

# ANNUAL REPORT

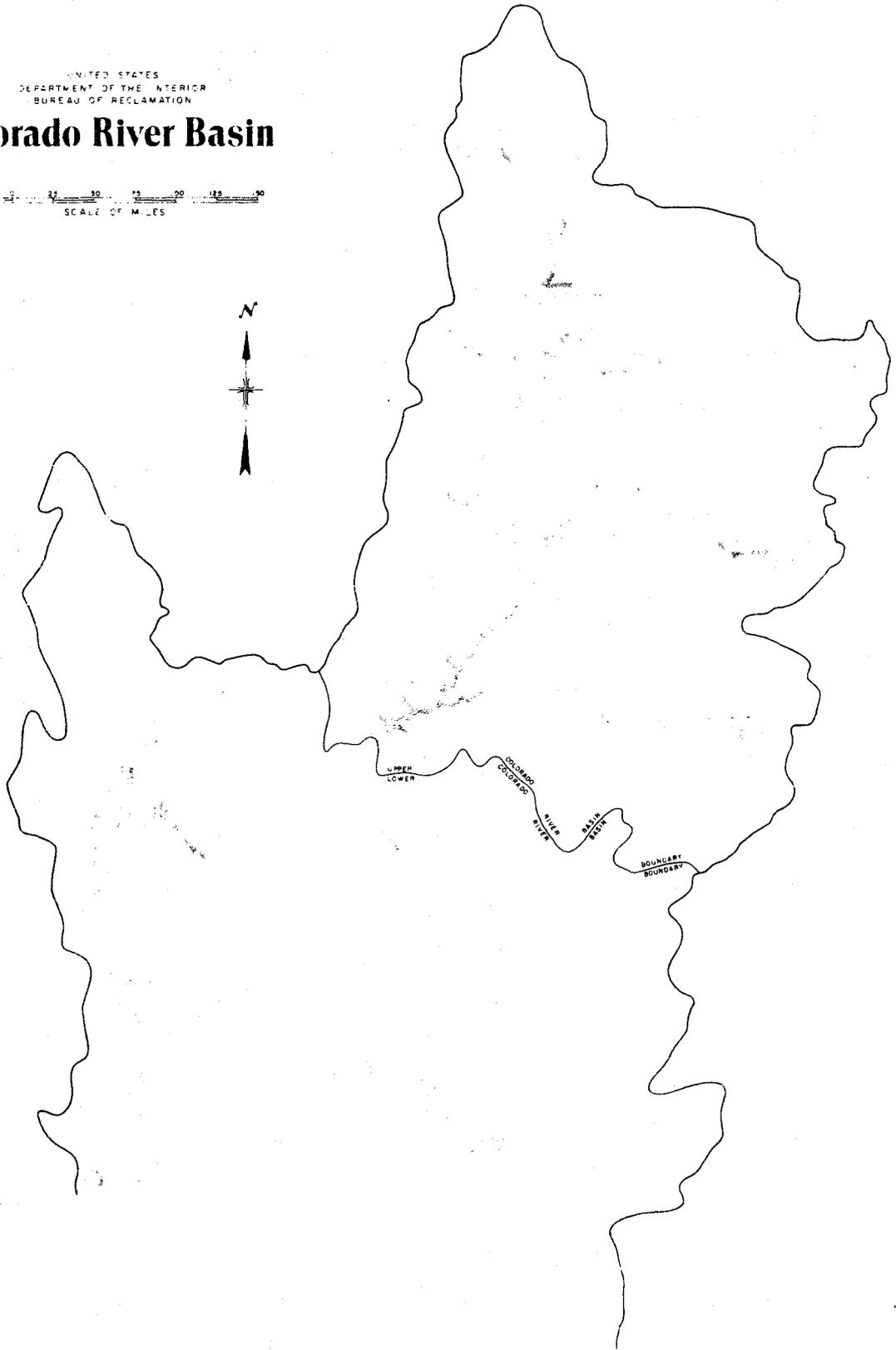
Operation of the Colorado River Basin  
Projected Operations

1973  
1974

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION

# Colorado River Basin

75 100 125 150 175 200  
SCALE OF MILES



# ANNUAL REPORT

## 1973 Operation of the Colorado River Basin 1974 Projected Operations

(prepared pursuant to the Colorado River Basin  
Project Act of 1968, Public Law 90-537)

U. S. Department of the Interior  
Rogers C. B. Morton, Secretary

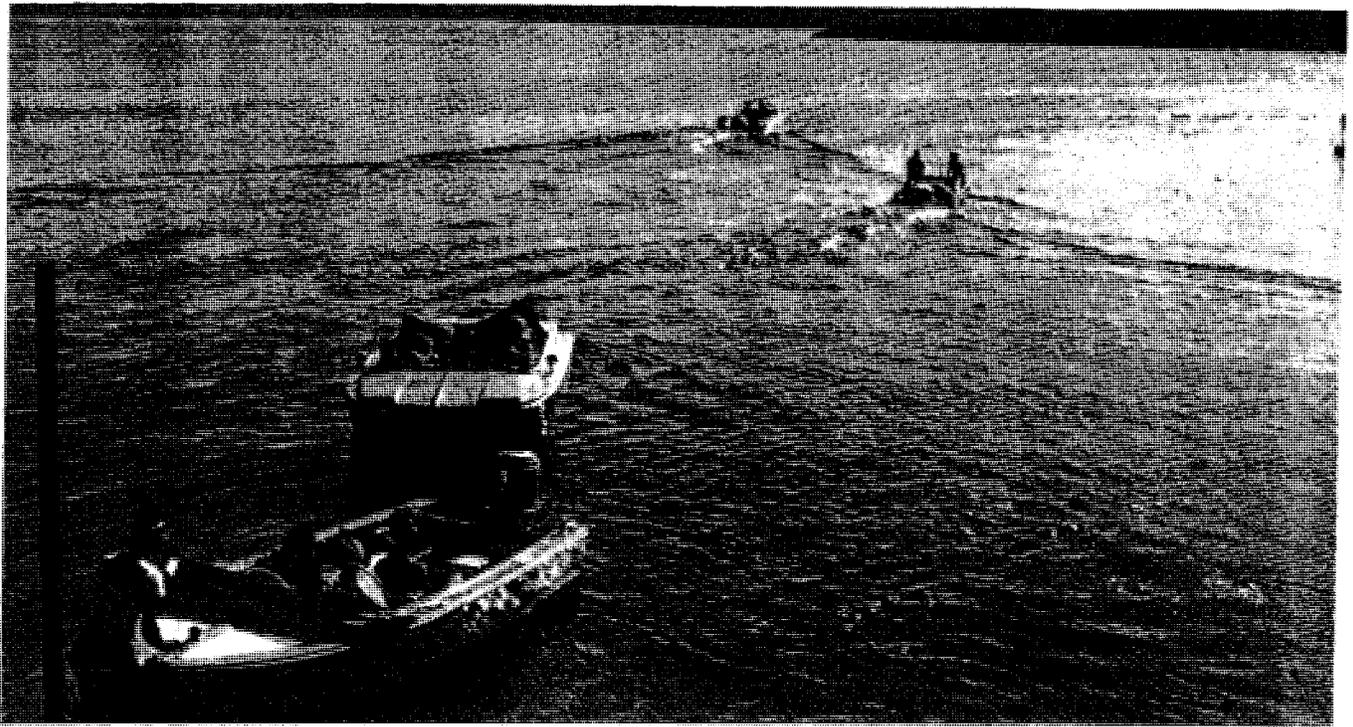
Bureau of Reclamation  
Gilbert G. Stamm, Commissioner



January 1974

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*Boating on Lake Powell*

## Authority for Report

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Pursuant to the Colorado River Basin Project Act (P.L. 90-537) of 1968, I am pleased to present to the Congress and to the Governors of the Colorado River Basin States, the third Annual Report on the Operation of the Colorado River.

This report describes the actual operation of the reservoirs in the Colorado River drainage constructed under the authority of the Colorado River Storage Project Act, the Boulder Canyon Project Act, and the Boulder Canyon Project Adjustment Act during water year 1973 and the projected operation of these reservoirs during water year 1974 under the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs published in the Federal Register June 10, 1970.

ROGERS C. B. MORTON  
Secretary, United States  
Department of the Interior

## Introduction

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The operation of the Colorado River during the past year and the projected operation for the current year reflect domestic use, irrigation, hydroelectric power generation, water quality control, fish and wildlife propagation, recreation, flood control, and Colorado River Compact requirements.

Storage and release of water from the Upper Basin reservoirs recognize all applicable laws and relevant factors governing the Colorado River, including the impoundment of water in the Upper Basin required by Section 602(a) of Public Law 90-537. The operation of the Lower Basin reservoirs reflects Mexican Treaty obligations and Lower Basin contractual commitments.



*Las Vegas Wash Marina, Lake Mead*

## **Actual Operations Under Criteria - Water Year 1973**

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Operation of the Colorado River during 1973 was based on a forecast of runoff. Starting January 1, the snowmelt runoff was forecast and the required release of stored water to meet demands was scheduled for each reservoir through September. At the beginning of each month thereafter through June, the forecast was revised based on precipitation and snow data collected during the month and the scheduled operation was revised accordingly.

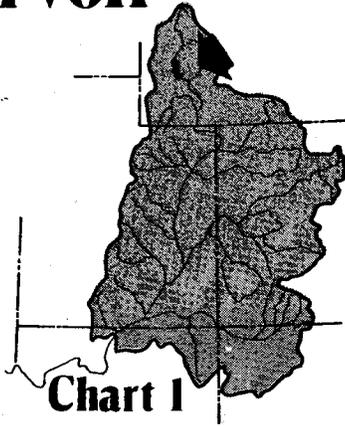
On February 27, 1973, the Federal District Court in Salt Lake City, Utah, caused the operation of the Colorado River to be altered by ordering the Secretary of the Interior to take such actions as were necessary to prevent the waters of Lake Powell

from rising above elevation 3,606 feet and entering Rainbow Bridge National Monument. This order remained in effect until a stay of execution was issued on May 1, 1973, by the Tenth Circuit Court of Appeals. During the time the order was in effect deviation from the operation criteria resulted in the release of about 1,425,000 acre-feet of water from the Upper Basin that would otherwise have been stored in Lake Powell.

A description of the actual operation of each of the reservoirs in the Colorado River Basin is given in the following paragraphs. Charts 1 through 9 show hydrographs of monthly outflow from the reservoirs and water surface elevation and active storage in the reservoirs for water year 1973.

## Upper Basin Reservoirs

# Fontenelle Reservoir



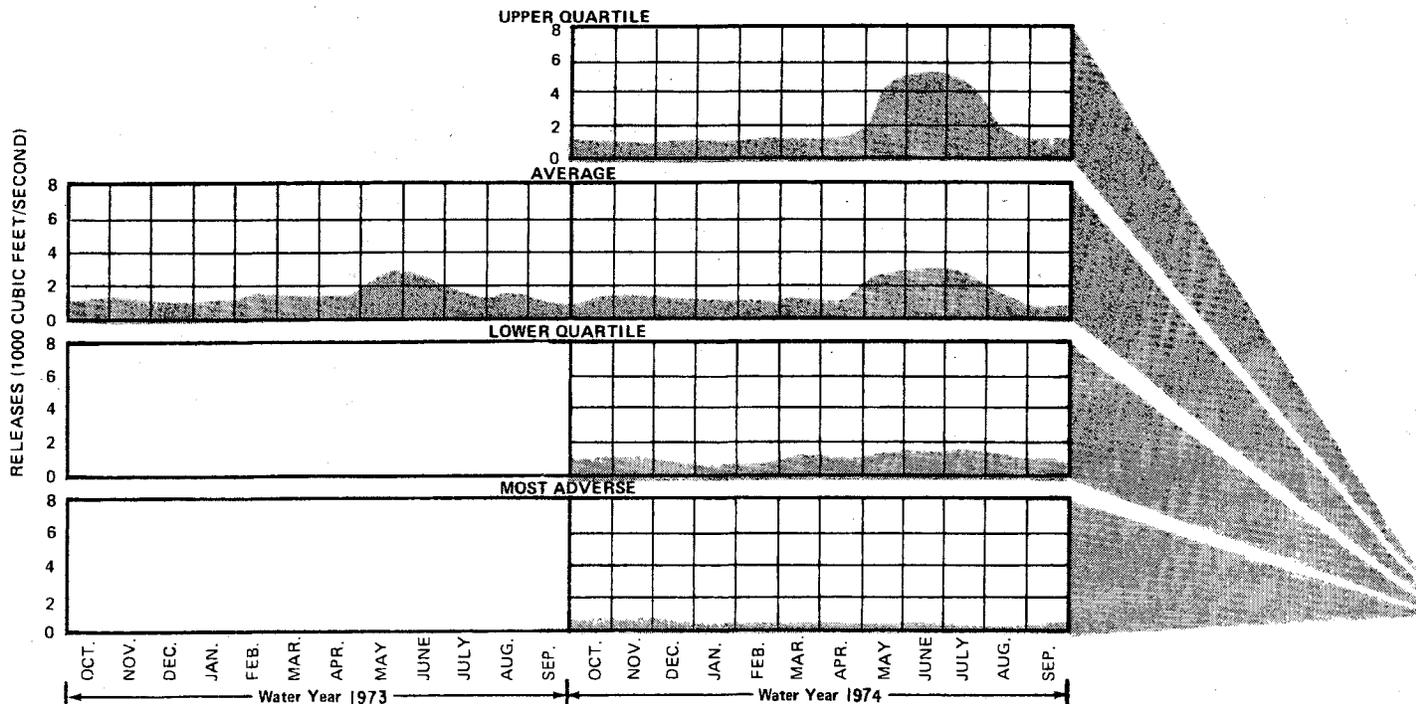
### STATISTICS ACTIVE STORAGE\*

RESERVOIR	(ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	344,834	6506
RATED HEAD	233,789	6491
MINIMUM POWER	194,962	6485
SURFACE AREA (FULL)	8058 ACRES	
RESERVOIR LENGTH (FULL)	18 MILES	
<b>POWER PLANT</b>		
NUMBER OF UNITS	1	
TOTAL CAPACITY	10,000	KILOWATTS

\*does not include 563 acre feet of dead storage below 6408 feet

During the past year, Fontenelle Reservoir was operated for hydroelectric generation, flood control, fish and wildlife enhancement, and for recreation. During the fall and winter of 1972-73, the reservoir was slowly reduced from elevation 6,505 feet at the beginning of the water year to a low prior to spring runoff of elevation 6,480 feet in April. The minimum release during the fall and winter was 700 cubic feet per second (c.f.s.) in order that power could be generated at the powerplant and fish flows maintained. Starting March 7, 1973, releases were gradually increased to 1,660 c.f.s. on March 13 to force the geese in the Seedska-dee National Bird Refuge to build their nests on higher ground. After the actual geese hatching and nesting period, releases were controlled to allow the reservoir to fill late in July. Special studies were made during the period September 6-30, 1973, to allow the Bureau of Sport Fisheries and Wildlife and the Wyoming Game and Fish Department to make a study of downstream fisheries. Releases varied from 300 to 1,600 c.f.s. The reservoir as of September 30, 1973, had 337,000 acre-feet of active storage at elevation 6,505 feet. (Chart 1)

