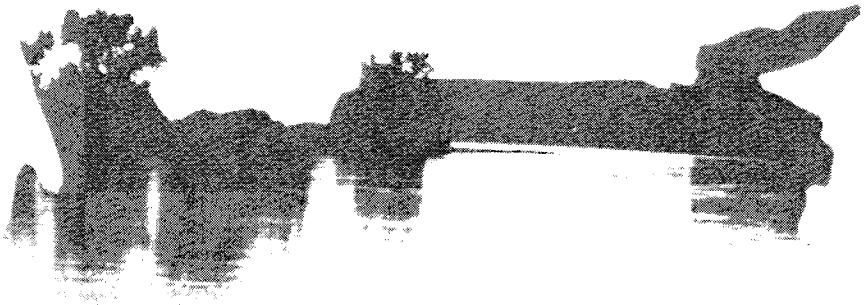
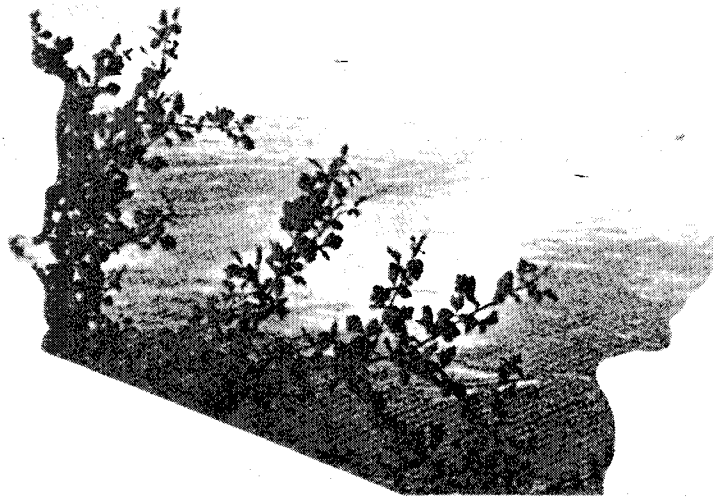
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

ANNUAL REPORT





1971 Operation of the Colorado River Basin
1972 Projected Operations

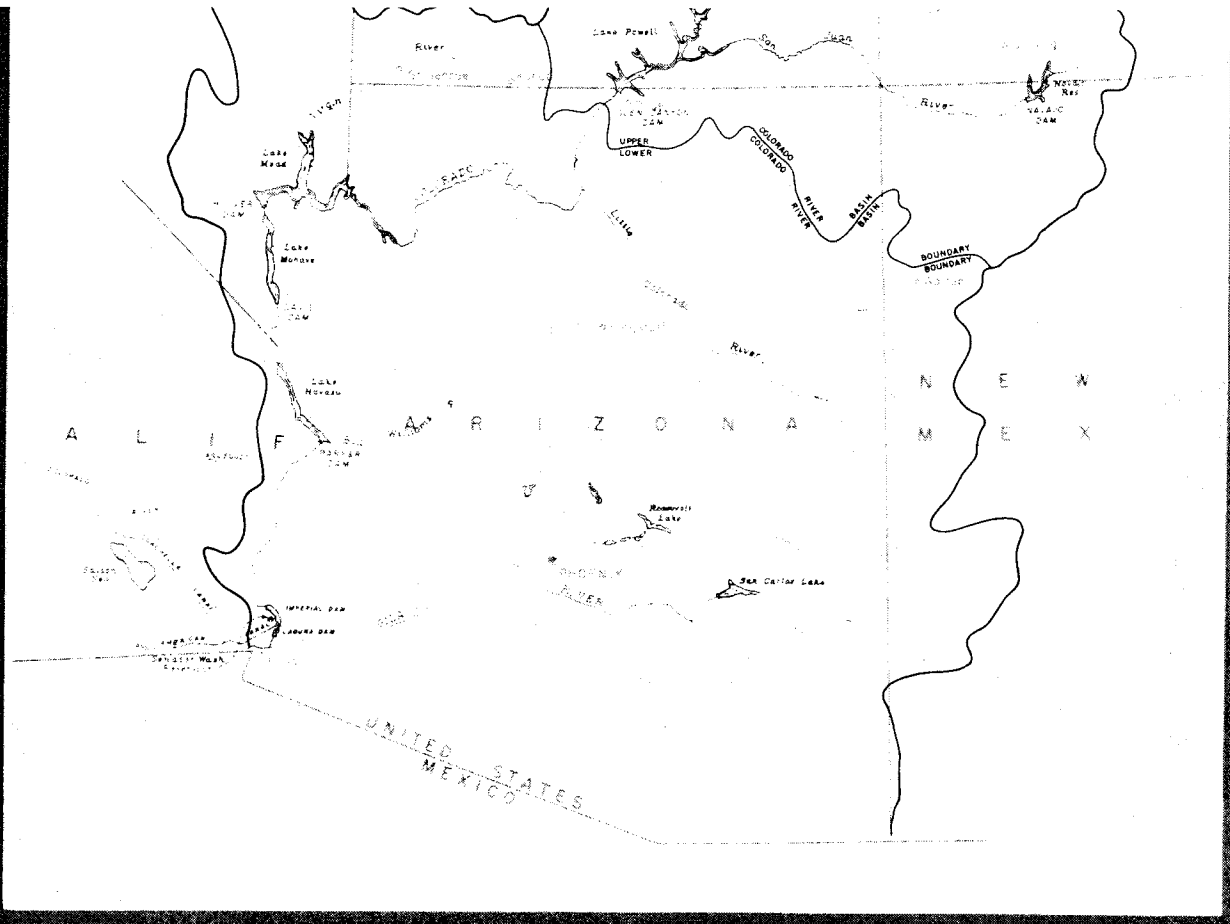
ANNUAL REPORT

1971 Operation of the Colorado River Basin

1972 Projected Operations

Errata

Page 1	Second paragraph--Numerals "I through IX" should read "1 through 9."
Page 2	"Fontenelle" is incorrectly spelled
Page 15	Storage chart low elevation should be 640 feet.
Page 17	Storage chart should show low elevation as 530 feet and high elevation as 647 feet.
Page 19	Storage chart should show low elevation as 400 feet and high elevation as 450 feet.
Page 29	First paragraph--Numberals "I through IX" should read "1 through 9."
Page 29	"Fontenelle" is incorrectly spelled.
Page 29	Third paragraph--"March" is incorrectly spelled.
Page 33	"Lake Mead" should be inserted under "Lower Basin Reservoirs," adjacent to the last paragraph.



ANNUAL REPORT

1971 Operation of the Colorado River Basin 1972 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
Ellis L. Armstrong, Commissioner
January 1972

Table of Contents

Frances Canyon, Navajo Reservoir, Navajo Unit, Colorado River Storage Project, New Mexico

Authority for Report

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 first Annual Report on the Operation of the Colorado River.

This report describes the actual operation of the reservoirs in the Colorado River drainage area 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 1971 and the projected operation of these reservoirs during water year 1972 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

The operation of the Colorado River during both the past year and the projected operation for the current year reflects domestic use, irrigation, hydroelectric power generation, 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 reflect Mexican Treaty obligations and Lower Basin contractual commitments.

Lake Mead Marina, Boulder Canyon Project, Nevada

Actual Operations Under Criteria - Water Year 1971

Operation of the Colorado River during 1971 was based on a forecast of runoff. Starting January 1, the snowmelt runoff was forecasted and the required release of storage of water to meet demands 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.

A description of the actual operation of each of the reservoirs in the Colorado River Basin is given in the following paragraphs. Charts I through IX show hydrographs of monthly outflow from the reservoirs and end-of-month elevation and active storage in the reservoirs for water year 1971.

Upper Basin Reservoirs

Fountenelle Reservoir

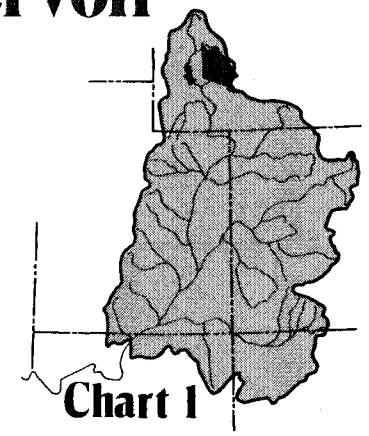


Chart 1

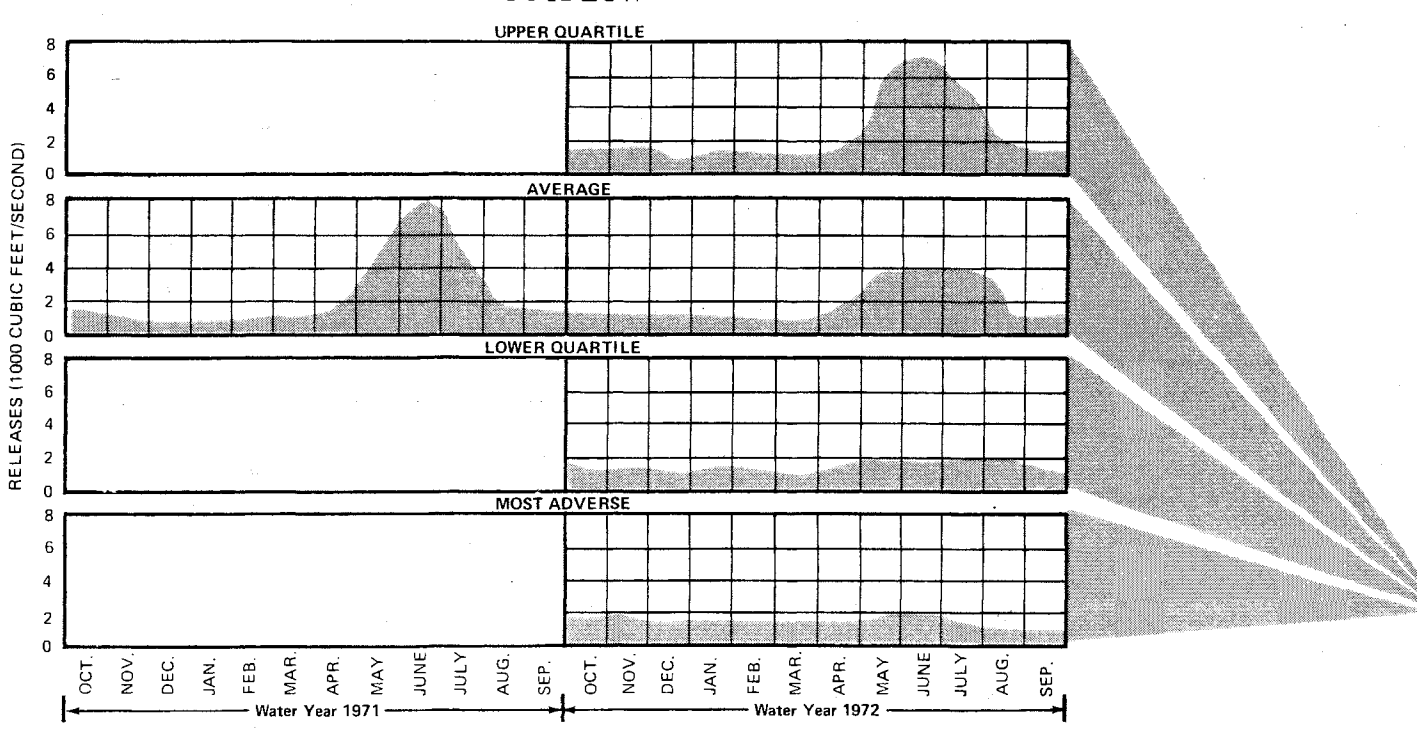
STATISTICS

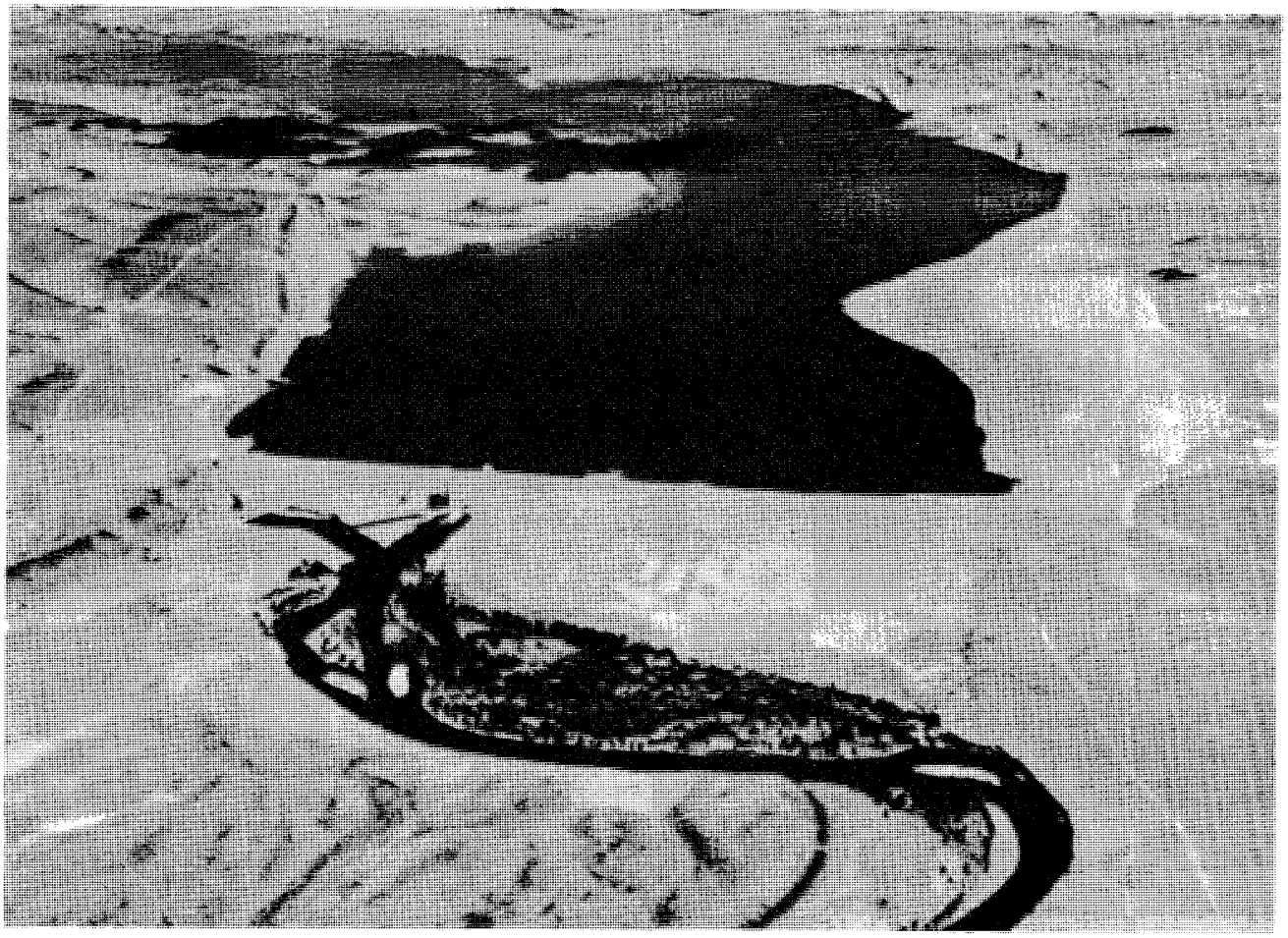
RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	344,834	6506
RATED HEAD	233,789	6491
MINIMUM POWER	194,962	6485
SURFACE AREA (FULL)	8058 ACRES	
RESERVOIR LENGTH (FULL)	18 MILES	
POWER PLANT		
NUMBER OF UNITS	1	
TOTAL CAPACITY	10,000	KILOWATTS

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

During the past year, Fontenelle Reservoir has been operated for hydroelectric generation, flood control, fish and wildlife enhancement, and for recreation. During the fall and winter of 1970-71, the reservoir was slowly reduced from elevation 6,492 feet at the beginning of the year to a low prior to spring runoff of elevation 6,481 feet in April. The minimum release during the fall and winter was 600 cubic feet per second (c.f.s.) in order that power could be generated at the powerplant. Starting March 19, 1971, releases were gradually increased to 1,450 c.f.s. on March 27 to force the geese to build their nests on higher ground. After the actual geese-nesting period, a maximum of 10,900 c.f.s. had to be released at the end of June when the reservoir was within 23,000 acre-feet of being full. The reservoir as of September 30, 1971, had 330,000 acre-feet of active storage at elevation 6,504 feet, two feet below maximum water surface level.

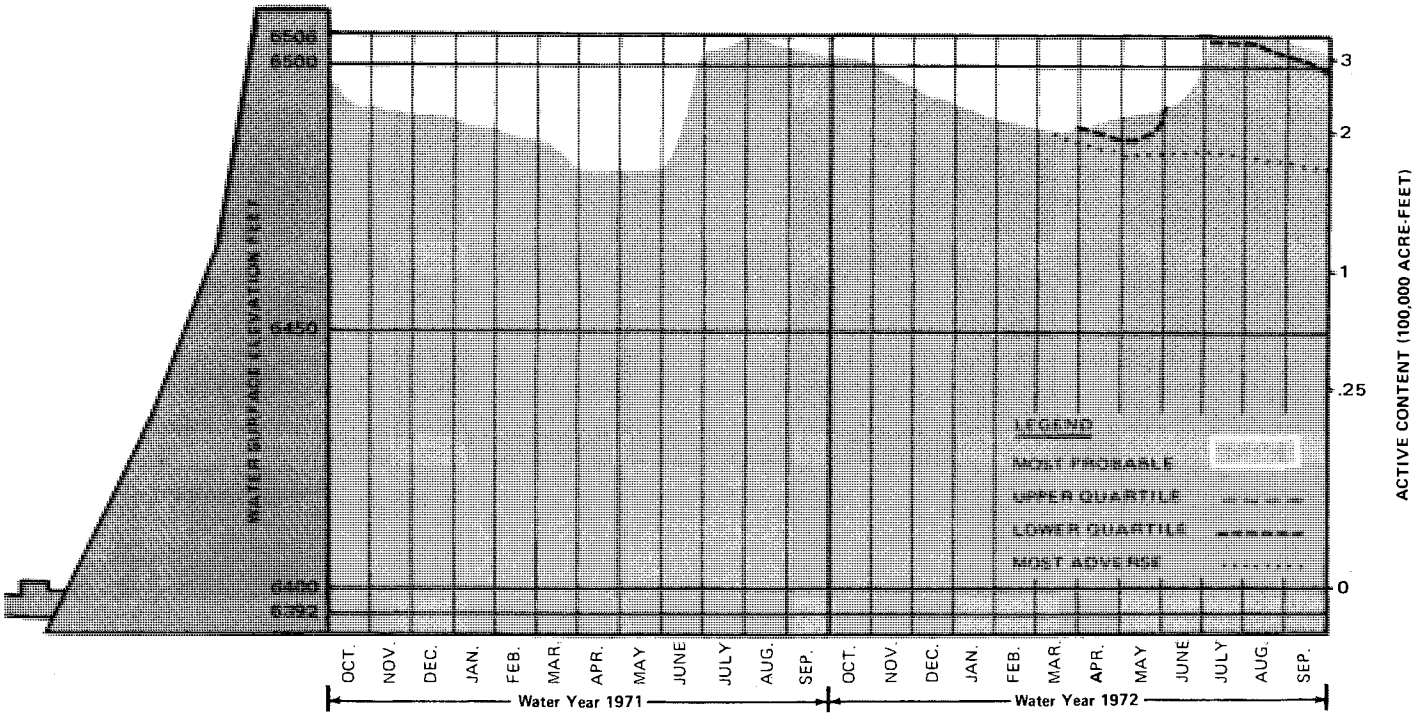
During water year 1971, the Green River April-July inflow to Fontenelle was 150 percent of the long-time average and releases to control the peak inflow reached 11,000 c.f.s. No flood damage was sustained below Fontenelle Dam. (Chart 1)





