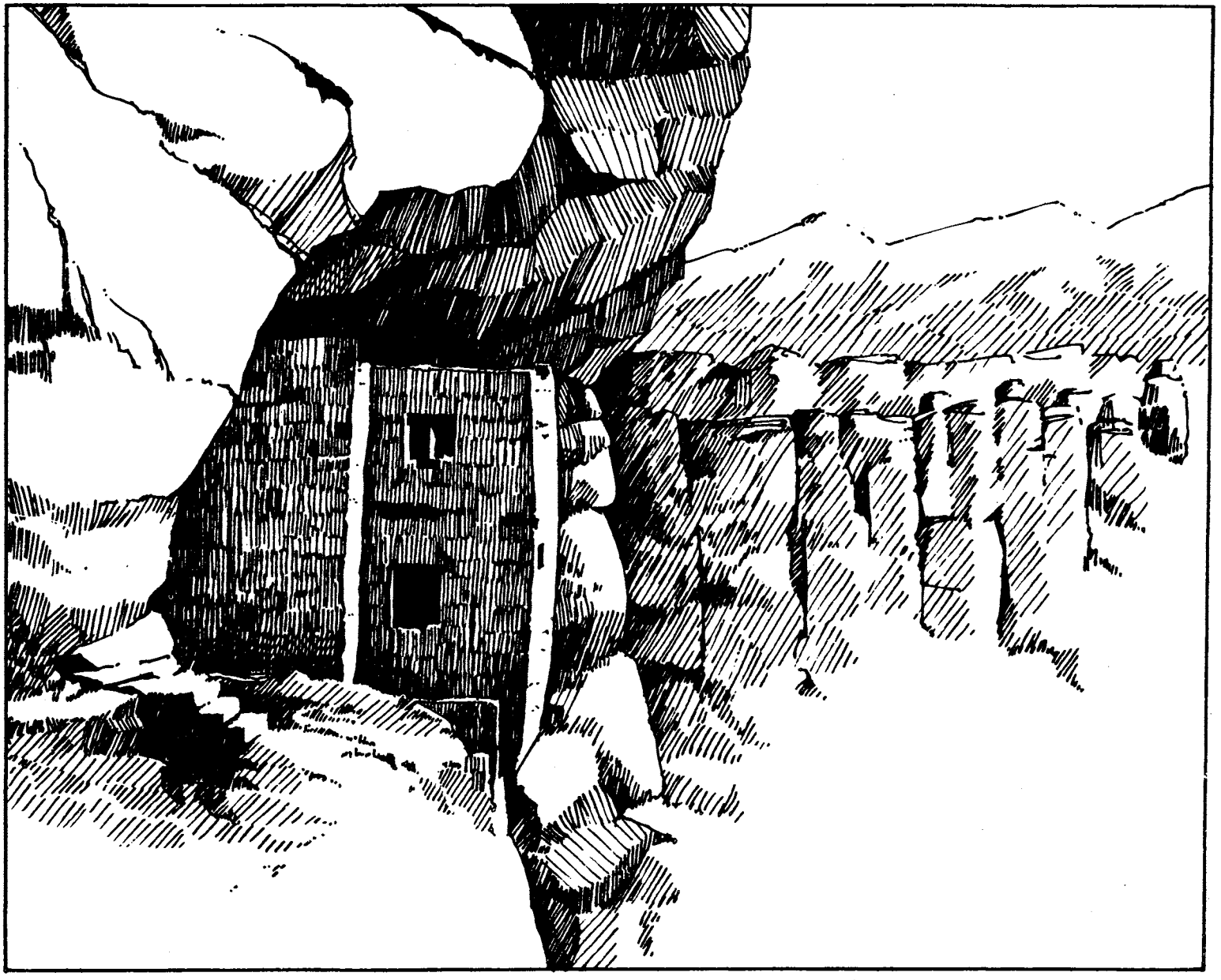
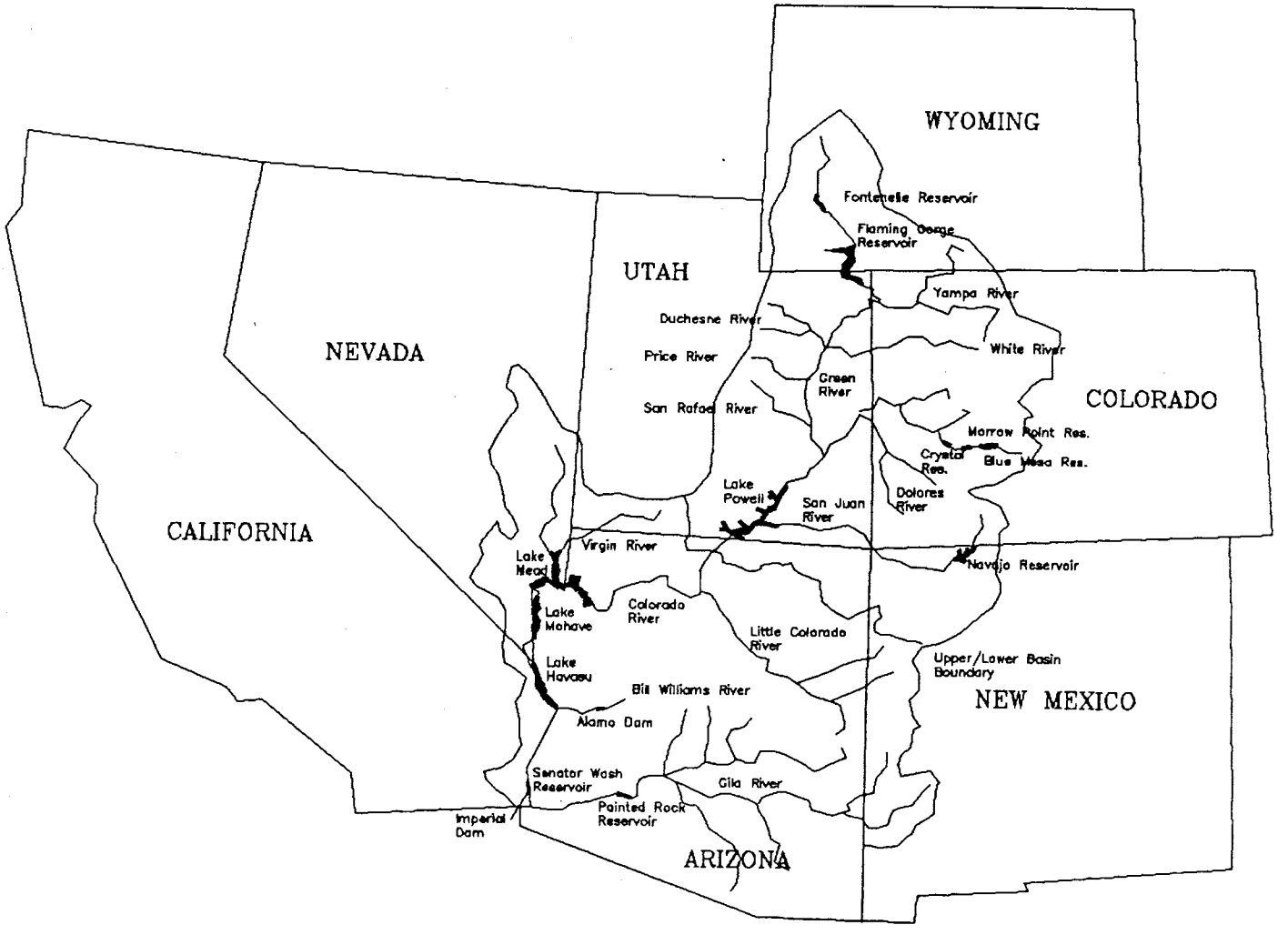
19th Annual Report