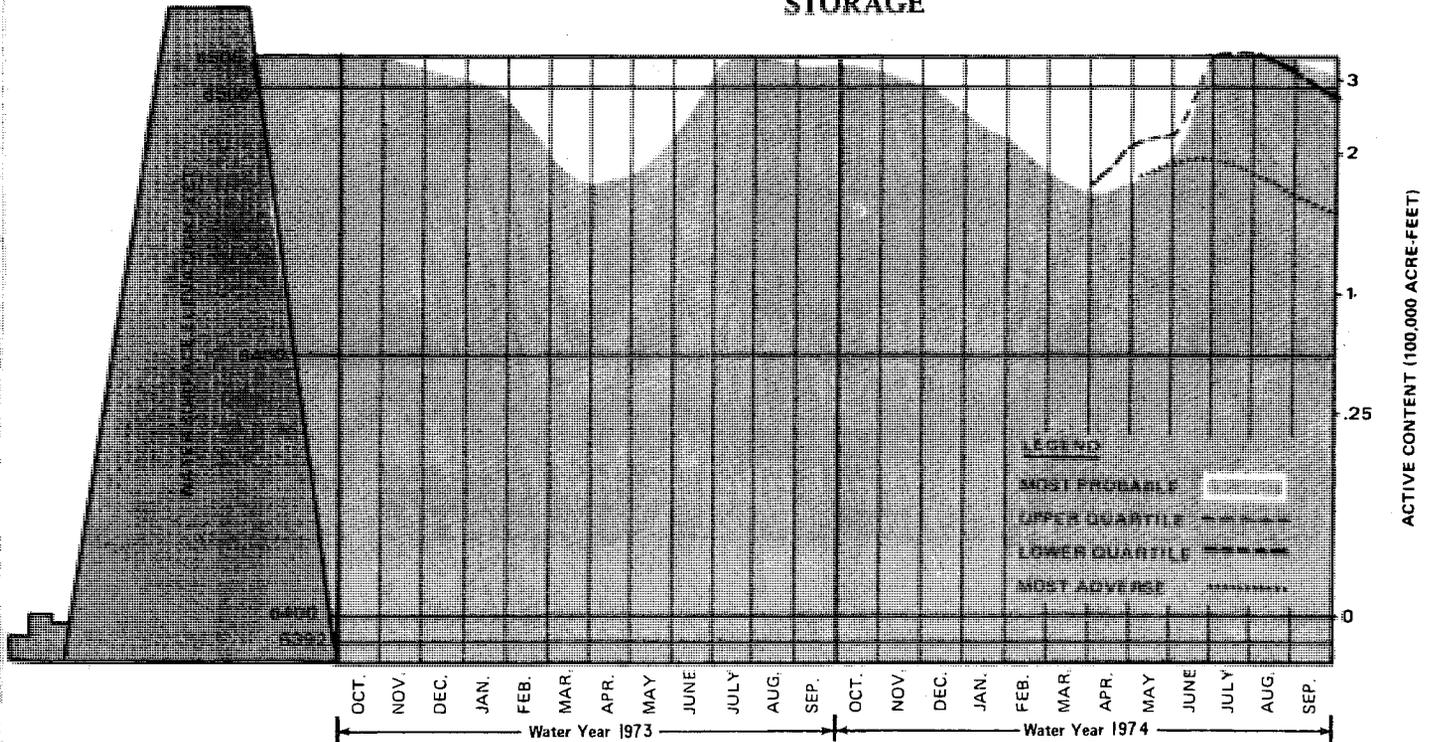
### OUTFLOW



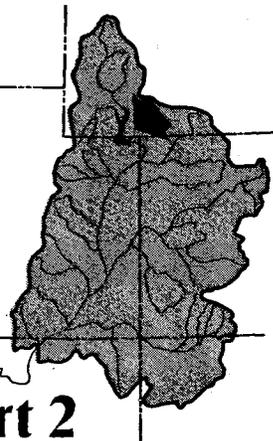


Fontenelle Dam and Reservoir, Seedskaadee Project, Wyoming

**STORAGE**



# Flaming Gorge Reservoir



**Chart 2**

**STATISTICS**

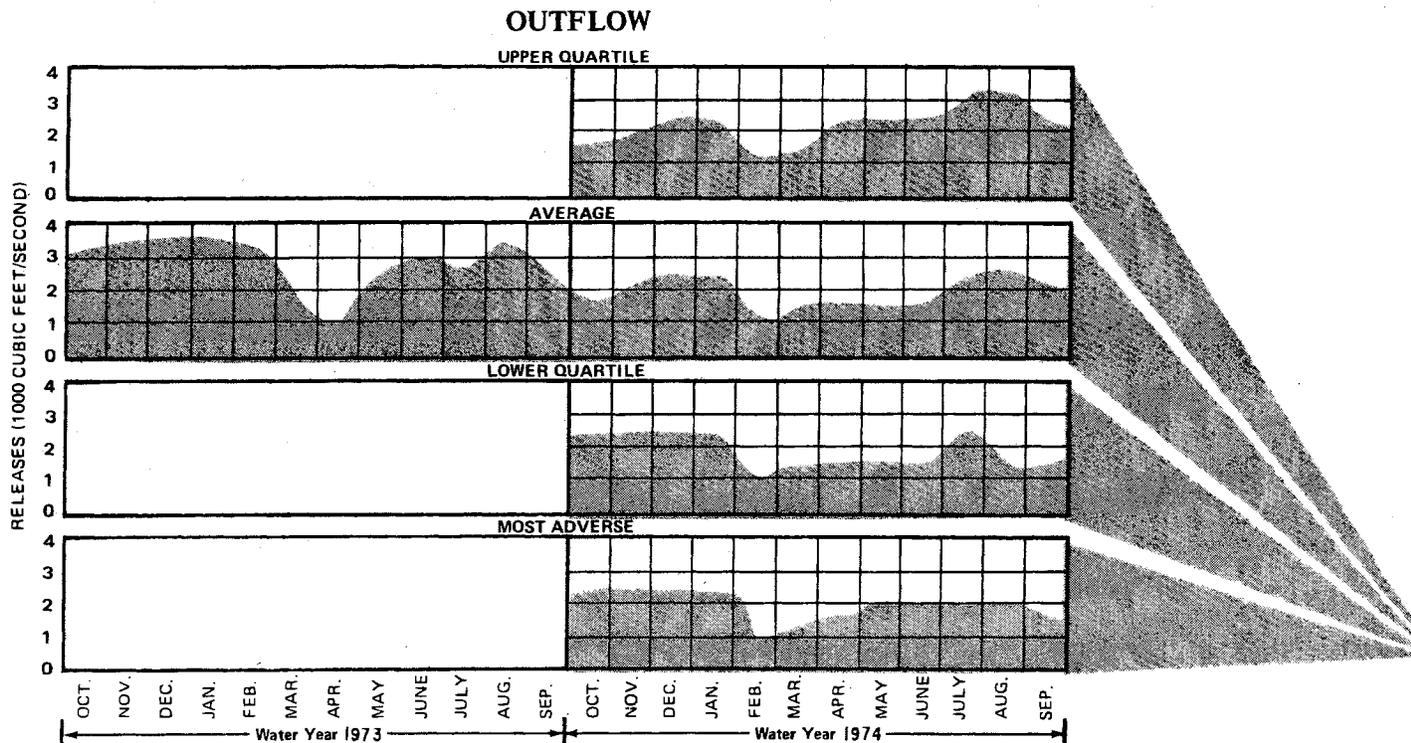
RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	3,749,000	6040
RATED HEAD	1,062,000	5946
MINIMUM POWER	233,000	5871
SURFACE AREA (FULL)	42,020 ACRES	
RESERVOIR LENGTH (FULL)	91 MILES	
<b>POWER PLANT</b>		
NUMBER OF UNITS	3	
TOTAL CAPACITY OF UNITS	108,000 KILOWATTS	

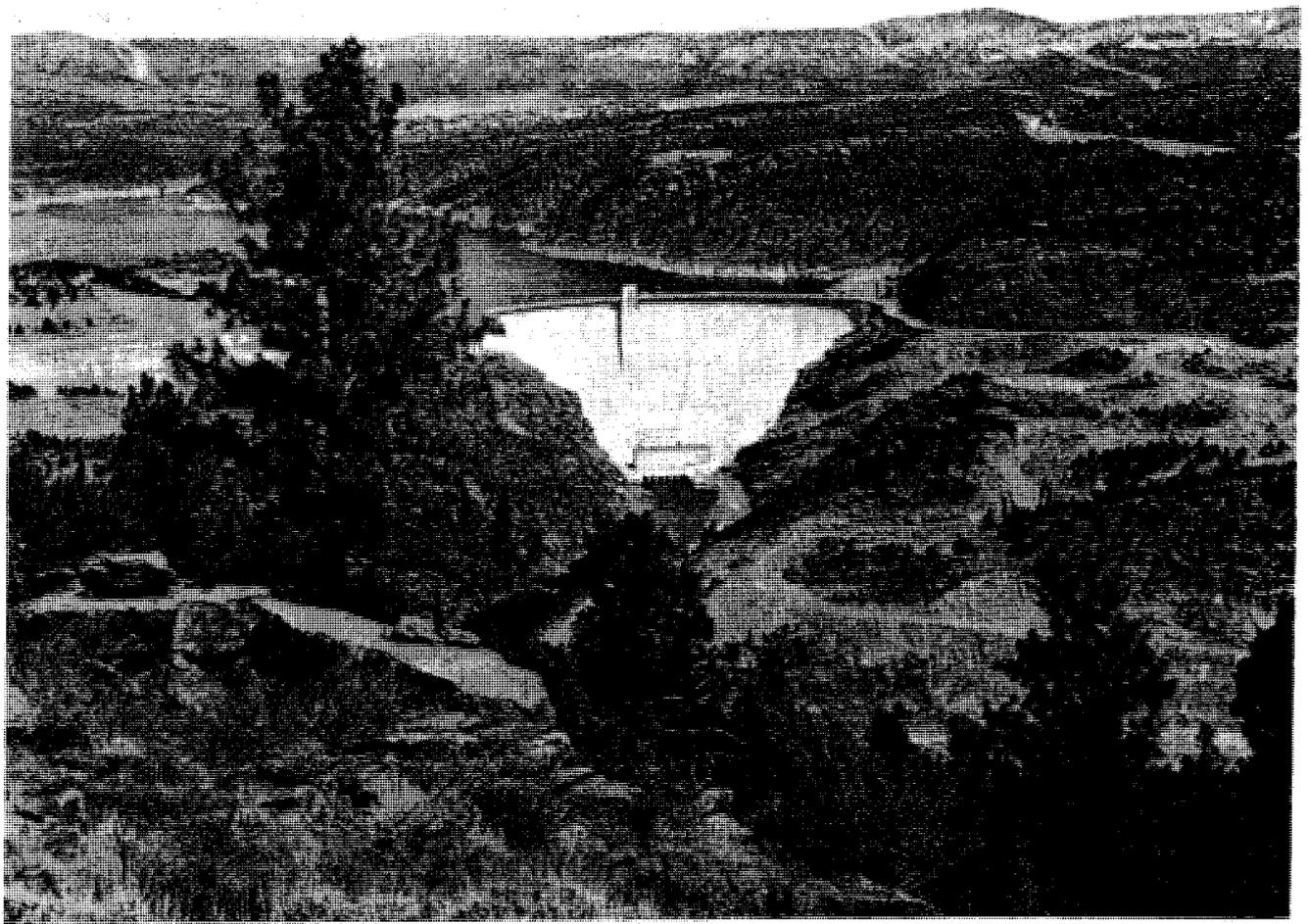
\*does not include 40,000 acre feet of dead storage below 5740 feet

Flaming Gorge Reservoir has been operated as part of the Colorado River Storage Project in accordance with governing compacts and laws to provide optimum power production, recreation opportunities, and fish and wildlife benefits.

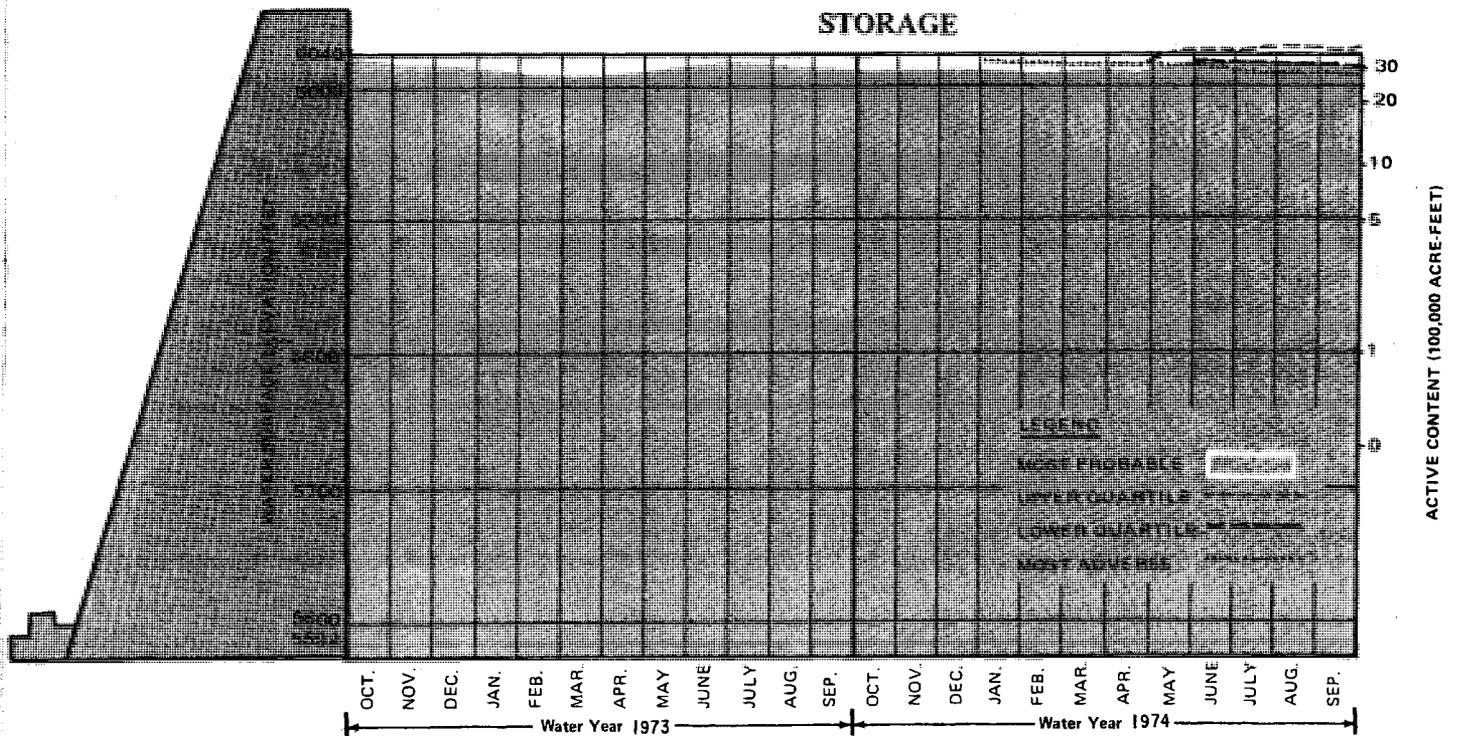
On September 30, 1972, Flaming Gorge was at elevation 6,033 feet with an active storage of 3,465,000 acre-feet. Releases for power production caused the reservoir to recede 17 feet during the fall and winter to elevation 6,016 feet. The April-July 1973 runoff above Flaming Gorge was 1,271,000 acre-feet, or 109 percent of the long-time average. With this runoff, Flaming Gorge reached a seasonal high elevation of 6,029 feet and an active storage of 3,323,000 acre-feet. The reservoir was held near the seasonal maximum through the recreation season. (Chart 2)

Reservoir releases were higher than normal during the summer season. This was a result of coordinated operation with other reservoirs so we could reduce Glen Canyon releases to meet the operation criteria.

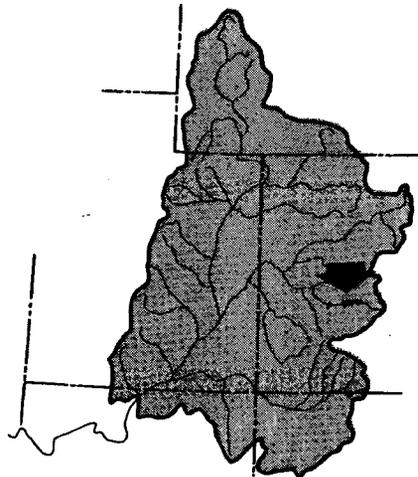




*Flaming Gorge Dam and Reservoir, Flaming Gorge Unit, Colorado River Storage Project, Utah-Wyoming*



# Curecanti Unit



At the end of September 1972 Blue Mesa Reservoir had 511,000 acre-feet of active storage and a water surface elevation of 7,481 feet. The reservoir was gradually drawn down to elevation 7,450 feet by March 1, 1973, with a content of 315,000 acre-feet. During April-July 1973, inflow to Blue Mesa was 762,000 acre-feet, with a 1973 water year total of 1,020,000 acre-feet. This amount of water caused the reservoir to fill at elevation 7,519 feet and an active storage of 829,300 acre-feet in July. During water year 1973, a minimum flow of 200 c.f.s. was maintained below Gunnison Tunnel.

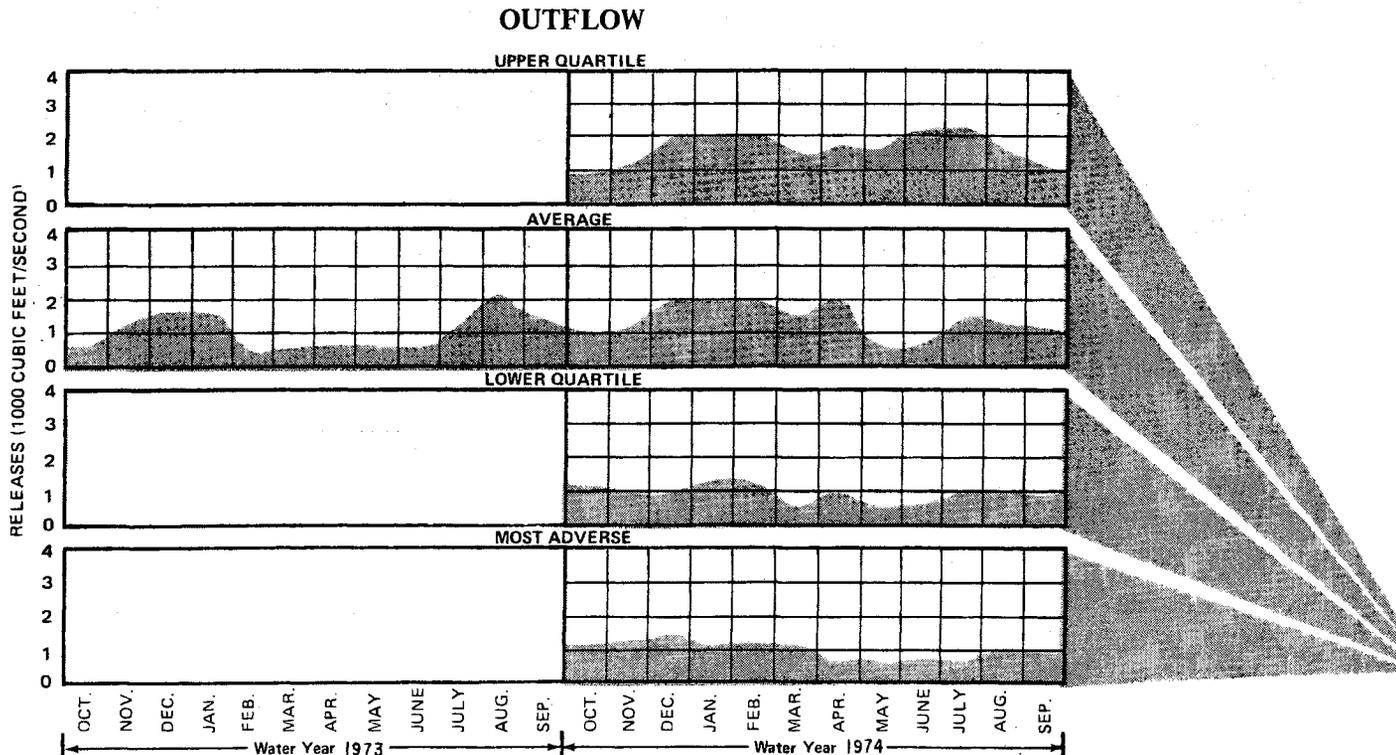
The March 1, 1973, forecast of the April-July 1973 inflow to Blue Mesa was 780,000 acre-feet. The flood control diagram showed that the reservoir could have remained full the remainder of the snowmelt season; therefore, the operation of Blue Mesa did not include releases for flood control. (Chart 3)

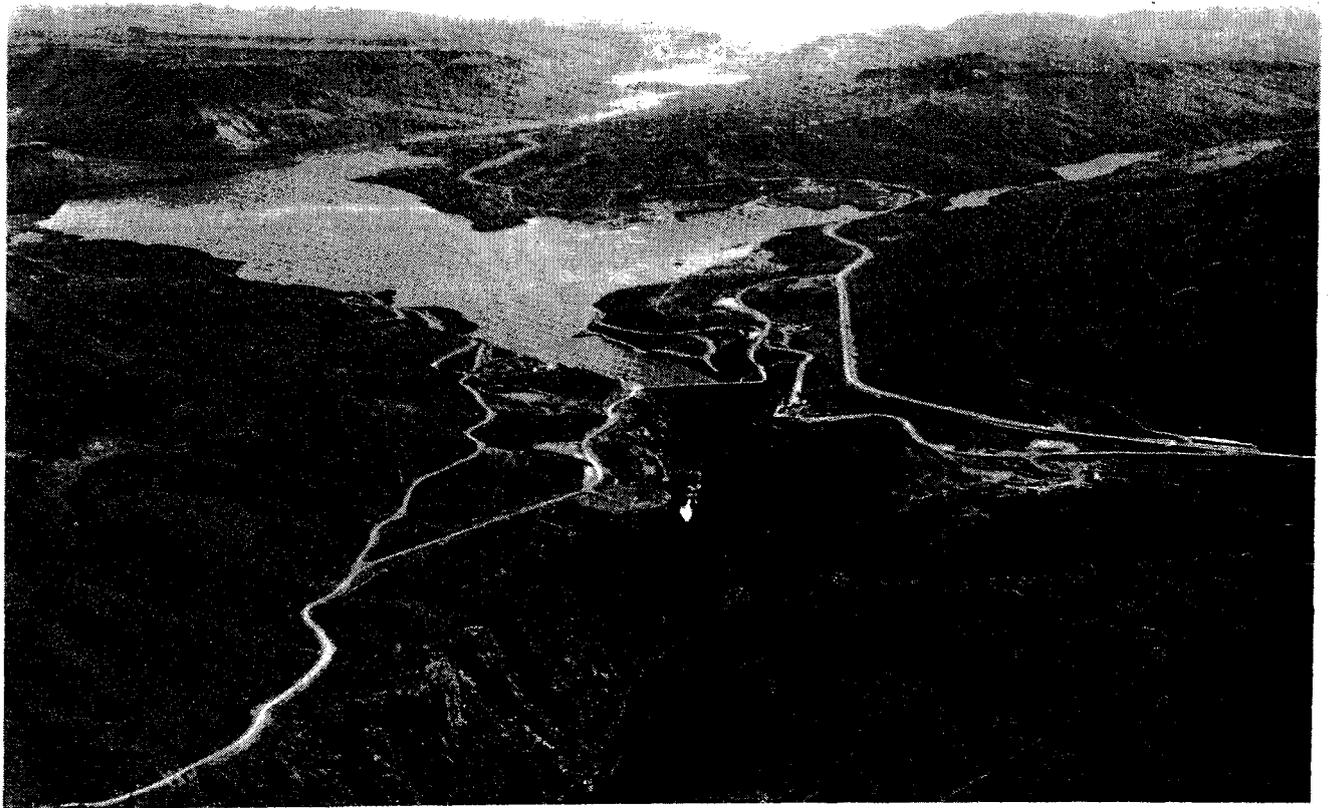
On May 11, 1973, Blue Mesa releases were reduced to zero in order to reduce flooding of the agricultural area near Delta, Colorado. All inflow to Blue Mesa was stored until mid-April when the gain of the river below the Curecanti Unit began to subside. Flows in the Delta area were held to a maximum of about 9,000 c.f.s., thus reducing the peak by about 5,000 c.f.s.