Fontenelle Dam and Reservoir, Seedskadee Project, Wyoming

STORAGE



Flaming Gorge Reservoir

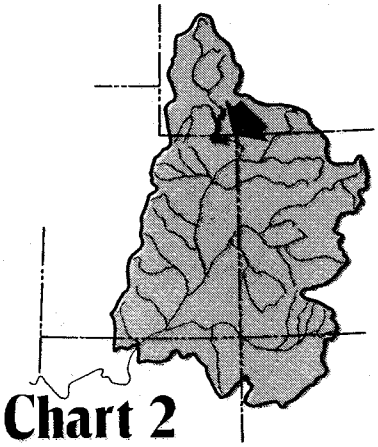


Chart 2

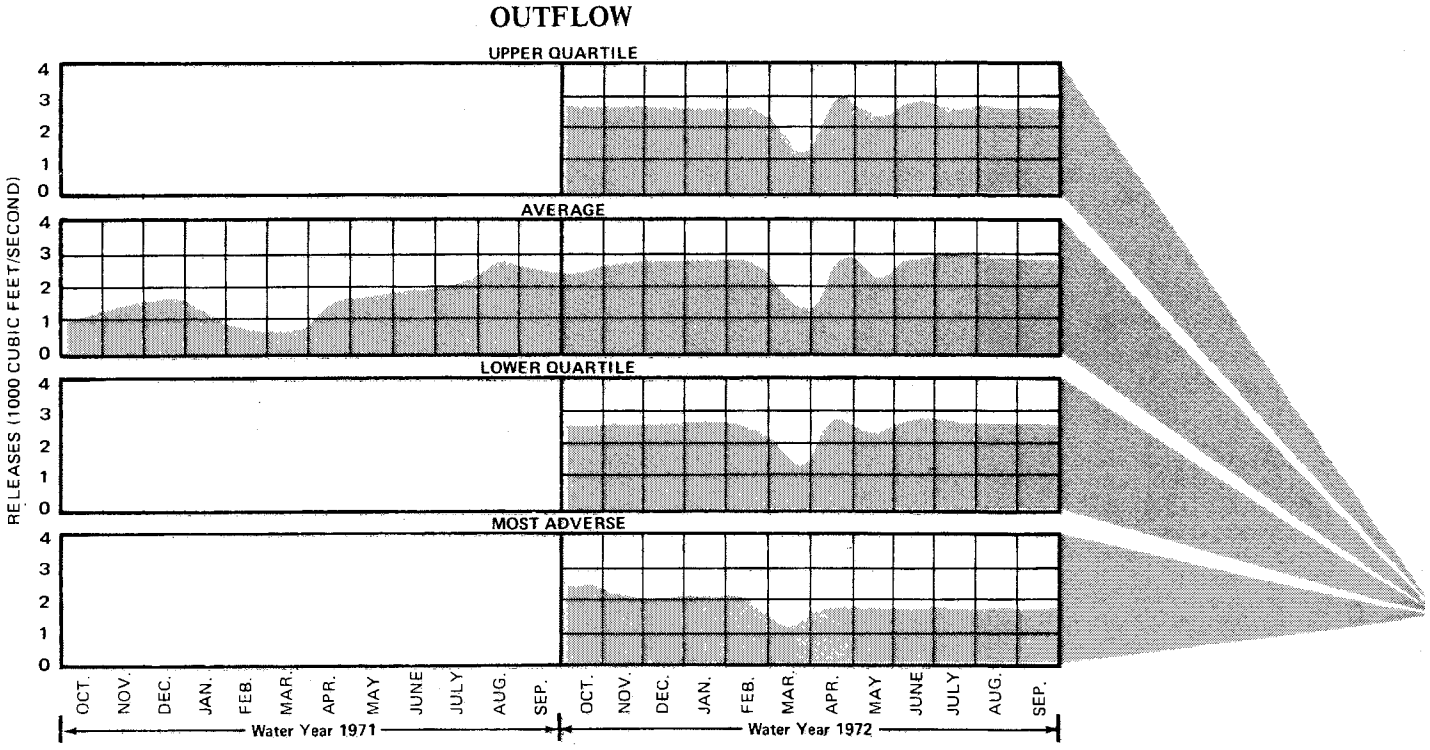
Flaming Gorge Reservoir has been operated as part of the Colorado River Storage Project in accordance with compacts and laws to provide optimum power production, recreation, and fish and wildlife.

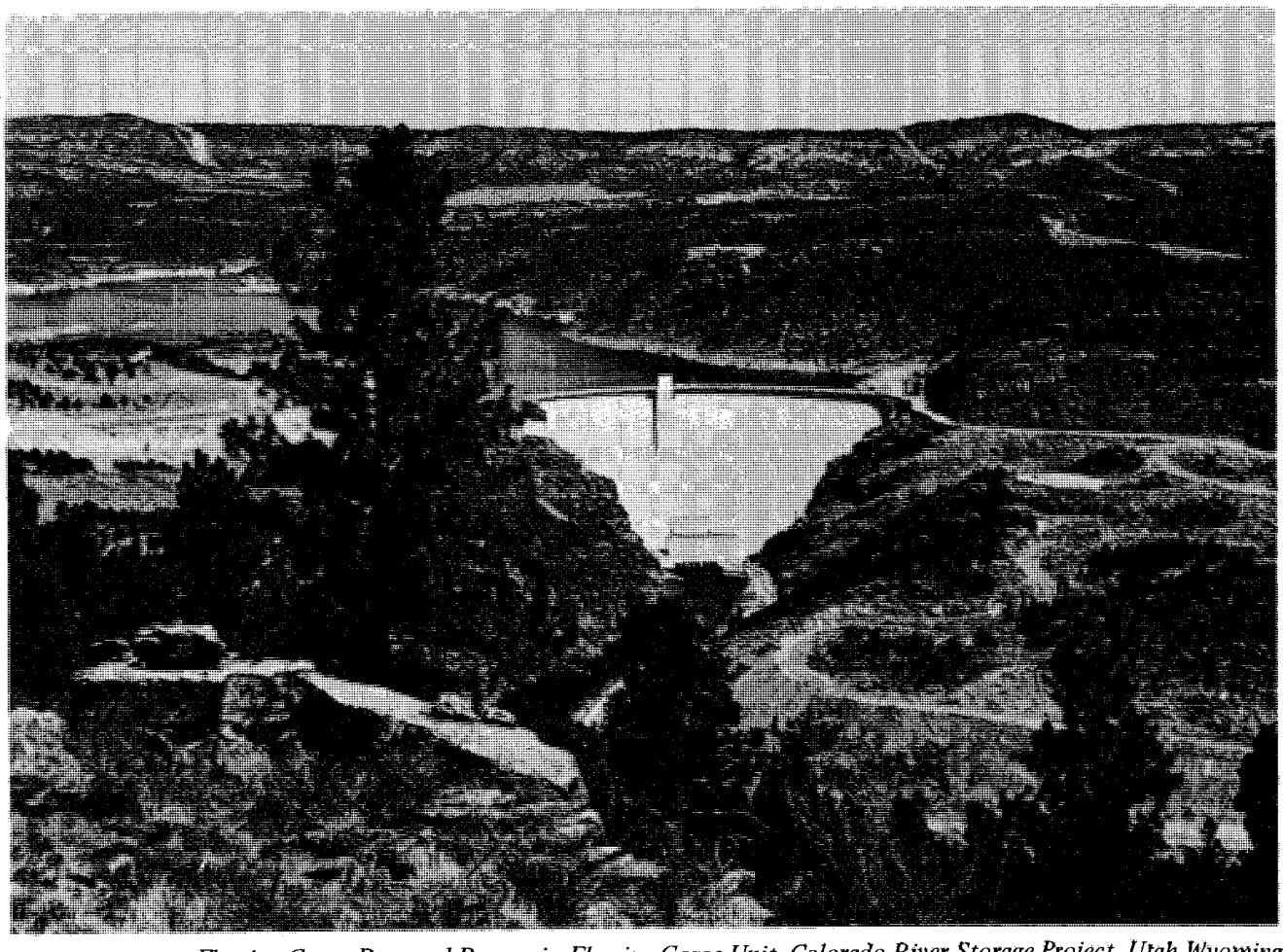
On September 30, 1970, Flaming Gorge was at elevation 5,980 feet with an active storage of 1,790,000 acre-feet. Power releases caused the reservoir to recede only 1 foot during the fall and winter to elevation 5,979 feet. The April-July 1971 runoff above Flaming Gorge was 1,900,000 acre-feet or 164 percent of the long-time average. With this runoff Flaming Gorge reached an all-time high on August 4, 1971, of elevation 6,022 feet and an active storage of 3,046,000 acre-feet. During May 1971 the reservoir reached elevation 5,990 feet, the elevation above which all boat ramps of the reservoir could be used during the recreational season. (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	
POWER PLANT		
NUMBER OF UNITS	3	
TOTAL CAPACITY OF UNITS	108,000 KILOWATTS	

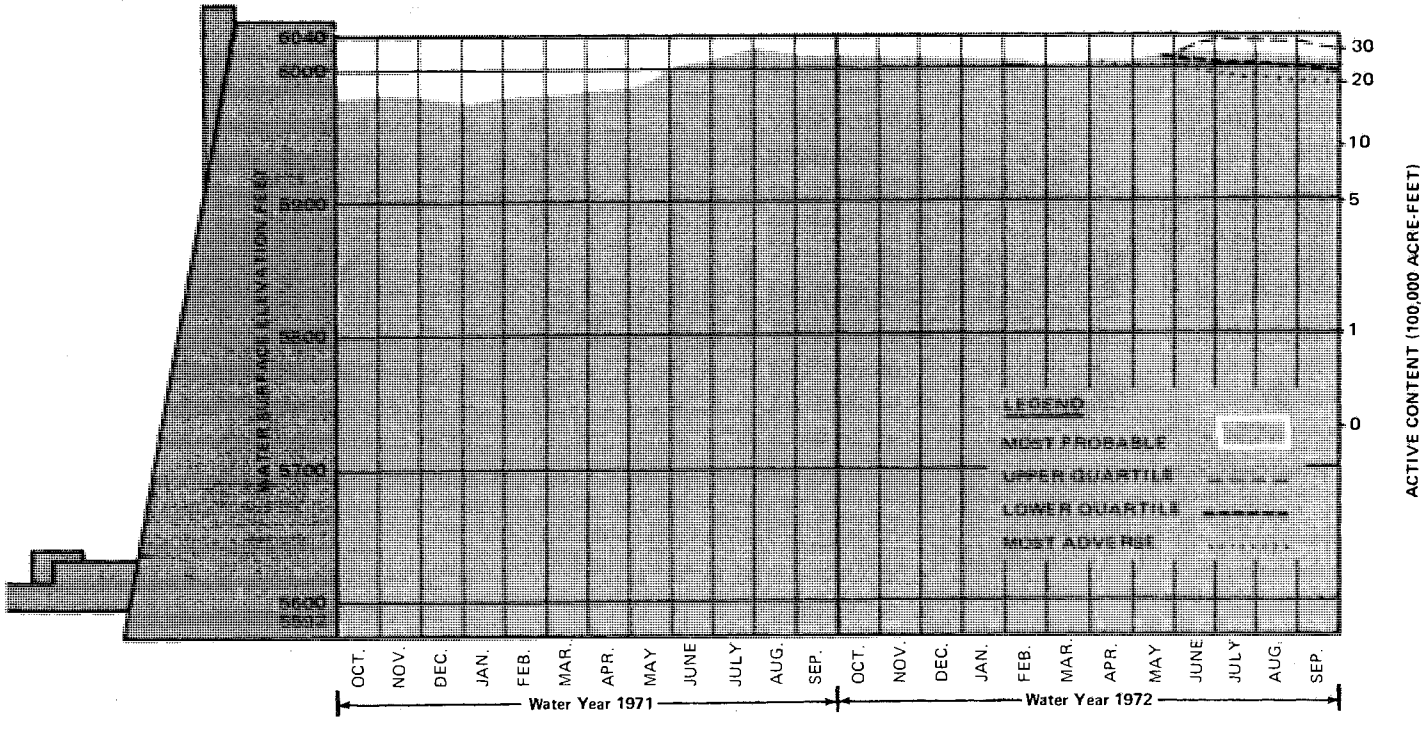
**does not include 40,000 acre feet of dead storage below 5740 feet*





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

STORAGE



Curecanti Unit

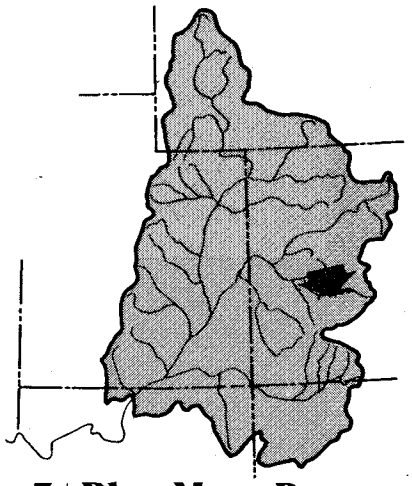


Chart 3/ Blue Mesa Reservoir

STATISTICS

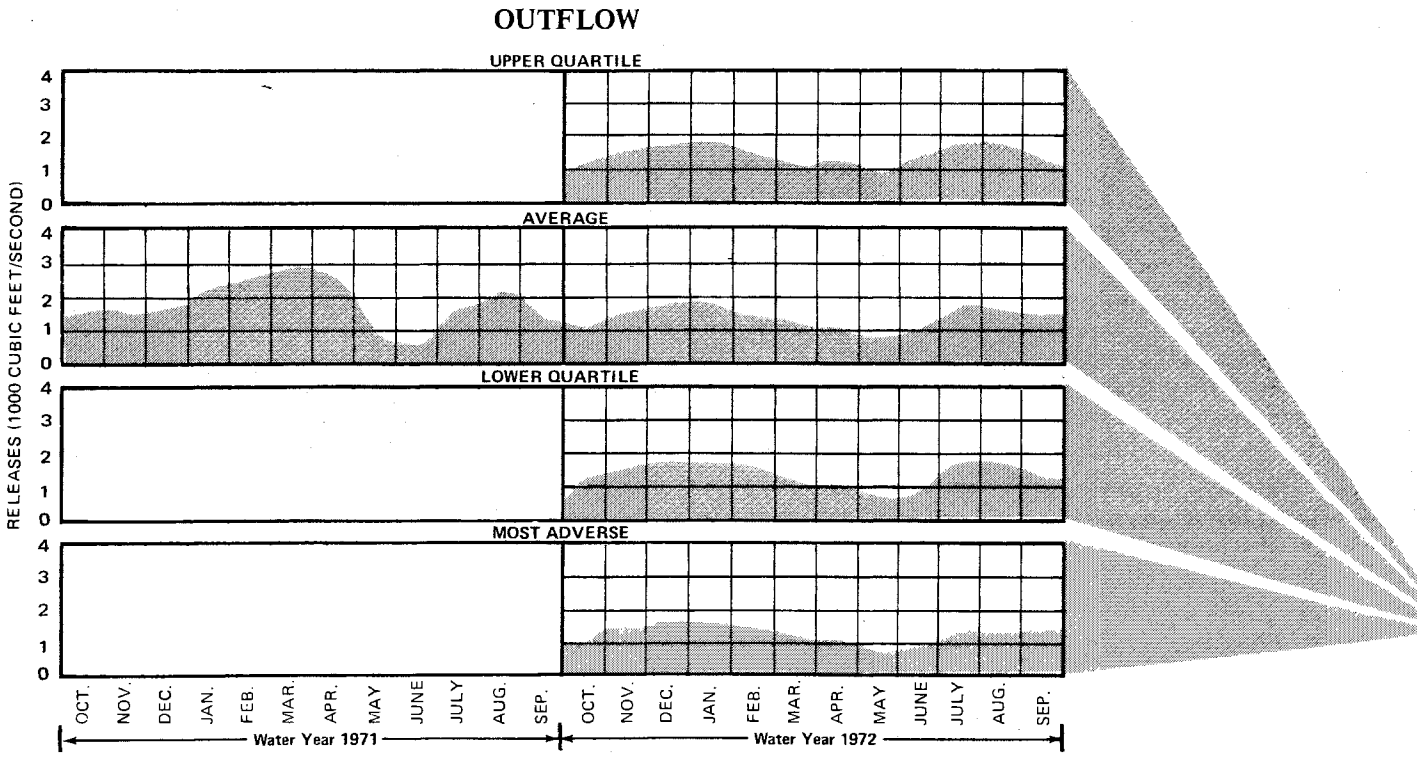
RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	829,523	7519
RATED HEAD	249,395	7438
MINIMUM POWER	81,070	7393
SURFACE AREA (FULL)	9180 ACRES	
RESERVOIR LENGTH (FULL)	24 MILES	
POWER PLANT		
NUMBER OF UNITS	2	
TOTAL CAPACITY OF UNITS	60,000 KILOWATTS	

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

At the end of September 1970 Blue Mesa Reservoir had 810,000 acre-feet of active storage and a water surface elevation of 7,517 feet. In order to facilitate construction of a boat ramp at Lake Fork Recreation Area, the water surface of Blue Mesa was lowered during the winter of 1970 and spring of 1971 to elevation 7,440 feet and an active storage of 360,000 acre-feet. During April-July 1971 inflow to Blue Mesa was 708,000 acre-feet. This amount of water caused the reservoir to reach elevation 7,496 feet and an active storage of 628,000 acre-feet in the latter part of July. During water year 1971 fishing was enhanced below Gunnison Tunnel by the flow of not less than 300 c.f.s.

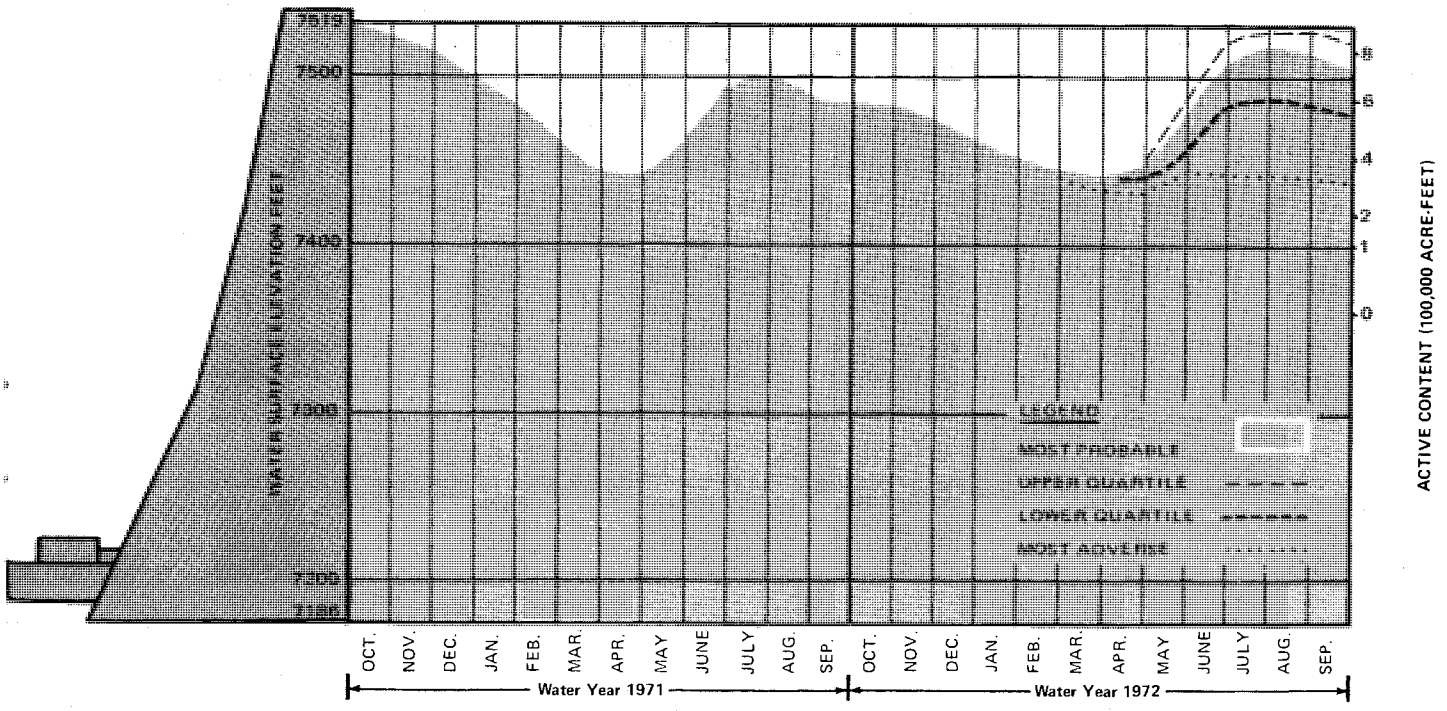
A preliminary flood control diagram for Blue Mesa is being used to plan and monitor the routing of the snowmelt runoff. Blue Mesa had an active storage of 416,000 acre-feet on March 1, 1971.