Operation of the Colorado River Basin 1989 Projected Operations 1990



Colorado River Basin



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United States
Department of the Interior
Bureau of Reclamation

January 1990

Prepared pursuant to the Colorado River
Basin Project Act of 1968
Public Law 90-537

Introduction

The operation of the Colorado River Basin during the past year and the projected operation for the current year reflect flood control, river regulation, beneficial consumptive uses, hydroelectric power generation, water quality control, enhancement of fish and wildlife, recreation, and Colorado River Compact requirements.

Storage and release of water from the Upper Basin reservoirs are governed by all applicable laws and agreements concerning the Colorado River, including the impoundment and release of water in the Upper Basin required by Section 602(a) of the Colorado River Basin Project Act of September 30, 1968 (Public Law 90-537). The operation of the Lower Basin reservoirs reflects Mexican Treaty obligations and Lower Basin contractual commitments.

Nothing in this report is intended to interpret the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (Treaty Series 994, 59 Stat. 1219), the United States/Mexico agreement in Minute No. 242 of August 30, 1973, (Treaty Series 7708; 24 UST 1968), the Decree entered by the Supreme Court of the United States in Arizona v. California et al. (376 U.S. 340), the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774; 43 U.S.C. 618a), the Colorado River Storage Project Act (70 Stat. 105; 43 U.S.C. 620), the Colorado River Basin Project Act (82 Stat. 885; 43 U.S.C. 1501), the Colorado River Salinity Control Act (88 Stat. 266; 43 U.S.C. 1951), or the Hoover Power Plant Act of 1984 (98 Stat. 1333).

Authority for Report

Pursuant to the Colorado River Basin Project Act (Public Law 90-537) of 1968, I am pleased to present to the Congress, and to the Governors of the Colorado River Basin States, the nineteenth annual report on the Operation of the Colorado River Basin.

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 1989, and the projected operation of these reservoirs during water year 1990 under the "Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs," (Operating Criteria) published in the Federal Register June 10, 1970.

The Operating Criteria and Section 602 of Public Law 90-537 mandate consultation with representatives of the Governors of the seven Basin States and the Upper Colorado River Commission relative to annual plans for operation of the Colorado River reservoirs. The 1990 Annual Operating Plan (AOP) was prepared by the Bureau of Reclamation in consultation with the seven Basin States Governors' representatives, the Upper Colorado River Commission, and others.

Manuel Lujan, Jr., Secretary
United States Department of the Interior

Actual Operations Under Criteria - Water year 1989

The initial plan of operation for the water year ending September 30, 1989, called for scheduled releases from Lake Powell of 8.5 million acre-feet (maf). Based on the inflow forecast at the beginning of the year, this plan of operation would have created 7.1 maf of vacant space in the Colorado River reservoir system by the end of September 1989.

The April through July forecast of runoff into Lake Powell made on January 1, 1989, was 7.0 maf or 87 percent of the long term average. The long-term average is calculated by the Bureau of Reclamation using 80 years of natural flow data (1906-1985) and current depletion levels. Releases from Glen Canyon Powerplant averaged about 12,000 cubic feet per second (cfs) for January through February. The monthly April-July forecasts decreased slightly for March, to 85 percent of average. In response to this lower forecast, powerplant releases were decreased to 30 percent of capacity during March and April. The April 1 forecast dropped to 80 percent of the long-term average or 6.5 maf for the April through July period. Precipitation continued to be below average through June and the forecast for April through July continued to drop. On June 1 the April through July forecast was 3.8 maf or 47 percent of average. Releases for the water year were set at 8.23 maf to meet minimum required releases to the lower basin states and Mexico.

As in 1988, climatic conditions for water year 1989 were again dry, a result of the continued dry storm pattern's from the last few years, affecting much of the Upper Colorado River basin and surrounding areas. Precipitation for the water year was 81 and 68 percent of average, over the Upper Colorado Basin and the Lower Colorado Basin, respectively. Runoff over the Upper Colorado Basin was much below average, with actual unregulated April-July inflow to Lake Powell of 3.5 maf or 43 percent of the long-term average. Unregulated runoff is the inflow to Lake Powell adjusted for the change in storage of the upstream reservoirs discussed in this report. Lake Powell recorded a peak snowmelt inflow of 18,400 cfs on May 27, and reached a maximum elevation on June 11, 1989, of 3,678.64 feet, or 86.7 percent full.