### Chart 3/ Blue Mesa Reservoir

STATISTICS		
ACTIVE STORAGE*		
RESERVOIR	(ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	829,523	7519
RATED HEAD	249,395	7438
MINIMUM POWER	81,070	7393
SURFACE AREA (FULL)	9180 ACRES	
RESERVOIR LENGTH (FULL)	24 MILES	
POWER PLANT		
NUMBER OF UNITS	2	
TOTAL CAPACITY OF UNITS	60,000 KILOWATTS	

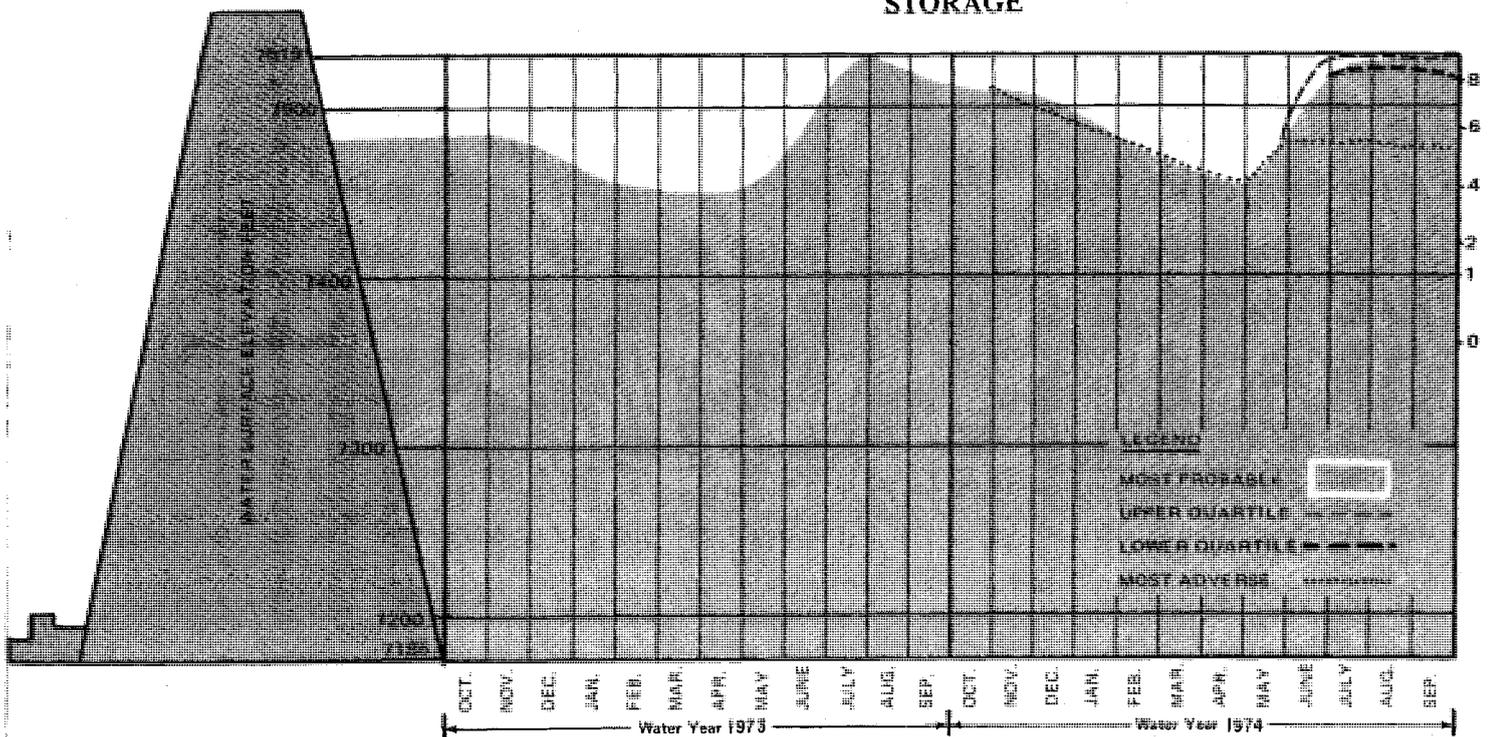
\*does not include 111,232 acre feet of dead storage below 7358 feet





*Blue Mesa Dam and Reservoir, Curecanti Unit, Colorado River Storage Project, Colorado*

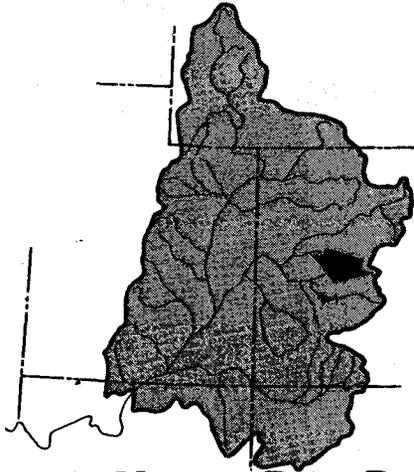
**STORAGE**



# Curecanti Unit

Morrow Point Reservoir was essentially full during water year 1973. On September 30, 1973, the reservoir contained 115,000 acre-feet of active storage at elevation 7,158 feet. Its inflow is extensively controlled by the larger Blue Mesa Reservoir which is upstream.

Morrow Point Reservoir will normally be operated at or near full capacity regardless of the amount of snowmelt runoff. (Chart 4)

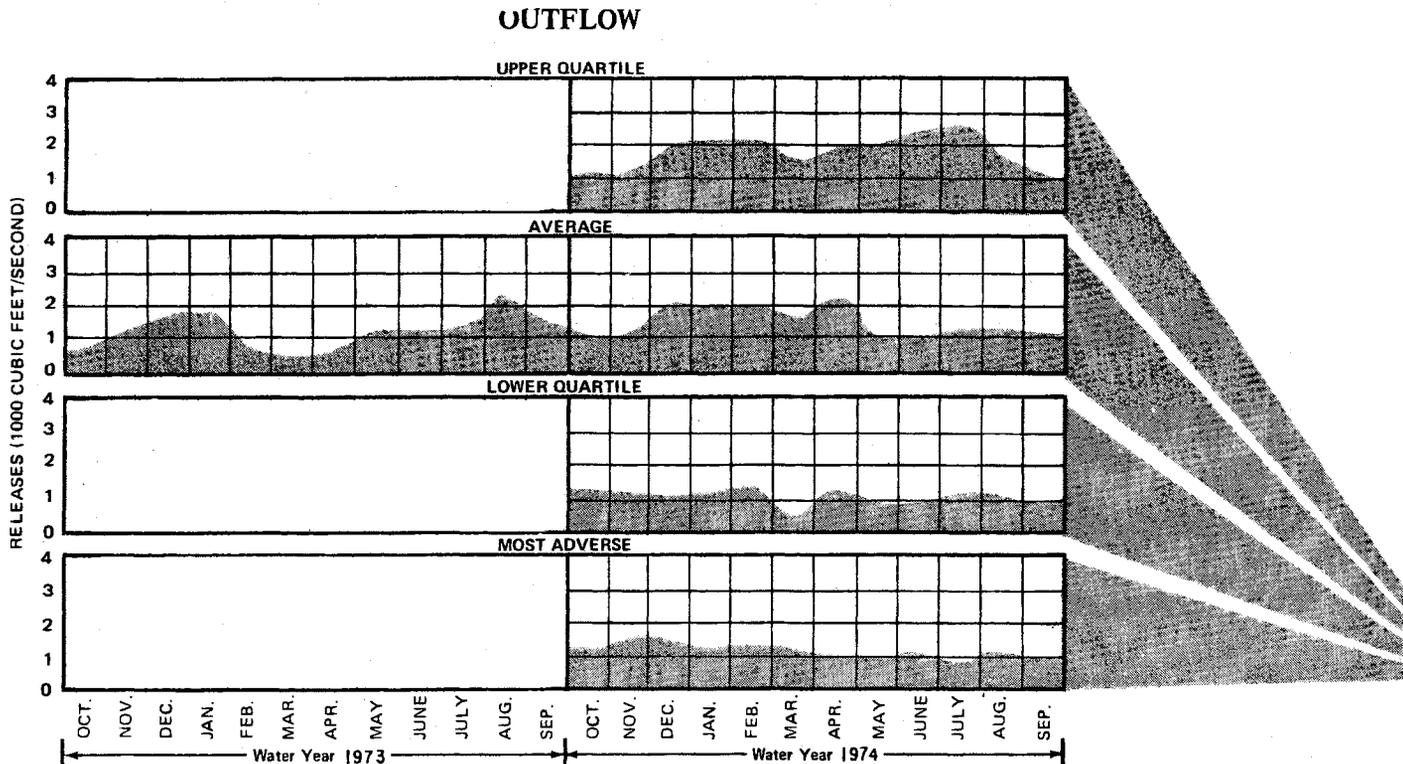


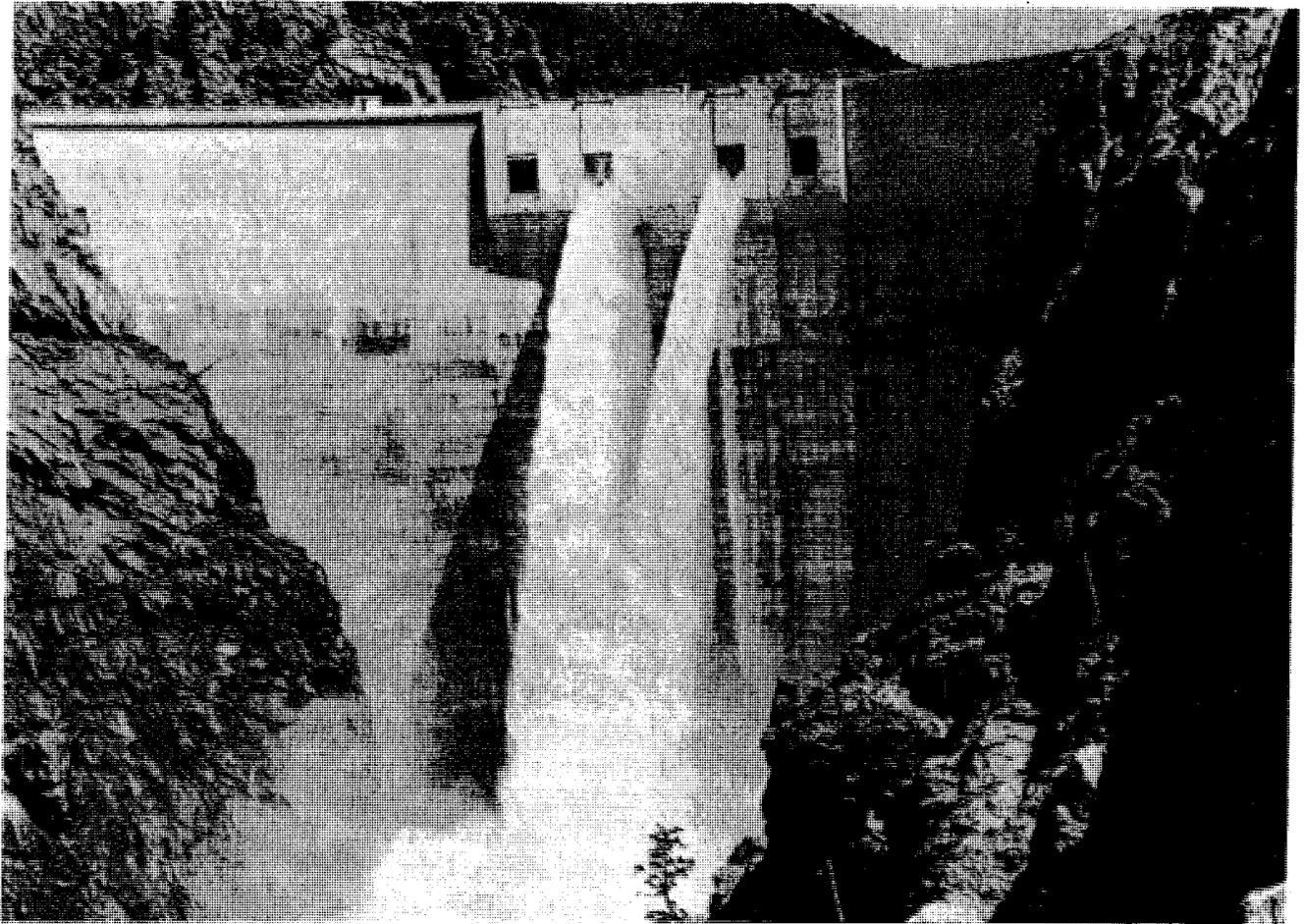
## Chart 4 / Morrow Point Reservoir

### STATISTICS

RESERVOIR	ACTIVE STORAGE*	
	(ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	117,025	7160
RATED HEAD	79,805	7108
MINIMUM POWER	74,905	7100
SURFACE AREA (FULL)	817 ACRES	
RESERVOIR LENGTH (FULL)	11 MILES	
<b>POWER PLANT</b>		
NUMBER OF UNITS	2	
TOTAL CAPACITY OF UNITS	120,000 KILOWATTS	

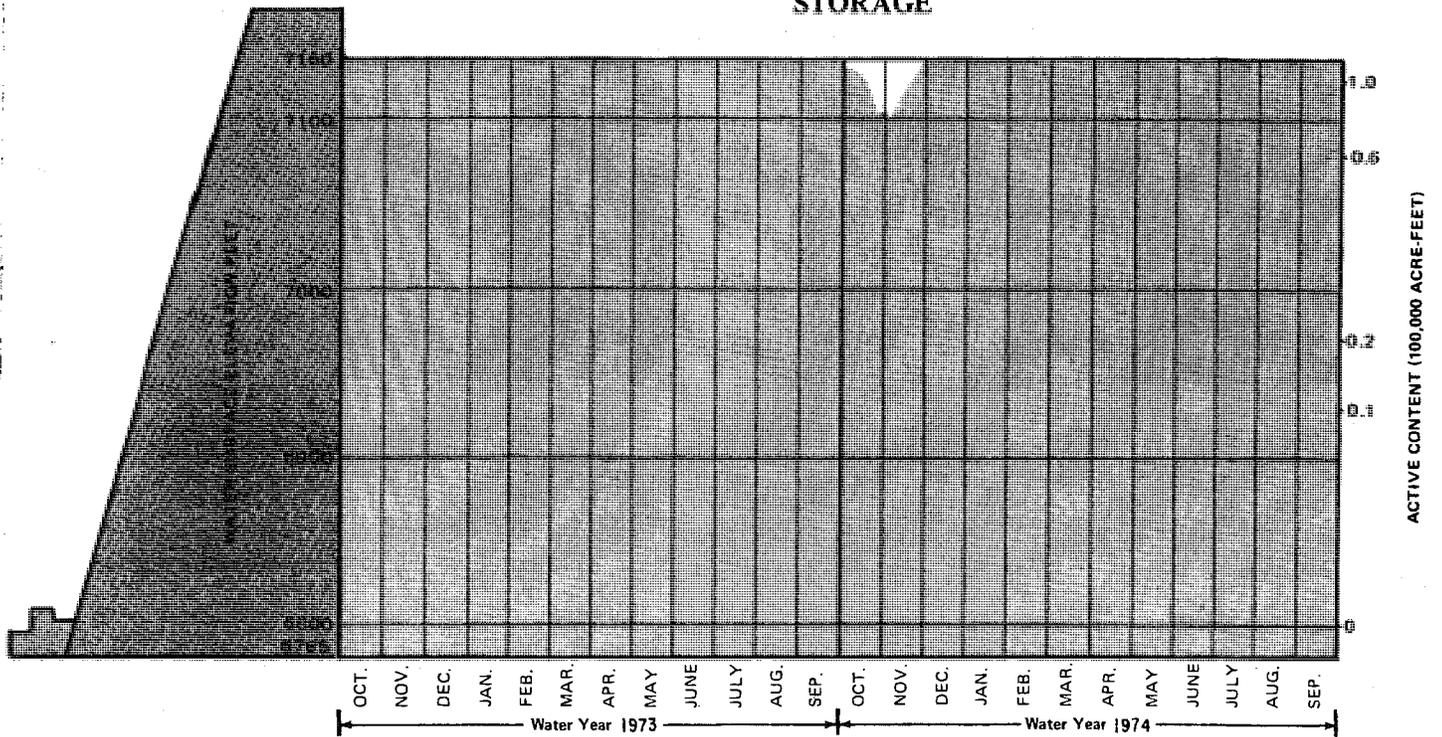
\*does not include the 165 acre feet of dead storage below 6808 feet



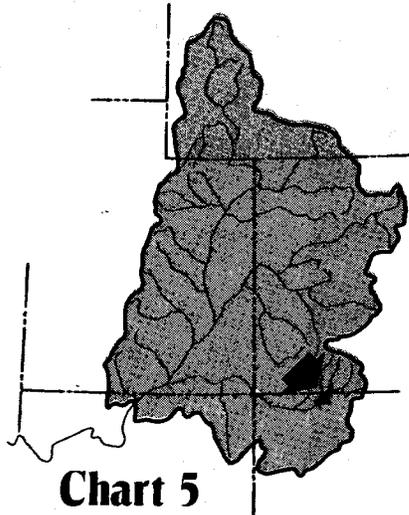


*Morrow Point Dam and Reservoir, Curecanti Unit, Colorado River Storage Project, Colorado*

**STORAGE**



# Navajo Reservoir



**Chart 5**

During water year 1973 Navajo Reservoir was kept within the limits specified by the Bureau of Reclamation in its interim operation rules. The reservoir was lowered to elevation 6,018 feet during the winter of 1972 and spring of 1973. During the early part of the spring runoff storage was accumulated as rapidly as possible with releases for downstream uses of 500 c.f.s. The actual April-July inflow to Navajo Reservoir was 1,363,000 acre-feet or 163 percent of the long-time April-July runoff average above Navajo. The high runoff caused the reservoir to reach an all-time high elevation of 6,087 feet, 2 feet above normal maximum water surface elevation, with an active storage of 1,730,000 acre-feet. Maximum releases from the reservoir were about 5,440 c.f.s. during the runoff season.