The March 1, 1971, forecast of the April-July 1971



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

STORAGE



Curecanti Unit

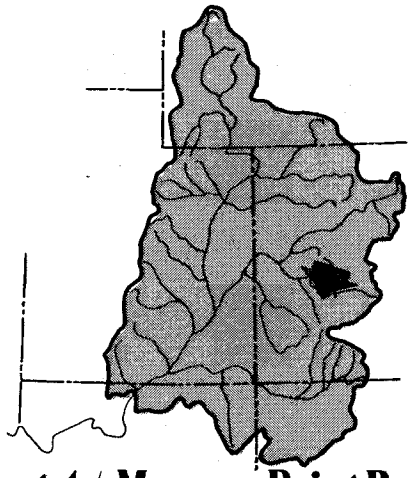


Chart 4 / Morrow Point Reservoir

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	
POWER PLANT		
NUMBER OF UNITS	2	
TOTAL CAPACITY OF UNITS	120,000 KILOWATTS	

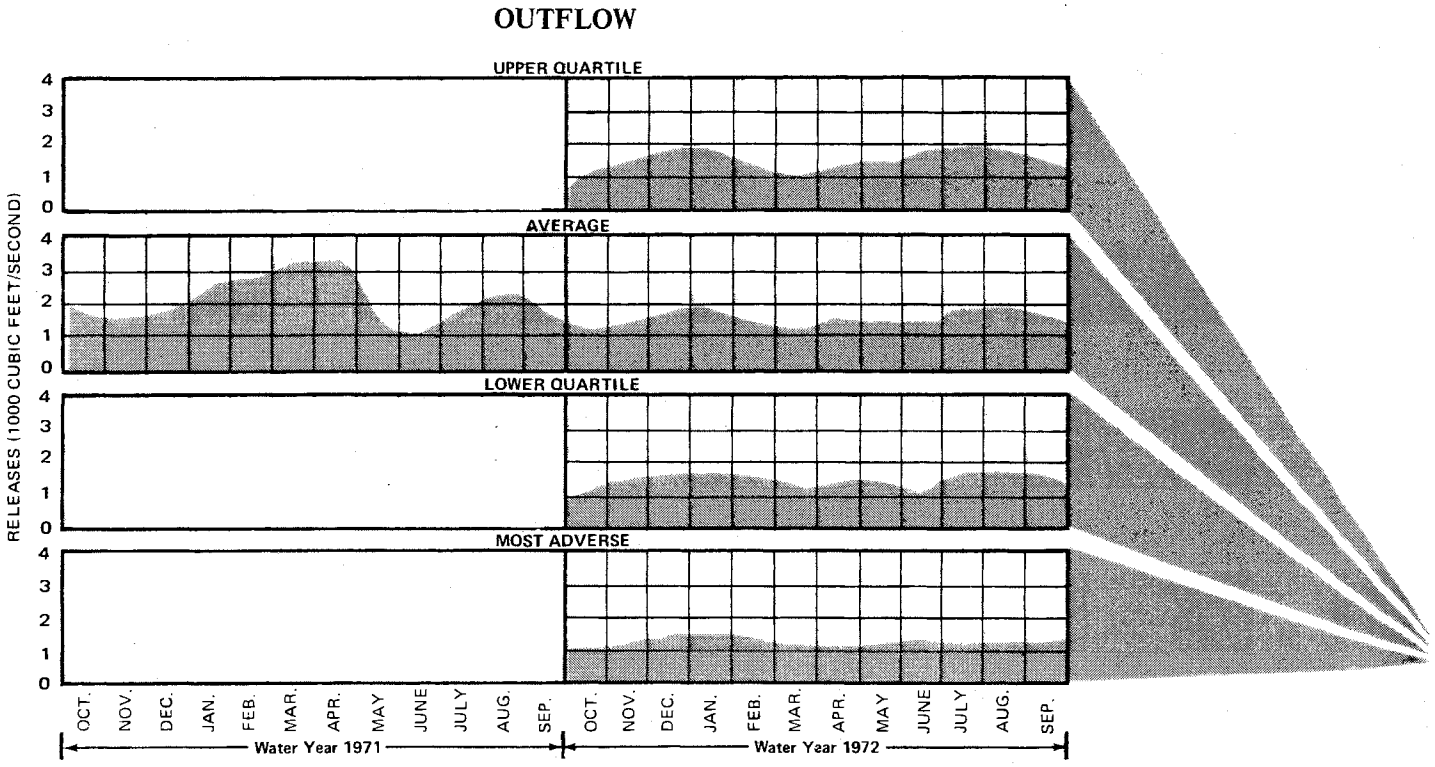
**does not include the 165 acre feet of dead storage below 6808 feet*

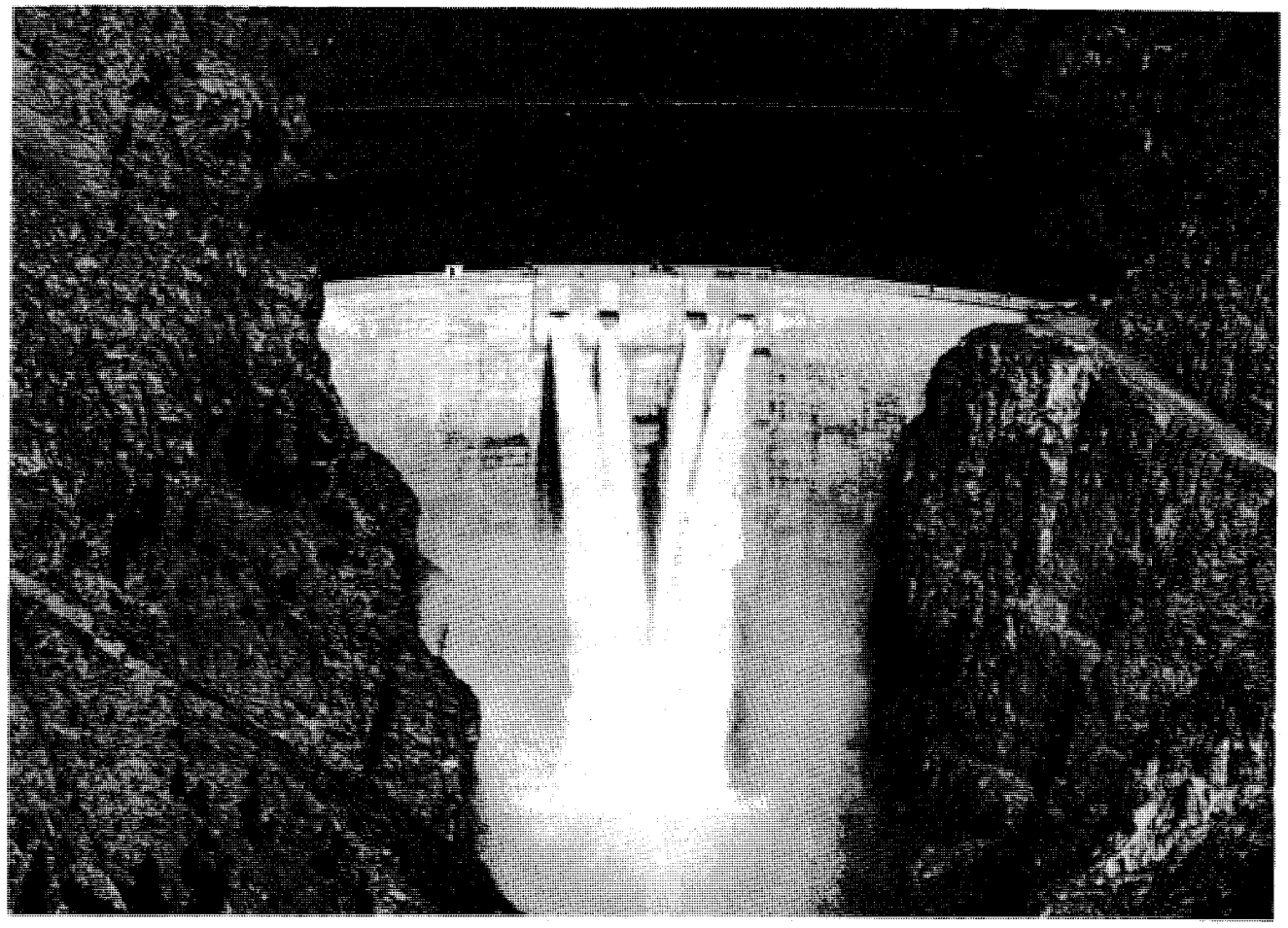
inflow to Blue Mesa was 730,000 acre-feet. The flood control diagram showed that the reservoir could have remained full the remainder of the snowmelt season; therefore, the operation of Blue Mesa did not include releases for flood control (Chart 3)

Some ice jamming and overflow occurred along the Gunnison River above Blue Mesa Reservoir during the winter 1970-71. A clearing and snagging program by the Corps of Engineers which is nearing completion should improve channel flow conditions during freezing weather. The Bureau is buying additional right-of-way to provide space for ice storage.

Morrow Point Reservoir was essentially full during water year 1971 and occasional spills were necessary over the 360-foot free fall spillway. During the winter 1970-71 both generators were completed at Morrow Point and are now on line. On September 30, 1971, the reservoir contained 116,000 acre-feet of active storage at elevation 7,160 feet. Its inflow is extensively controlled by the larger Blue Mesa Reservoir which is upstream.

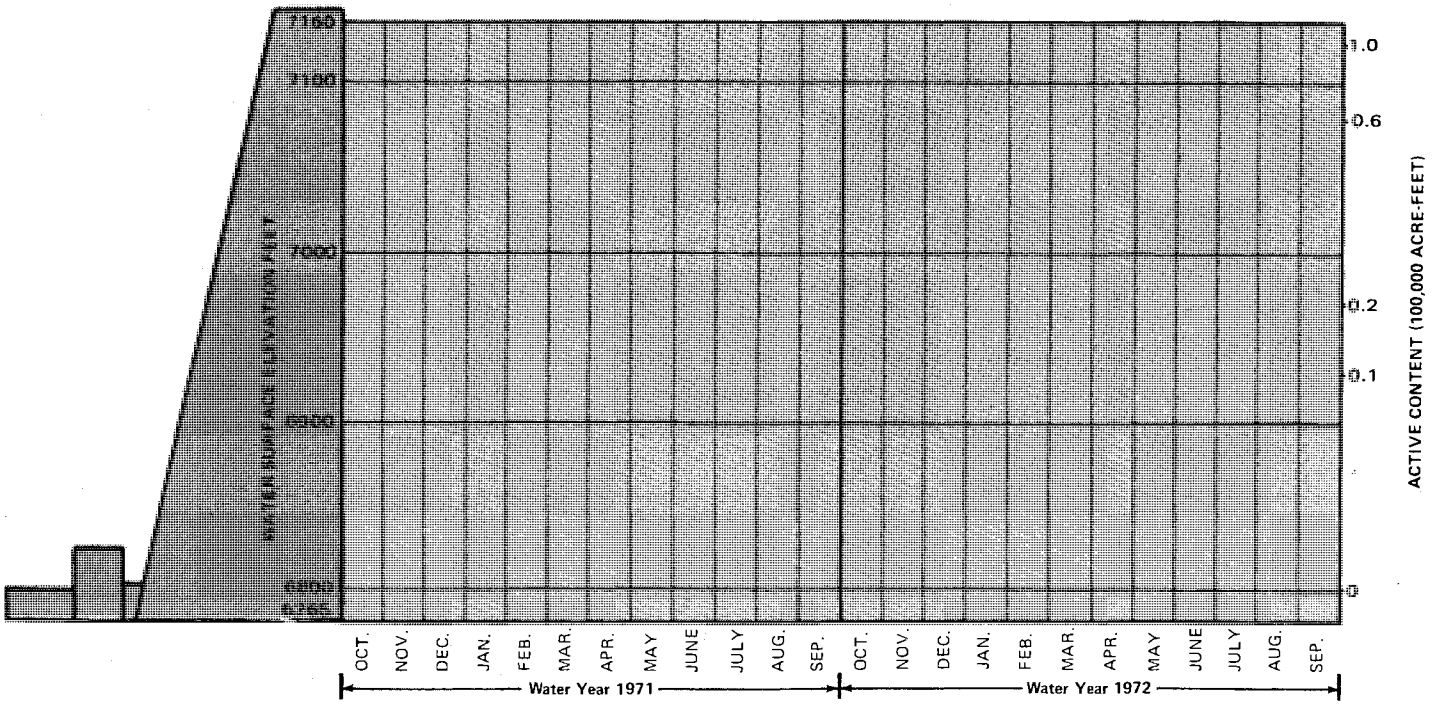
Morrow Point Reservoir will normally be operated at or near full capacity regardless of the amount of snowmelt runoff (Chart 4)





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

STORAGE



Navajo Reservoir

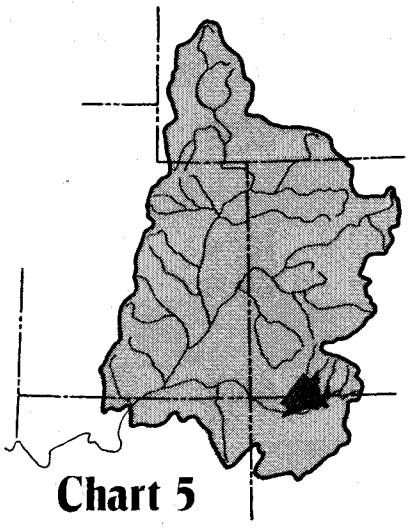


Chart 5

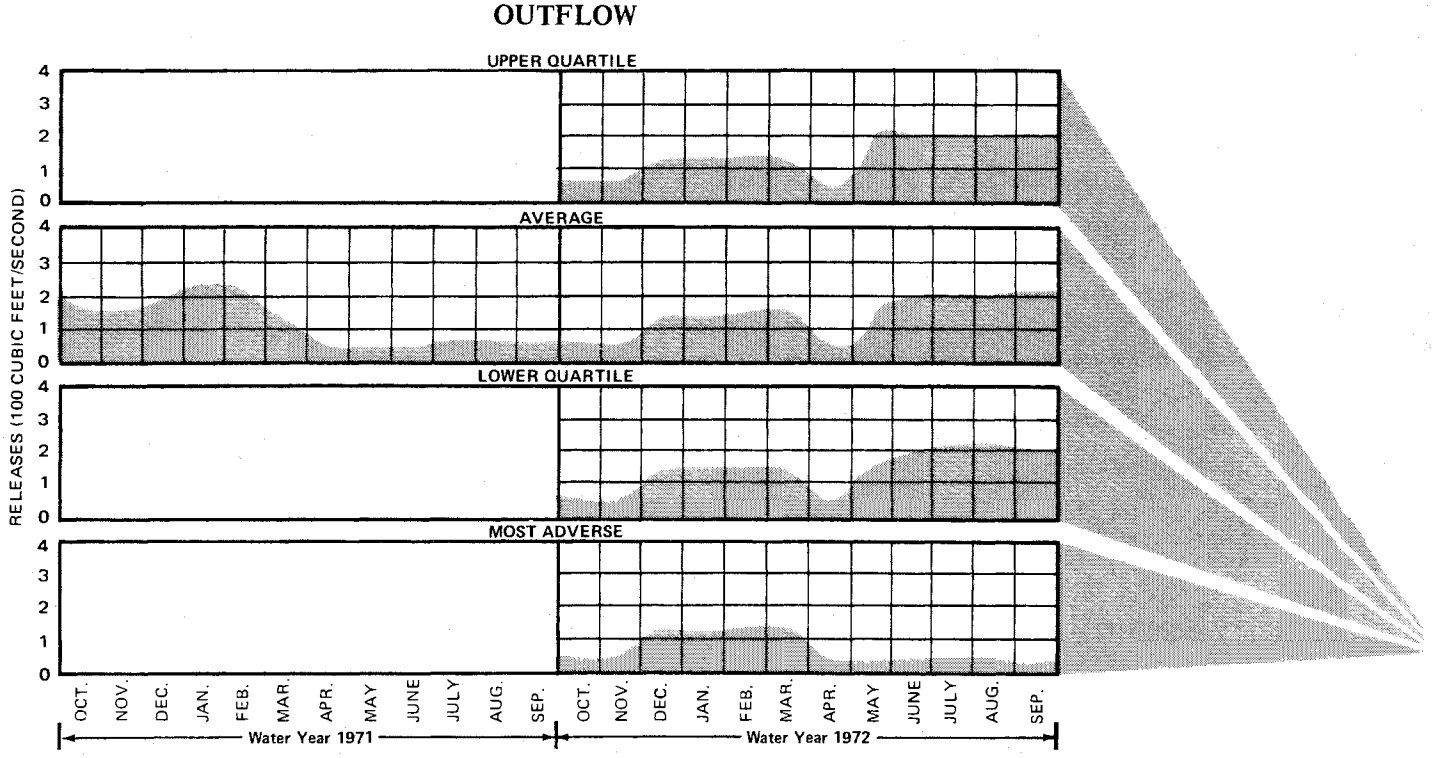
During water year 1971 Navajo Reservoir was kept within the limits specified by the Bureau of Reclamation in its interim operating rules. The reservoir was lowered to elevation 6,009 feet during the winter 1970 and spring 1971 to accommodate extension of the Pine River boat ramp. During the spring runoff 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 305,000 acre-feet or 36 percent of the long-time April-July runoff average above Navajo. The reservoir reached a seasonal high of elevation 6,028 feet with an active storage of 990,000 acre-feet. It was held at or near this elevation during the summer months for recreational purposes by continuing a release of 500 c.f.s.