The total unregulated runoff into Lake Powell for the water year was 6.25 maf or 53 percent of the long-term average. Water supply for the San Juan River above Navajo Dam for the water year was 84 percent of the long-term average; the Gunnison River above Blue Mesa Dam was at 61 percent; the mainstem Colorado River above Grand Junction, Colorado, 65 percent; and the Green River above Flaming Gorge Dam, 53 percent. Total releases from Glen Canyon Dam were 8.23 maf while the regulated inflow for the year was 5.78 maf. Aggregate Colorado River storage at the end of the year was 48.2 maf representing a decrease of 4.2 maf from the previous year.

During water year 1989, Mexico received a total delivery of about 1,540,000 acre-feet at the Northerly International Boundary (NIB). Of the 1,540,000 acre-feet of Colorado River water reaching the NIB, about 520,000 acre-feet were delivered through the Pilot Knob Powerplant and Wasteway from the All-American Canal. An estimated 440,000 acre-feet were released through Laguna Dam. The remainder of the flow at the NIB was made up of return flows to the Colorado River below Laguna Dam, and returns to the Gila River below the gaging station near Dome, as well as small Gila River releases from Painted Rock Reservoir.

Projected Plan of Operation - Water Year 1990

Determination of "602(a) Storage"

Section 602(a)(3) of the Colorado River Basin Project Act of September 30, 1968 (Public Law 90-537), stipulates that Colorado River water, which is not required to be released under article III(c) and III(d) of the Colorado River Compact, be stored in Upper Basin reservoirs to the extent the Secretary of the Interior (Secretary) finds such storage necessary to assure compact deliveries without impairment of annual consumptive uses in the Upper Basin.

Article II of the Operating Criteria provides that the annual plan of operation shall include a determination by the Secretary of the quantity of water considered necessary to be in Upper Basin storage as of September 30 of the current year.

This determination shall consider 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; and (f) the necessity to assure that Upper Basin consumptive uses are not impaired because of failure to store sufficient water to assure deliveries under Section 602(a)(1) and (2) of Public Law 90-537.

Taking into consideration these relevant factors, the Secretary has determined that the active storage in Upper Basin reservoirs forecast for September 30, 1990, exceeds the "602(a) Storage" requirement under any reasonable range of assumptions which might be applied to those items previously listed. Therefore, the accumulation of "602(a) Storage" is not the criterion governing the release of water during the current year.

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 signed in 1944, are formulated by the Mexican Section and presented to the United States Section, International Boundary and Water Commission (Commission), before the beginning of each calendar year. Upon 30 days advance notice to the United States Section, Mexico has the right to modify, within the total schedule, any monthly quantity prescribed by the schedule by not more than 20 percent.

Based on the current water supply conditions, the United States will make scheduled deliveries of 1,500,000 acre-feet of Colorado River water to the Republic of Mexico in calendar year 1990. Representatives of the Republic of Mexico will be kept informed of operating schedules through the United States Section of the Commission.

Projected Plan

The 1990 operation plan reflects the effects of below average reservoir inflow during 1988 and 1989. However, recognizing the system storage that is available and the beneficial water needs of the basin states, all requests for Colorado River water by holders of water delivery contracts with the United States, and of other water rights recognized by the decree in Arizona v. California, will be satisfied during calendar year 1990.

A proposed operation plan for water year 1990 for major reservoirs of the Colorado River system was formulated and distributed to representatives of the Colorado River Basin States in November 1989. This plan was prepared in accordance with the Operating Criteria published June 4, 1970, in compliance with Section 602, Public Law 90-537. The plan reflects operation for flood control, river regulation, beneficial consumptive uses, hydroelectric power generation, water quality control, enhancement of fish and wildlife, recreation, and Colorado River Compact requirements.

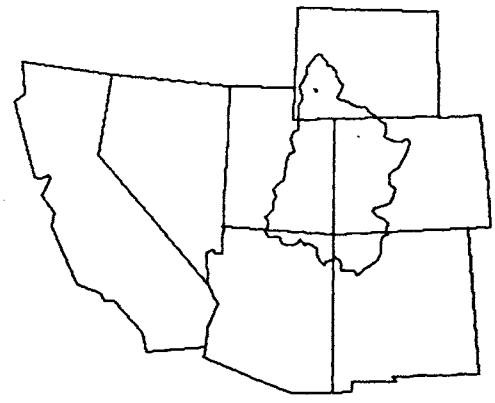
The Colorado River Basin has experienced below normal precipitation for the last few years resulting in depleted reservoir storage, very dry soil moisture conditions, lowering water tables, and below normal streamflows. Because of these conditions the operation plan for water year 1990 emphasizes the conservation of reservoir storage by providing minimum releases from Colorado River Basin reservoirs.

For 1990 operations, three reservoir inflow scenarios were developed and analyzed. The projected monthly inflows were based upon current hydrological conditions and the following assumptions: (1) reasonable maximum, based upon the annual volume of inflow which would be exceeded about 10 percent of the time. (2) most probable, based upon annual volume of inflow which would be exceeded about 50 percent of the time; and (3) reasonable minimum, based upon the annual volume of inflow which would be exceeded about 90 percent of the time. Each of these scenarios was adjusted for current soil moisture deficiencies throughout the basin; therefore, each is lower in magnitude than the historical upper decile, mean, and lower decile inflows. The National Weather Service computer model used to adjust the scenarios was the Extended Streamflow Prediction model. This model calculated the projected unregulated inflows for water year 1990 above Lake Powell as 13,328,000, 9,009,000, and 5,854,000 acre-feet for the three scenarios, respectively.

The plan for water year 1990 calls for a total Glen Canyon release of 8.23 maf under all three assumed inflow conditions. Hoover Dam releases (including pumping from Lake Mead) will be sufficient to satisfy up to 7,500,000 acre-feet of reasonable beneficial consumptive use requirements by mainstream users in the Lower Basin during calendar year 1990 in accordance with Article III of the Operating Criteria and Article II(B)(1) of the Decree in Arizona v. California. Because Arizona and Nevada will not fully consume their respective apportionments pursuant to Article II(B)(1), California will be allowed to utilize apportioned but unused water from these States, provided that the calendar year 1990 consumptive use by mainstream Lower Basin users does not exceed 7,500,000 acre-feet in accordance with Article II(B) of the decree in Arizona v. California.

