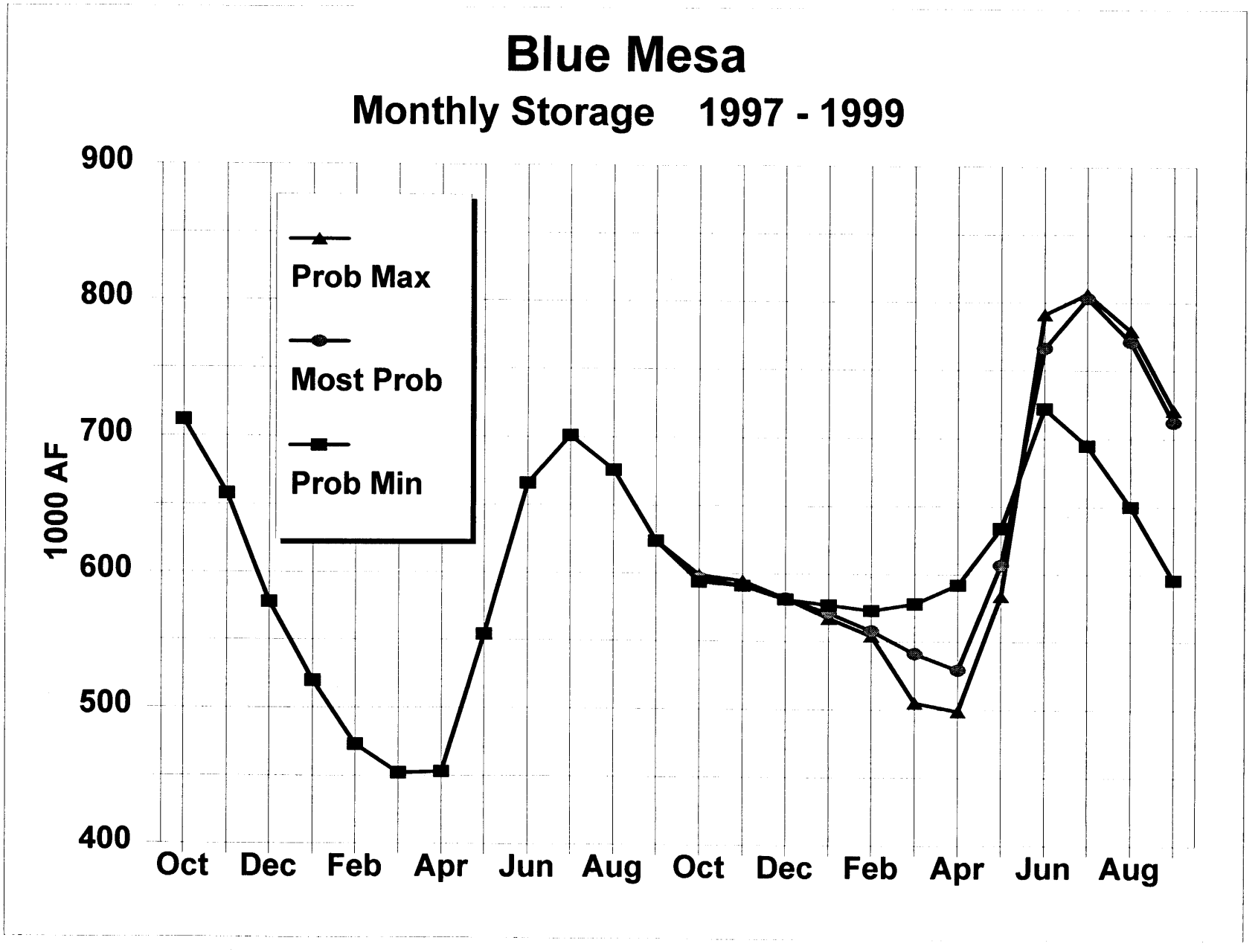
Monthly Releases 1997 - 1999
1000 AF
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Blue Mesa
Monthly Storage 1997 - 1999
1000 AF
900
800
700
600
500
400
Prob Max
Most Prob
Prob Min
Oct
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Apr
Jun
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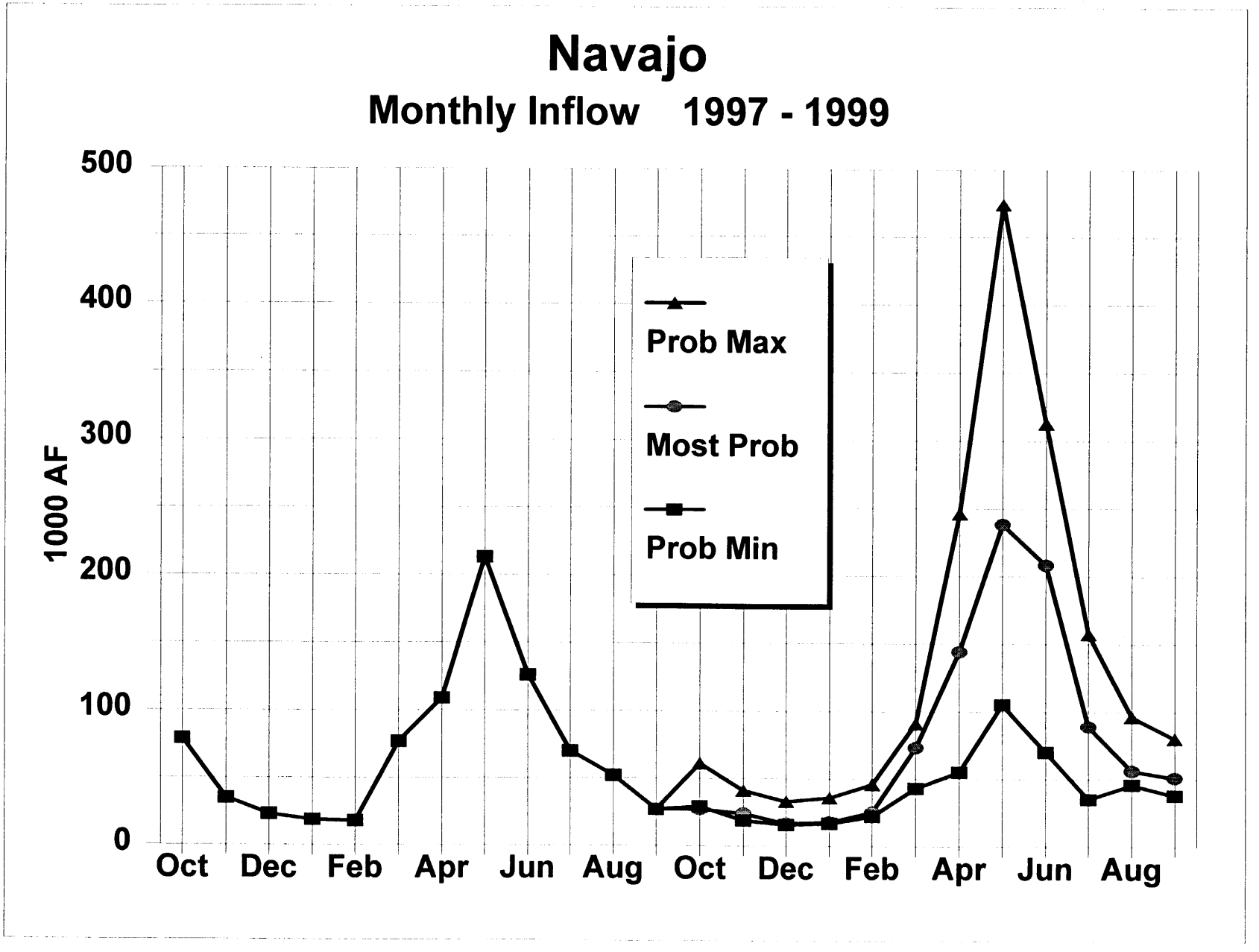
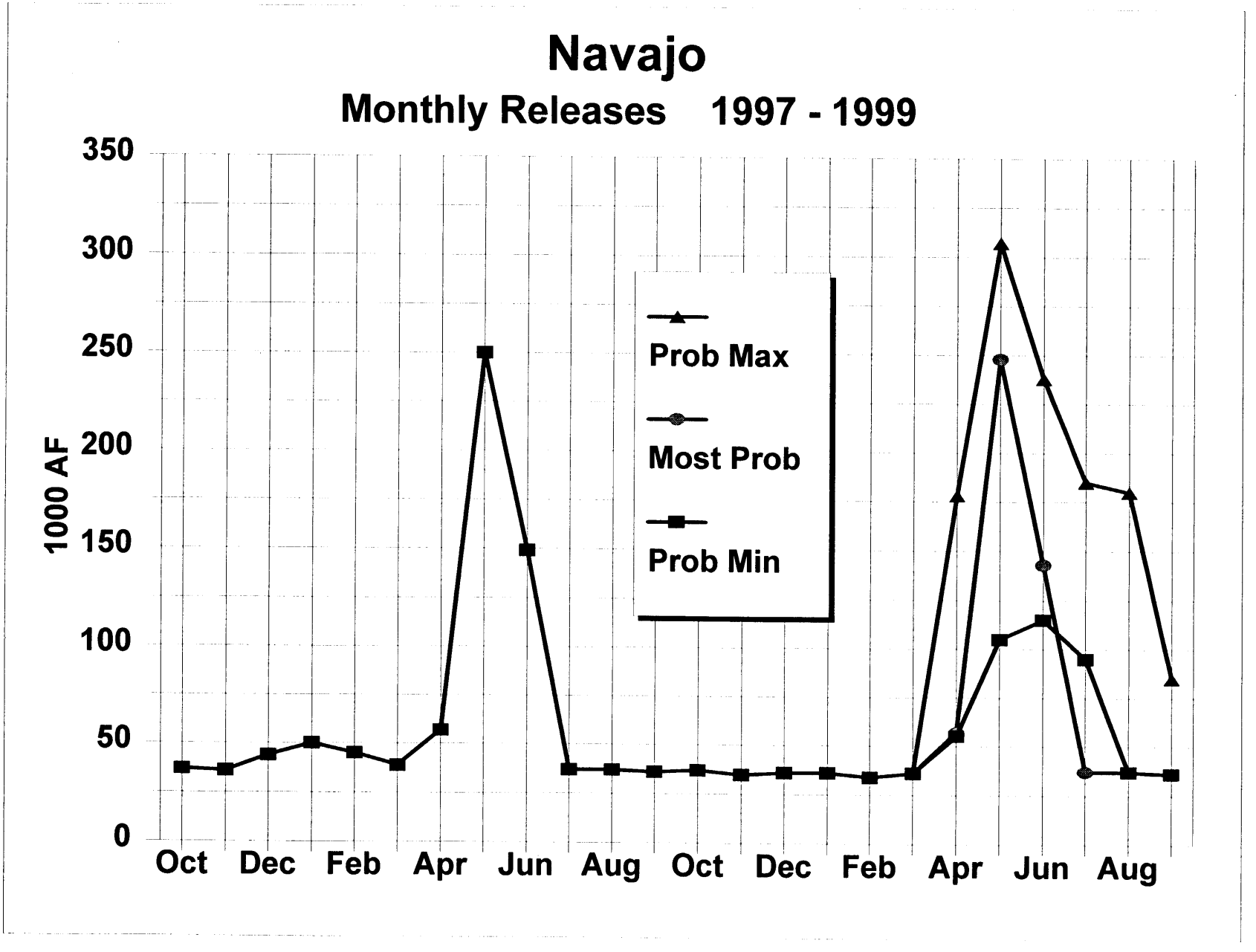
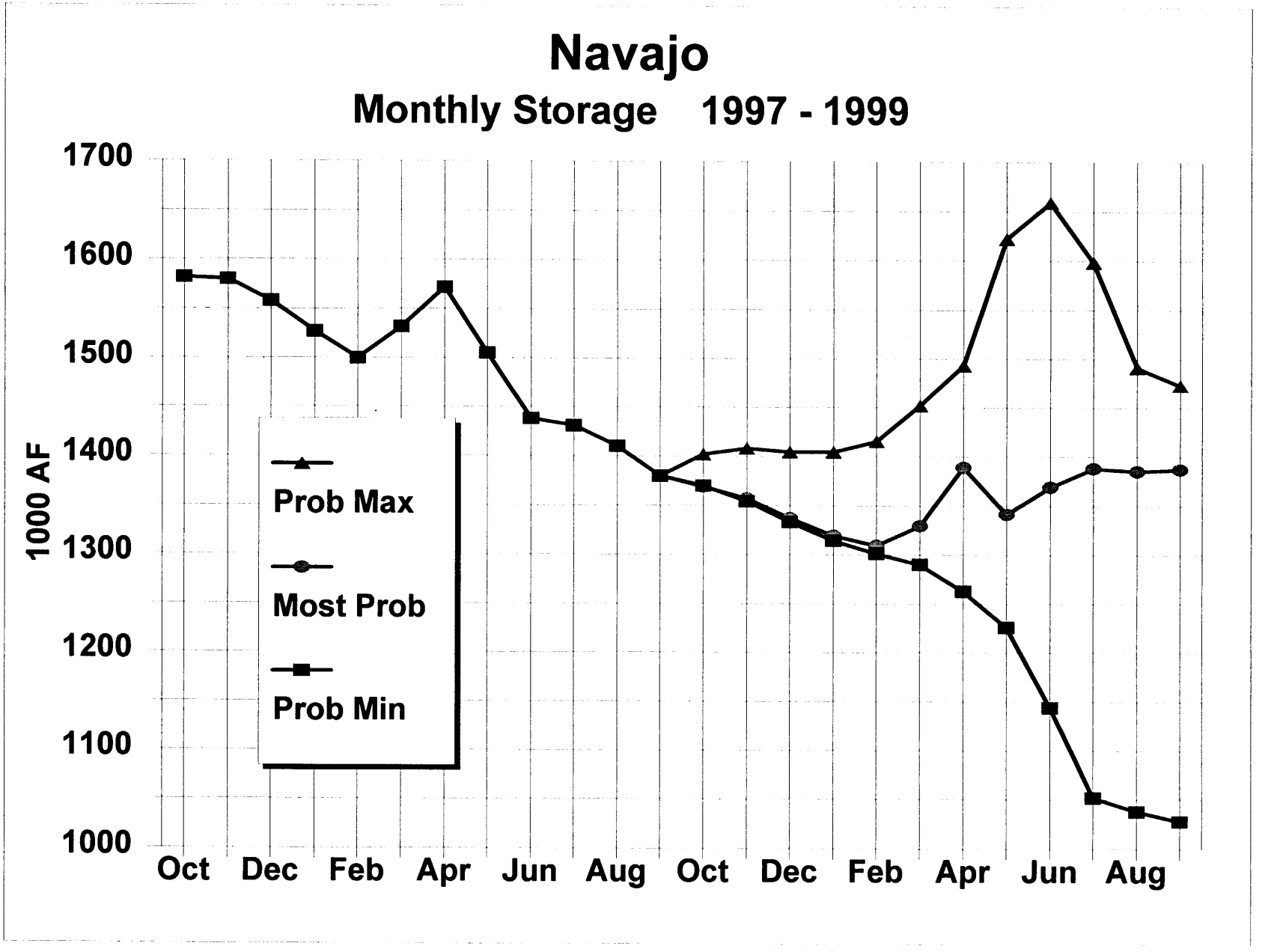