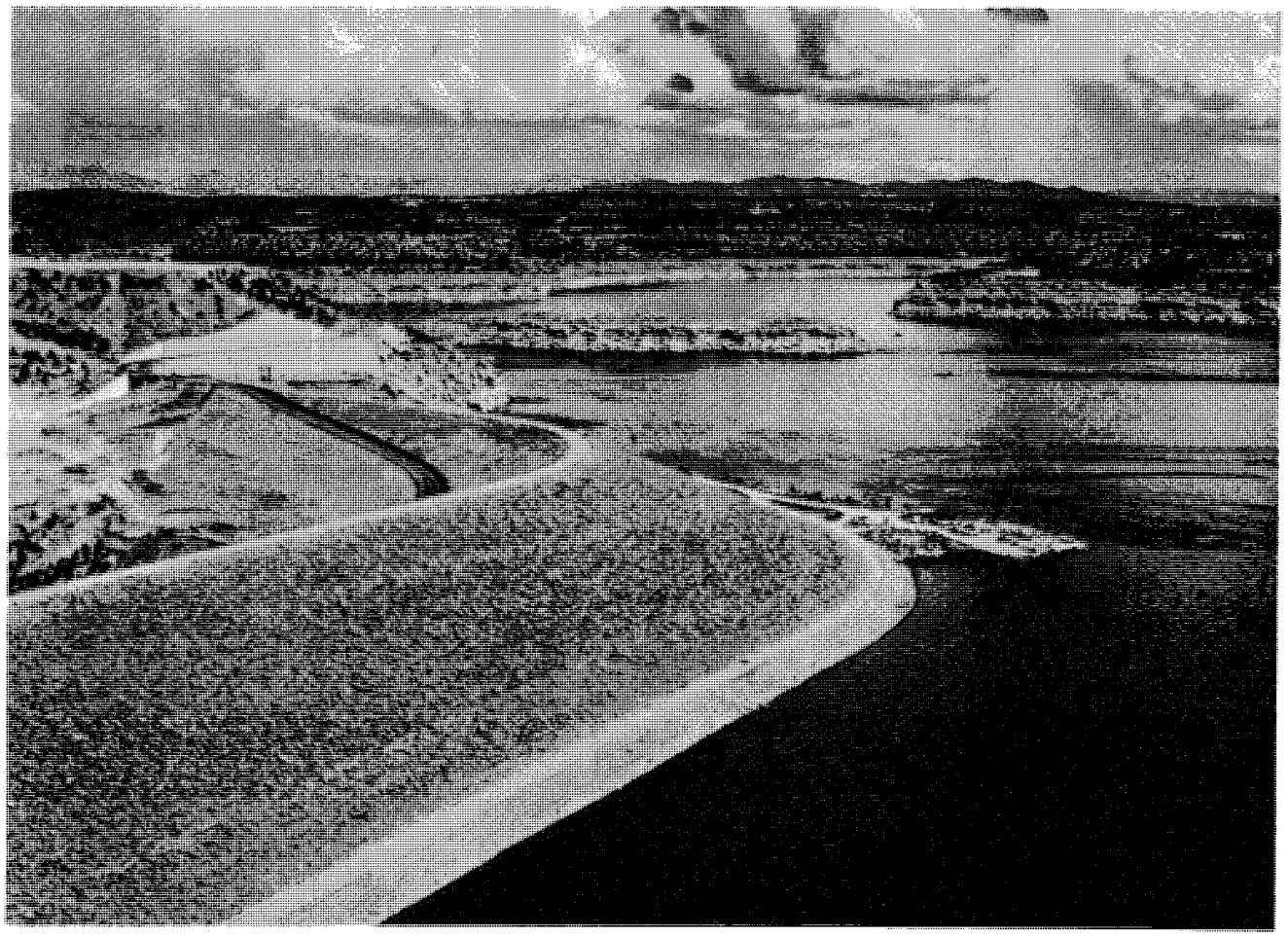
Navajo Reservoir is operated under a formal flood control plan. On March 1, 1971, Navajo Reservoir had 848,000 acre-feet of storage. The April-July inflow forecast on March 1 was 500,000 acre-feet. The current flood control diagram allowed the reservoir to be full with an active storage of 1,696,400 acre-feet during the entire 1971 snowmelt runoff season. Therefore, the scheduled operation of the reservoir did not include any releases for flood control. (Chart 5)

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	

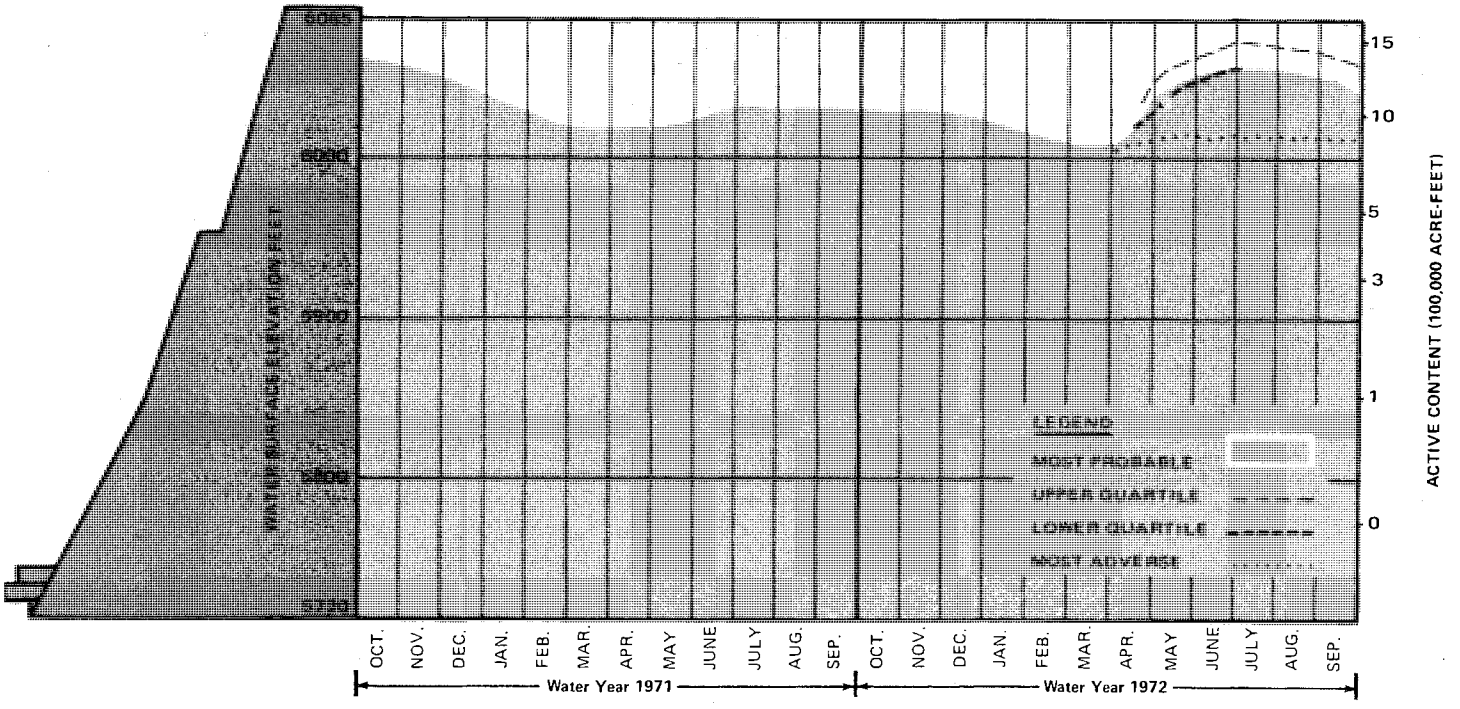
**does not include 12,600 acre feet of dead storage below elevation 5775 feet*





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

STORAGE



Glen Canyon Dam
Lake Powell

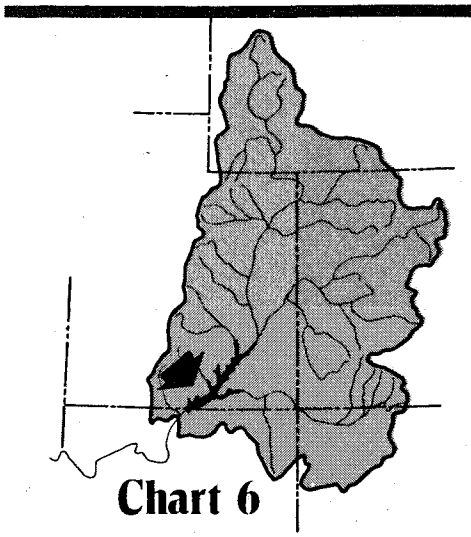


Chart 6

STATISTICS

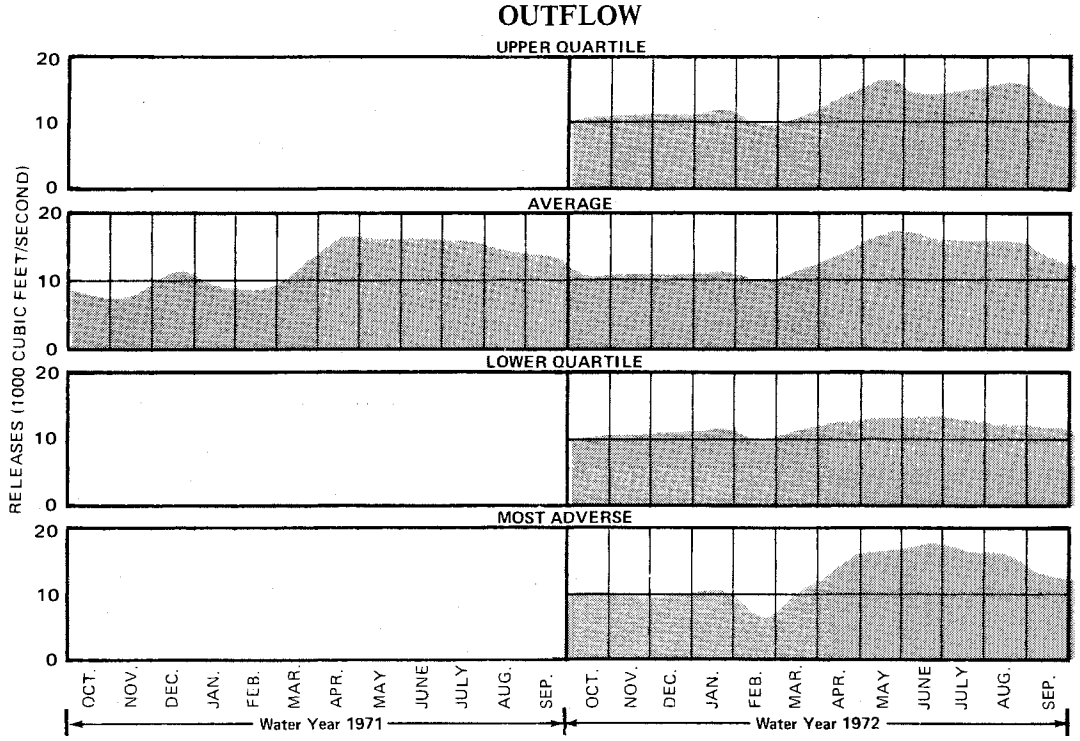
RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	25,002,000	3700
RATED HEAD	9,428,000	3570
MINIMUM POWER	4,126,000	3490
SURFACE AREA (FULL)	161,390 ACRES	
RESERVOIR LENGTH (FULL)	186 MILES	
POWER PLANT		
NUMBER OF UNITS	8	
TOTAL CAPACITY OF UNITS	900,000 KILOWATTS	

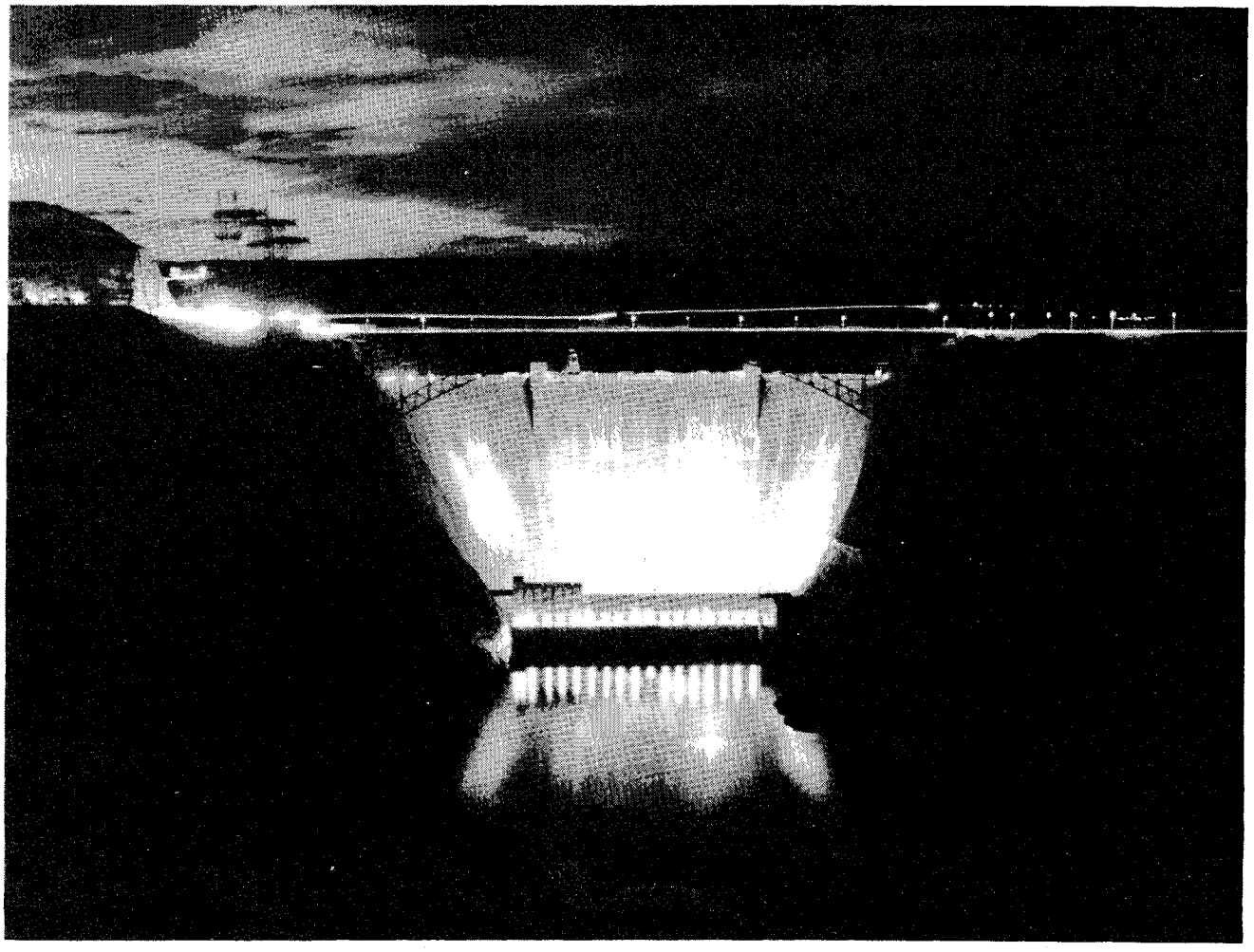
**does not include 1,998,000 acre feet of dead storage below 3370 feet*

Lake Powell has been operated as part of the Colorado River Storage Project in accordance with compacts and laws to provide optimum power production, recreation, and fish and wildlife enhancement. One of the important functions of the reservoir is to provide water from storage to meet the delivery of 75,000,000 acre-feet of water to the Lower Basin each 10 years as required by the Colorado River Compact. A total of 8,558,000 acre-feet was released from Lake Powell during water year 1971, with 8,574,000 acre-feet passing the Compact point at Lee Ferry, Arizona. Releases from Lake Powell during the year were scheduled so that Lake Mead remained at a near-constant level during the bass spawning season to provide good habitat for propagation.

On September 30, 1970, Lake Powell had an elevation of 3,599 feet and an active storage of 12.0 million acre-feet. The high water elevation occurred on July 11, 1971, when the reservoir had 14.5 million acre-feet of active storage at elevation 3,622 feet. This is an all-time high for Lake Powell, being 52 feet above rated head with 58 percent of the active capacity of the reservoir.

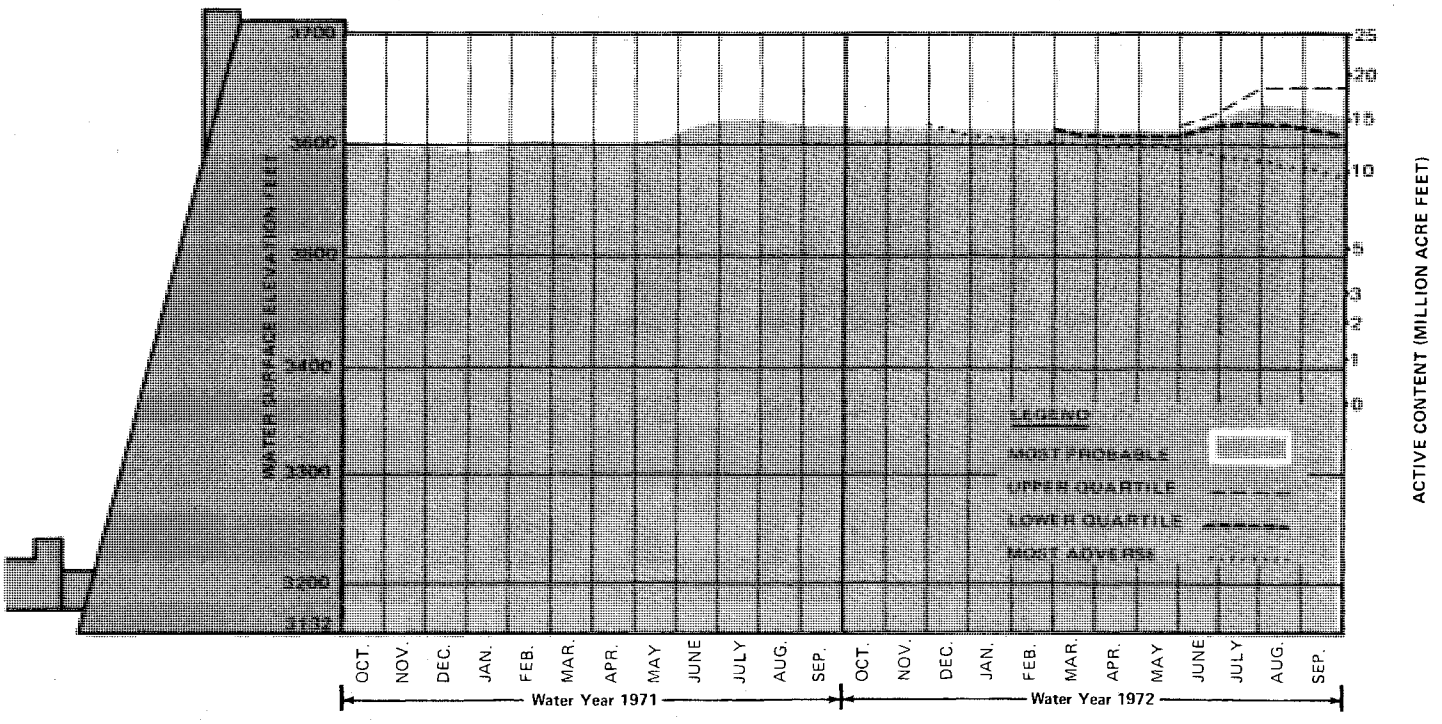
The April-July 1971 runoff above the gage at Lees Ferry, Arizona, undepleted by CRSP reservoirs, was 8.4 million acre-feet or 101 percent of the 1906-68 average. On September 30, 1971, the lake had receded 8 feet to elevation 3,614 feet and an active storage of 13.6 million acre-feet. (Chart 6)





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

STORAGE



Lower Basin Reservoirs

Hoover Dam
Lake Mead

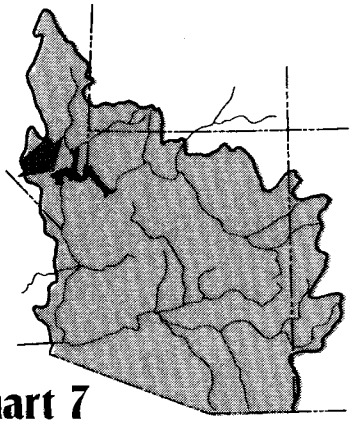


Chart 7

STATISTICS

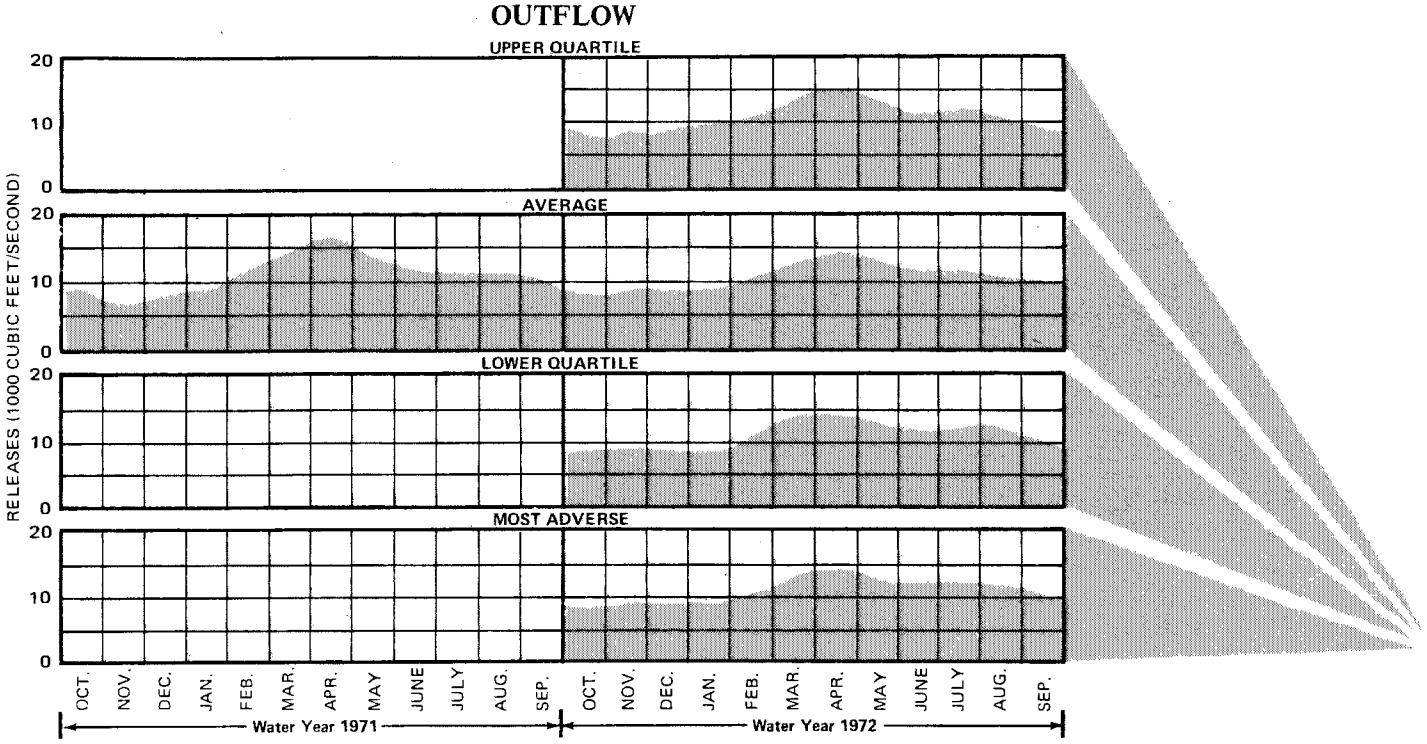
RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	27,377,000	1229
RATED HEAD	13,653,000	1123
MINIMUM POWER POOL	10,024,000	1083
SURFACE AREA (FULL)	162,700 ACRES	
RESERVOIR LENGTH (FULL)	115 MILES	
POWER PLANT		
NUMBER OF UNITS	17	
TOTAL CAPACITY OF UNITS	1,344,800 KILOWATTS	