Because of the large vacant storage space in the Colorado River system reservoirs at the beginning of water year 1990, no flood control releases are anticipated from Hoover Dam pursuant to the Hoover Dam Flood Control Regulations, and no releases are contemplated from Glen Canyon Dam to avoid anticipated spills or to equalize active storage in Lakes Mead and Powell. Water releases from each of the Colorado River system reservoirs will be in accordance with existing minimum flow, reservoir operating criteria, target storage elevations, and, with the exception of Fontenelle, all releases will pass through the powerplants. The resulting operation will provide benefits to all the authorized project purposes at each of the reservoirs.

The projected operation for most probable runoff conditions for the major reservoirs in the Colorado River Basin for water year 1990 is described in the following pages. Charts showing the projected monthly outflows from each reservoir for the three assumed hydrologic conditions are presented with each reservoir operation.



UPPER BASIN RESERVOIRS

FONTENELLE RESERVOIR (GREEN RIVER)

Water Year 1989

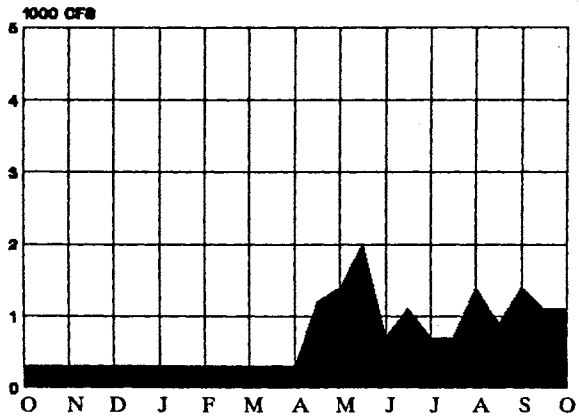
After five years of filling restrictions due to dam safety concerns, the construction of a concrete cutoff wall in Fontenelle Dam is now complete, and the reservoir was refilled by the end of July 1989. The reservoir started water year 1989 at elevation 6442.6 feet, with an active storage of 32,100 acre-feet.

The January 1, 1989 forecast of April through July runoff was 750,000 acre-feet, or 89 percent of the long-term average. The forecast continued to decline through the spring runoff until on June 1, it was 411,000 acre-feet, or 49 percent of average.

The elevation of Fontenelle Reservoir peaked at 6505.64 feet on July 30-31, 1989. A peak inflow of 5,031 cfs was observed on June 18, 1989.

The actual April through July runoff into Fontenelle Reservoir was 518,000 acre-feet which was 61 percent of average. Inflow for the entire 1989 water year was 768,000 acre-feet or 65 percent of average. The total release from Fontenelle Dam for water year 1989 was 498,000 acre-feet, of which 247,000 acre-feet bypassed the powerplant.

ACTUAL RELEASES **WY 1989**



FONTENELLE RESERVOIR

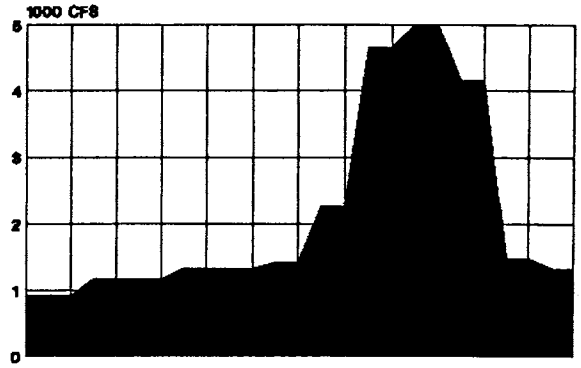
Reservoir	Acre-feet	Elevation, feet
Maximum Storage	344,834	6,506
Rated Head	233,789	6,491
Minimum Power	194,962	6,485
Surface Area, full		8,058 Acres
Reservoir Length, full		18 Miles
Powerplant		
Number of Units		1
Total Capacity		10,000 KW

Water Year 1990

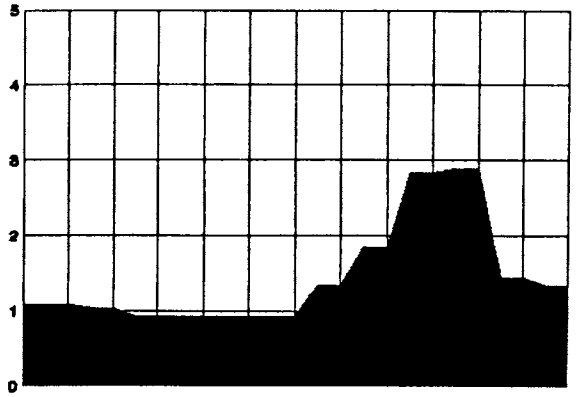
Since the mean annual inflow for Fontenelle Reservoir of 1.2 maf far exceeds the reservoir storage capacity of 345,000 acre-feet, the chances of the reservoir not filling in any given year are minimal. In order to minimize the powerplant bypasses that occur in the spring, the reservoir will be drawn down to the minimum operating pool, elevation 6463 feet, which corresponds to 27 percent of reservoir capacity, by the end of March.

Releases are projected to remain relatively constant this winter with the level of the releases dependent primarily on fall rainstorms. Based on a reasonable maximum inflow, releases will average about 1,250 cfs until the spring runoff when releases would peak between 4,500 and 5,000 cfs. Assuming average inflows, releases will range from 900 cfs to peak flows of 2,800 cfs during the spring runoff. Minimum flow commitments of 300 cfs are expected to be exceeded by an additional 500 to 700 cfs throughout the summer and fall of 1990 as releases are made to draw down the reservoir for the following year. These releases not only provide greater benefits to the fishery but also improve the water quality of the river for downstream municipal and industrial uses. Under all but the most adverse inflow assumptions, the reservoir is expected to fill in the spring or summer of 1990.