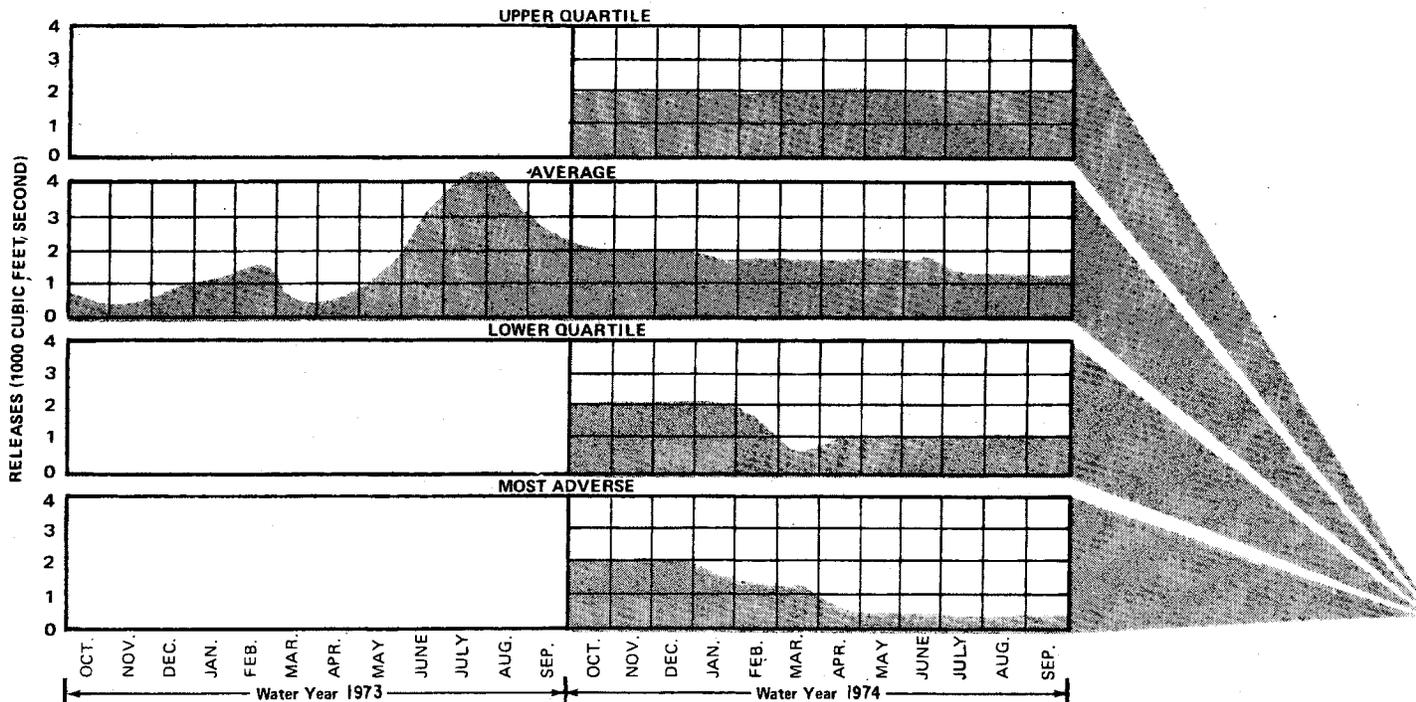
Navajo Reservoir is operated under a formal flood control plan. On March 1, 1973, Navajo Reservoir had 891,000 acre-feet of storage. The April-July inflow forecast on March 1 was 830,000 acre-feet. The current flood control diagram allowed the reservoir to be full with an active storage of 1,696,400 acre-feet during the entire 1973 snowmelt runoff season for

**STATISTICS**

RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	1,696,400	6085
INACTIVE STORAGE	660,500	5990
SURFACE AREA (FULL)	15,610 ACRES	
RESERVOIR LENGTH (FULL)	33 MILES	

\*does not include 12,600 acre feet of dead storage below elevation 5775 feet

**OUTFLOW**



the March 1 forecasts and subsequent forecasts made during the snowmelt runoff period. Therefore, the scheduled operation of the reservoir did not include any releases specifically

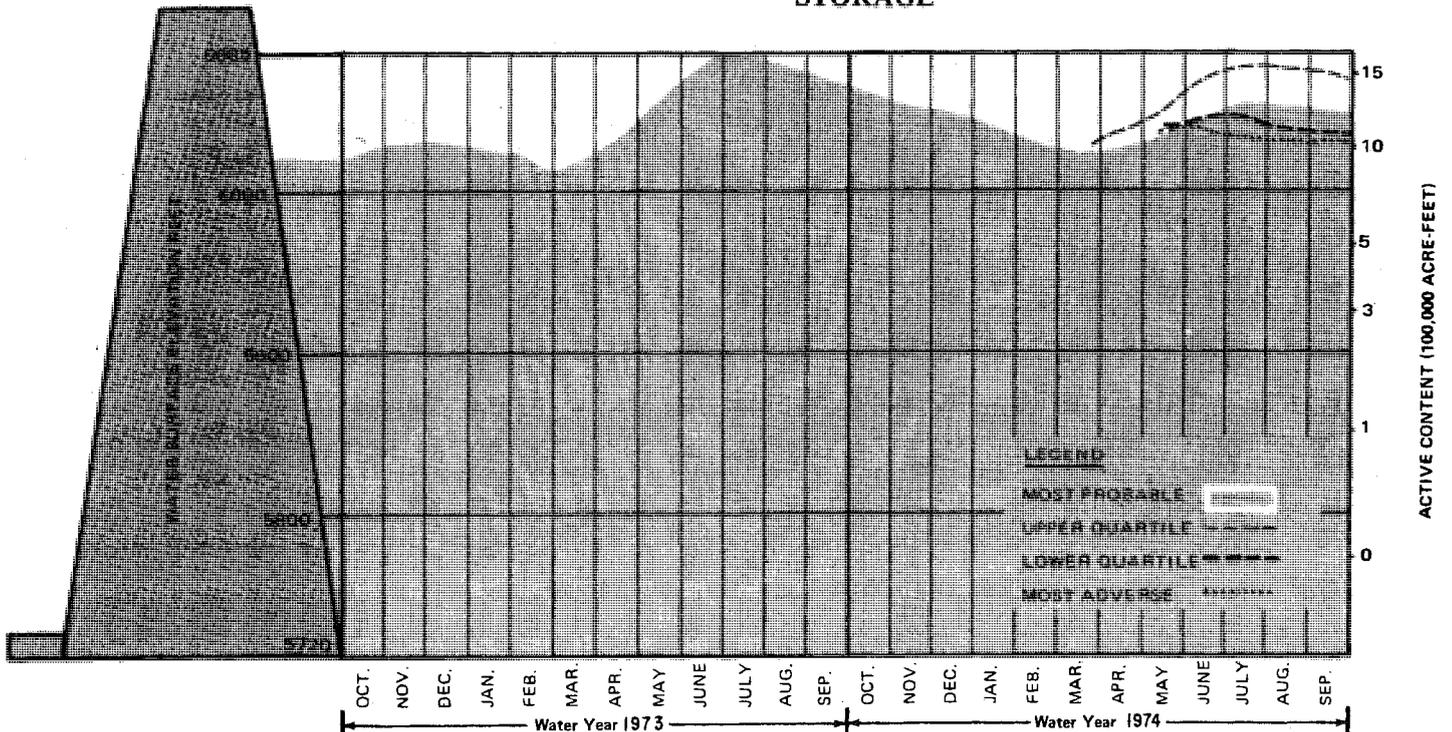
required for flood control. (Chart 5)

Releases were scheduled to control downstream flows to the minimum level practical order to minimize bank erosion.

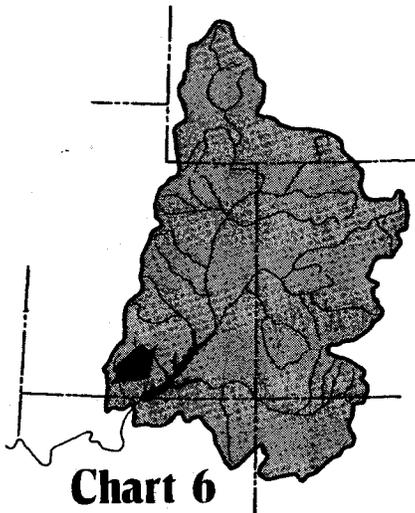


*Navajo Dam and Reservoir, Navajo Unit, Colorado River Storage Project, New Mexico-Colorado*

**STORAGE**



# Glen Canyon Dam Lake Powell



**Chart 6**

**STATISTICS**

RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	25,002,000	3700
RATED HEAD	9,428,000	3570
MINIMUM POWER	4,126,000	3490
SURFACE AREA (FULL)	161,390 ACRES	
RESERVOIR LENGTH (FULL)	186 MILES	

**POWER PLANT**

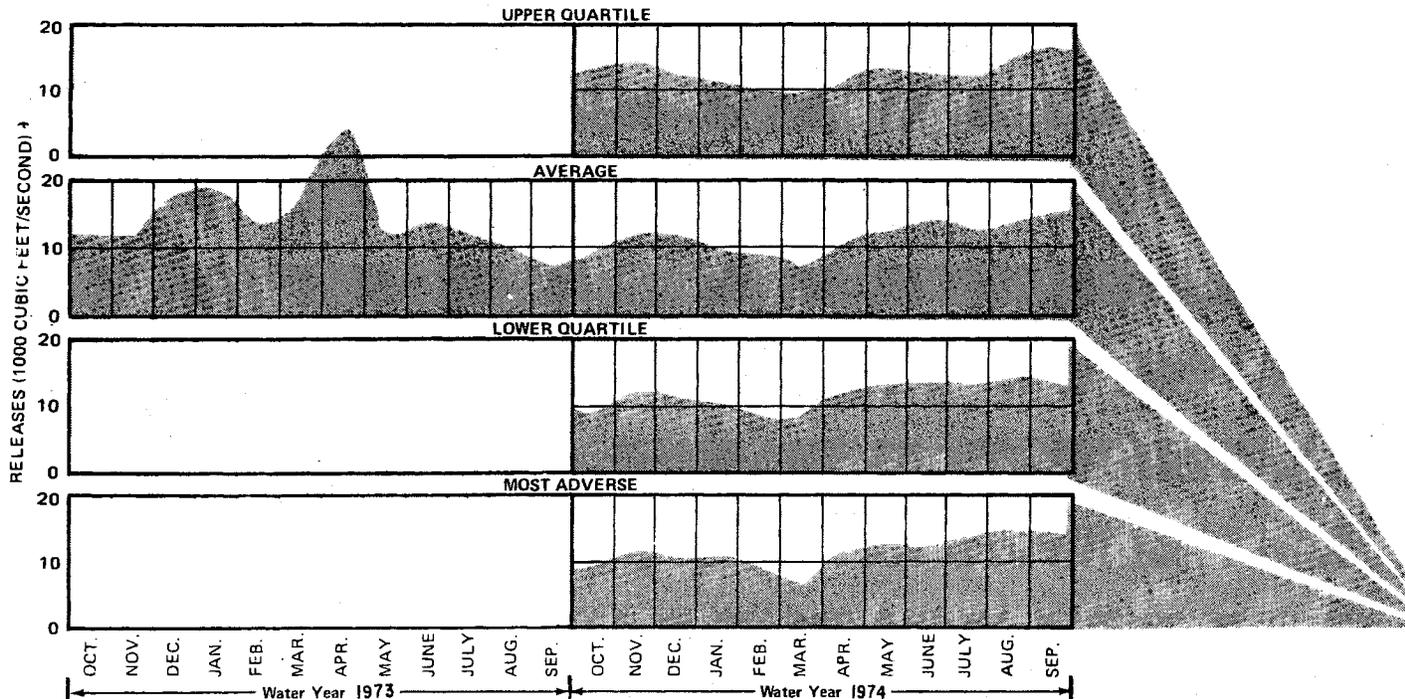
NUMBER OF UNITS	8
TOTAL CAPACITY OF UNITS	900,000 KILOWATTS

\*does not include 1,998,000 acre feet of dead storage below 3370 feet

Lake Powell has been operated during water year 1973 as part of the Colorado River Storage Project in accordance with governing compacts and laws to provide optimum power production, recreation opportunities, and fish and wildlife benefits. The order issued by the Federal District Court in Salt Lake City on February 27, 1973, to limit the storage of water in Lake Powell to a maximum level of elevation 3,606 feet, the boundary of Rainbow Bridge National Monument, resulted in the release to the Lower Basin of about 1,425,000 acre-feet of water that under the existing criteria promulgated under P.L. 90-537 would have been stored in Lake Powell. Consequently, a total of 10,111,000 acre-feet was released from Lake Powell during water year 1973, with 10,141,000 passing the Compact Point at Lee Ferry, Arizona. The 1964-73 10-year delivery to the Lower Basin was 82,930,000 acre-feet.

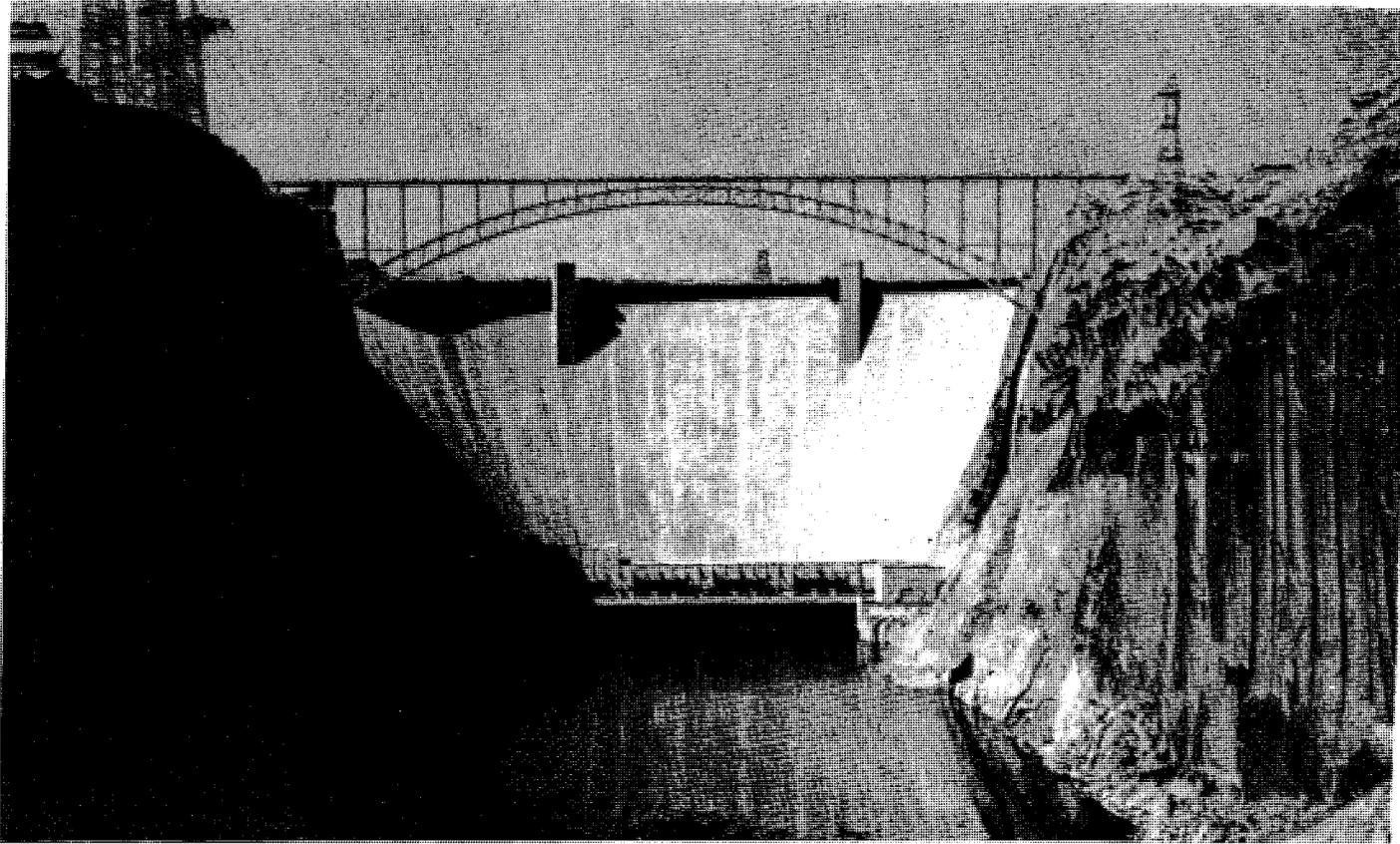
On September 30, 1972, the surface of Lake Powell was at elevation 3,603 feet with an active storage of 12,488,000 acre-feet. An all-time high water elevation occurred on September 19,

## OUTFLOW



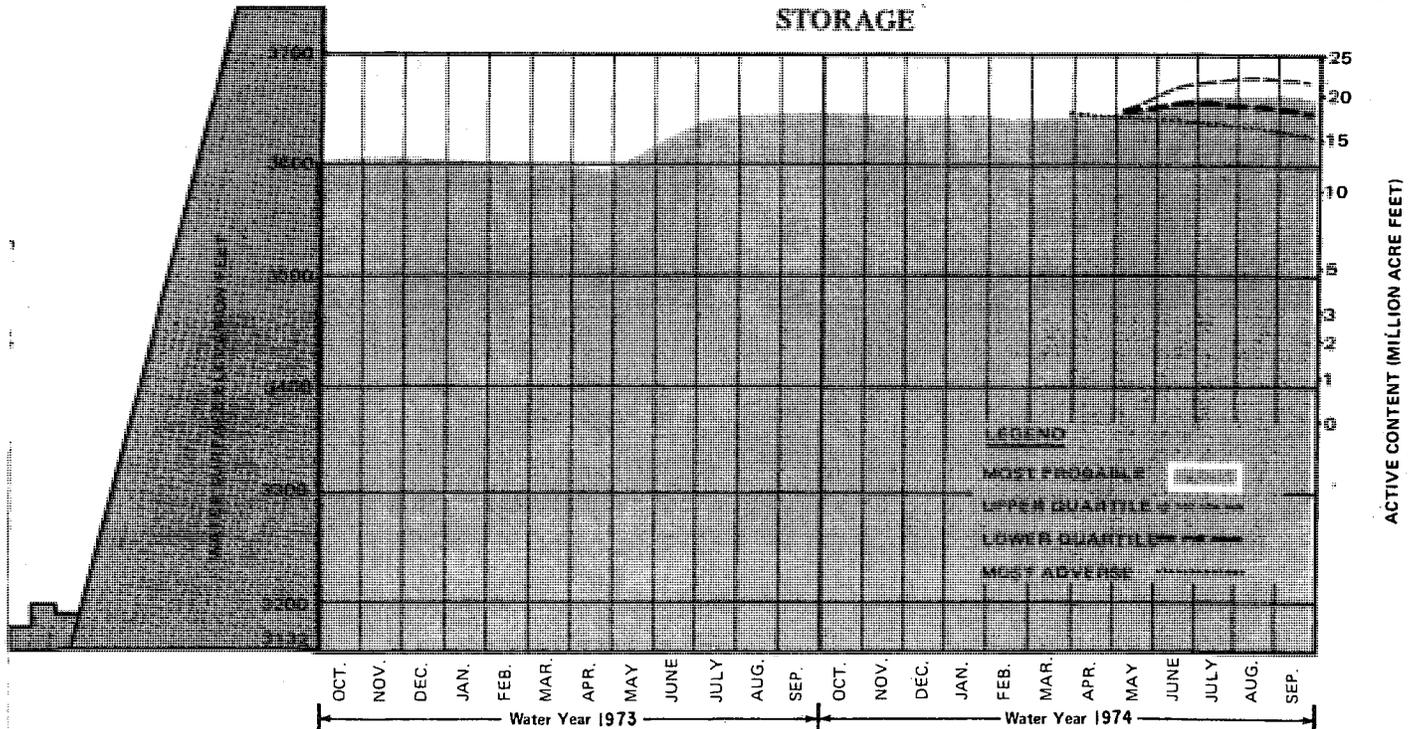
1973, when the reservoir contained 17,306,000 acre-feet of active storage at elevation 3,646 feet. This is about 24 feet higher than the former all-time high that occurred 2 years ago.