Navajo
Monthly Inflow 1997 - 1999
1000 AF
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Navajo
Monthly Releases 1997 - 1999
1000 AF
350
300
250
200
150
100
50
0
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Navajo
Monthly Storage 1997 - 1999
1000 AF
1700
1600
1500
1400
1300
1200
1100
1000
Prob Max
Most Prob
Prob Min
Oct
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Jun
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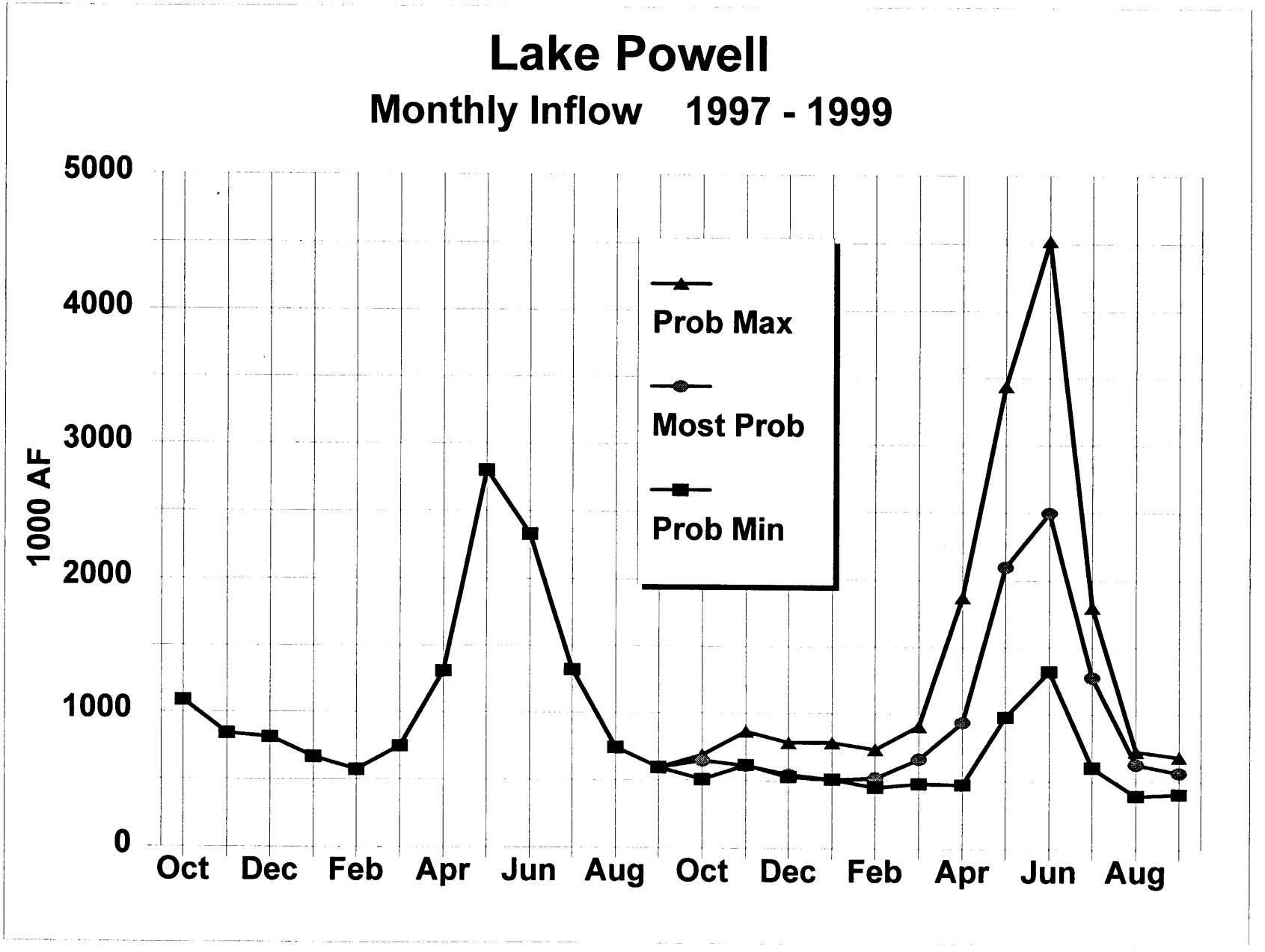
Feb
Apr
Jun
Aug


Lake Powell
Monthly Inflow 1997 - 1999
1000 AF
5000
4000
3000
2000
1000
0
Oct
Dec
Feb
Apr
Jun
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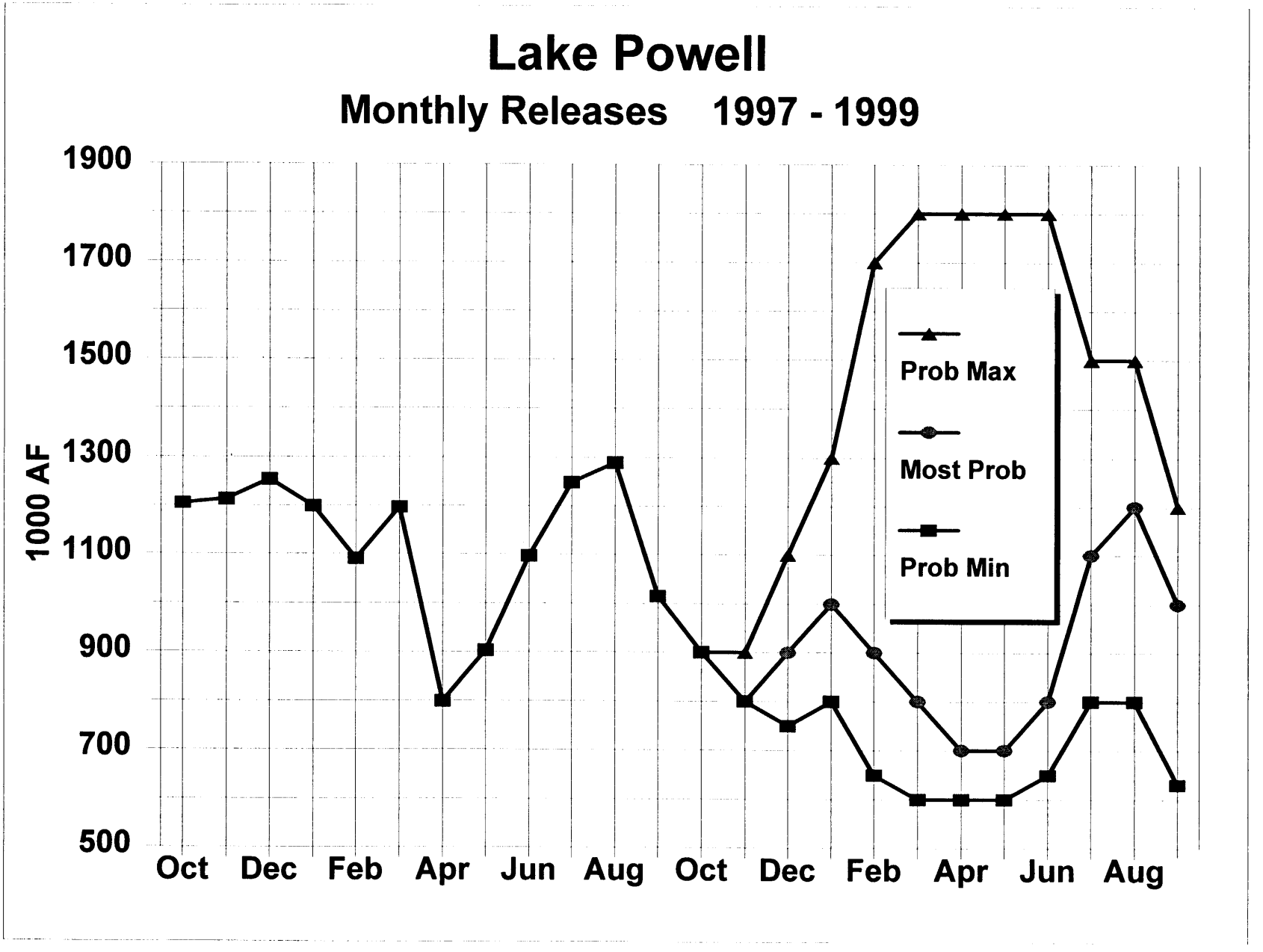
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Lake Powell
Monthly Releases 1997 - 1999
1000 AF
1900
1700
1500
1300
1100
900
700
500
Oct
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Aug