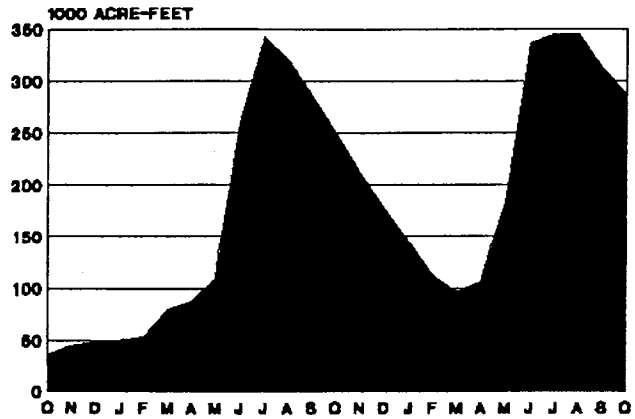
PROJECTED OPERATION 1990
REASONABLE MAXIMUM RELEASES



MOST PROBABLE RELEASES

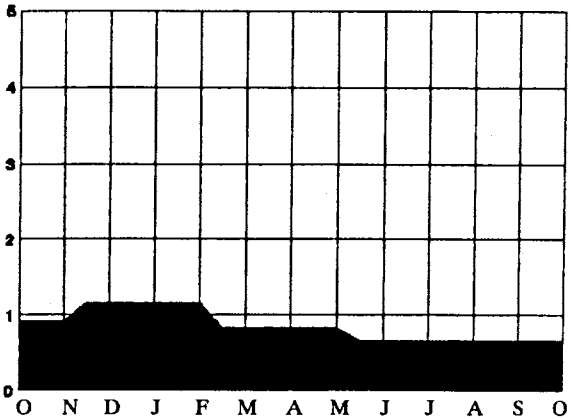


FONTENELLE STORAGE

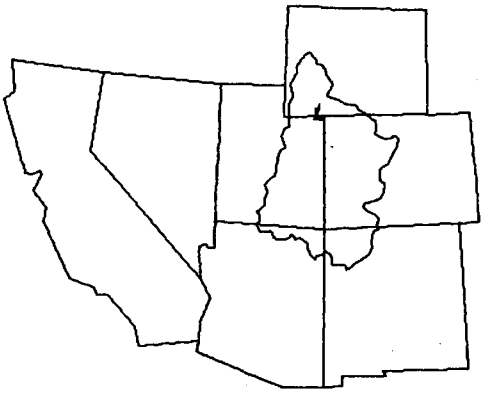


ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES



FLAMING GORGE RESERVOIR (GREEN RIVER)



Water Year 1989

As a result of several extremely dry years in the Green River Basin, Flaming Gorge Reservoir has been drawn down about 20 feet from full capacity. Releases during most of water year 1989 were restricted to minimum flows of about 800 cfs.

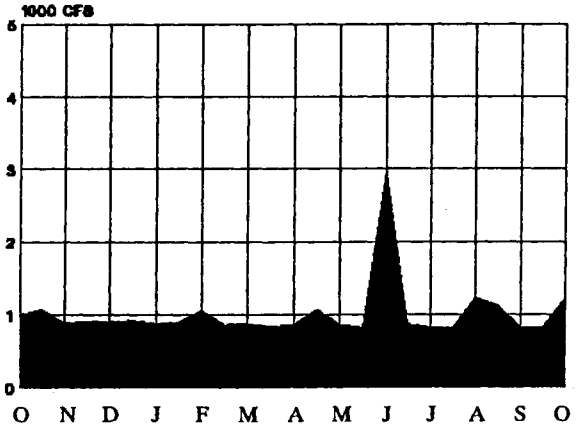
Flaming Gorge Reservoir started water year 1989 at elevation 6023.4 feet with an active storage of 3,098,000 acre-feet. Releases from Flaming Gorge Dam for water year 1989 were projected to be 840,000 acre-feet for the most probable operating plan based on the October forecast of an unregulated inflow of 1.35 maf.

Flaming Gorge Reservoir was gradually drawn down to elevation 6019.5 feet by January 1, 1989. The forecast of April through July runoff made on January 1, 1989, was 1.02 maf or 88 percent of the long-term average. Powerplant releases for January and February averaged 1,000 cfs. On March 1, 1989, the April through July forecast had decreased to 980,000 acre-feet, or 77 percent of average. The main spring runoff occurred during the middle of May with powerplant releases held at about 1,000 cfs. Releases for June averaged about 1,300 cfs and then were decreased to 850 cfs for July. For the months of August and September, releases were increased to an average daily flow of 1,200 cfs. Flaming Gorge reached a maximum elevation of 6019.66 on May 30 with a storage of approximately 2.96 maf, or 84 percent of reservoir capacity.

Specific releases for research and data collection for studies concerning endangered fish survival requirements were provided in 1989. Releases from Flaming Gorge Dam have been limited to a maximum of 2,600 cfs during the months of August and September to test the effect of releases on endangered Colorado Squawfish. This species is currently being studied as part of the Recovery Implementation Program in the Upper Colorado River Basin and the restricted summer flows are thought to enhance the downstream habitat of the fish.

The actual April through July unregulated runoff into Flaming Gorge Reservoir was 589,000 acre-feet or 48 percent of average. The peak inflow was 2,735 cfs, occurring on April 15. The total unregulated inflow for water year 1989 was 903,000 acre-feet, or 60 percent of the long-term average. Total releases for the water year were 712,000 acre-feet, all of which passed through the powerplant. The spillway was not used.

ACTUAL RELEASES **WY 1989**



FLAMING GORGE RESERVOIR

Reservoir	Acre-feet	Elevation, feet
Maximum Storage	3,749,000	6,040
Rated Head	1,062,000	5,946
Minimum Power	233,000	5,871
Surface Area, full		42,020 Acres
Reservoir Length, full		91 Miles

Powerplant	
Number of Units	3
Total Capacity	108,000 KW

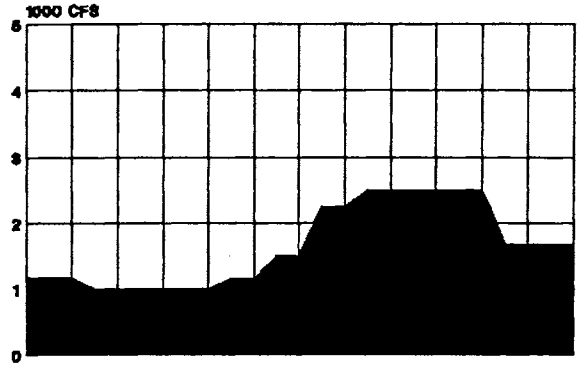
Water Year 1990

It is projected that the water surface at Flaming Gorge will be at about elevation 6019 feet before the 1990 spring runoff. This lower elevation drawdown is a result of continued below average inflows for the last several years. Flaming Gorge releases will most probably be maintained near the minimum flow of 800 cfs during most of water year 1990 and the reservoir is not expected to fill this year due to the projected below average inflow. The reservoir will refill in the spring of 1991 under the most probable inflow assumptions.