The April-July 1973 runoff for the river above the gage at Lees Ferry, Arizona, undepleted by CRSP reservoirs, was 11.4 million acre-feet or 1 percent of the 1906-68 average. (Chart 6)



Glen Canyon Dam and Lake Powell. Glen Canyon Unit, Colorado River Storage Project, Arizona-Utah

**STORAGE**



## Lower Basin Reservoirs

# Hoover Dam Lake Mead

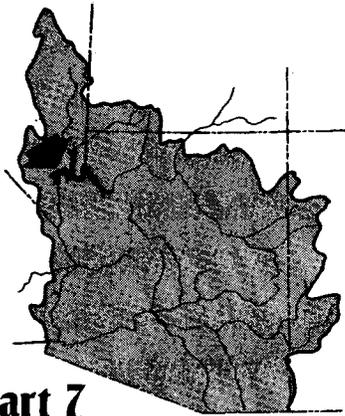


Chart 7

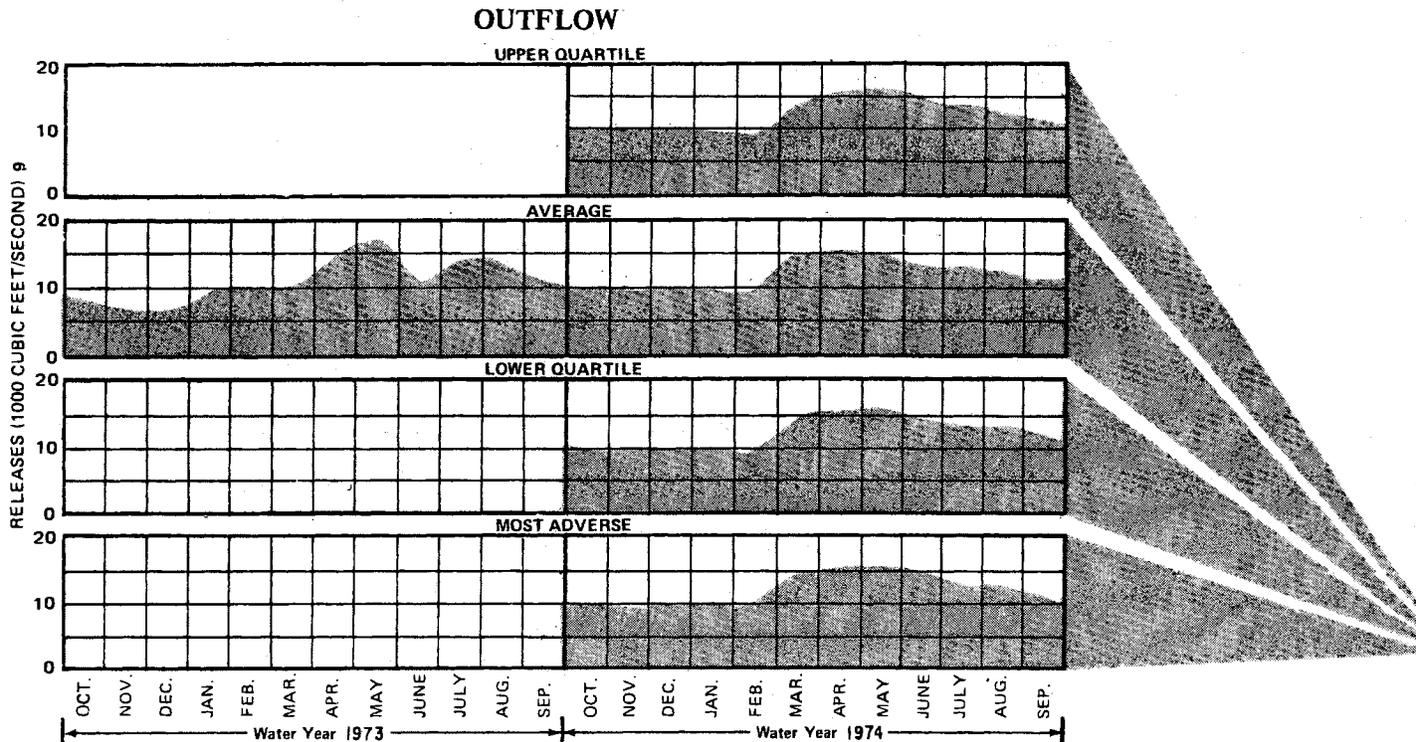
STATISTICS		
RESERVOIR	ACTIVE STORAGE*	
	(ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	27,377,000	1229
RATED HEAD	13,653,000	1123
MINIMUM POWER POOL	10,024,000	1083
SURFACE AREA (FULL)	162,700 ACRES	
RESERVOIR LENGTH (FULL)	115 MILES	
POWER PLANT		
NUMBER OF UNITS	17	
TOTAL CAPACITY OF UNITS	1,344,800 KILOWATTS	

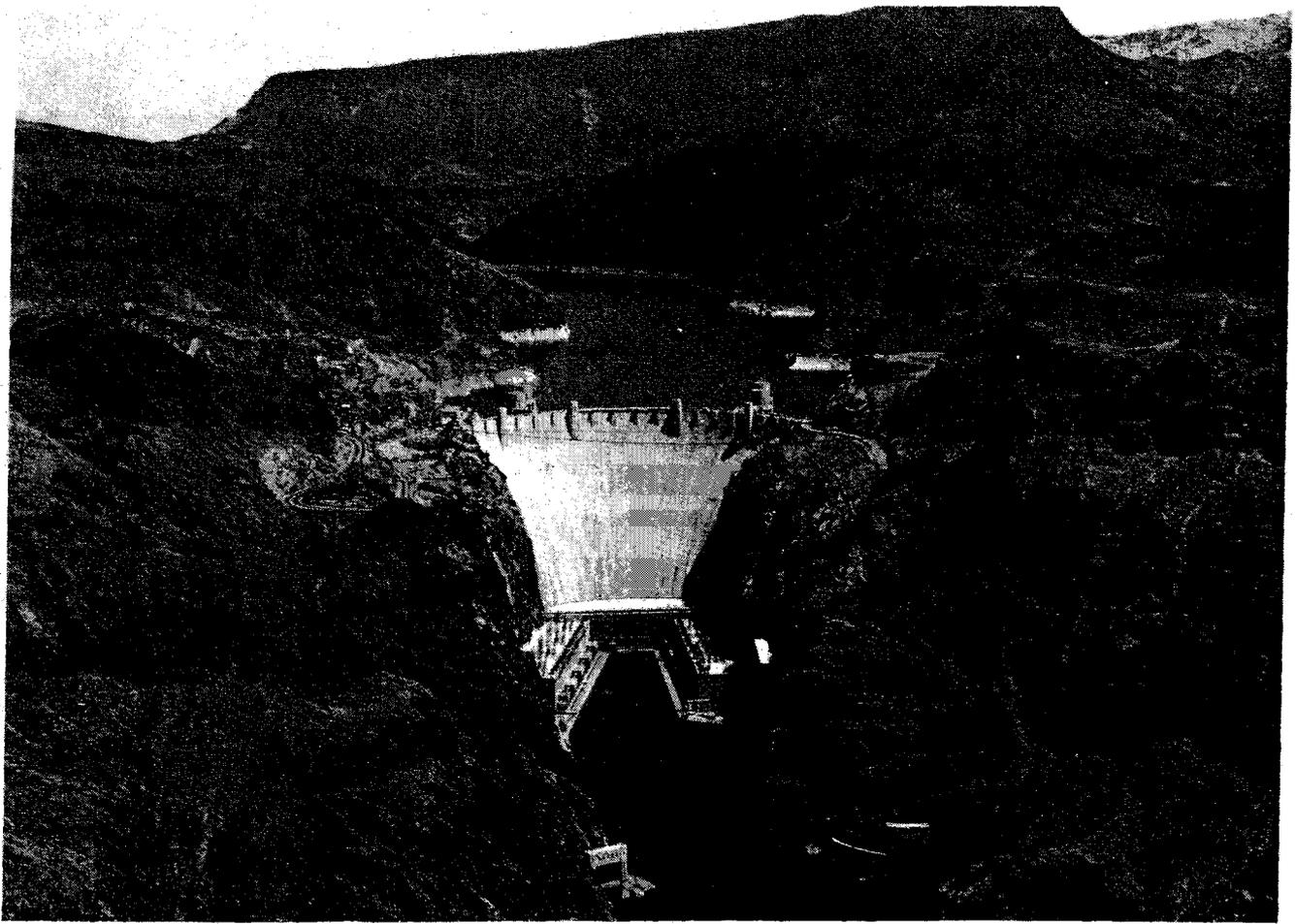
\*does not include 2,378,000 acre-feet of dead storage below elevation 895 feet

Lake Mead at the beginning of water year 1973 had a water surface level of 1,158 feet and an active storage of 17,451,000 acre-feet. During the water year releases were made to meet downstream water use requirements in the United States and Mexico, programmed levels of Lake Mohave and Havasu, and transit losses which include river and reservoir evaporation, uses by phreatophytes, changes in bank storage, unmeasured inflows and diversions, etc. The total release from Lake Mead through Hoover Dam was 7,937,000 acre-feet. At the end of the water year, Lake Mead had a water surface elevation of 1,180 feet and an active storage of 20,176,000 acre-feet, which reflects an increase in storage during the water year of 2,725,000 acre-feet. On September 30, 1973, the active storage of Lake Mead was 2,892,000 acre-feet greater than the active storage in Lake Powell.

Lake Mead is the only reservoir on the Colorado River in which a specified space is exclusively allocated for mainstream flood control. Flood control regulations have been published. These regulations take into account effective space in CRSP reservoirs as well as in Lake Mead.

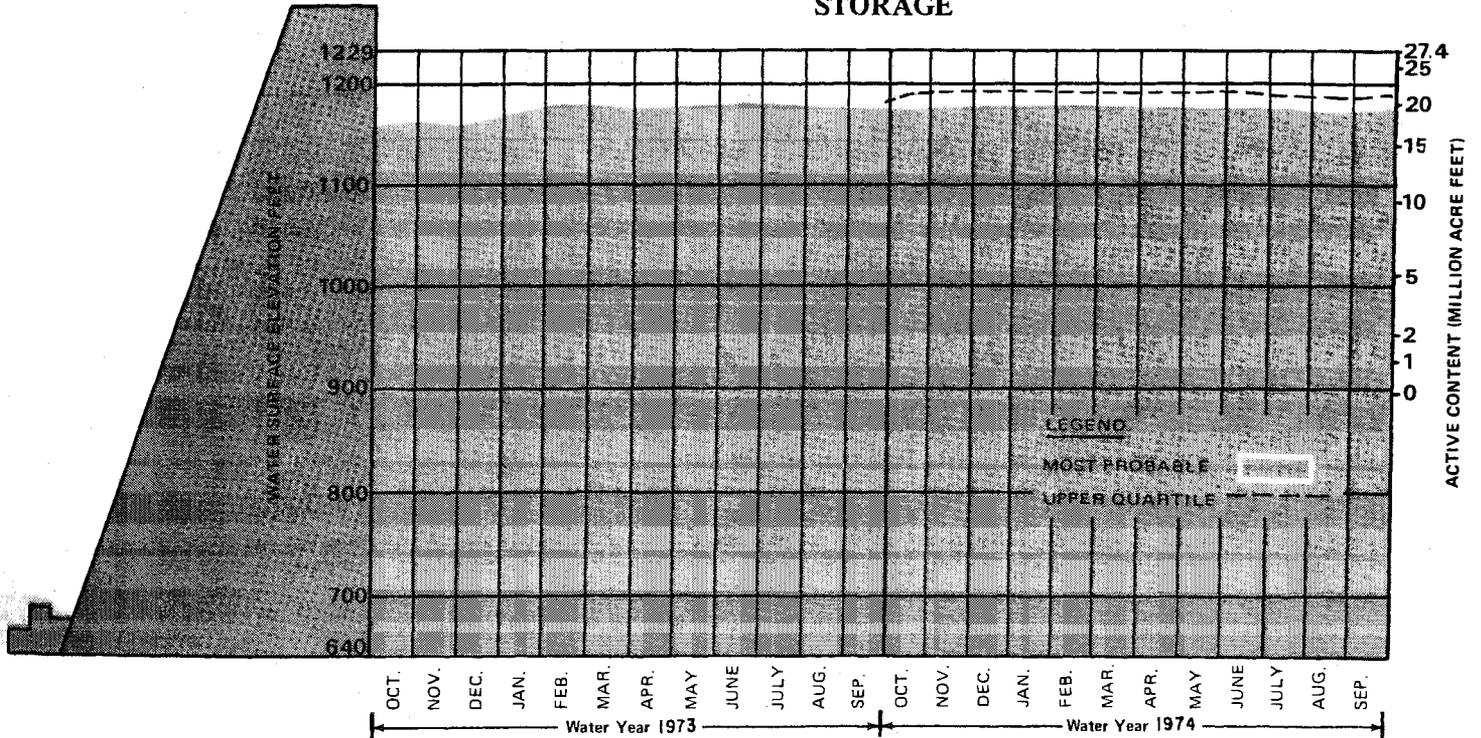
Space in Lake Mead and CRSP reservoirs during water year 1973 was such that no unusual Hoover releases were required to operate pursuant to provisions of the flood control regulations. (Chart 7)



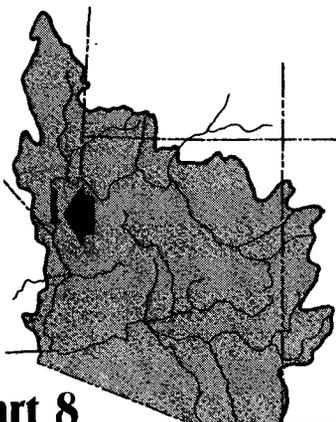


*Hoover Dam and Lake Mead, Boulder Canyon Project, Arizona-Nevada*

**STORAGE**



# Davis Dam Lake Mohave



**Chart 8**

**STATISTICS  
ACTIVE STORAGE\***

RESERVOIR	(ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	1,810,000	647.0
RATED HEAD	1,188,000	623.0
MINIMUM POWER	217,500	570.0
SURFACE AREA (FULL)	28,200 ACRES	
RESERVOIR LENGTH (FULL)	6.7 MILES	

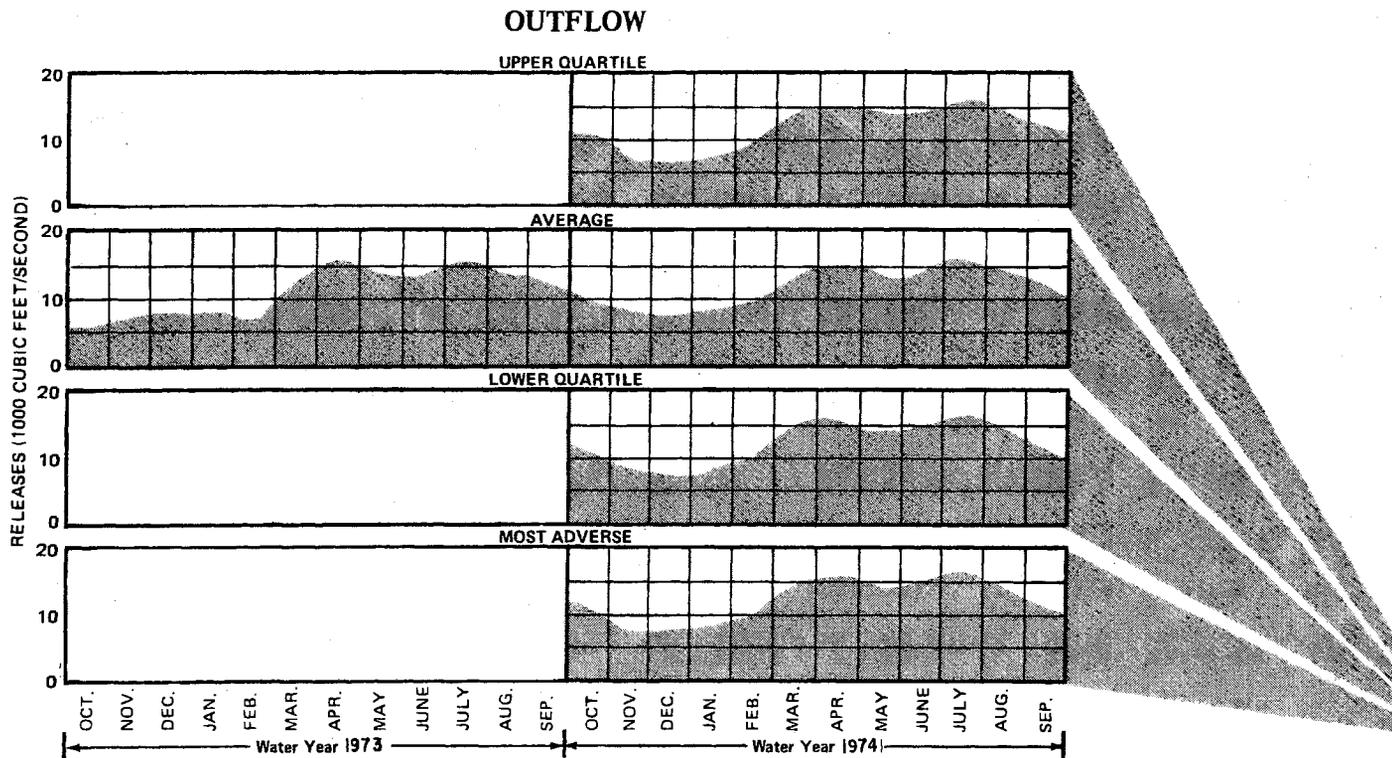
**POWER PLANT**

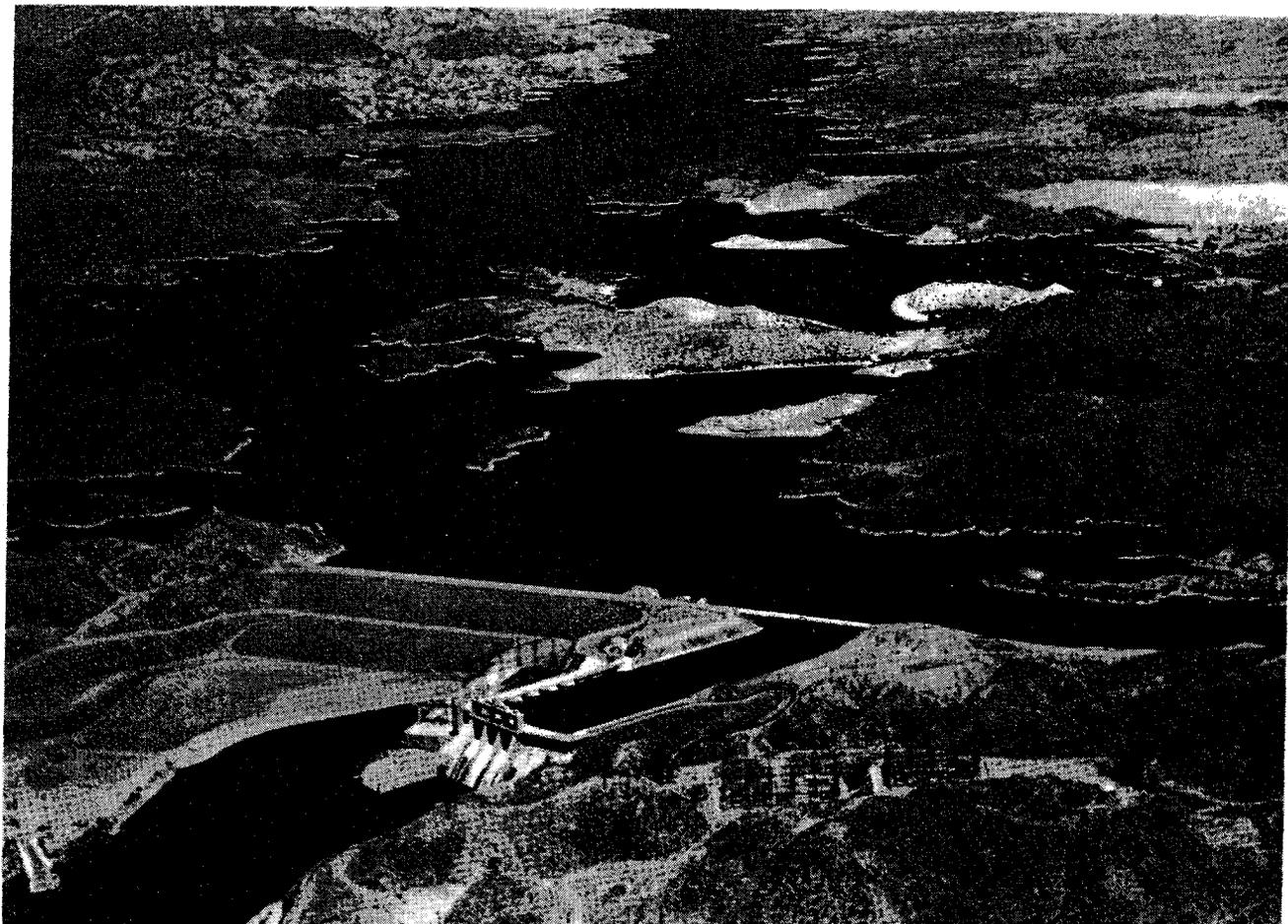
NUMBER OF UNITS	5
TOTAL CAPACITY OF UNITS	225,000 KILOWATTS

\*does not include 8,570 acre-feet of dead storage below elevation 533.39 feet

At the beginning of water year 1973, the level of Lake Mohave was 632 feet with an active storage of 1,404,000 acre-feet, which was the minimum storage during the year. During the winter months the level was raised to about 645 feet by the end of February and maintained between that level and 639 feet through April. The high level of Lake Mohave was 646 feet with an active storage of 1,796,000 acre-feet on June 8 which is about the beginning of the heavy irrigation season. The level was drawn down during the summer months to elevation 632 feet with an active storage of 1,412,000 acre-feet at the end of the water year.