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Feb
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Jun
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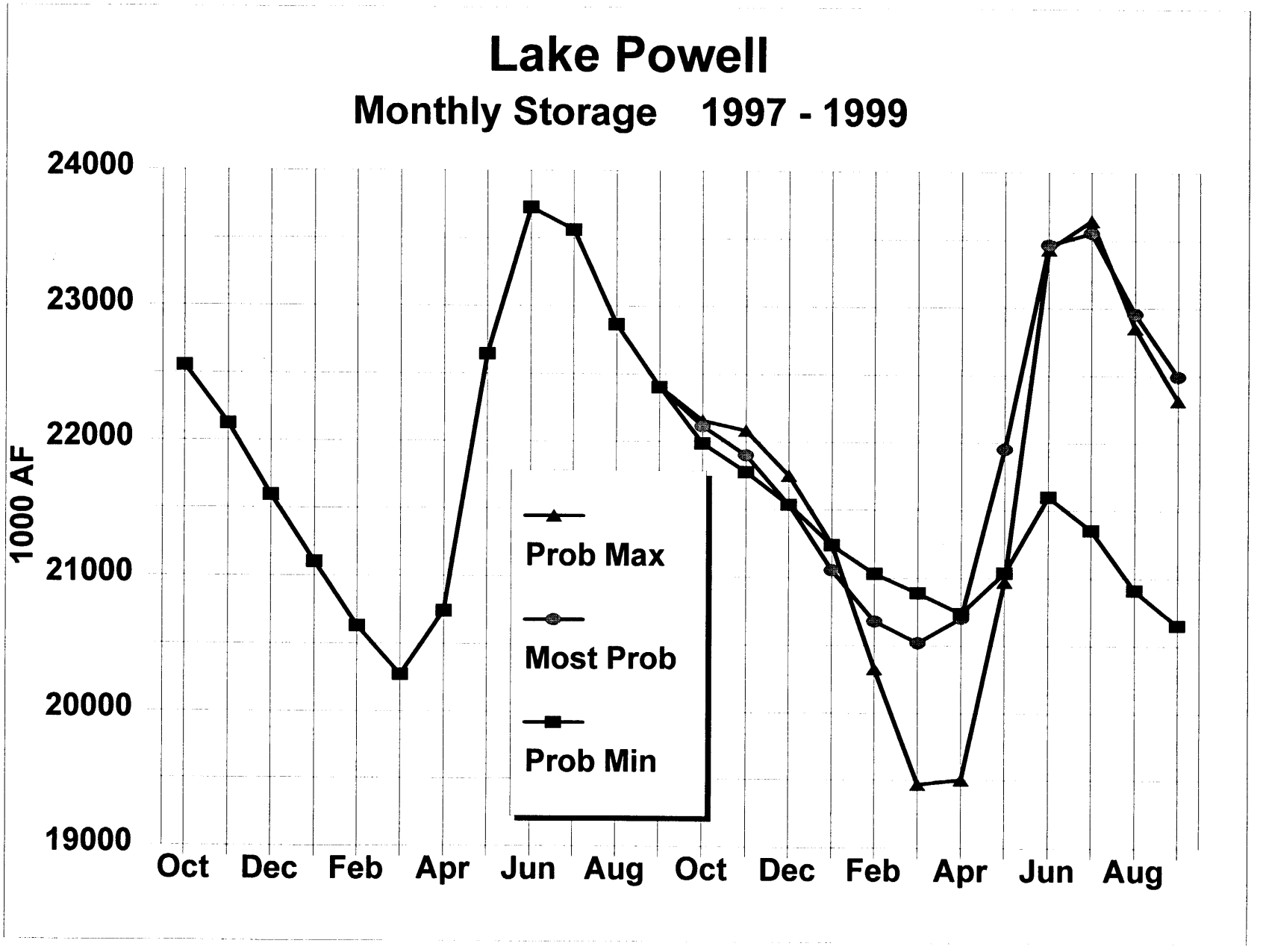
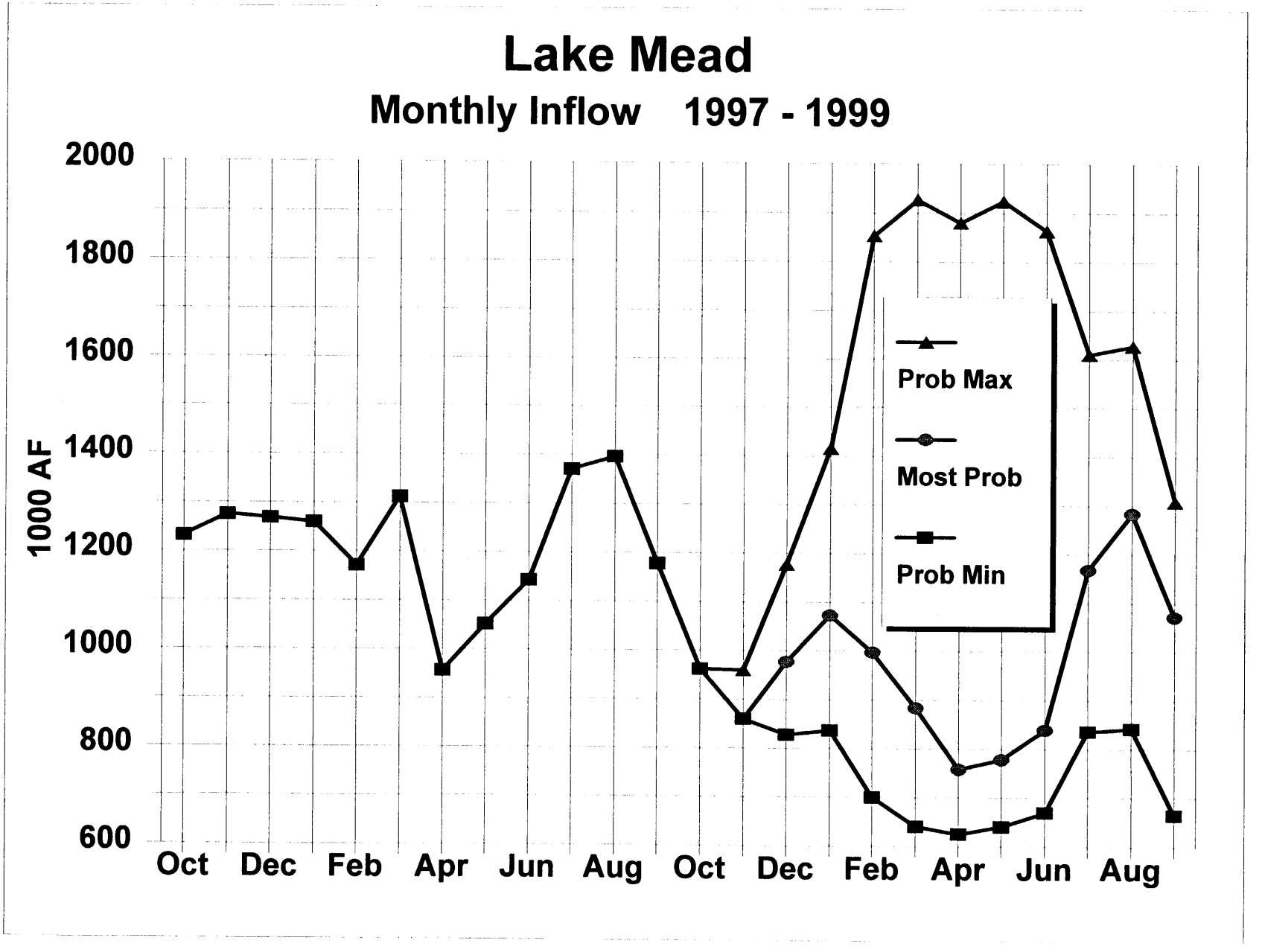
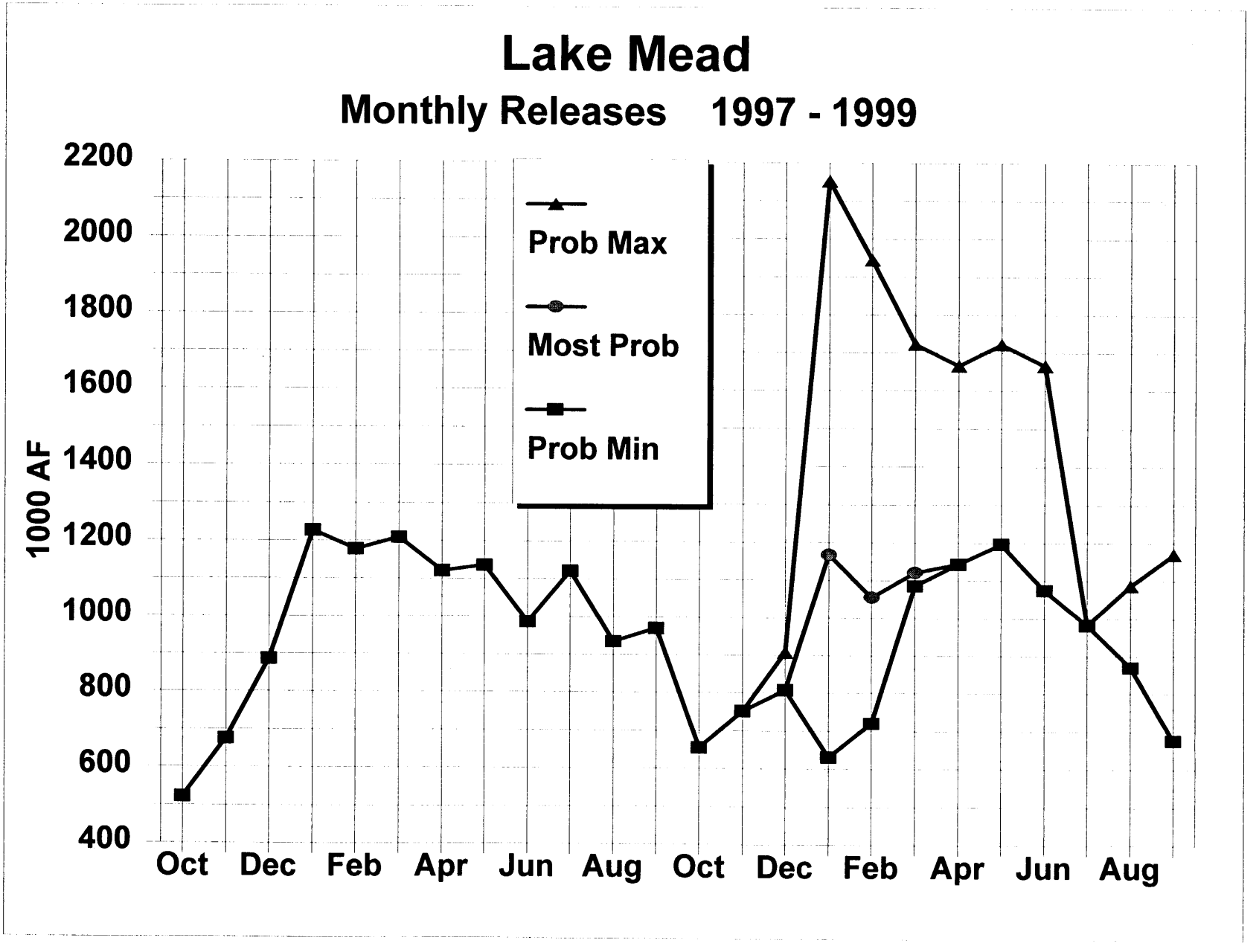
Prob Max
Most Prob
Prob Min


Lake Powell
Monthly Storage 1997 - 1999
1000 AF
24000
23000
22000
21000
20000
19000
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Lake Mead