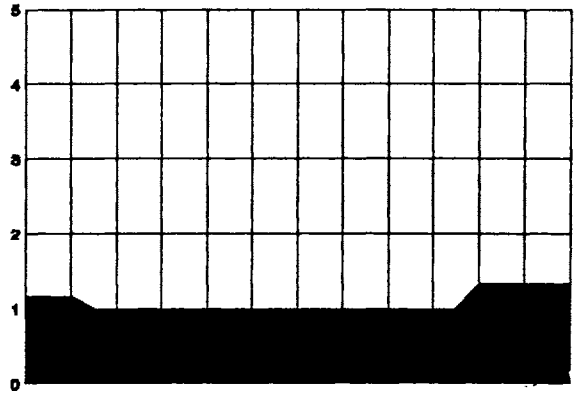
Under the most probable and reasonable minimum operation plans the total water year 1990 releases will be about 770,000 and 730,000 acre-feet, with total unregulated inflows of 1,400,000 and 756,000 acre-feet, respectively.

A reasonable maximum inflow for Flaming Gorge would require peak average releases of 2,000 to 2,500 cfs during the spring runoff, and August and September release requirements would decrease to average about 1,600 cfs. Total water year 1990 releases for the reasonable maximum operation would be about 1.19 maf, with a total unregulated inflow of 2.0 maf.

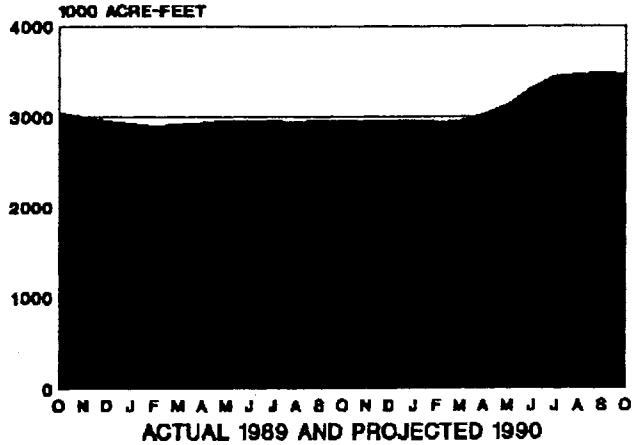
PROJECTED OPERATION 1990
REASONABLE MAXIMUM RELEASES



MOST PROBABLE RELEASES

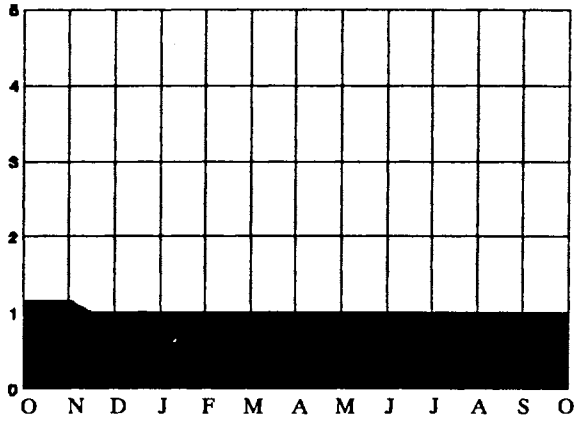


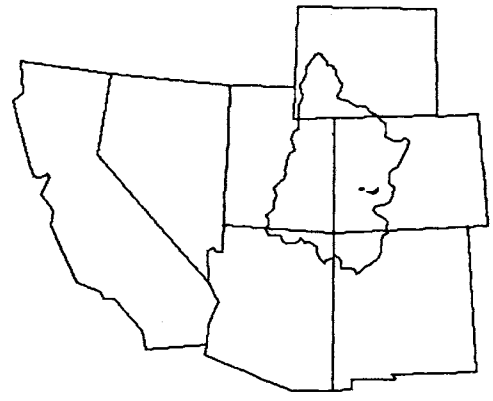
FLAMING GORGE STORAGE



ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES





WAYNE N. ASPINALL UNIT BLUE MESA, MORROW POINT, AND CRYSTAL RESERVOIRS (GUNNISON RIVER)

Water Year 1989

The Wayne N. Aspinall Unit, is comprised of Blue Mesa, Morrow Point, and Crystal Reservoirs. Blue Mesa provides nearly all of the long-term storage and regulation for all three powerplants. Morrow Point provides peaking power, and thus has highly variable releases. The primary function of the Crystal Reservoir is to regulate the variable Morrow Point releases.

The Gunnison River Basin experienced below average runoff for water years 1988 and 1989, which substantially reduced reservoir storage. In 1988, Blue Mesa Reservoir peaked at 40 feet from full capacity and in 1989 had recovered to within 18 feet of capacity. This recovery was accomplished by limiting releases from Crystal Reservoir to provide minimum streamflows of 300 cfs through the Black Canyon of the Gunnison River.

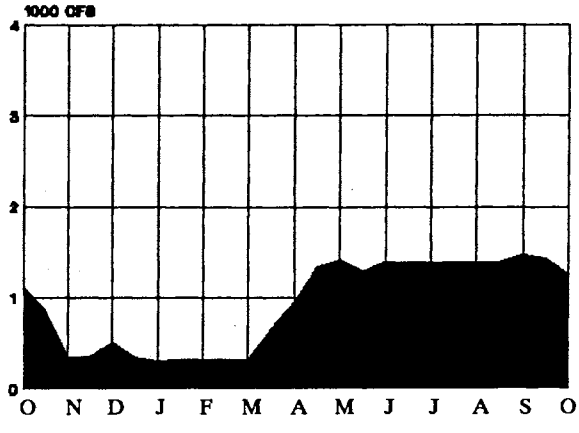
Blue Mesa Reservoir began water year 1989 at elevation 7472.0 feet with a storage of 449,000 acre-feet. The reservoir was at elevation 7473.4 feet by January 1, 1989, and the April through July runoff forecast at that time was 670,000 acre-feet, or 96 percent of the long-term average. The reservoir inflow forecast continued to decline for each month's forecast through the entire runoff season until on June 1, the forecast had declined to 429,000 acre-feet, or 47 percent of average. Due to these below average forecasts, releases from Blue Mesa Powerplant averaged about 34 percent of maximum powerplant capacity for January through May. By June 30, 1989, Blue Mesa Reservoir had reached a maximum elevation of 7501.72 feet with a storage of 675,350 acre-feet, or 81 percent of capacity. The maximum peak inflow to the reservoir of 3,058 cfs occurred on May 30, 1989.