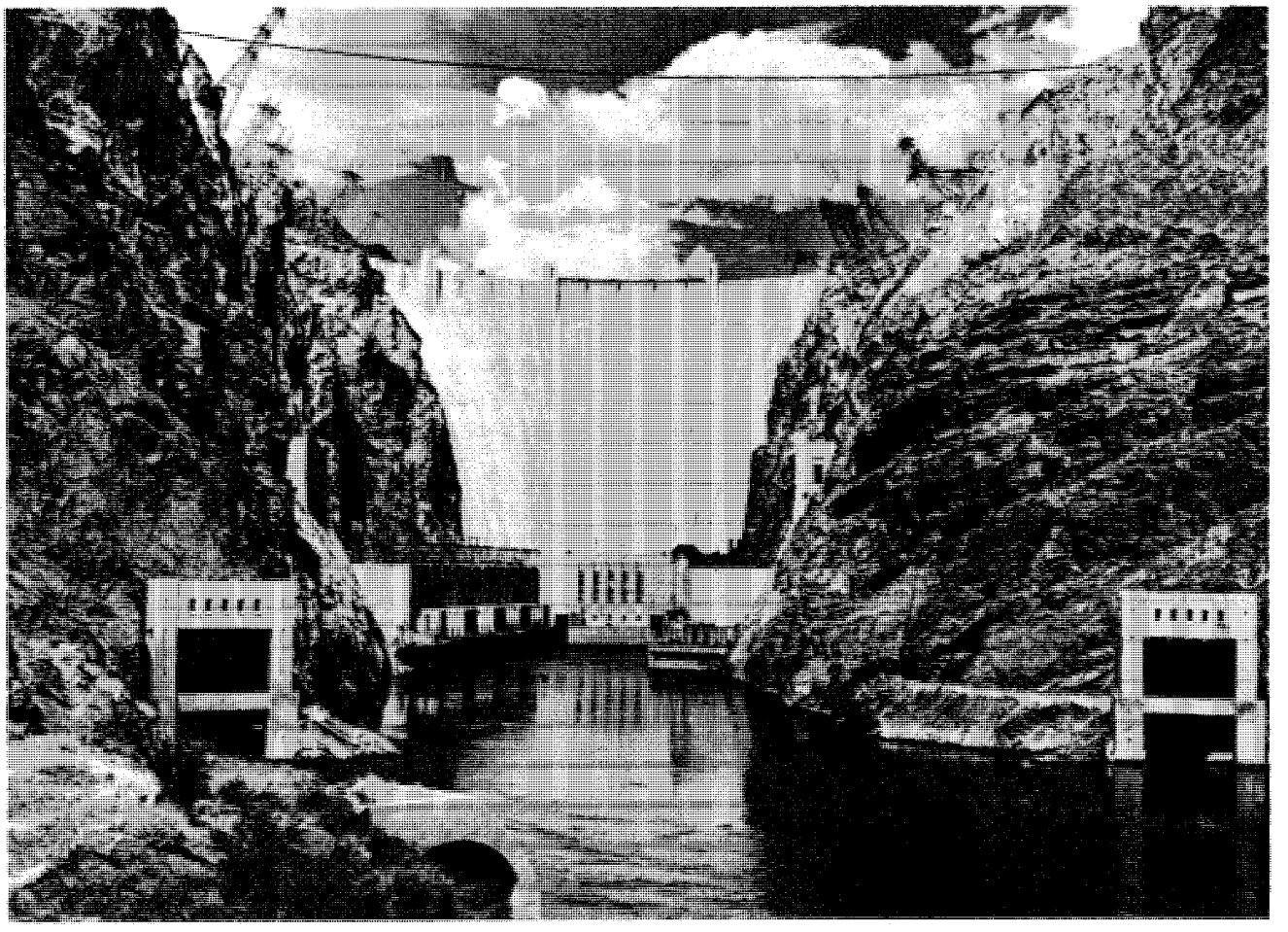
**does not include 2,378,000 acre-feet of dead storage below elevation 895 feet*

Lake Mead at the beginning of water year 1971 had a water surface level of 1,152.58 feet and an active storage of 16,769,000 acre-feet. During the water year releases were made to meet downstream water use requirements in the United States and Mexico, programmed levels of Lakes Mohave and Navasu, 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 8,233,000 acre-feet. At the end of the water year, Lake Mead had a water surface elevation of 1,153.61 feet and an active storage of 16,886,000 acre-feet, which reflects an increase in storage during the water year of 117,000 acre-feet.

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.

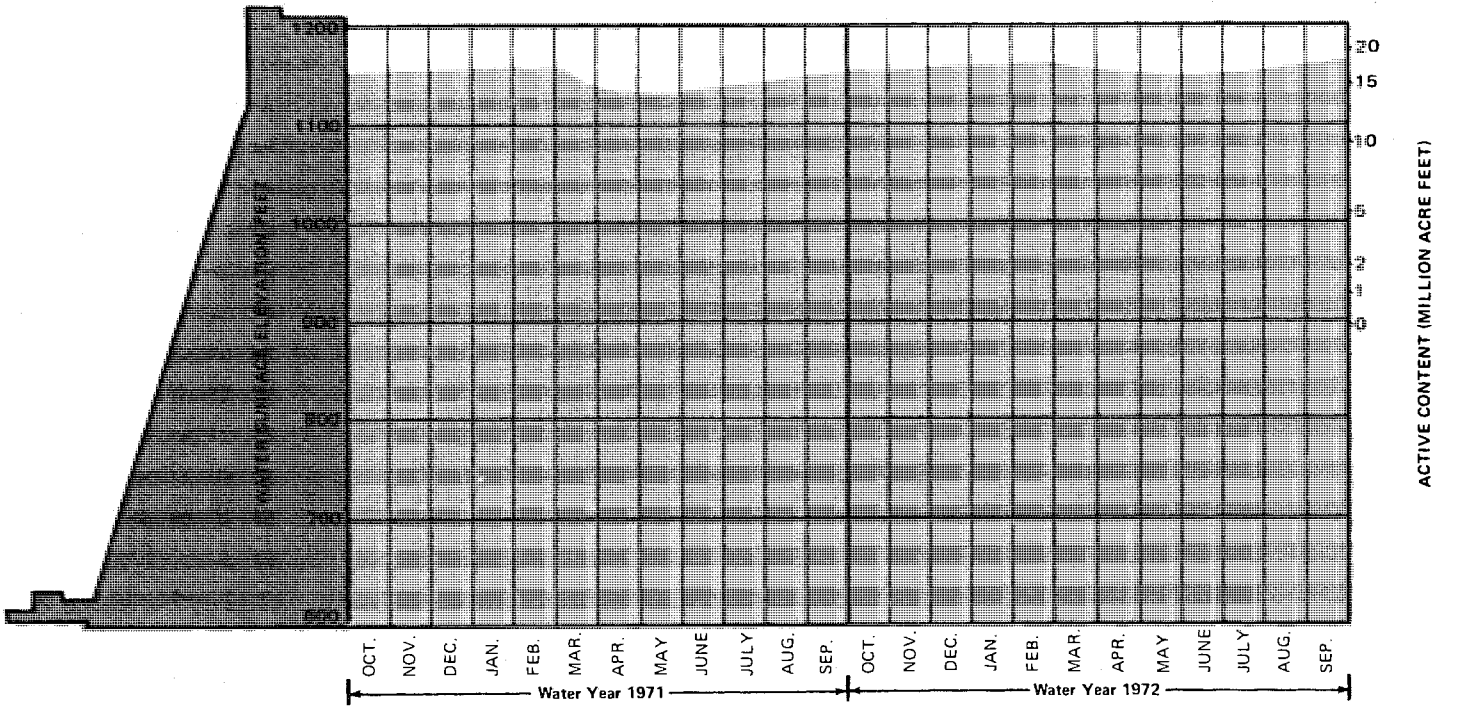
Space in Lake Mead and CRSP reservoirs during water year 1971 was such that no unusual Hoover releases were required to operate pursuant to provisions of the flood control regulations. (Chart 7)





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

STORAGE



Davis Dam
Lake Mohave

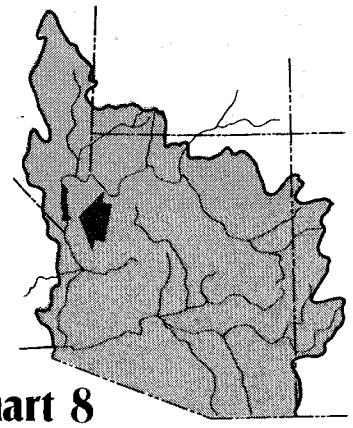


Chart 8

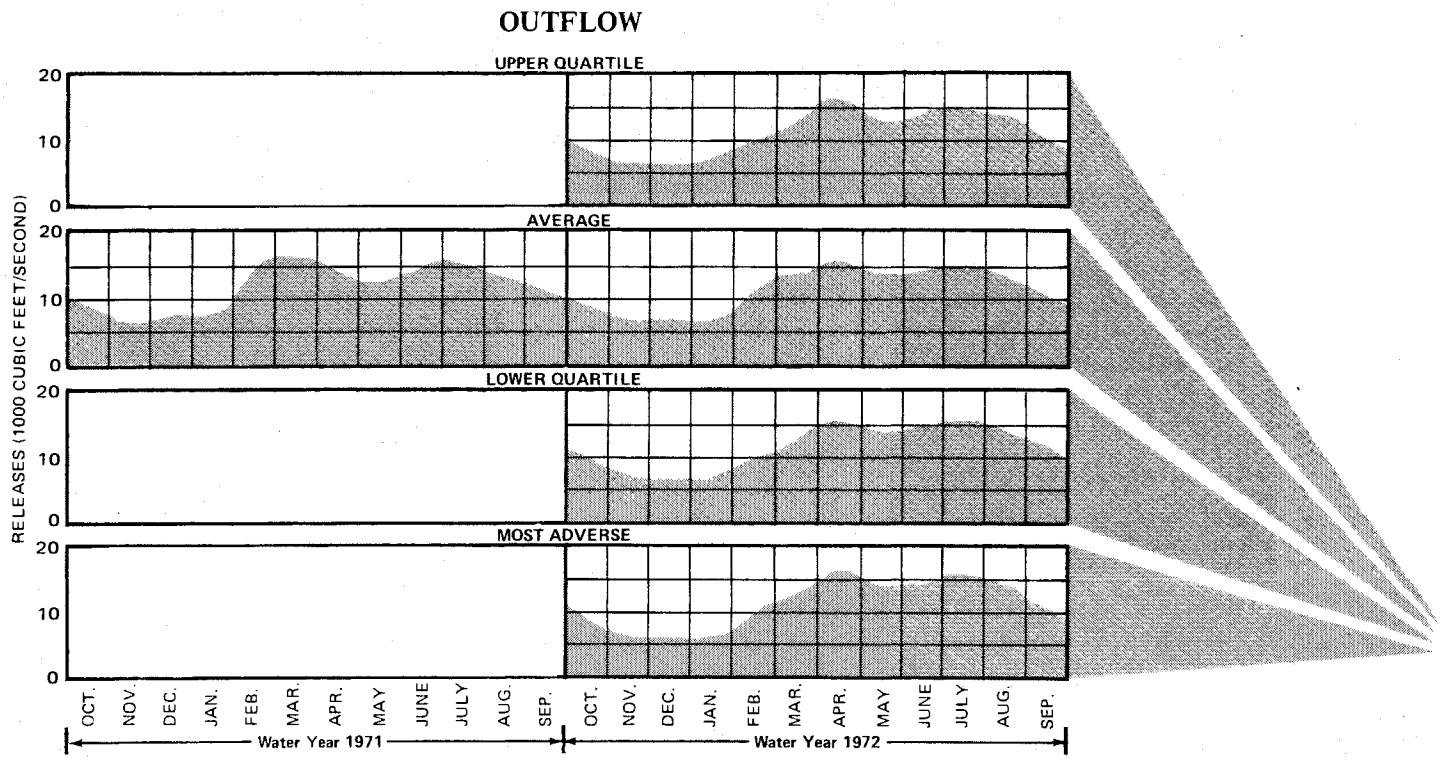
STATISTICS

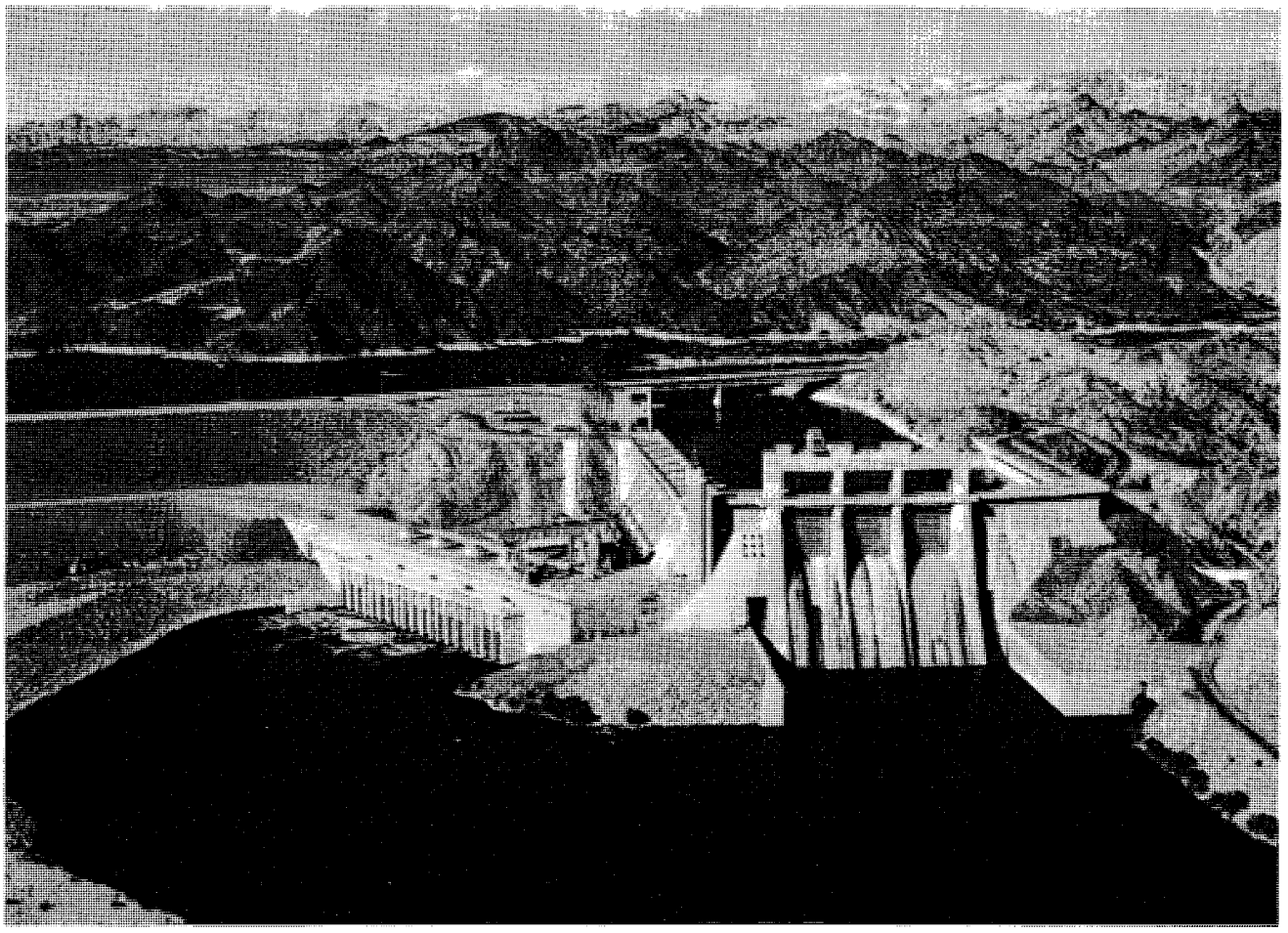
RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	1,810,000	647.0
RATED HEAD	1,188,000	623.0
MINIMUM POWER	217,500	570.0
SURFACE AREA (FULL)	28,200 ACRES	
RESERVOIR LENGTH (FULL)	6.7 MILES	
POWER PLANT		
NUMBER OF UNITS	5	
TOTAL CAPACITY OF UNITS	225,000 KILOWATTS	

**does not include 8,530 acre-feet of dead storage below elevation 533.39 feet*

At the beginning of water year 1971, the level of Lake Mohave was 630.70 feet with an active storage of 1,376,000 acre-feet, about the normal minimum storage during the year. During the winter months the level was raised to elevation 643 feet by the end of February and maintained near that level through April. The high level of Lake Mohave was 646.83 feet with an active storage of 1,805,000 acre-feet on May 29 which is about the beginning of the heavy irrigation season. The level was drawn down during the summer months to elevation 633.26 feet with an active storage of 1,441,000 acre-feet at the end of the water year.