Monthly Inflow 1997 - 1999
1000 AF
2000
1800
1600
1400
1200
1000
800
600
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Lake Mead
Monthly Releases 1997 - 1999
1000 AF
2200
2000
1800
1600
1400
1200
1000
800
600
400
Prob Max
Most Prob
Prob Min
Oct
Dec
Feb
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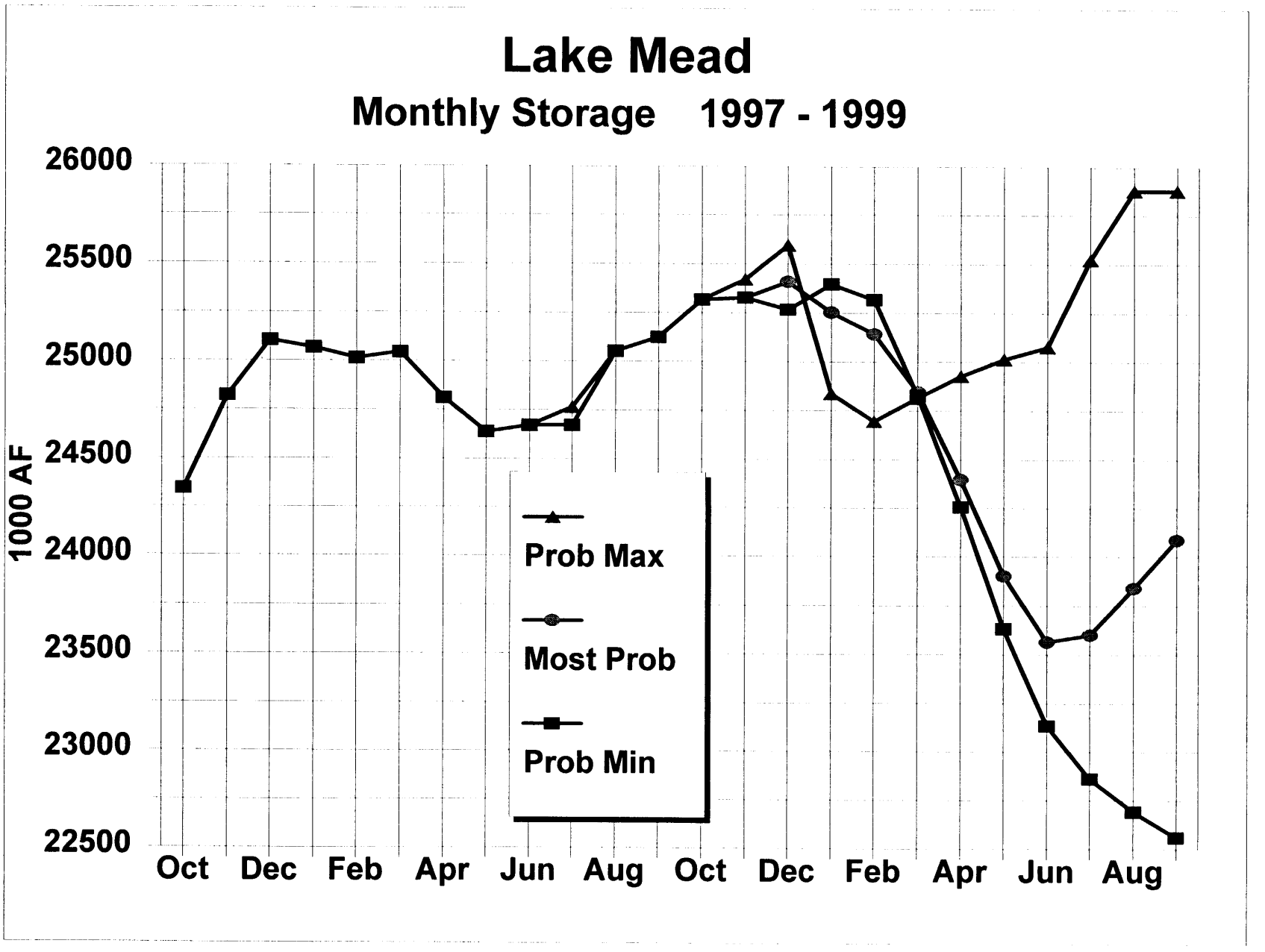
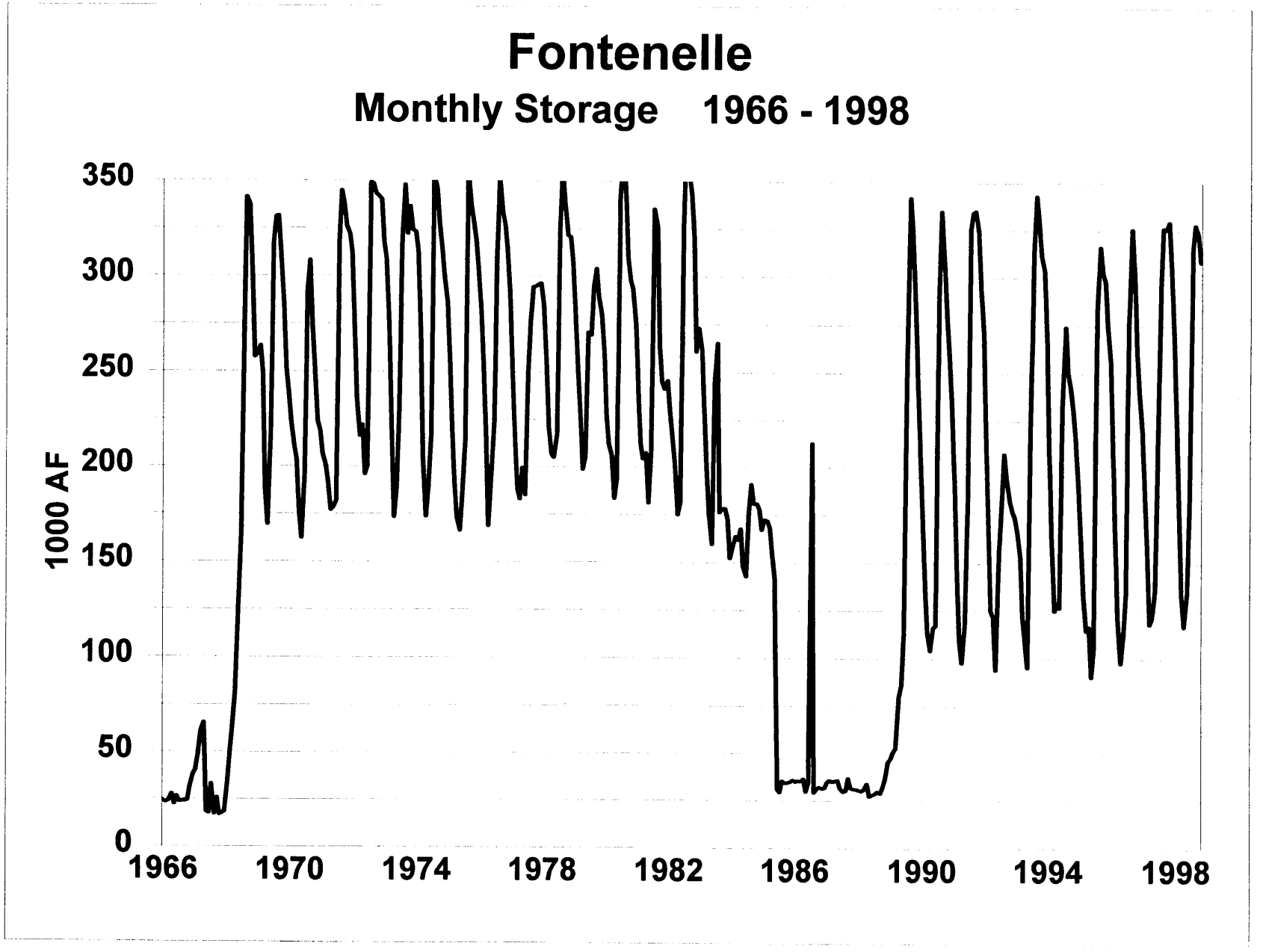

Lake Mead
Monthly Storage 1997 - 1999