The actual April through July unregulated runoff into Blue Mesa Reservoir was 444,000 acre-feet, or 57 percent of average. The total water year 1989 inflow was 671,000 acre-feet, or 61 percent of average. Releases from Blue Mesa Dam totaled 518,000 acre-feet for the water year.

Morrow Point Reservoir was operated between elevations 7154 and 7160 feet. The April through July side inflow into Morrow Point Reservoir was 38,000 acre-feet, or 54 percent of average. A total of 576,000 acre-feet was released during the water year.

Crystal Reservoir was operated to meet minimum downstream commitments during water year 1989. The April through July side inflow to Crystal was 38,000 acre-feet, which was 32 percent of average. A total of 658,000 acre-feet was released during the water year, of which 124,000 acre-feet bypassed the powerplant. During water year 1989 the maximum release from Crystal Reservoir was 1400 cfs.

ACTUAL CRYSTAL RELEASES WY 1989



BLUE MESA RESERVOIR

Reservoir	Acre-feet	Elevation, feet
Maximum Storage	829,523	7,519
Rated Head	249,395	7,438
Minimum Power	81,070	7,393
Surface Area, full		9,180 Acres
Reservoir Length, full		24 Miles

Powerplants (Blue Mesa, Morrow Point, & Crystal)

Number of Units	5
Total Capacity	208,000 KW

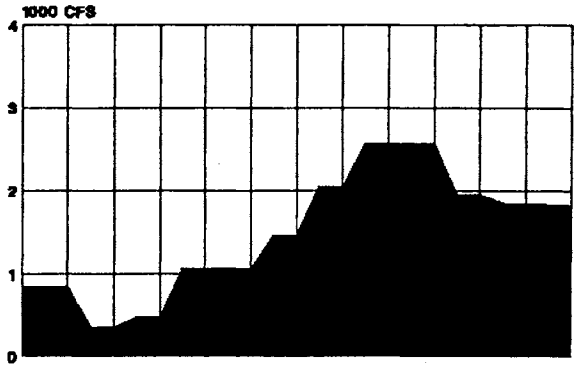
Water Year 1990

Blue Mesa powerplant will be operated during the water year to meet downstream requirements and to minimize powerplant bypasses at Crystal Dam. Assuming most probable average inflow, a minimum water elevation of 7488 feet is expected by the end of April, with a maximum elevation of 7518 feet in July.

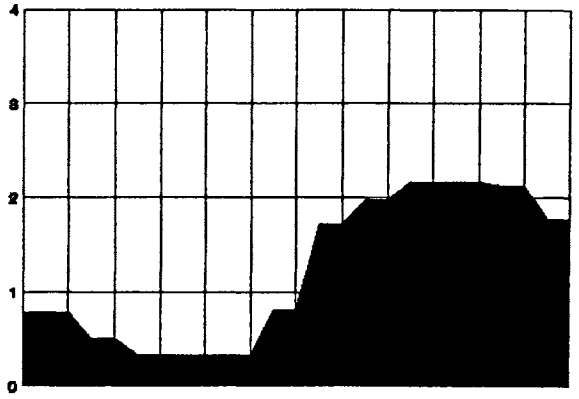
Morrow Point Reservoir is expected to fluctuate up to powerplant capacity during the current water year. Crystal Reservoir will be operated to regulate releases from Morrow Point Reservoir, to meet downstream requirements for diversions through the Gunnison Tunnel, and to protect the blue ribbon trout fishery in the Black Canyon. Releases are carefully planned to minimize large monthly changes in flow below the Gunnison Tunnel Diversion. The forecasted runoff during the spring of 1990 will be constantly monitored to achieve this objective.

With reasonable maximum inflows, releases from Crystal Dam would be at least 2,500 cfs. Assuming most probable inflow conditions, releases from Crystal Reservoir will range from 300 cfs to the maximum powerplant capacity of 1,700 cfs, in addition to possible bypasses of up to 500 cfs. Under reasonable minimum inflow conditions, releases will range from 300 to 1,500 cfs. Minimum releases from Crystal Reservoir are projected to continue until the spring of 1990, when, under most probable inflow conditions, Blue Mesa Reservoir will refill and the downstream releases will be increased.

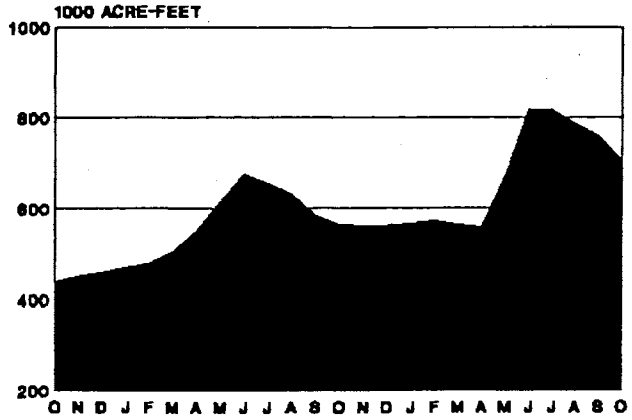
PROJECTED OPERATION 1990
REASONABLE MAXIMUM CRYSTAL RELEASES



MOST PROBABLE RELEASES



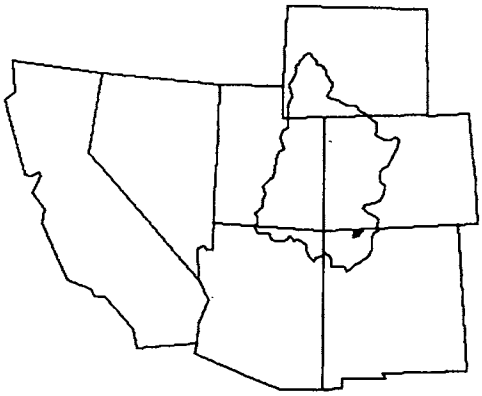
BLUE MESA STORAGE



ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES

NAVAJO RESERVOIR
(SAN JUAN RIVER)