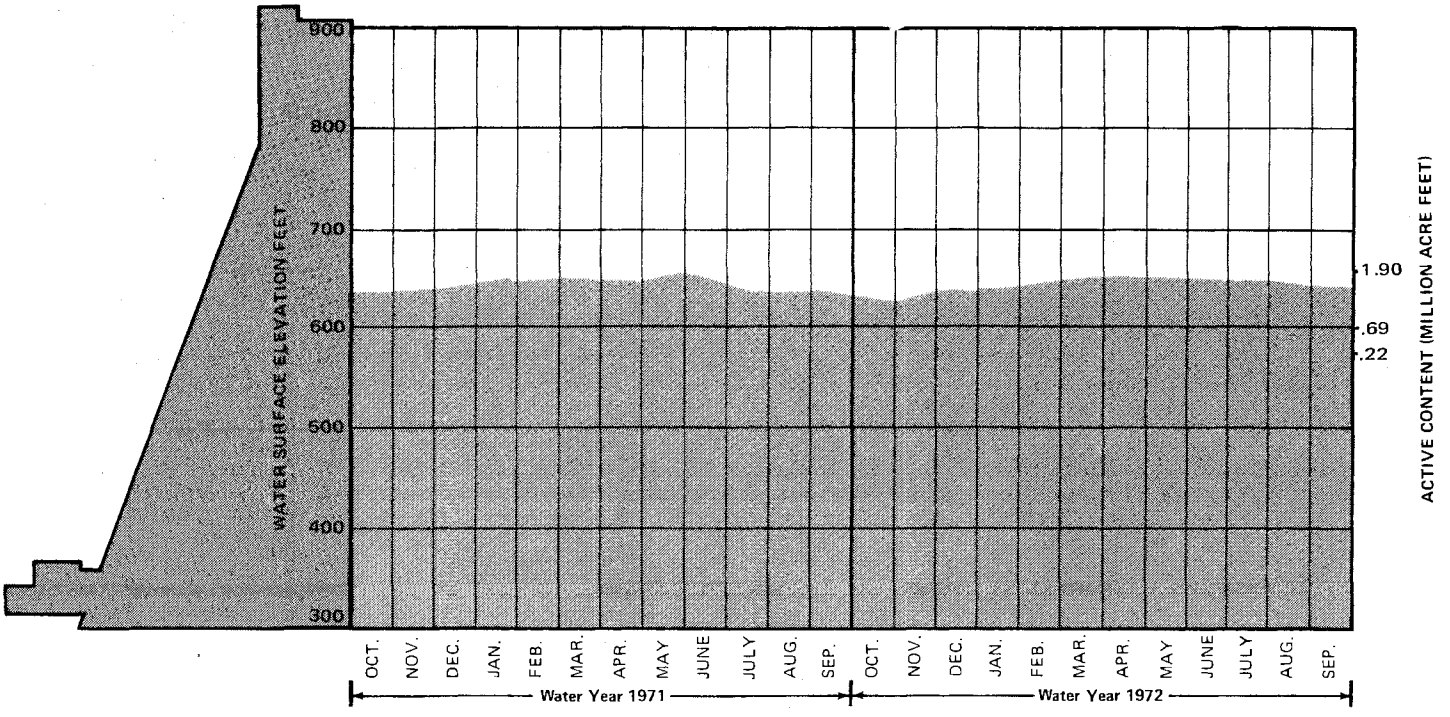
Releases from Lake Mohave were made monthly to satisfy downstream requirements with a small amount of re-regulation by Lake Havasu. There were 8,259,000 acre-feet released at Davis Dam during the water year, all of which was passed through the turbines for power production. (Chart 8)





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

STORAGE



Parker Dam
Lake Havasu

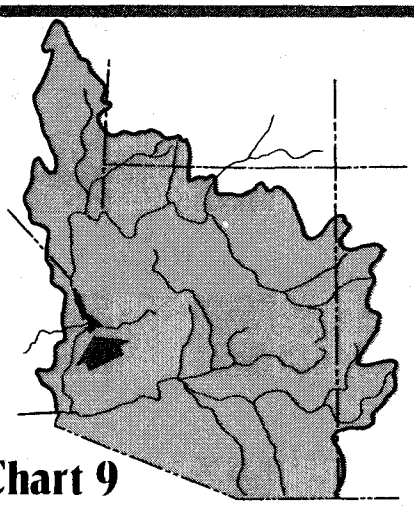


Chart 9

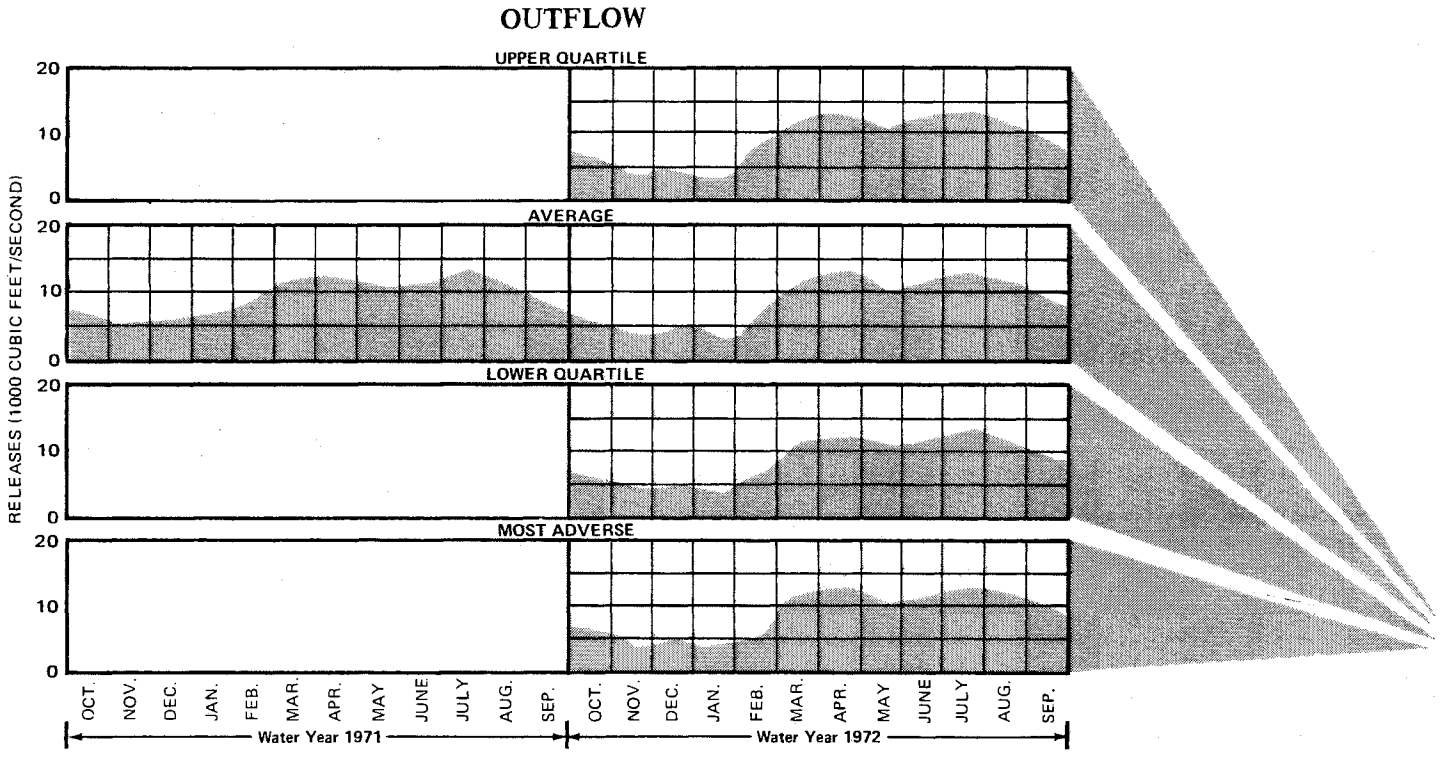
STATISTICS

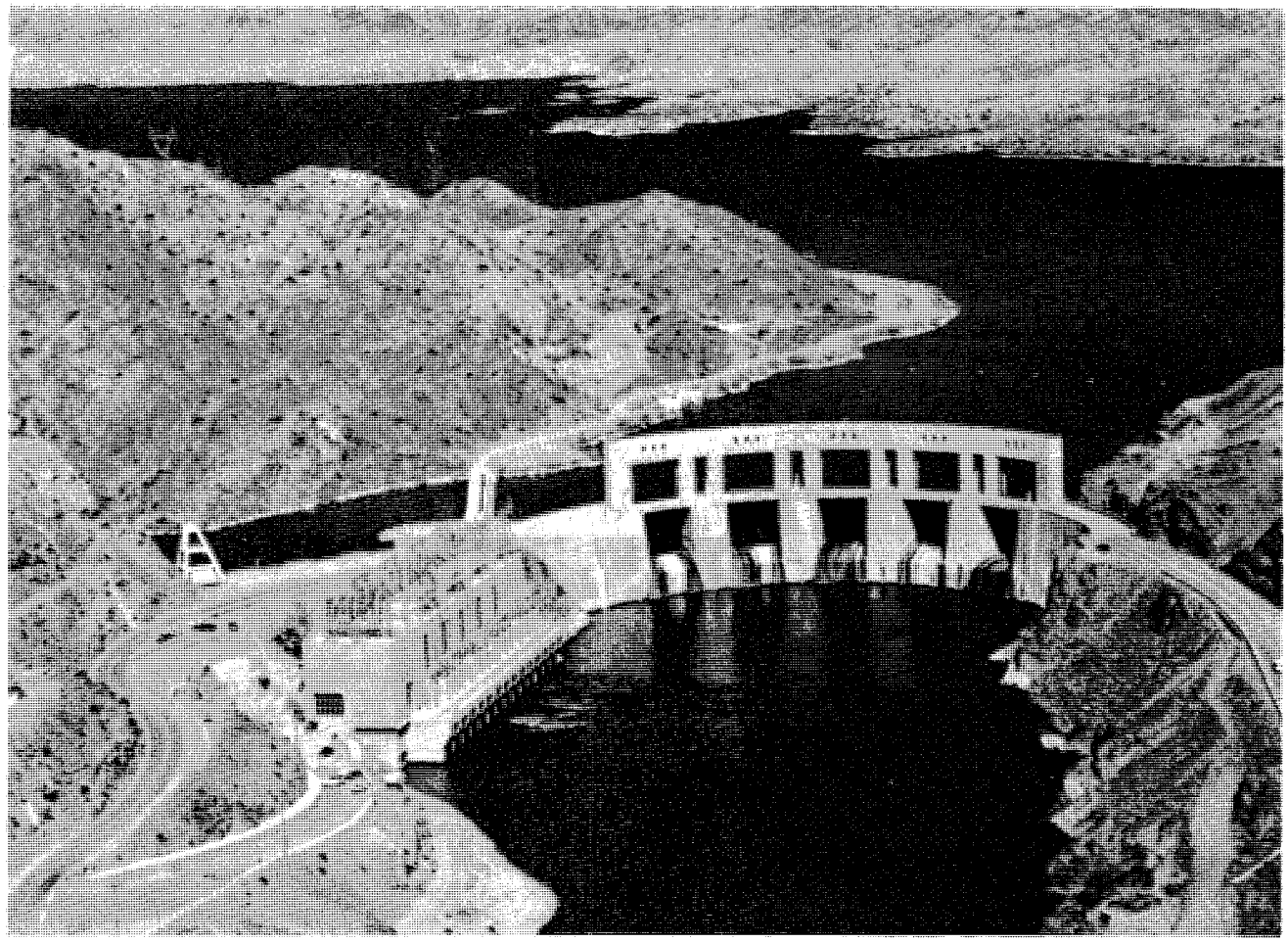
RESERVOIR	ACTIVE STORAGE* (ACRE-FEET)	ELEVATION (FEET)
MAXIMUM STORAGE	619,400	450.0
RATED HEAD	619,400	450.0
MINIMUM POWER	439,400	440.0
SURFACE AREA (FULL)	20,400 ACRES	
RESERVOIR LENGTH (FULL)	35 MILES	
POWER PLANT		
NUMBER OF UNITS	4	
TOTAL CAPACITY OF UNITS	120,000 KILOWATTS	

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

At the beginning of water year 1971 the level of Lake Havasu was 446.70 feet with an active storage of 554,400 acre-feet. The level was drawn down to elevation 446 feet with an active storage of about 543,000 acre-feet on December 15 and remained near that level through March 15 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 447.56 feet with an active storage of 571,600 acre-feet by the end of the water year. There were 6,936,000 acre-feet released at Parker Dam during the water year, all of which was passed through the turbines for power production.

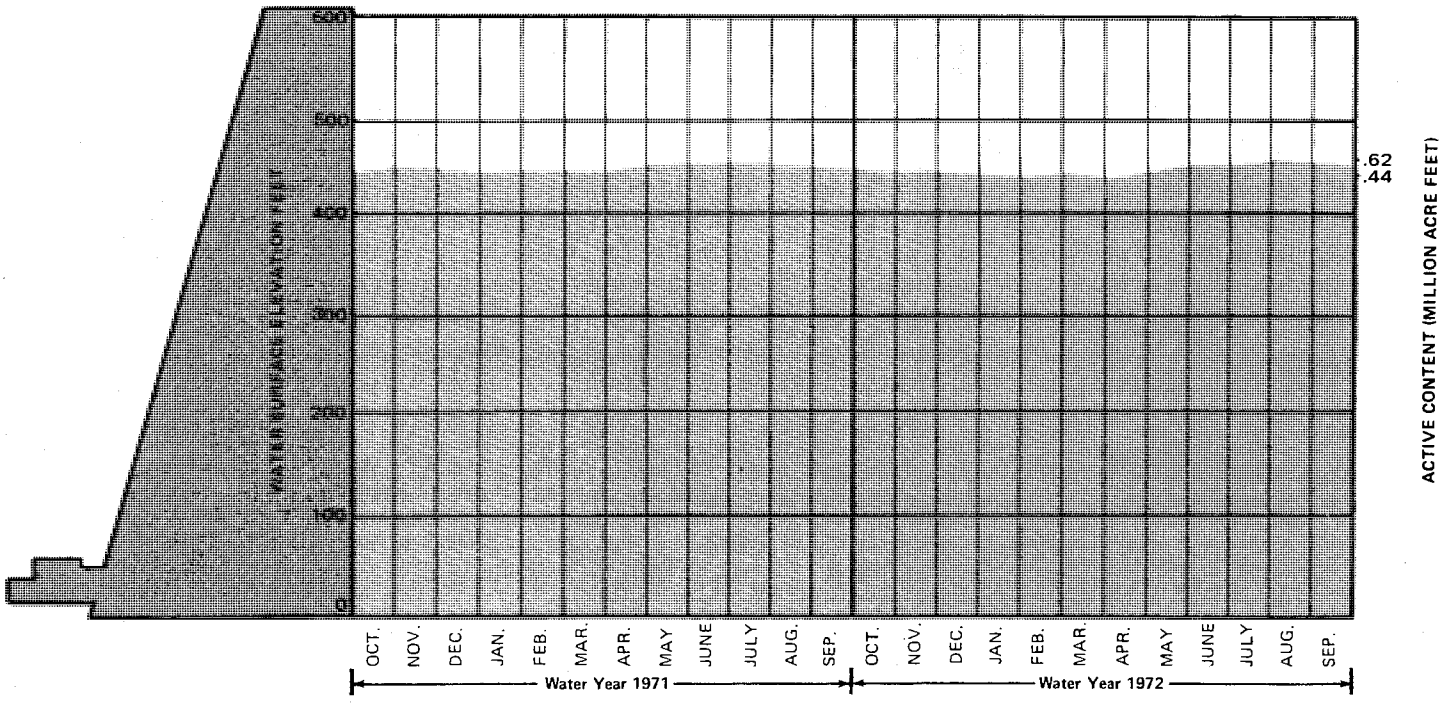
Joint use space in the top 10 feet of Lake Havasu (about 180,000 acre-feet) is reserved by the United States for control of floods and other uses including river regulation. Now that Alamo Reservoir on the Bill Williams River is in operation, only about the top 4 feet or about 77,000 acre-feet of space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

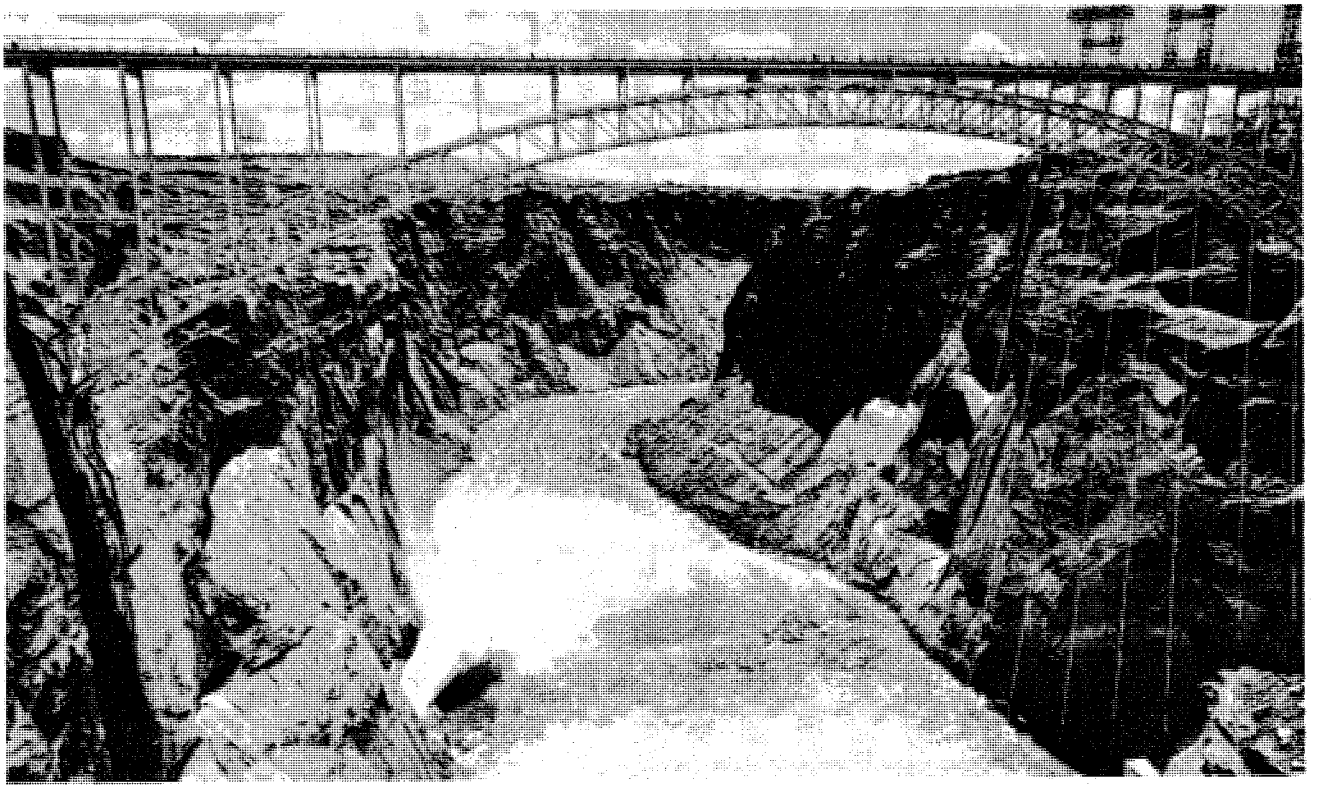




Parker Dam and Lake Havasu, Parker-Davis Project, Arizona-California

STORAGE





Colorado River below Glen Canyon Dam, Arizona

River Regulation

Water release from Glen Canyon Reservoir during water year 1971 was 8,558,000 acre-feet. The water passing the Compact point at Lee Ferry totalled 8,574,000 acre-feet and 80,736,000 acre-feet for the one-year and ten-year periods ending September 30, 1971, respectively. Next year the annual release from Glen Canyon will be 9,000,000 acre-feet in order to deliver 75 million acre-feet to the Lower Basin in the 1963-72 decade. This particular 10-year period is especially critical because of small releases during the first 2 years when minimum power pools were being accumulated in both Lake Powell and Flaming Gorge. This period is also critical in that its pattern will carry over into the future and may require a release of more than 75 million acre-feet in the next 10 years in order to attain some uniformity in power generation at Glen Canyon.

Water release schedules 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 powerloads 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 59,693 acre-feet in excess of minimum Treaty requirements during water year 1971. There were 55,014 acre-feet of this quantity which were delivered pursuant to provisions of Minute 218 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 1971, there were 2,050,000 acre-feet of water used for agriculture and M&I purposes. About 450,000 acre-feet were diverted to adjacent drainage basins and 476,000 acre-feet were evaporated from mainstem reservoirs in the Upper Basin. An additional 160,000 acre-feet are estimated as evaporation from other reservoirs and stockponds in the Upper Colorado Basin.