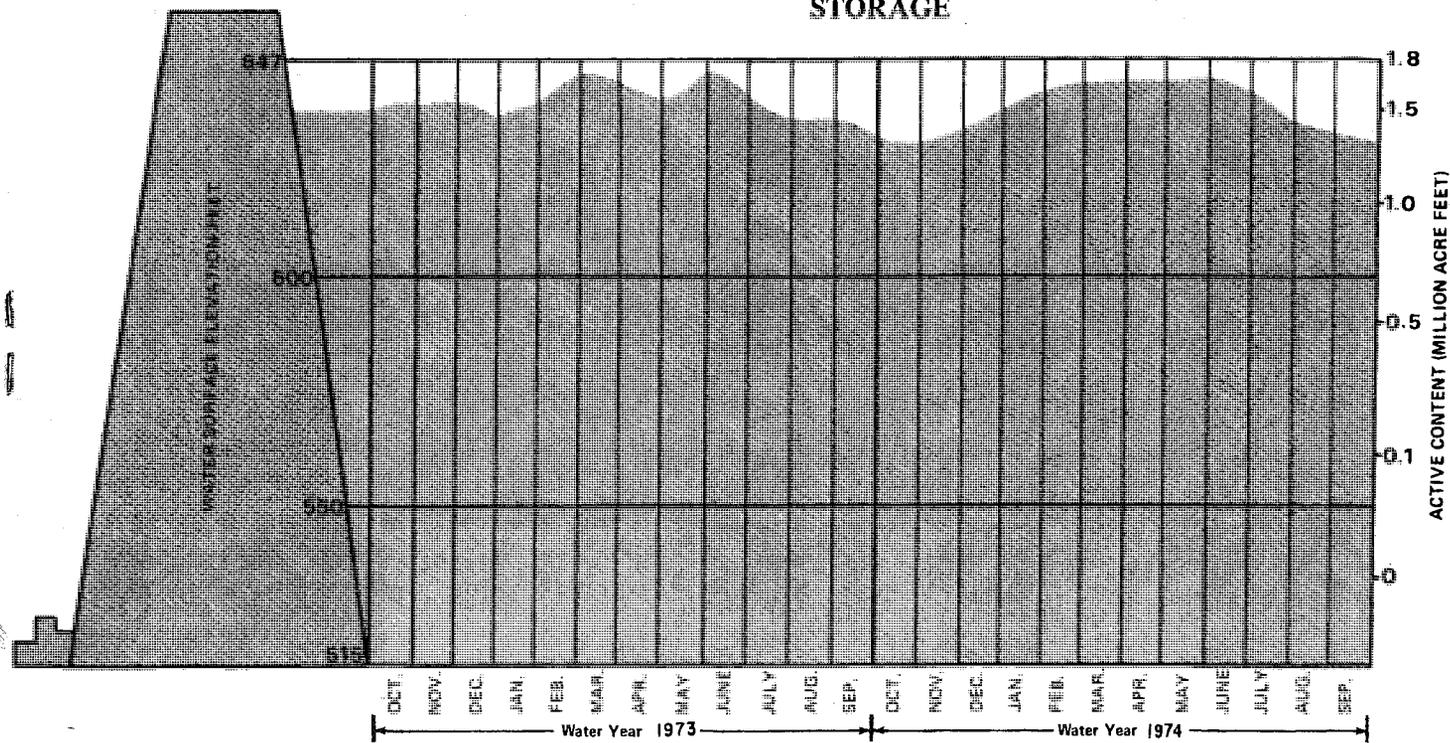
Releases from Lake Mohave were made monthly to satisfy downstream requirements with a small amount of reregulation by Lake Havasu. There were 7,946,000 acre-feet released at Davis Dam during the water year, all of which was passed through the turbines for power production. (Chart 8)



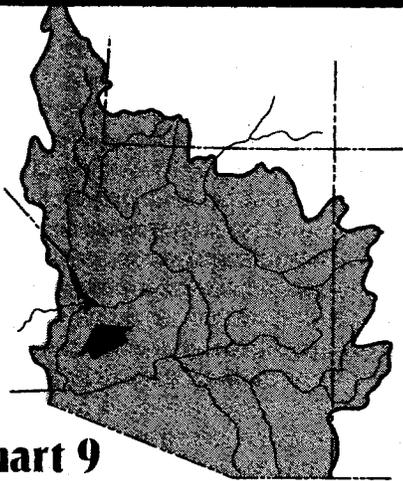


*Davis Dam and Lake Mohave, Parker-Davis Project, Arizona-Nevada*

**STORAGE**



# Parker Dam Lake Havasu



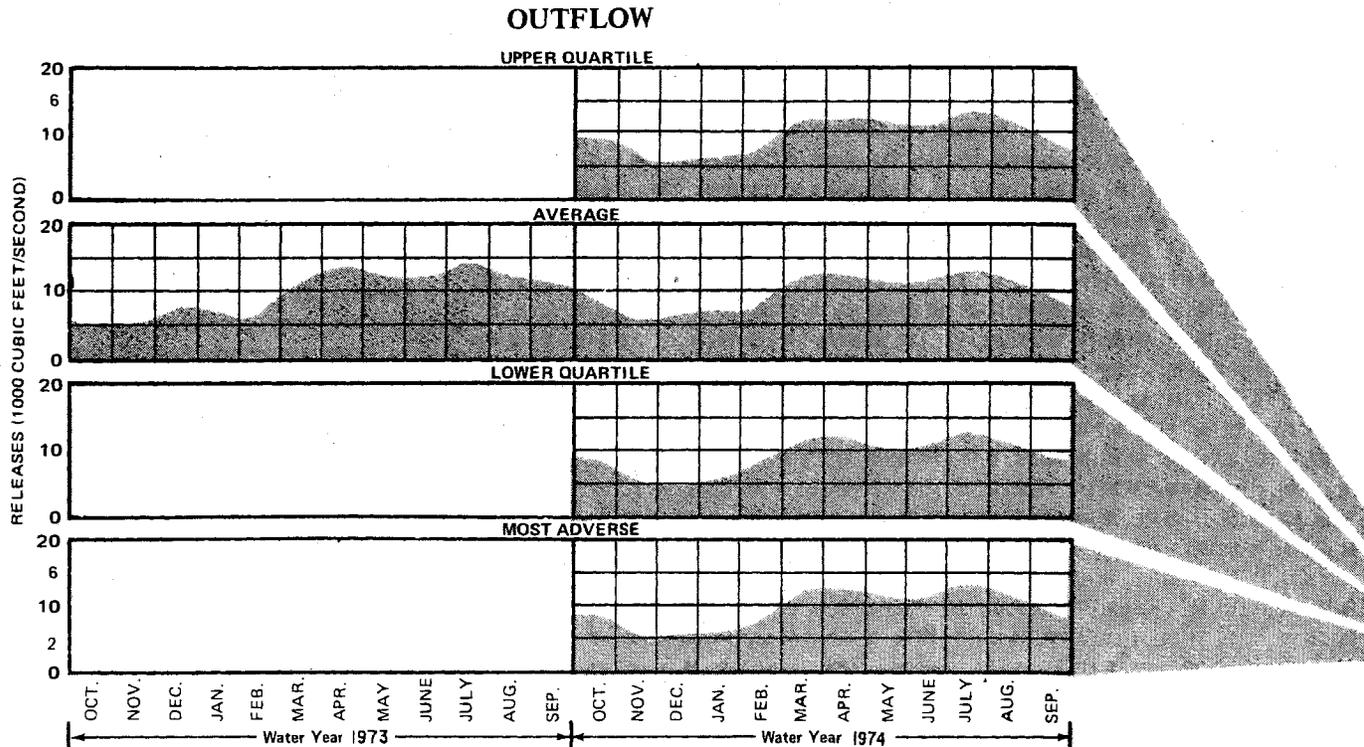
**Chart 9**

STATISTICS		
RESERVOIR	ACTIVE STORAGE*	
	(ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	619,400	450.0
RATED HEAD	619,400	450.0
MINIMUM POWER	439,400	440.0
SURFACE AREA (FULL)	20,400 ACRES	
RESERVOIR LENGTH (FULL)	35 MILES	
POWER PLANT		
NUMBER OF UNITS	4	
TOTAL CAPACITY OF UNITS	120,000 KILOWATTS	

\*does not include 28,600 acre-feet of dead storage below elevation 400.0 feet

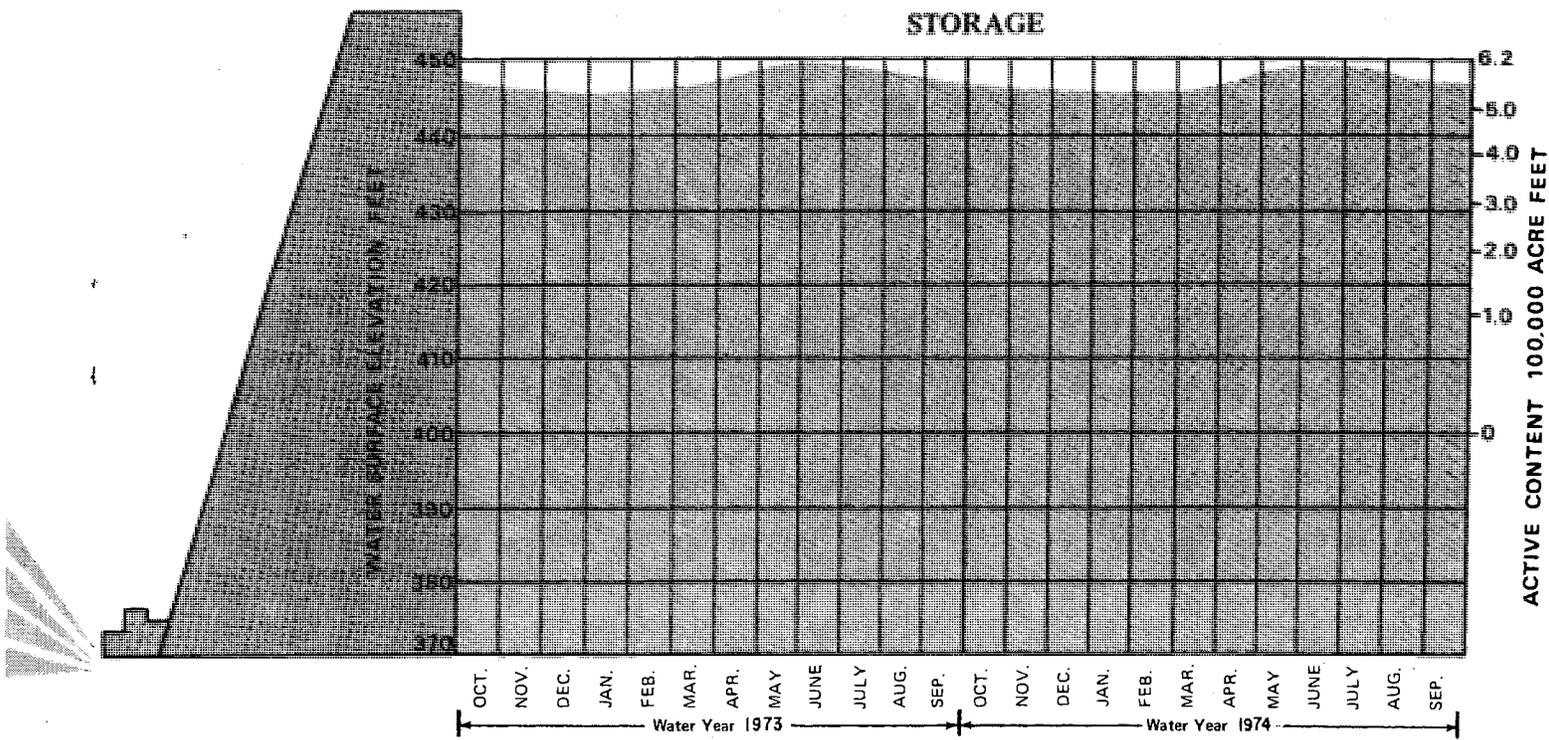
At the beginning of water year 1973 the level of Lake Havasu was 447 feet with an active storage of 560,000 acre-feet. The level was drawn down to about 446 feet with an active storage of about 537,000 acre-feet on November 1 and remained near that level through March 9 to provide flood control space for runoff from the drainage area between Davis and Parker Dams. The level was then raised to near full condition by mid-May. During the May 15 through June 30 period the level was maintained near maximum with an active storage of about 605,000 acre-feet and then was drawn down to 447 feet with an active storage of 559,000 acre-feet by the end of the water year. There were 6,651,000 acre-feet released at Parker Dam during the water year, all of which passed through the turbines for power production.

Joint use space in the top 10 feet of Lake Havasu (about 180,000 acre-feet) is reserved by the United States for control of floods and other uses including river regulation. Now that Alamo Reservoir on the Bill Williams river is in operation, only about the top 4 feet or about 77,000 acre-feet of space is normally used for this purpose. (Chart 9)





*Parker Dam and Lake Havasu, Parker-Davis Project, Arizona-California*





*Colorado River below Davis Dam, Arizona-Nevada*

## River Regulation

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Water release from Glen Canyon Reservoir during water year 1973 was 10,111,000 acre-feet as measured at the Lees Ferry gaging station. The water passing the Compact point at Lee Ferry totalled 10,141,000 acre-feet and 82,930,000 acre-feet for the 1-year and 10-year periods ending September 30, 1973, respectively. The annual release of 8,230,000 acre-feet from Lake Powell scheduled for the current year based on most probable runoff, when added to the flow of the Paria River, will result in Upper Basin delivery of about 89 million acre-feet for the 10-year period ending September 30, 1974.

Water releases scheduled for the Colorado River Storage Project and Participating Project reservoirs were planned to accommodate all of the multiple purposes for which the project was designed plus many day-to-day demands that developed throughout the year.

Daily releases are normally made from the

storage reservoirs in the Lower Basin to meet the daily orders of the water user agencies and all water passes through the turbines. The daily releases are regulated on an hourly basis to meet as nearly as possible the power loads of the electric power customers. Minimum daily flows are provided in the river to maintain fishery habitat. Adjustments to the normal releases are made when possible to provide for more satisfactory conditions for water-oriented recreation activities, to provide transport for river-borne sediment to desilting facilities, and to provide a degree of control of water quality.

River regulation below Hoover Dam was accomplished in a manner which resulted in delivery to Mexico of only 150,543 acre-feet in excess of minimum Treaty requirements during water year 1973. There were 119,855 acre-feet of this quantity which were delivered pursuant to provisions of Minutes 241 and 242 of the Mexican Treaty.

# Beneficial Consumptive Use

## UPPER BASIN USES

The three largest categories of depletion in the Upper Basin are agricultural use within the drainage basin, diversions for all purposes to adjacent drainage basins, and evaporation losses from all reservoirs.

During water year 1973, agriculture and M&I uses in the Upper Basin are estimated to have been more than 2,200,000 acre-feet due to above normal runoff above points of diversion in the San Juan and parts of the mainstem Colorado River drainage areas. About 690,000 acre-feet were diverted to adjacent drainage basins and 550,000 acre-feet were evaporated from mainstem reservoirs in the Upper Basin. An additional 150,000 acre-feet are estimated as evaporation from other reservoirs and stockponds in the Upper Colorado Basin.

Water is being stored in the Upper Basin reservoirs and will be released to the Lower Basin as specified by Section 602(a) of Public Law 90-537 and the laws, compacts, and treaties upon which Section 602(a) is based.

## LOWER BASIN USES AND LOSSES

Releases of 6,651,000 acre-feet from Lake Havasu during water year 1973 were made to meet the requirements for water deliveries at Imperial Dam as well as those of the Colorado River Indian Reservation near Parker, Arizona, the Palo Verde Irrigation District near Blythe, California, other miscellaneous users along the river, and transit losses between Parker Dam and Imperial

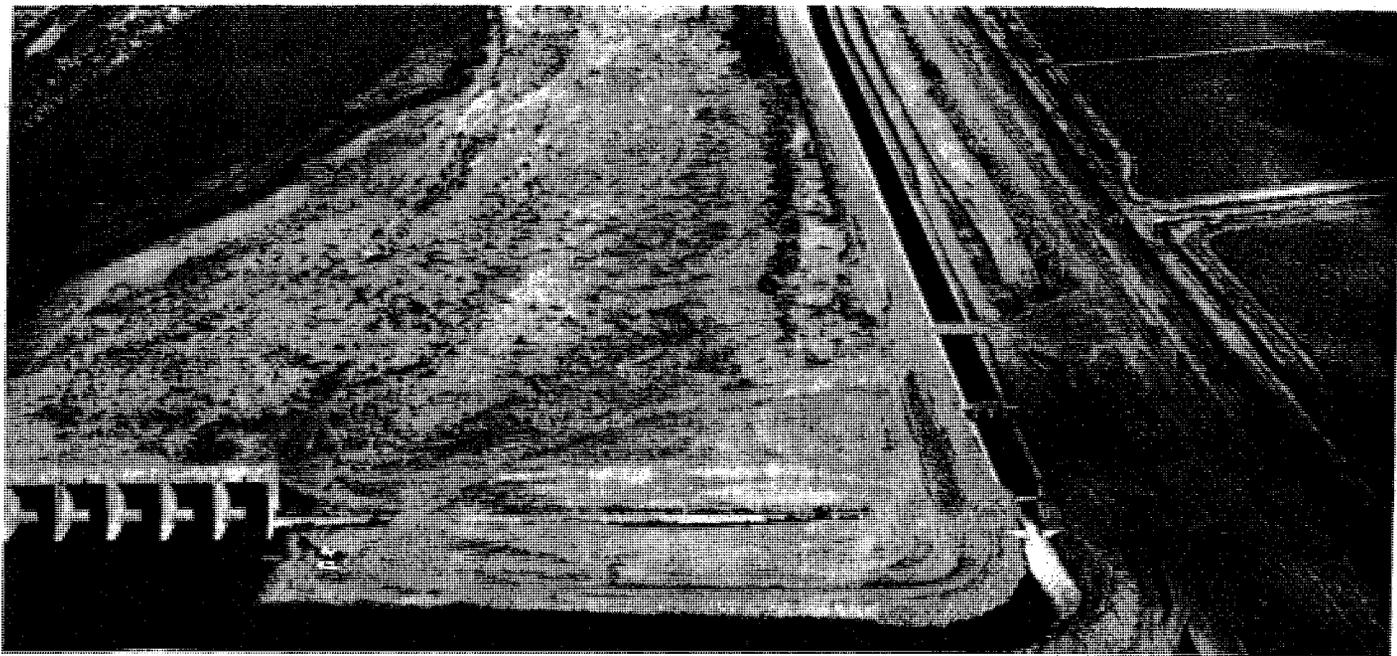
Dam. Deliveries to Mexico were made up of river water delivered to Imperial Dam and waste and drainage return flows from water users below Imperial Dam. The small regulatory waste of 30,688 acre-feet was the result of winter storms, which were prevalent over the Lower Colorado Basin.