1000 AF
26000
25500
25000
24500
24000
23500
23000
22500
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Prob Max
Most Prob
Prob Min


Fontenelle
Monthly Storage 1966 - 1998
1000 AF
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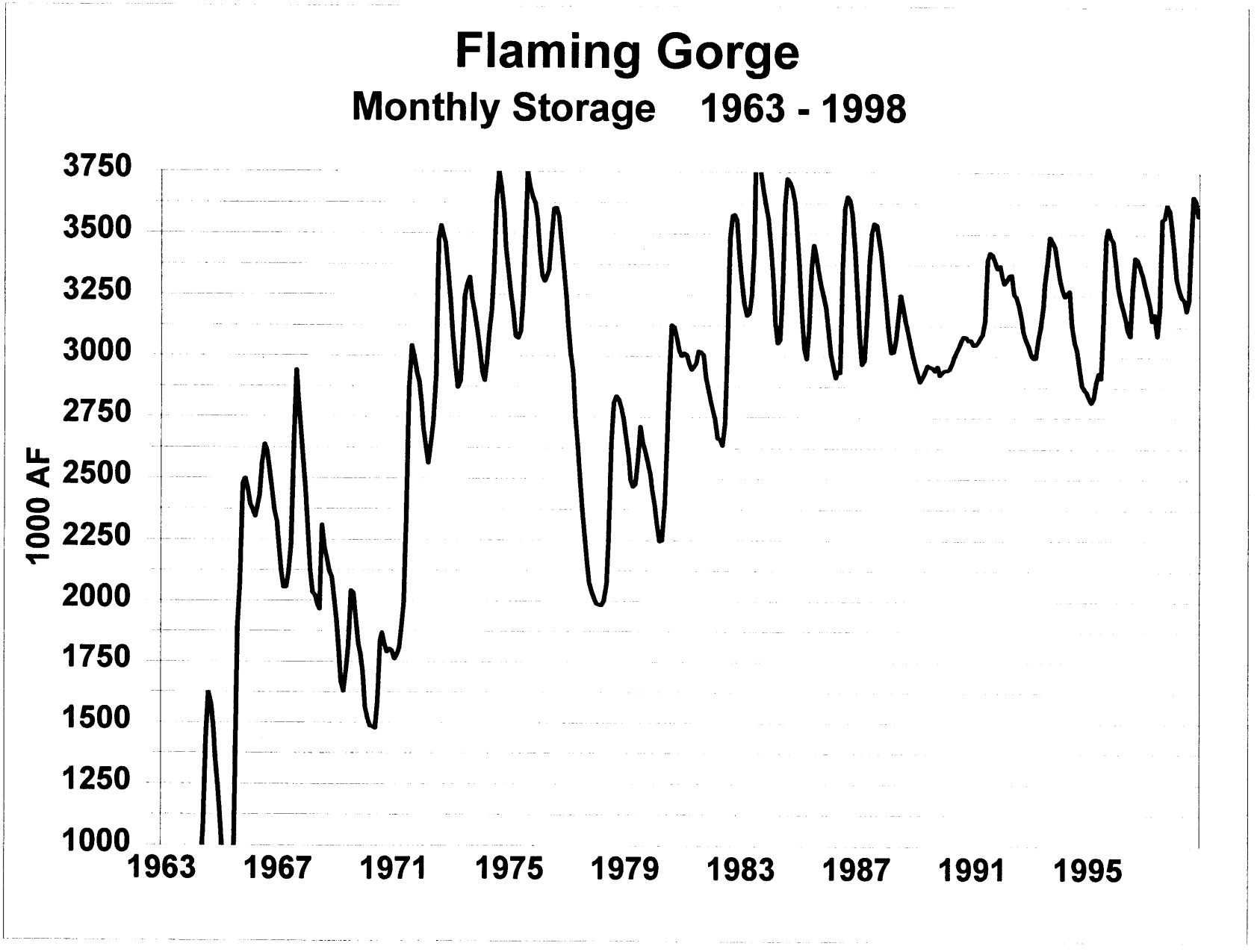
300
250
200
150
100
50
0
1966
1970
1974
1978
1982
1986
1990
1994
1998


Flaming Gorge
Monthly Storage 1963 - 1998
1000 AF
3750
3500
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