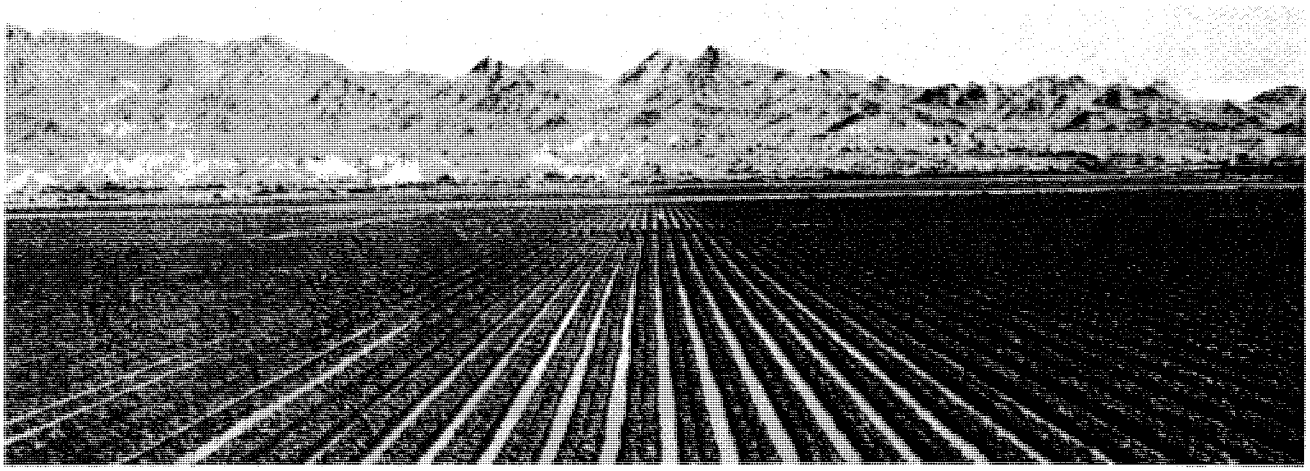
Therefore, water is being stored in the Upper Basin Reservoirs and will be released to the Lower Basin as specified by Section 602(a) of Public Law 90-537 and the laws, compacts, and treaties upon which Section 602(a) is based.

LOWER BASIN USES AND LOSSES

Releases of 6,936,000 acre-feet from Lake Havasu during water year 1971 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 4,679 acre-feet was the result of careful scheduling and of making good use of the small amount of regulatory storage space in Imperial, Laguna, and Senator Wash Reservoirs.

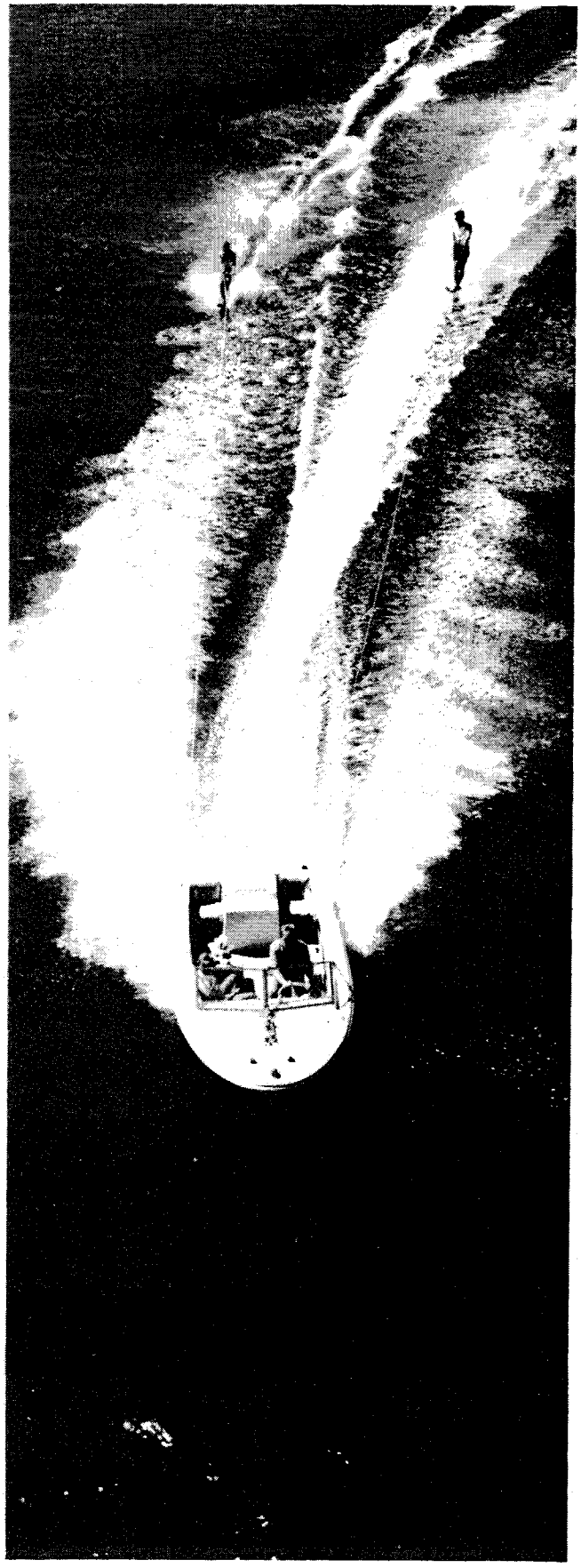
The major water use above Parker Dam was that by Metropolitan Water District of Southern California. Metropolitan Water District pumped 1,209,534 acre-feet from Lake Havasu during water year 1971. Releases of 8,259,000 acre-feet were made from Lake Mohave during water year 1971 to meet the requirements 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 8,233,000 acre-feet were made from Lake Mead at Hoover Dam during water year 1971 to regulate the levels of Lake Mohave and to provide for the small uses and the losses from that reservoir. In addition there were 39,780 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 1971 were 8,273,000 acre-feet.



Irrigating lettuce in the Palo Verde Valley, California

Blue Mesa Reservoir, Curecanti Unit, Colorado River Storage Project, Colorado



Water Quality Control

WATER QUALITY OPERATIONS DURING WATER YEAR 1971

Since water quality aspects of Colorado River operations are extensively described in the biannual series entitled "Quality of Water, Colorado River Basin," which was last issued in January 1971 (Progress Report No. 5), only minimal discussion of this aspect of operation is presented in this report.

Specific water quality operations are performed pursuant to Minute No. 218 with Mexico such that during water year 1971, the United States bypassed 55,014 acre-feet of drainage water to the Colorado River below Morelos Dam and replaced it with a like amount of river 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 non-irrigation season and during the snow-melt 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 and in response to the efforts of concerned groups, we anticipate that studies will be initiated in fiscal year 1972 which will lead to an action program for managing the water quality aspects within the basin.

Enhancement of Fish and Wildlife

UPPER BASIN

During the last part of March releases were increased from 650 c.f.s. to 1,500 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 then controlled through the geese-nesting period to avoid inundating the nests. The interim operating rules for Fontenelle Reservoir call for a continuous flow of at least 300 c.f.s. in the channel immediately below the dam for the benefit of fish habitat.

During the nesting season at Brown's Park, releases of 4,000 c.f.s. were made for 6 hours every other day from Flaming Gorge Reservoir to encourage the geese to build their nests back away from the Green River. Fishing below Flaming Gorge Dam has been enhanced by keeping a minimum of 400 c.f.s. in the river. During water year 1971, Utah Fish and Game Department requested that a minimum of 1,200 c.f.s. be released from Flaming Gorge Dam while the trout were spawning. This minimum release was met by the Bureau of Reclamation during the spawning season.

A constant release of 75 c.f.s. throughout the winter 1970-71 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.

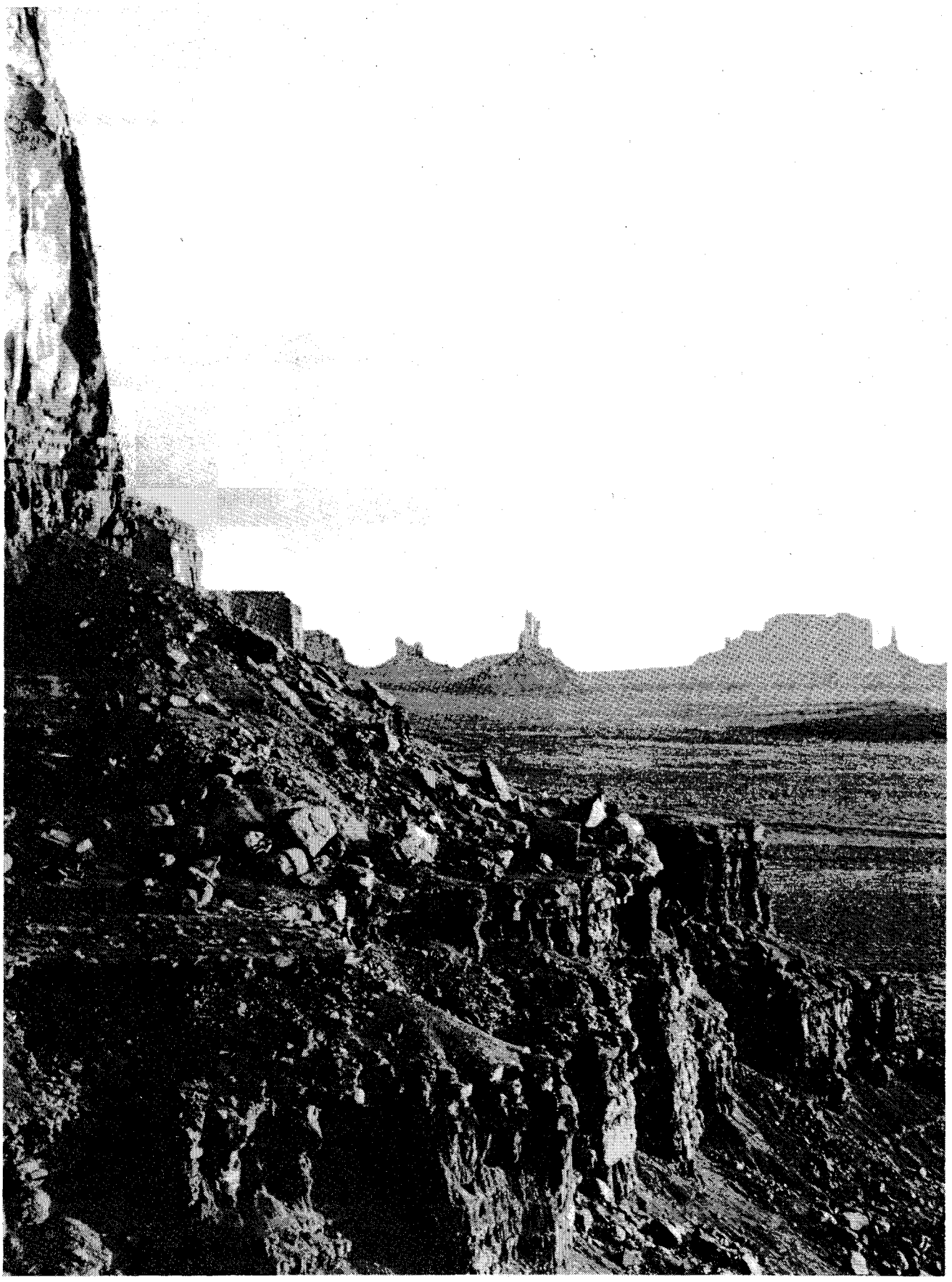
Good habitat for fish was maintained in the river below Glen Canyon Dam.

LOWER BASIN

During April through August 1971 releases from Lake Powell were sufficient to cause the level of Lake Mead to gradually rise 4.6 feet. This provided lake levels favorable to the bass spawn and survival of the young bass. The early spawn was only fair this year, because of wind and cool air temperatures causing a lowering of the water temperatures below optimum conditions after the early spawn was laid. Later spawn conditions were favorable as were survival conditions.

Releases from Lakes 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.

Water fowl on Topock Marsh, Lower Colorado River, Arizona



Monument Valley, Colorado River Plateau Country, Utah-Arizona

Preservation of Environment

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 right-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 needs to schedule releases from Fontenelle and Flaming Gorge Reservoirs so that the flow pattern will not adversely affect the ecology of downstream geese and duck 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 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 later control of noxious gases, 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, Kaiparowits, Four Corners, and San Juan Powerplants has been delegated to the Commissioner of Reclamation and redelegated to the Director of Region 4. The Regional Director of Region 3 has been delegated responsibility for pollution control at the Mohave Powerplant.

During the year active development of the Navajo and San Juan Powerplants triggered intensive in-depth appraisal of the Companies' environment quality protection designs and plans to assure their adequacy. Air quality improvement plans at the Four Corners Plant were also under careful review with the objective of obtaining the earliest, highest quality performance that modern technology can provide. A contract for use of water from Emery County Project for the new Huntington Canyon Plant is now under consideration.

Releases from Lake Powell were made in sufficient quantities, as discussed above, 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 is making an appraisal 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 is to identify the sources and amounts of water available for thermal powerplant use as well as the compacts, laws, and other constraints that are likely to govern the use of the available water for this purpose.

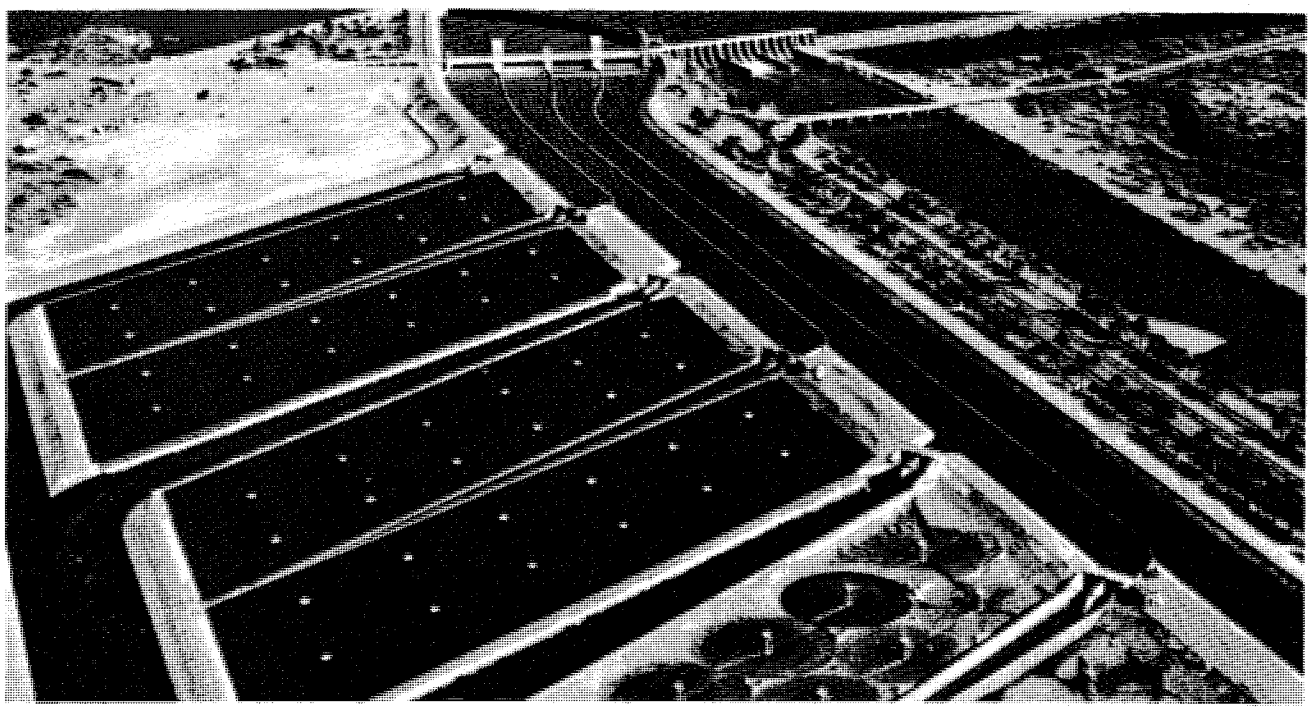
Projected Plan of Operation Under Criteria for Current Year.

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, 1972, 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, 1972, is projected to be less than the Lake Mead active storage forecast for that date. The objective of the plan of operation during the current year is to schedule a release of about 9.0 million acre-feet of water from Lake Powell which is greater than the 8,230,000 acre-feet minimum objective stated in Article II(2) of the criteria, but is the amount necessary to assure delivery of 75,000,000 acre-feet at Lee Ferry for the 10-year period ending September 30, 1972.



Imperial Dam and desilting works, Arizona-California

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-feet minimum treaty requirements, approximately 55,000 acre-feet are projected for delivery pursuant to Minute 218 and approximately 5,000 acre-feet are projected in regulatory waste. The total delivery to Mexico for water year 1972 is estimated to be 1,560,000 acre-feet.

CONSUMPTIVE USE AND LOSS REQUIREMENTS

A release of 6,581,000 acre-feet from Lake Havasu has been projected for water year 1972 to meet consumptive use requirements in the United States below Parker Dam, transit losses in the river between Parker Dam and the Mexican Border, and a 1,560,000-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 363,000 acre-feet for water year 1972.

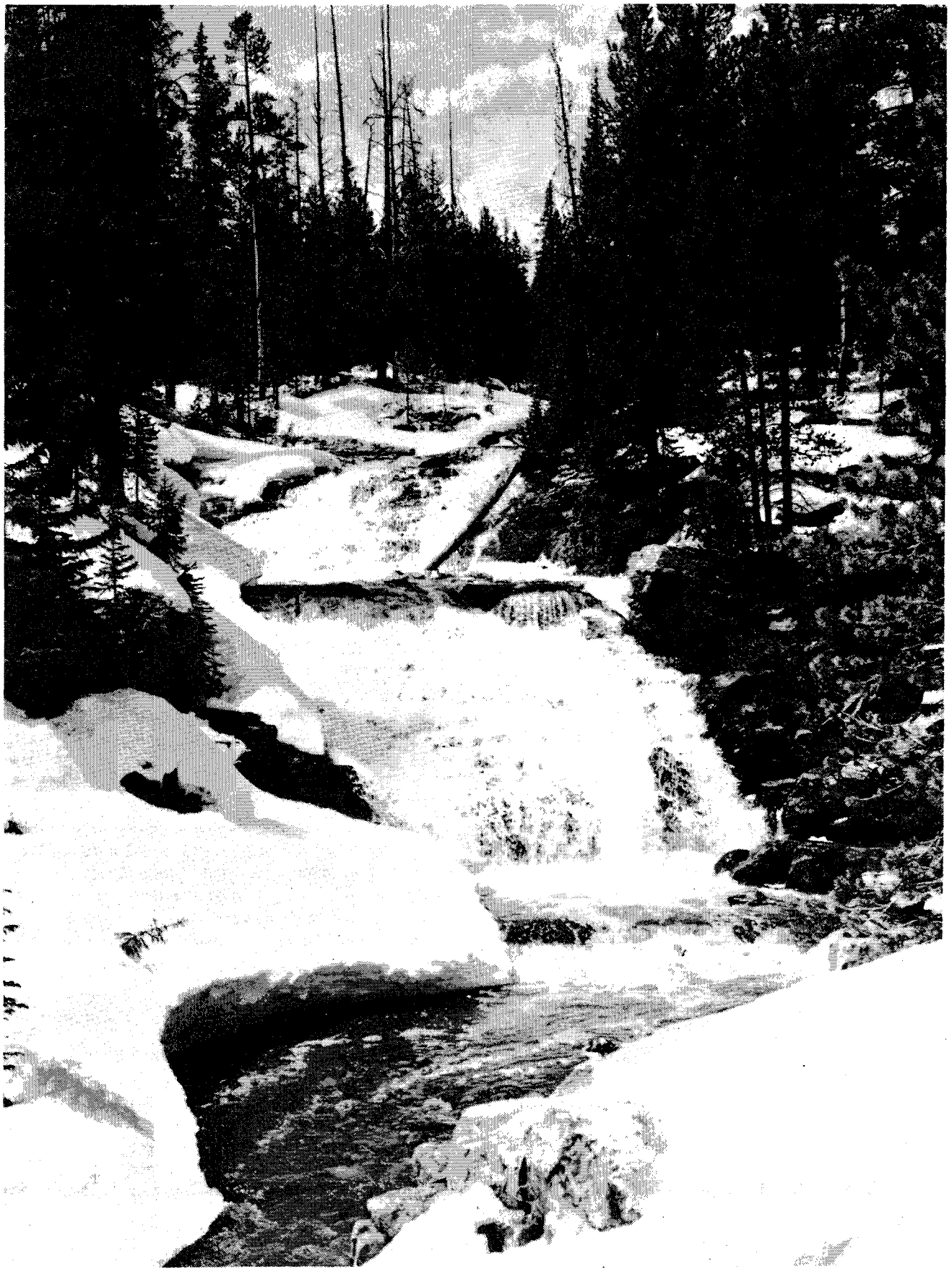
There are no major users between Hoover Dam and Davis Dam. Consumptive uses by small users, river losses or gains, and reservoir losses between Hoover Dam and Davis Dam are projected to be a net gain of 108,000 acre-feet for water year 1972.