The major water use above Parker Dam was that by Metropolitan Water District of Southern California. Metropolitan Water District pumped 1,128,000 acre-feet from Lake Havasu during water year 1973. Releases of 7,946,000 acre-feet were made from Lake Mohave during water year 1973 to meet the requirements for releases at Parker Dam, diversions to Metropolitan Water District, diversions to contractors for small uses, diversions to other miscellaneous users, along with quantities to offset evaporation and other transit losses between Davis and Parker Dams and to maintain the programmed levels of Lake Havasu.

Releases of 7,937,000 acre-feet were made from Lake Mead at Hoover Dam during water year 1973 to regulate the levels of Lake Mohave and to provide for the small uses and the losses from that reservoir. In addition there were 77,000 acre-feet diverted from Lake Mead for use by Lake Mead National Recreation Area, Boulder City, Basic Management, Inc., and contractors of the Colorado River Commission of Nevada. The total releases and diversions from Lake Mead during water year 1973 were 8,014,000 acre-feet.



*Water for pinto beans in Grand Valley, Colorado*



*Wellton-Mohawk Bypass Canal, Arizona*

# Water Quality Control

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## WATER QUALITY OPERATIONS DURING WATER YEAR 1973

Since water quality aspects of Colorado River operations are extensively described in the biennial series of reports entitled "Quality of Water, Colorado River Basin," only minimal discussion of this aspect of operation is presented in this report. Report No. 6 of this series was issued in January 1973.

Specific water quality operations are performed pursuant to Minutes Nos. 241 and 242 with Mexico such that during water year 1973, the United States bypassed 119,855 acre-feet of drainage water to the Colorado River below Morelos Dam and replaced it with a like amount of other water. Even though this was the only specific operation carried out for quality purposes, other incidental benefits accrue to water quality from normal procedures. Water is stored in reservoirs during the nonirrigation season and during the snowmelt runoff period when the water is surplus to the immediate requirements. As the streamflows diminish in the late summer, storage water is released as

needed to supplement the natural flows in meeting demands. Although water quality control is not generally recognized as a beneficial use of surface water, this type of release pattern greatly enhances the quality of water in the Basin.

## FUTURE WATER QUALITY CONTROL

In recognizing the need to manage the water quality of the Colorado River, it has been recommended that the salinity increases in the river will be minimized through a water quality improvement program generally described in the Department of the Interior's report "Colorado River Quality Improvement Program," dated February 1972. This program calls for a basin-wide approach to salinity control while the Upper Basin continues to develop its Compact-apportioned waters. Intensive investigations are in progress on several units throughout the Basin. Minute 242 was negotiated with Mexico and became effective September 1, 1973.

# Enhancement of Fish and Wildlife

## UPPER BASIN

The interim operating rules for Fontenelle Reservoir provide for a continuous flow of at least 300 c.f.s. in the channel immediately below the dam for the benefit of fish habitat. Releases for power production and other purposes during water year 1973 provided flows in excess of 750 c.f.s. except during the latter part of September when fish and wildlife tests were conducted with releases as low as 300 c.f.s.

During the first part of March releases were increased from 800 c.f.s. to 1,600 c.f.s. to force the geese below Fontenelle Dam to build their nests at a higher elevation and away from the river. Releases were less than 3,000 c.f.s. throughout the geese-nesting period to avoid inundating the nests.

Fishing below Flaming Gorge Dam has been enhanced by keeping a minimum of 800 c.f.s. in the river.

A release of at least 55 c.f.s. throughout the winter 1972-73 assured good fish habitat between Taylor Park and Blue Mesa Reservoirs. Coordinated operation between Taylor Park and Blue Mesa Reservoirs in delivering irrigation water to the Uncompahgre Project provided additional fishery and recreation opportunities between the two reservoirs. The interim operating rules specify a minimum of

200 c.f.s. for good fish habitat below Morrow Point Dam and below the Gunnison Tunnel.

A continuous flow of at least 400 c.f.s. was maintained immediately below Navajo Dam for good fish propagation.

Clear water and a minimum release of 1,000 c.f.s. provided good habitat for fish in the river below Glen Canyon Dam.

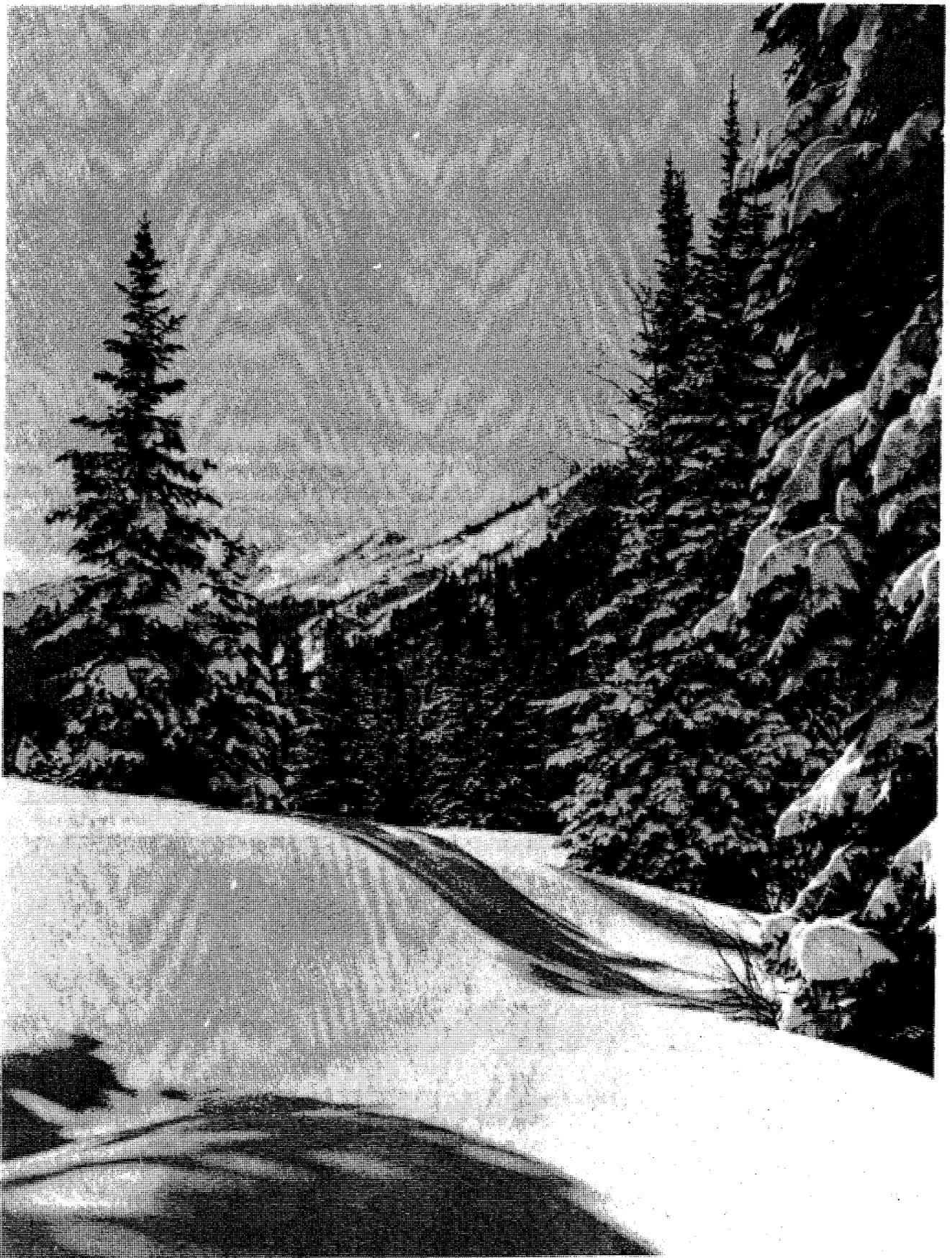
## LOWER BASIN

Releases from Lake Powell were sufficient to maintain the level of Lake Mead constant or rising during the spawning season. This provided lake levels satisfactory to the spawn; however, the elevations in which the spawn occurred limited the food and cover needed for favorable survival of the young bass. Weather conditions were also satisfactory through most of the period this year. This combination of conditions has contributed to the resulting satisfactory spawn and survival of the young bass this season.

Releases from Lake Mohave and Havasu were regulated such that minimum flows below the dams were never less than 2,000 c.f.s. This was done to provide satisfactory fish habitat along the lower river.



*Waterfowl on Topock Marsh, Lower Colorado River, Arizona*



*Heavy snowfall in the Rocky Mountains provides high quality water*

# Preservation of Environment

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Preservation or enhancement of environment is a matter of the highest importance in the planning, construction, and operation of the Colorado River Storage Project. Contracts for water services, grants of rights-of-way and indentures of lease for use of Federal land, supply contracts, and participating agreements executed by the Secretary of the Interior include language to control water and air pollution, to require restoration and reseeding of lands scarred by construction and operation activities, and to encourage conservation of the aesthetic beauty of nature.

Operation of the reservoirs of the Colorado River system recognizes the need to schedule releases from Fontenelle Reservoir so that the flow pattern will not adversely affect the ecology of downstream geese-nesting areas. Minimum flows are maintained below all dams to provide a desirable habitat for fish, animal, and plant life. Flood control operations at Navajo Reservoir and Lake Mead protect the downstream channels and flood plains from erosion and scouring during periods of high flow. Recent proposals for several large thermal-electric generating plants cooled with water and coal gasification plants utilizing water from Reclamation facilities in the Colorado River system have required special consideration to protect the environment and ecology of the area. Particulate emissions from combustion of coal, provision for control of noxious gasses, appearance, and aesthetic considerations are some of the factors in which Reclamation has become involved in planning these plants. The Secretary of the Interior's responsibility for pollution control at the Navajo, Four Corners, Huntington Canyon, San Juan Powerplants, and two coal gasification plants all using water from the

Colorado River system being planned for the Four Corners area, has been delegated to the Commissioner of Reclamation and redelegated to the Regional Director of the Upper Colorado Region. The Regional Director of the Lower Colorado Region has been delegated responsibility for pollution control at the Mohave Powerplant.

The final environmental statement for the initial unit of San Juan Powerplant, FES 73-10, was filed with the Council on Environmental Quality on March 1, 1973.

Even though schedules of releases were modified by the court order in the Rainbow Bridge suit, inflow to Lake Mead should have been more than sufficient during the bass spawning season, as discussed previously, to enhance the Lake Mead fishery. Fish habitat was enhanced in the river below Glen Canyon Dam by maintaining adequate flow rates.

In order to assess the potential impact of thermal powerplants on the Colorado River Basin and adjacent areas, the Secretary of the Interior has made an appraisal report of the requirements and availability of resources needed to permit an orderly development of thermal-electric power to meet a logical portion of the projected demand for electric power through year 1990 while protecting the quality of the environment. One of the resources vital to any thermal power development in the semi-arid Southwest is water for cooling. The report identifies the sources and amounts of water available for thermal powerplant use as well as the compacts, laws, and other constraints likely to govern use of the available water for this purpose.

# Projected Plan of Operation Under Criteria for Current Year.

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## DETERMINATION OF "602(a) STORAGE"

Section 602(a)(3) of the Colorado River Basin Project Act of September 30, 1968 (Public Law 90-537), provides for the storage of Colorado River water not required to be released under Articles III(c) and III(d) of the Colorado River Compact in Upper Basin reservoirs to the extent the Secretary finds it to be reasonably necessary to assure Compact deliveries without impairment of annual consumptive uses in the Upper Basin. Article II of the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs pursuant to that Act provides that the annual plan of operation shall include a determination by the Secretary of the quantity of water considered necessary as of September 30 of the current year to be in storage as required by Section 602(a) of P.L. 90-537 after consideration of all applicable laws and relevant factors, including, but not limited to the following:

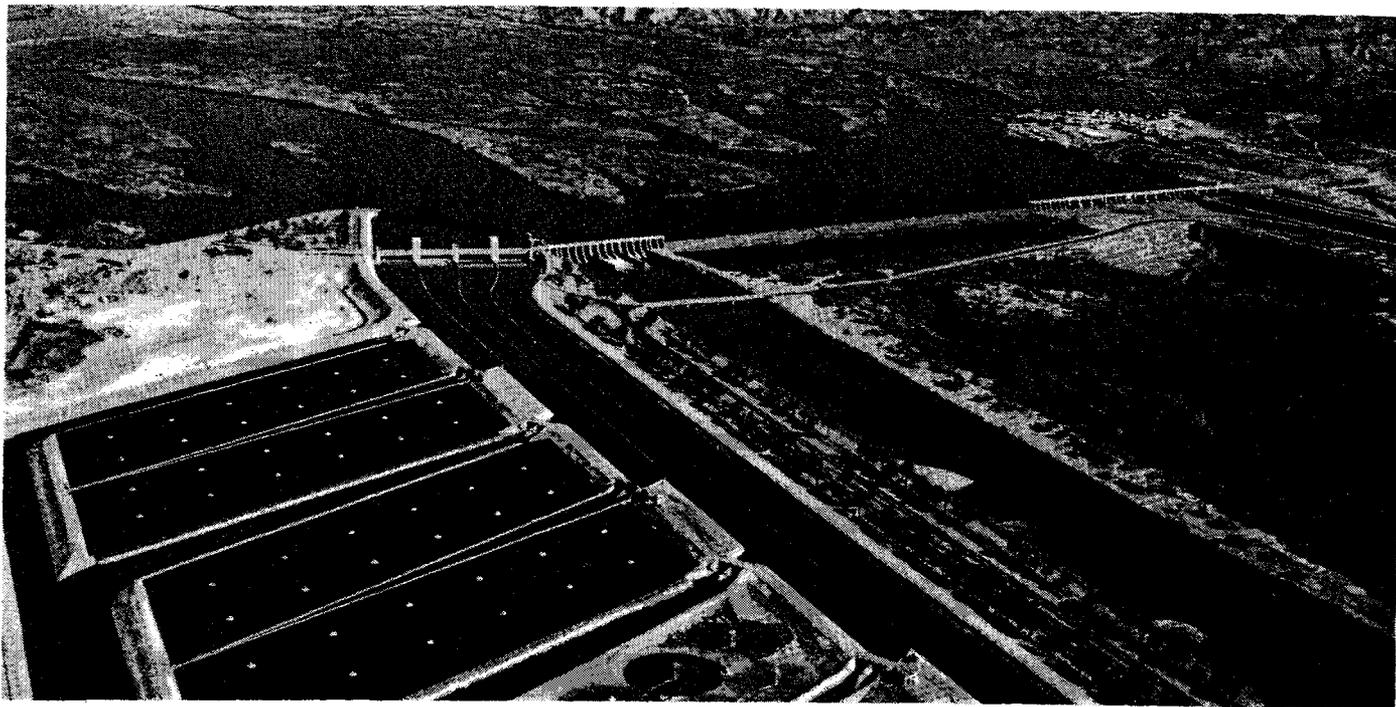
- (a) Historic streamflows;
- (b) The most critical period of record,
- (c) Probabilities of water supply;
- (d) Estimated future depletions in the Upper Basin, including the effects of recurrence of critical periods of water supply;
- (e) The "Report of the Committee on Probabilities and Test Studies to the Task Force on Operating Criteria

for the Colorado River," dated October 30, 1969, and such additional studies as the Secretary deems necessary;

- (f) The necessity to assure that Upper Basin consumptive uses not be impaired because of failure to store sufficient water to assure deliveries under Section 602(a)(1) and (2) of P.L. 90-537.

Taking into consideration these and other relevant factors, the Secretary has determined that the active storage in Upper Basin reservoirs forecast for September 30, 1974, on the basis of average runoff during the current year, exceeds this "602(a) Storage" requirement under any reasonable range of assumptions which might be realistically applied to those items which he is directed to consider in establishing this storage requirement. Therefore, the accumulation of "602(a) Storage" is not the criterion governing the release of water during the current year. The Lake Powell active storage forecast for September 30, 1974, is projected to be less than the Lake Mead active storage forecast for that date.

The plan of operation during the current year is to release about 8,230,000 acre-feet in accordance with Section 603(a)(3) of Public Law 90-537.



## Lower Basin Requirements

### MEXICAN TREATY OBLIGATIONS

Annual calendar year schedules of monthly deliveries of water in the limitrophe section of the Colorado River, allotted in accordance with the Mexican Water Treaty of 1945, are formulated by the Mexican Section and presented to the International Boundary and Water Commission before the beginning of each calendar year. Mexico has the right, upon 30 days' notice in advance to the United States Section, to modify, within the total schedule, any monthly quantity prescribed by the schedule by not more than 20 percent of the monthly quantity. In addition to the 1.5 million acre-foot minimum Treaty requirement, approximately 118,000 acre-feet are projected for delivery pursuant to Minute No. 242 and approximately 5,000 acre-feet are projected in regulatory waste. The total delivery to Mexico for water year 1973 is estimated to be 1,623,000 acre-feet.

### CONSUMPTIVE USE AND LOSS REQUIREMENTS

A release of 6,867,000 acre-feet from Lake Havasu has been projected for water year 1974 including 5,244,000 acre-feet to meet consumptive use requirements in the United States below Parker Dam, transit losses in the river between Parker Dam and the Mexican Border,

*Imperial Dam and desilting works, Arizona-California* and a 1,623,000 acre-foot delivery to Mexico.

The Metropolitan Water District of Southern California is expected to divert 1,212,000 acre-feet by pumping from Lake Havasu. Consumptive uses by small users, river losses or gains, and reservoir losses between Davis Dam and Parker Dam are projected to be 302,000 acre-feet for water year 1974.