1963
1967
1971
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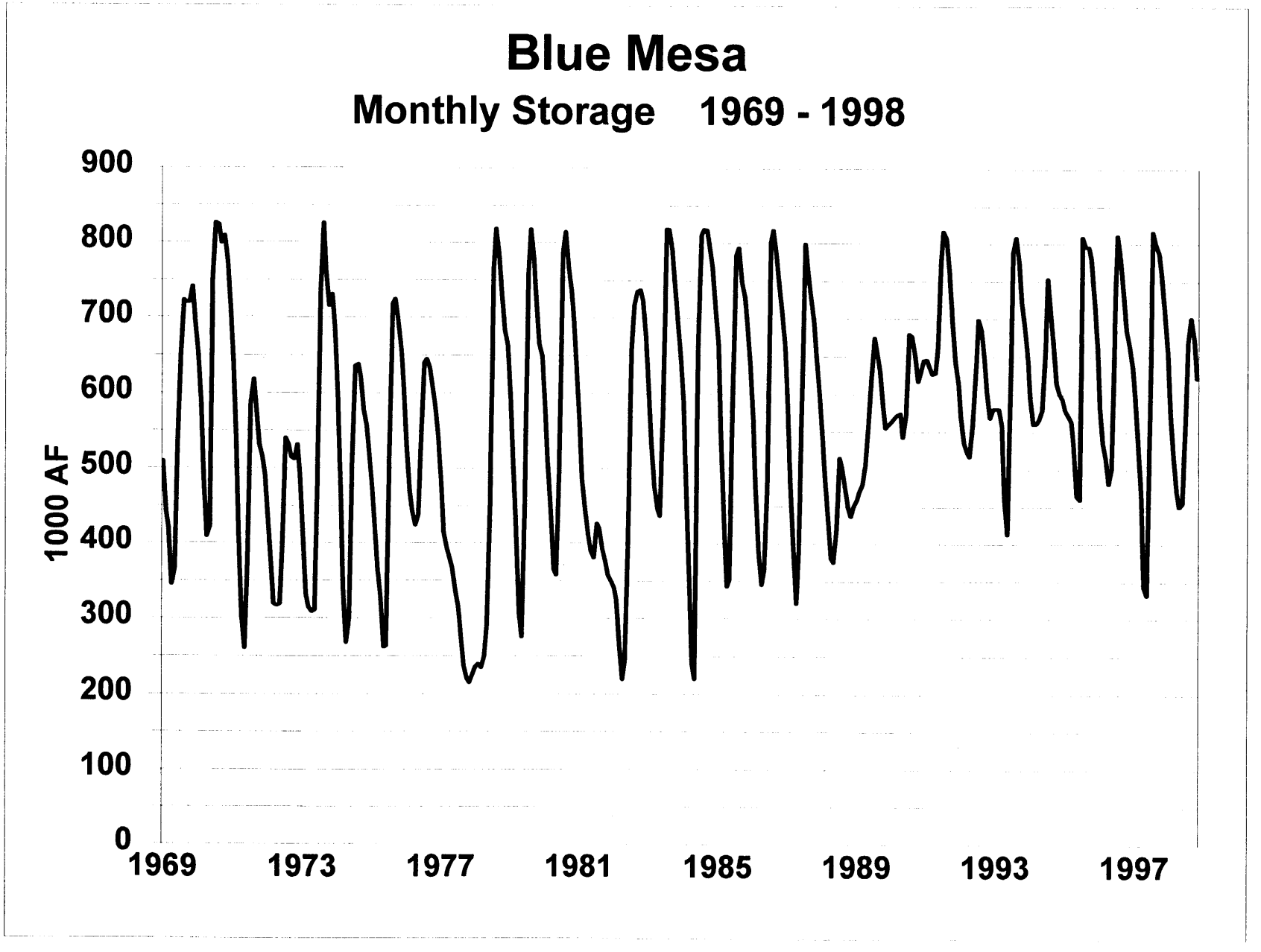
1979
1983
1987
1991
1995


Blue Mesa
Monthly Storage 1969 - 1998
1000 AF
900
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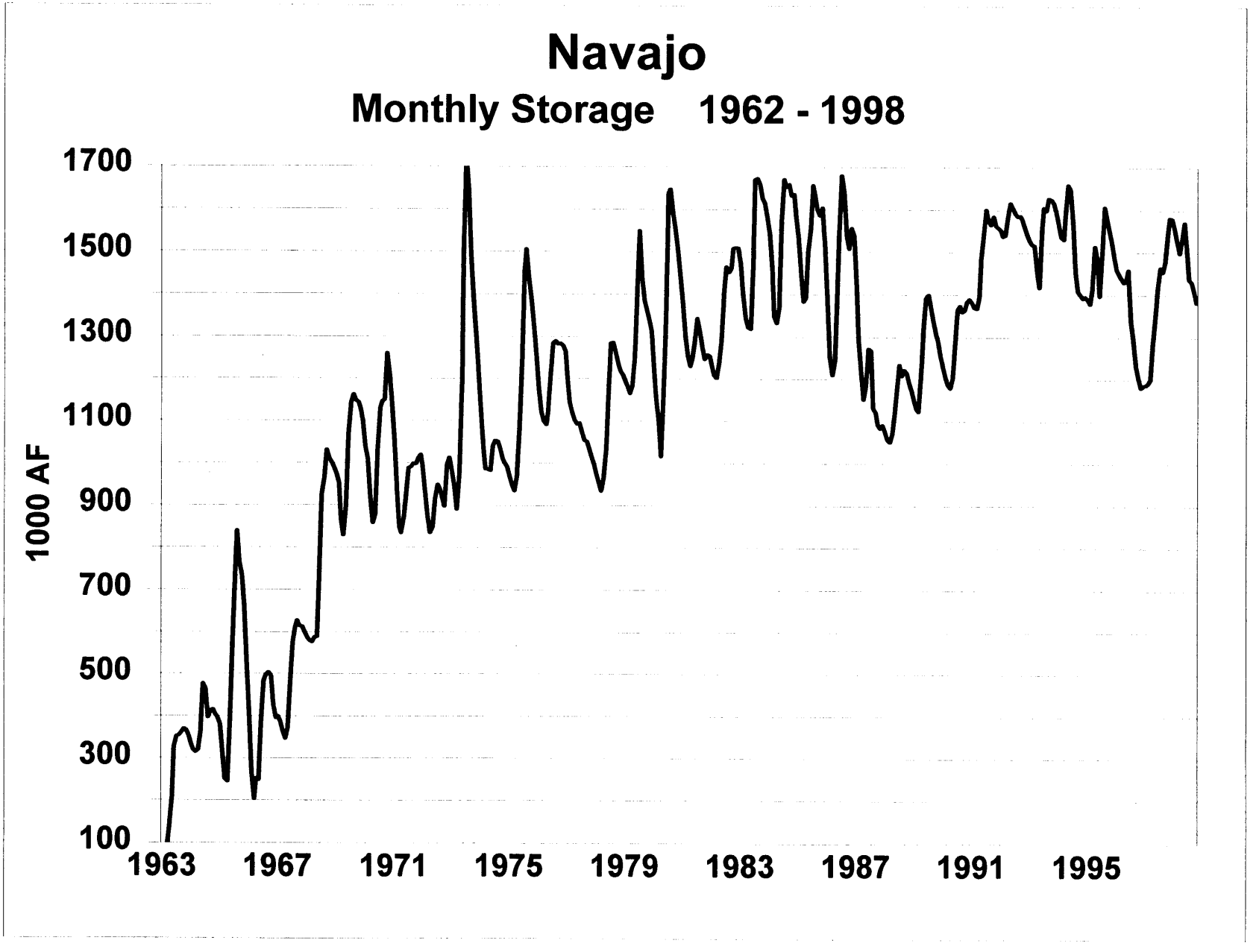
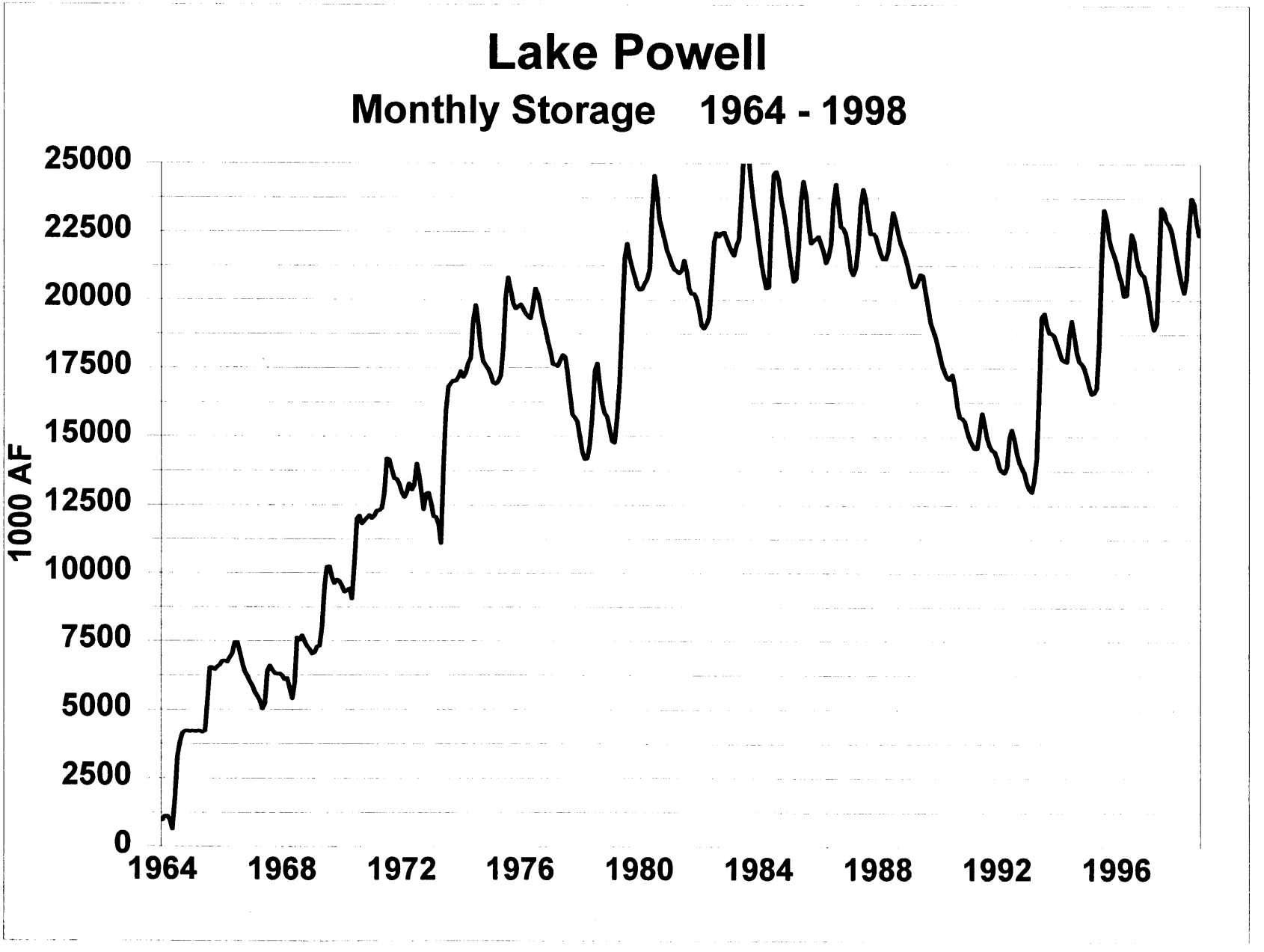
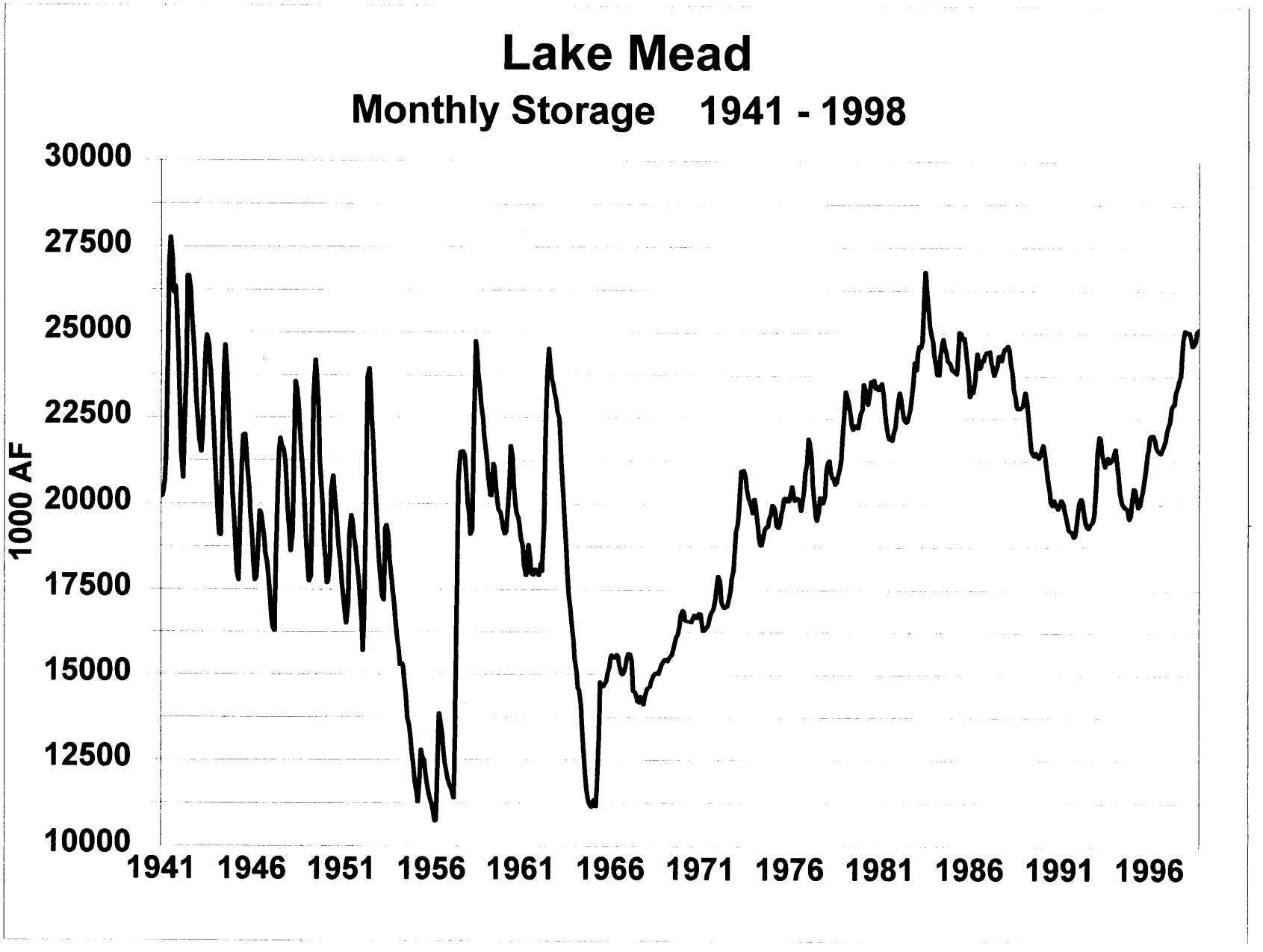
700
600
500
400
300
200
100
0
1969
1973
1977
1981
1985
1989
1993
1997


Navajo
Monthly Storage 1962 - 1998
1000 AF
1700
1500
1300
1100
900
700
500
300
100
1963
1967
1971
1975
1979
1983
1987
1991
1995


Lake Powell
Monthly Storage 1964 - 1998
1000 AF
25000
22500
20000
17500
15000
12500
10000
7500
5000
2500
0
1964
1968
1972
1976
1980
1984
1988
1992
1996


Lake Mead
Monthly Storage 1941 - 1998
1000 AF
30000
27500
25000
22500
20000
17500
15000
12500
10000
1941
1946
1951
1956
1961
1966
1971
1976
1981
1986
1991
1996