The net diversions from Lake Mead are projected at 40,000 acre-feet for water year 1972. Evaporation from Lake Mead is expected to be about 764,000 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 1972 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 1972.



Snowmelt runoff from high mountain watershed, Utah

Plan of Operation - Water Year 1972

A description of the projected operation of each of the reservoirs in the Colorado River Basin during water year 1972 for average runoff conditions is given in the following paragraphs. Charts I through IX 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 1972 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.

It will be noted that projected operations of Lakes Mead, Mohave, and Havasu are the same under all four of the runoff assumptions as it is necessary to release 9.0 million acre-feet from Lake Powell during water year 1972 regardless of the magnitude of the runoff from the basin.

Fountenelle

It is planned to lower the level of the reservoir through the fall and winter months until a water surface elevation of about 6,485 feet is reached, then from the last of Mrach 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 then be controlled by adjusting the releases through the powerplant to slowly reduce the elevation to 6,500 feet by the end of the summer 1972. (Chart I)

Curecanti Unit

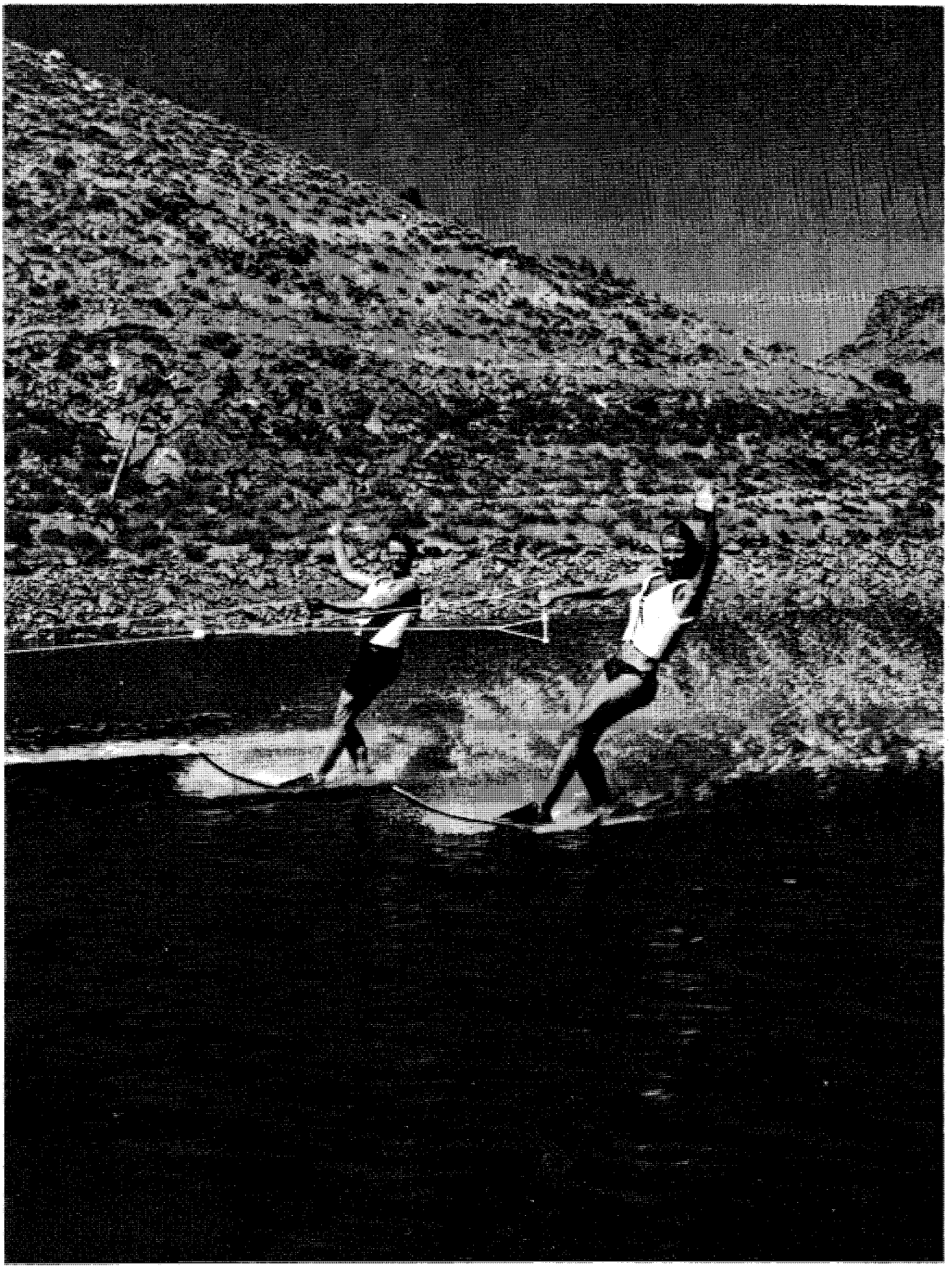
During the current year, Blue Mesa should reach a low for the year in March 1972 of elevation 7,440 feet with an active storage of 260,000 acre-feet. With average inflow during the spring of 1972 the reservoir should reach an elevation of 7,510 feet with an active storage of 740,000 acre-feet. At this elevation the reservoir has a surface area of 8,680 acres and a reservoir length of 23 miles (Charts 3 & 4)

Navajo Reservoir

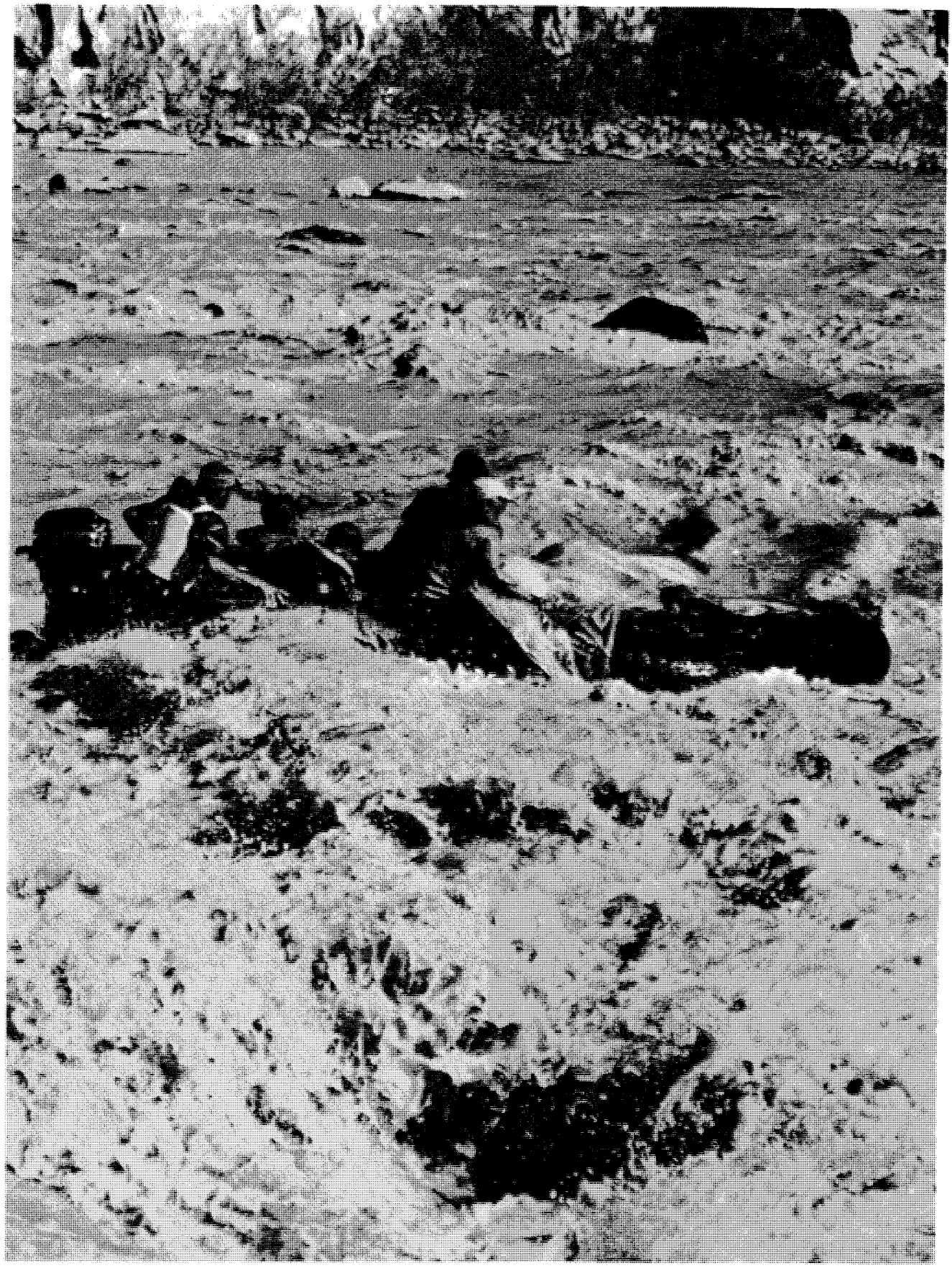
On September 30, 1971, Navajo Reservoir had an active storage of 993,000 acre-feet with an elevation of 6,028 feet. During the months of October through March releases will be controlled to lower the reservoir elevation to 6,010 feet prior to spring runoff. Average inflow would cause the reservoir to reach elevation 6,051 feet with an active storage of 1,230,000 acre-feet. It will be maintained at or near this level for the remainder of the summer for recreational purposes (Chart 5)

Glen Canyon Lake Powell

For the current year Lake Powell level should recede through the fall and winter months to a low elevation of 3,612 feet with an active storage of 13.3 million acre-feet. Assuming an average 1972 April-July runoff the resulting inflow of 8.3 million acre-feet should cause the lake to reach elevation 3,632 feet with an active storage of 15.6 million acre-feet. This will be an all-time high of about 62 percent of the active capacity of the reservoir. The lake will have a length of 183 miles and a water surface area of 116,700 acres. Total release from Lake Powell for water year 1972 must be at least 9.0 million acre-feet in order to deliver 75,000,000 acre-feet to the Lower Basin in the 1963-72 decade as required by the Colorado River Compact. Generation for this release can be easily marketed. (Chart 6)



Water Skiers, Blue Mesa Reservoir



Running the Rapids of Cataract Canyon, Utah

Flaming Gorge

At the beginning of water year 1972 the active reservoir storage was 2.9 million acre-feet with a water surface at elevation 6,018 feet. The reservoir level will be lowered about 10 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 1972 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 flow should not exceed 4,000 c.f.s. and normally would not be less than 1,500 c.f.s. Releases should be about 200,000 acre-feet per month through the rest of the summer for a water year total of 1,690,000 acre-feet. (Chart 2)

Lower Basin Reservoirs

During the current year the level of Lake Mead should gradually rise nearly 5 feet to elevation 1,159 feet by January 31, 1972. The level should remain near this elevation until early July. The level is then scheduled to rise to 1,163 feet by the end of the water year. At this level the lake will have an active storage of 18.0 million acre-feet. A total of 8.0 million acre-feet is scheduled to be released from Lake Mead during water year 1972 to meet all downstream requirements. All releases are scheduled to pass through the turbines for electric power production. (Chart 7)

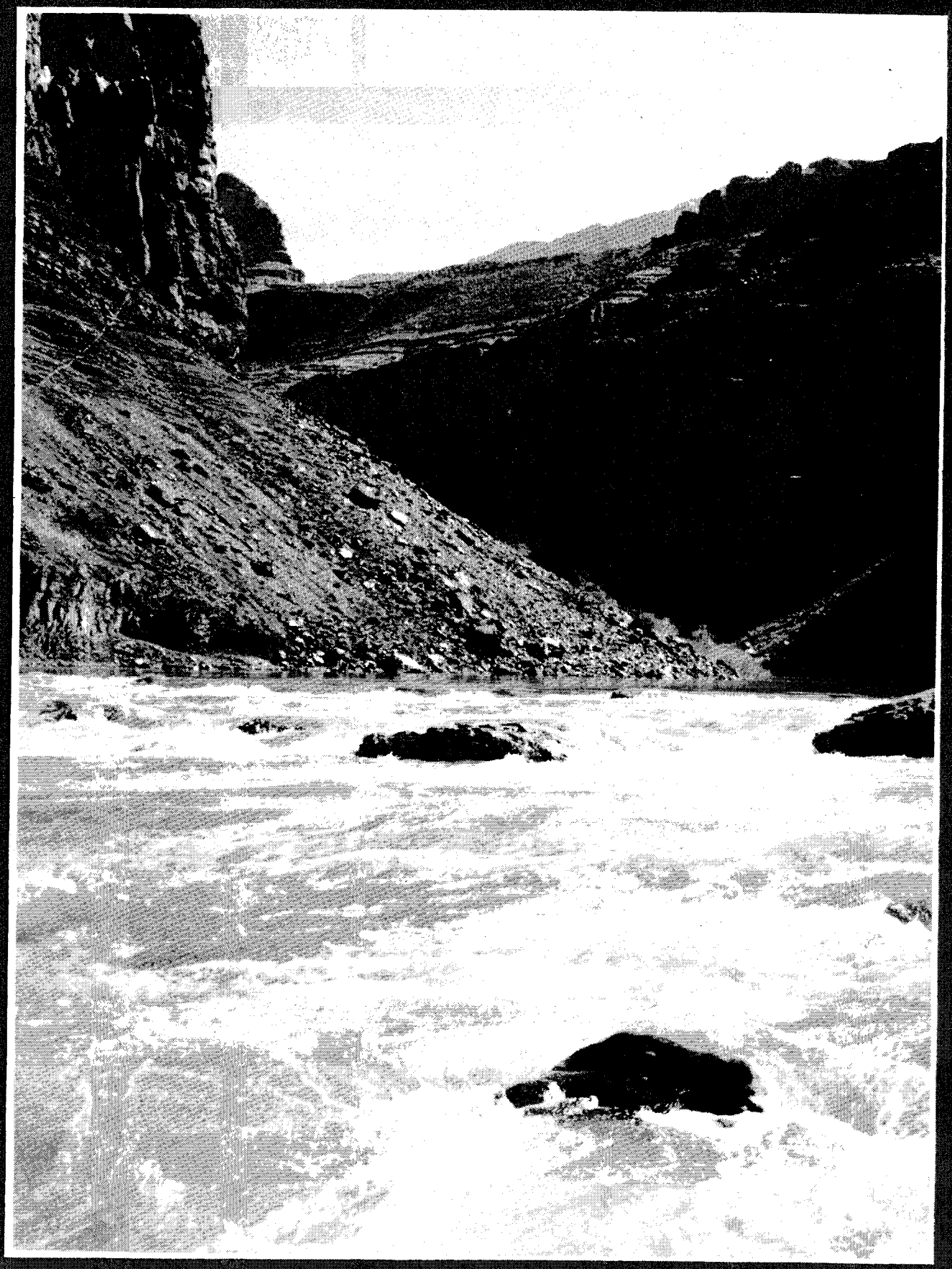
Lake Mohave

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 29, 1972. It should remain near that elevation through April and rise to its yearly high of 645 feet at the end of May 1972. The level of Lake Mohave is expected to be drawn down during the summer months of heavy irrigation use to elevation 630.5 feet at the end of water year 1972. A total of 8.2 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)

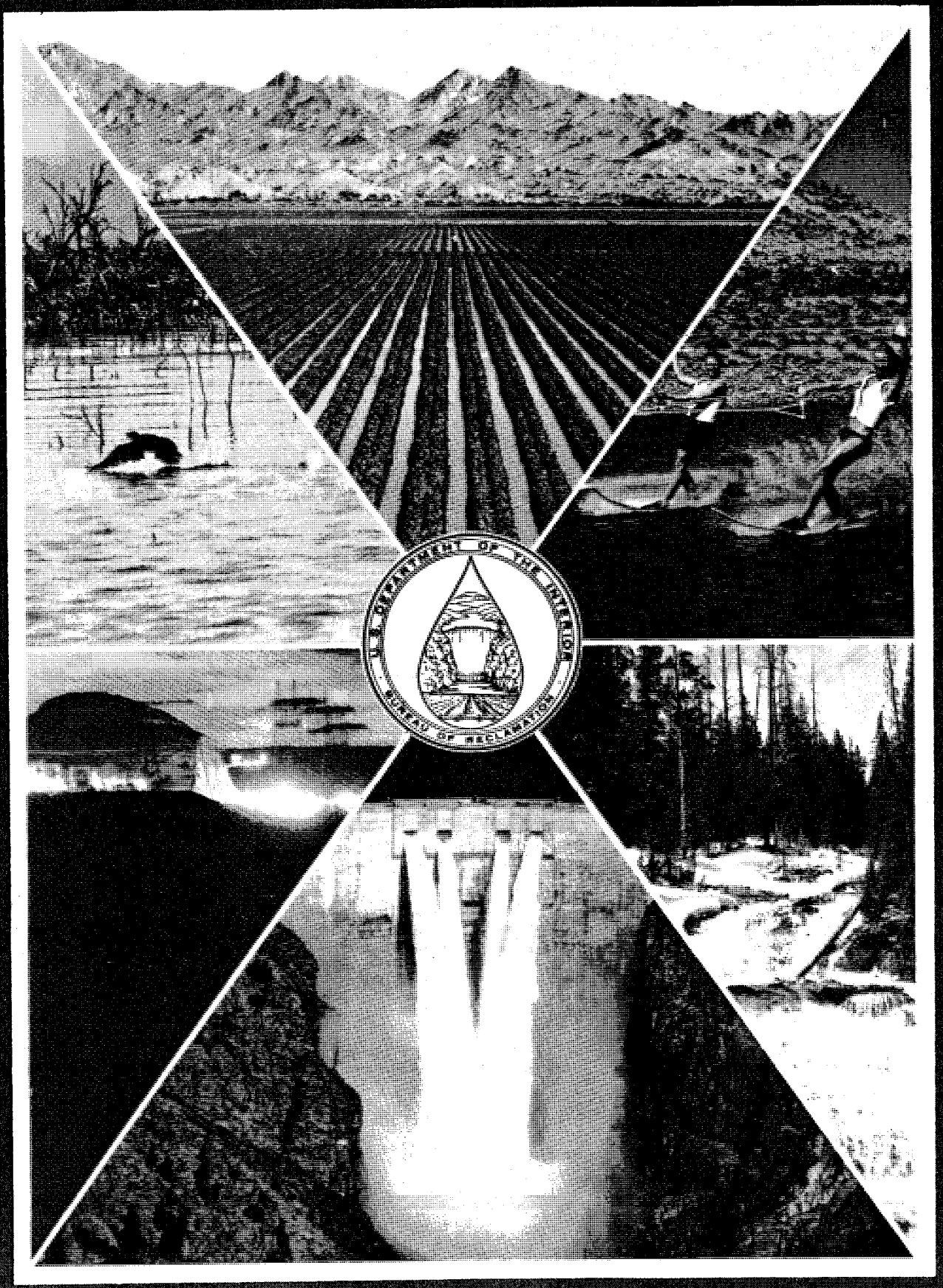
Lake Havasu

The level of Lake Havasu is scheduled to be maintained about 0.5 feet below the elevation required for flood control. The yearly low elevation of 445.8 feet is scheduled for the December through February high-flood-hazard period. The yearly high of 449.6 feet is scheduled for the low-flood-hazard months of May and June. A total of 6.6 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



Grand Canyon of the Colorado River, Arizona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