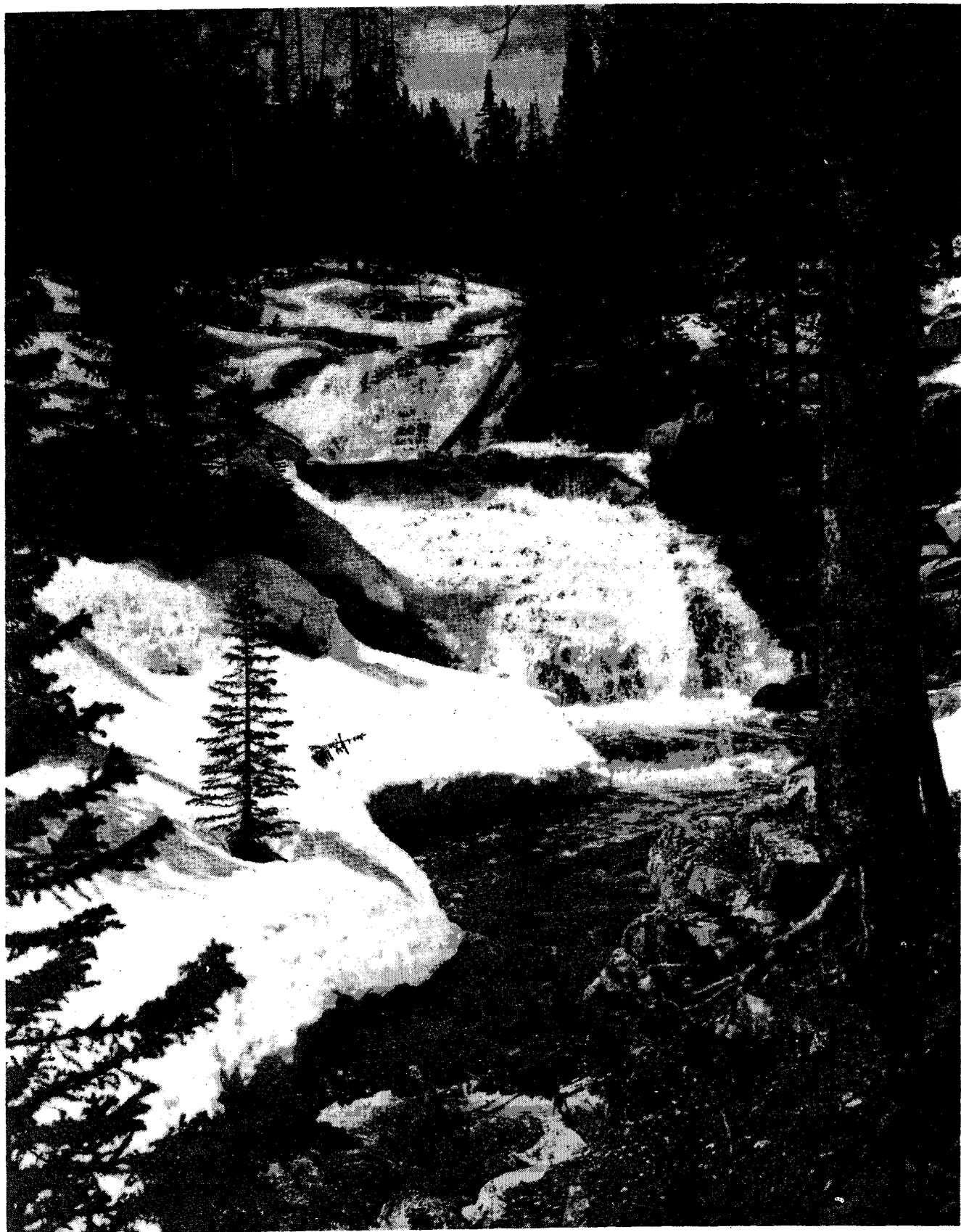
There are no major users between Hoover Dam and Davis Dam. Consumptive uses by small users, river losses or gains, and reservoir losses between Hoover Dam and Davis Dam are projected to be a net loss of 136,000 acre-feet for water year 1974.

The net diversions from Lake Mead are projected at 80,000 acre-feet for water year 1974. Evaporation from Lake Mead is expected to be about 854,000 acre-feet, and tributary inflow between Glen Canyon Dam and Lake Mead is expected to be about 880,000 acre-feet.

### REGULATORY WASTES

A regulatory waste of 5,000 acre-feet has been projected as being lost from the Lower Colorado River for water year 1974 as indicated in the section under Mexican Treaty obligations.

The guides set forth in the Report on Reservoir Regulations for Flood Control Storage at Hoover Dam and Lake Mead are in effect, but no flood control releases are anticipated for water year 1974.



*Start of snowmelt runoff from high mountain watershed, Utah*

# Plan of Operation - Water Year 1974

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The projected operation of each of the reservoirs in the Colorado River Basin during water year 1974 for average runoff conditions is described in the following paragraphs. Charts 1 through 9 show hydrographs of the projected monthly outflow from the reservoirs and the projected end-of-month elevation and active storage in the reservoirs for average and three other assumptions of 1974 modified runoff from the Basin. The four assumptions are: (1) AVERAGE based on the 1906-68 record of runoff, (2) UPPER QUARTILE based on flows exceeded 25 percent of the time during 1906-68, (3) LOWER QUARTILE based on flows exceeded 75 percent of the time during 1906-68, and (4) MOST ADVERSE based on the lowest year of record which occurred in 1934.

The projected releases from Lake Powell are 8.23 million acre-feet for each of the assumed runoff conditions with the exception of the Upper Quartile in which Lake Powell releases would be 9.4 million acre-feet. This Upper Quartile release from Lake Powell would cause Lake Mead to rise about 8 feet higher at the end of the current year than the level that would be reached with each of the other three assumed runoff conditions. The projected operations of Lakes Mohave and Havasu are the same under all four of the runoff assumptions.

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## Upper Basin Reservoirs

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### Fontenelle

It is planned to lower the level of the reservoir through the fall and winter months until a water surface elevation of about 6,480 feet is reached, then from the last of March through April to hold releases at about 1,450 c.f.s. to encourage wild geese to nest back away from the river. With average runoff during the spring months, Fontenelle Reservoir will fill by the end of June. After the spring runoff the reservoir level will be controlled by adjusting the releases through the powerplant to slowly reduce the elevation to 6,502 feet by the end of the summer of 1974. (Chart 1)

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## Flaming Gorge

At the beginning of water year 1974 the active reservoir storage was 3,180,000 acre-feet with a water surface at elevation 6,026 feet. The reservoir level will be lowered about 6 feet by March of the current year but should remain high enough until the spring runoff so that boats can be launched from all of the nine boat ramps. During the latter part of March and through April 1974 releases from the reservoir will be managed to encourage the geese to nest back away from the river in Brown's Park. This will be accomplished by varying the releases every other day from high to low flows until nests are established. Flow will then vary on a more uniform pattern throughout the summer, but the river should not exceed 4,500 c.f.s. and normally would not be less than 800 c.f.s. Releases should average about 125,000 acre-feet per month through the rest of the summer for a water year total of 1,410,000 acre-feet. (Chart 2)

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## Curecanti Unit

During the current year, Blue Mesa should reach a low for the year in April 1974 of elevation 7,453 feet with an active storage of 330,000 acre-feet. With average inflow during the spring of 1974 the reservoir should fill at elevation 7,519 feet with an active storage of 829,000 acre-feet. At this elevation the reservoir has a surface area of 9,180 acres and a reservoir length of 24 miles. (Charts 3 and 4)

Morrow Point Reservoir will be operated near full during the current year except for a short period during October and November when it will be lowered to elevation 7,100 feet for installation of the boat marine. Releases will be made for downstream irrigation requirements plus a flow of 200 c.f.s. below the Gunnison Tunnel Diversion Dam.

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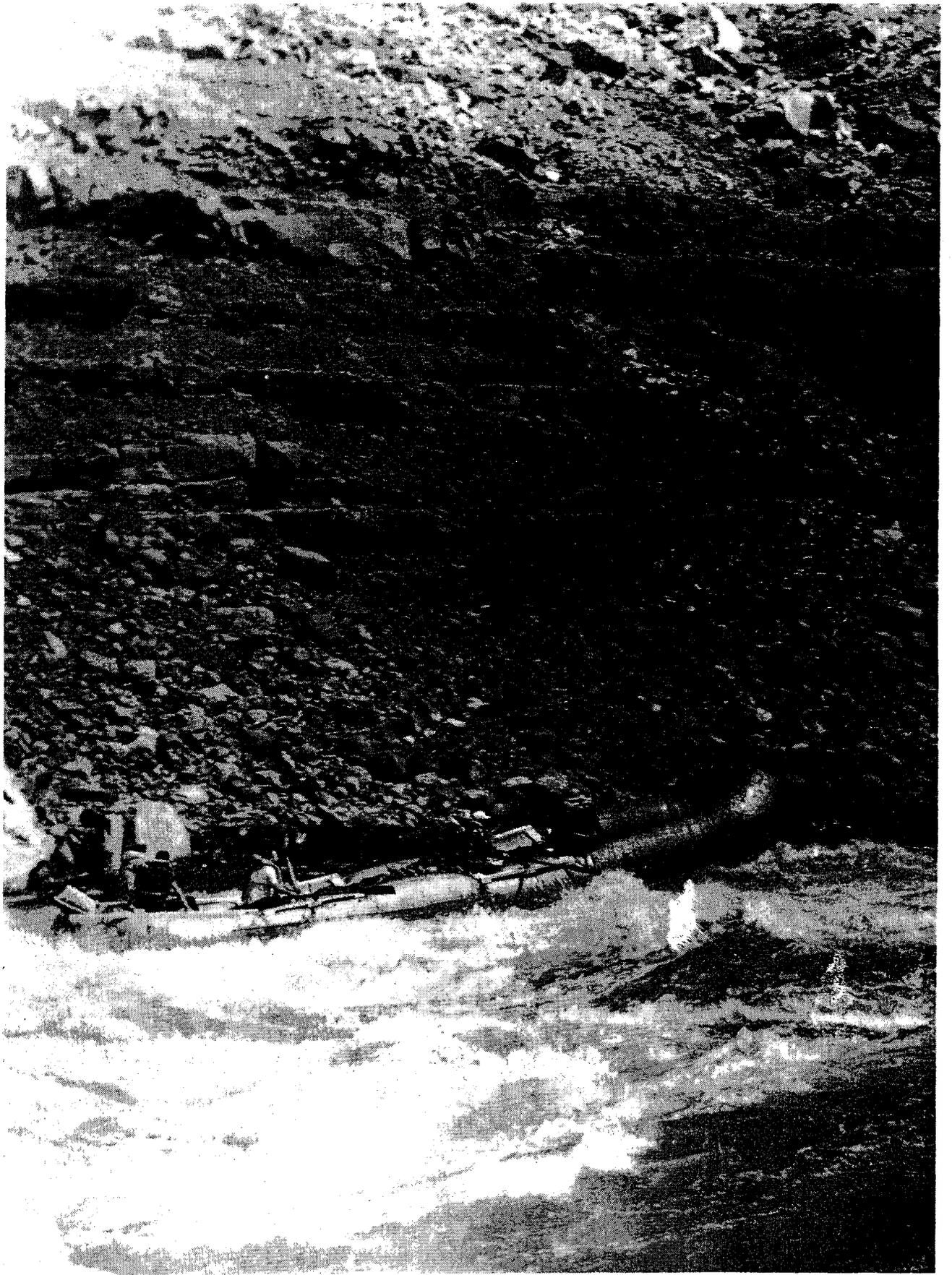
## Navajo Reservoir

On September 30, 1973, Navajo Reservoir had an active storage of 1,390,000 acre-feet with an elevation of 6,064 feet. During October through March releases will be controlled to lower the reservoir elevation to 6,025 feet prior to spring runoff. Average inflow would cause the reservoir to reach elevation 6,053 feet with an active storage of 1,260,000 acre-feet. It will be maintained for recreational purposes at or near this level for the remainder of the summer. (Chart 5)

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*Pine Creek Marina, Navajo Reservoir*



*White Water Boating in Grand Canyon, Arizona*  
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## **Glen Canyon Lake Powell**

For the current year the level of Lake Powell should drop about 2 feet during the fall and winter months to elevation 3,644 feet with an active storage of 17.1 million acre-feet. Assuming an average April-July 1974 runoff the resulting inflow of about 8.0 million acre-feet should cause the lake to reach an all-time high elevation of 3,668 feet during July with an active storage of 20.1 million acre-feet. This will be about 80 percent of the active capacity of the reservoir. The lake will have a length of 185 miles and a water surface area of 139,510 acres. Total release of 8.2 million acre-feet is scheduled from Lake Powell during water year 1974 to satisfy power market requirements and meet other downstream demands. (Chart 6)

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## **Lower Basin Reservoirs**

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### **Lake Mead**

The level of Lake Mead during the current year should gradually rise 2 feet to elevation 1,182 feet by January 31, 1974. The level will then drop about 6 feet to elevation 1,176 feet and then rise to about 1,178 elevation by the end of the water year. At these levels the lake will have an average active storage of about 20 million acre-feet. A total of 8.5 million acre-feet is scheduled to be released from Lake Mead during water year 1974 to meet all downstream requirements. All releases are scheduled to pass through the turbines for electric power production. (Chart 7)

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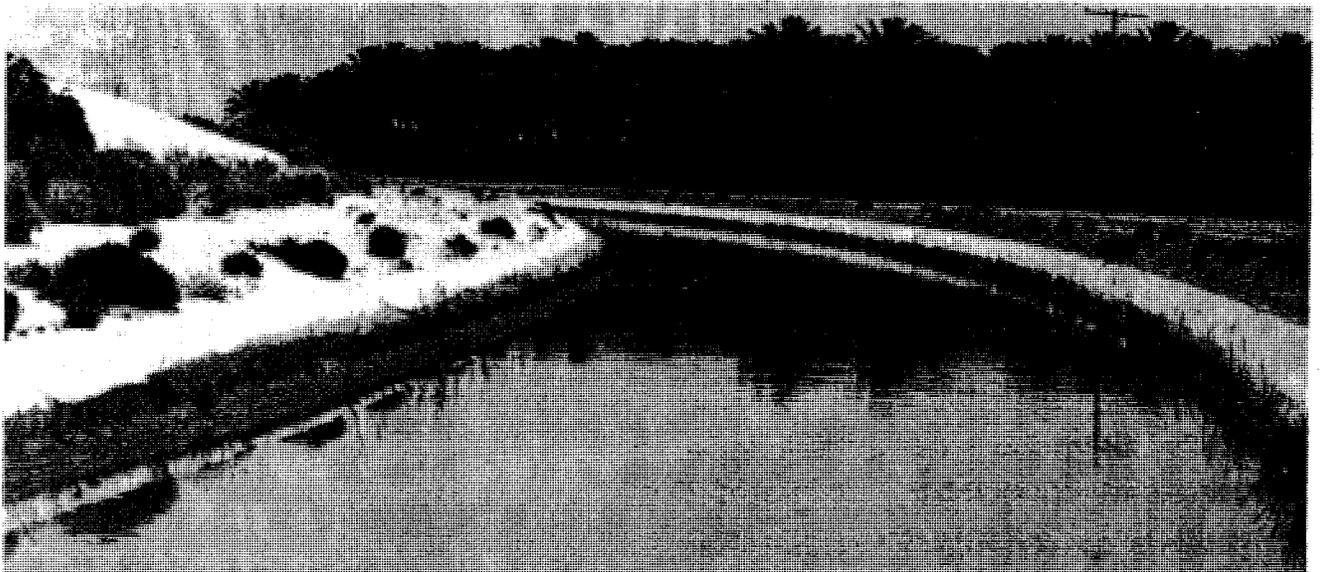
## Lake Mohave

The level of Lake Mohave is scheduled at about its minimum elevation during October, the first month of the current operating year. The level should rise through the fall and winter months to elevation 643 feet by February 28, 1974. It should remain near that elevation through April and rise to its yearly high of 645 feet at the end of May 1974. The level of Lake Mohave is expected to be drawn down during the summer months of heavy irrigation use to elevation 631 feet at the end of water year 1974. A total of 8.4 million acre-feet is scheduled to be released from Lake Mohave during this water year to meet all downstream requirements. All releases are scheduled to pass through the turbines for electric power production. (Chart 8)

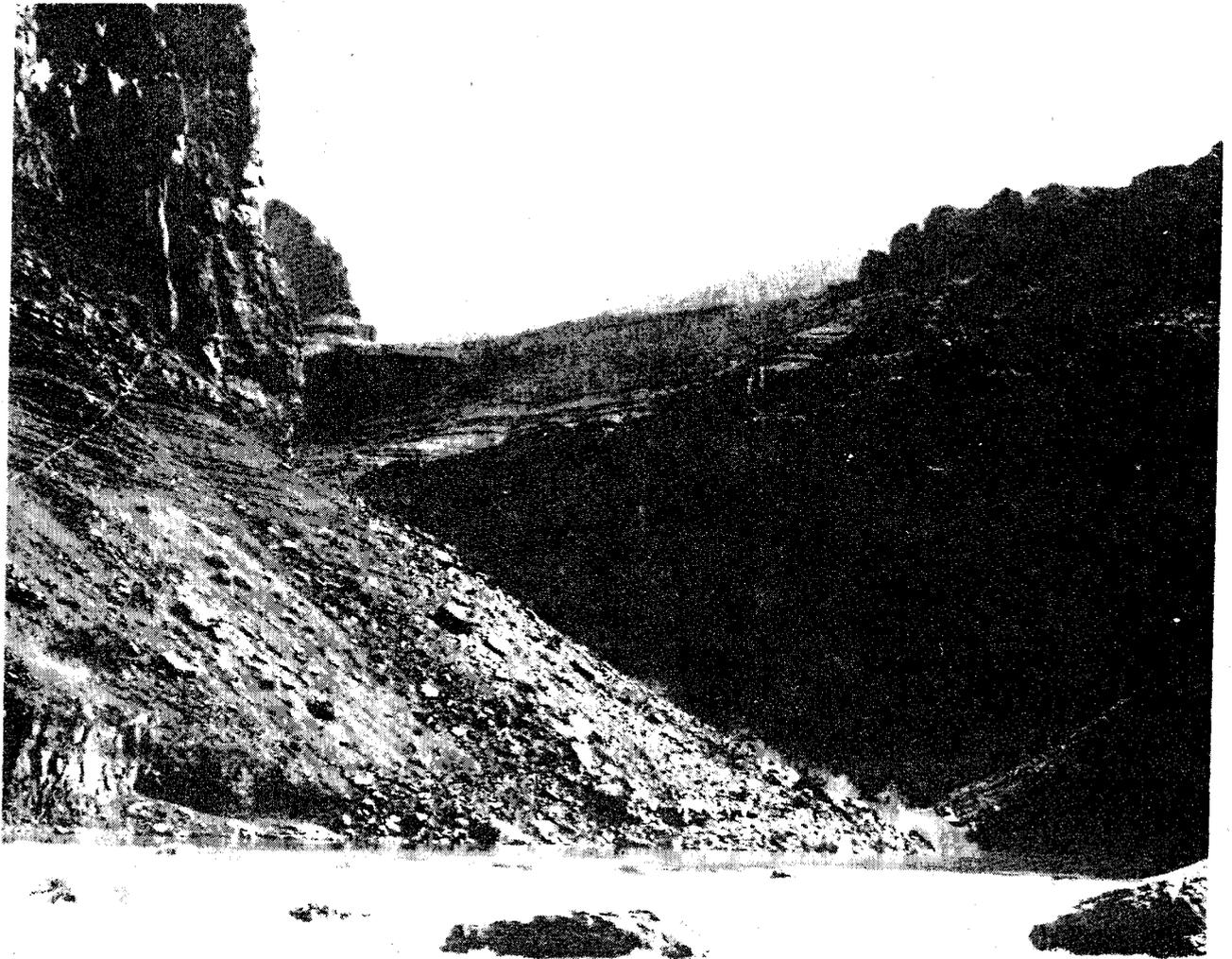
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## Lake Havasu

Lake Havasu is scheduled at the highest levels consistent with the requirements for maintaining flood control space. The yearly low elevation of 446 feet is scheduled for the December through February high-flood-hazard period. The yearly high of 449 feet is scheduled for the low-flood-hazard months of May and June. A total of 6.9 million acre-feet is scheduled to be released from Lake Havasu during this water year to meet all downstream requirements. All releases are scheduled to pass through the turbines for electric power production. (Chart 9)



*Coachella Canal near Indio California*



As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water; energy and minerals; fish and wildlife; park and recreation areas; and for the wise use of all these resources. The Department also has a major responsibility for American Indian Reservation communities and for people who live in Island Territories under United States administration.

*Grand Canyon of the Colorado River, Arizona*