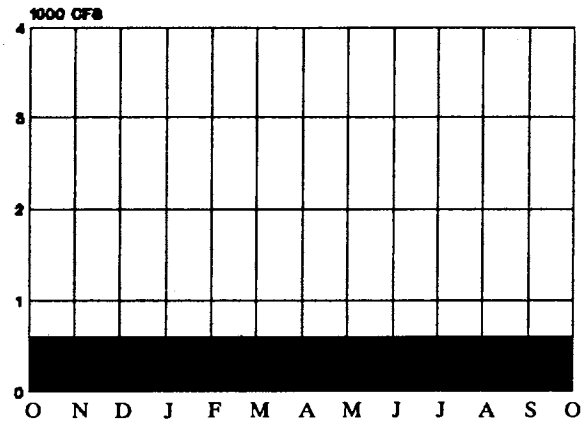
Water Year 1989

The elevation of Navajo Reservoir at the beginning of the water year was 6049 feet with 1,215,000 acre-feet of active storage, or 72 percent of capacity. Navajo Reservoir storage had been reduced to accommodate the construction of a concrete cutoff wall to reduce excessive seepage. Construction of the cutoff wall was completed in September 1988. It was projected that Navajo Reservoir would reach a maximum elevation of 6073 feet based on the most probable 1989 runoff.

Navajo Reservoir was gradually drawn down to the elevation of 6043.6 feet on January 1, 1989, and the April through July runoff forecast at this time was 690,000 acre-feet, or 109 percent of the long-term average. On March 1, the April through July forecast had increased to 830,000 acre-feet, then dropped each month until on June 1, it was 500,000 acre-feet or 79 percent of average. Since Navajo Reservoir was being refilled during this time period, releases were kept near a constant 600 cfs for the entire water year in order to refill the reservoir.

The actual April through July 1989 runoff volume into Navajo Reservoir was 424,000 acre-feet, or 67 percent of average. The total water year 1989 inflow was 730,000 acre-feet which was 76 percent of average. Peak inflow to Navajo reservoir occurred on April 9, at 3,700 cfs. The reservoir reached a peak elevation of 6064.8 feet on July 20, 1989.

ACTUAL RELEASES WY 1989



NAVAJO RESERVOIR

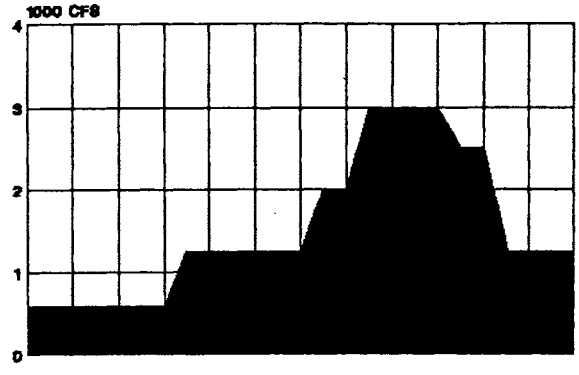
Reservoir	Acre-feet	Elevation, feet
Maximum Storage	1,696,400	6,085
Inactive Storage	660,500	5,990
Surface Area, full		15,610 Acres
Reservoir Length, full		33 Miles

Water Year 1990

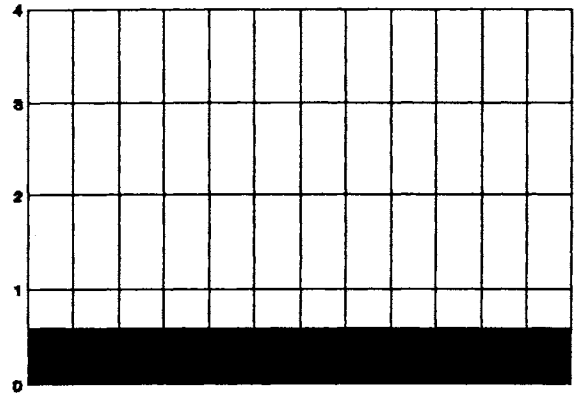
Navajo Reservoir is projected to be drawn down to about elevation 6051 feet by February 1990. Under a most probable runoff water year, releases are projected to remain near 600 cfs over the entire water year, resulting in Navajo Reservoir filling to about elevation 6068 feet, or 85 percent full, by July 1990.

With a reasonable maximum runoff water year, Navajo Reservoir is expected to fill to the normal water surface elevation of 6085 feet, with maximum releases of about 3,000 cfs during the months of May through June. A reasonable minimum level of runoff would not change the release pattern from the 600 cfs level provided for irrigation, consumptive use, and maintenance of fish and wildlife.

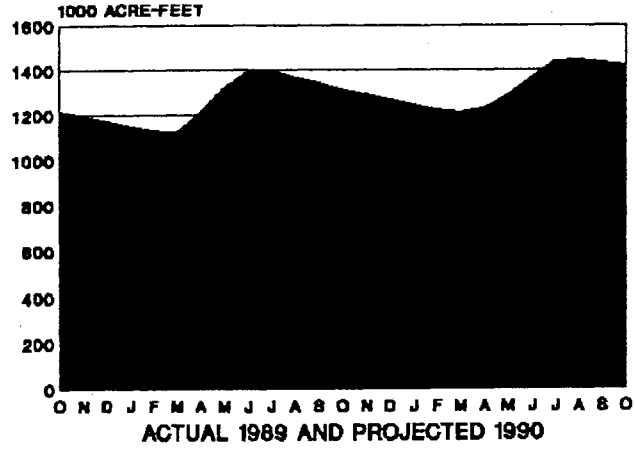
PROJECTED OPERATION 1990
REASONABLE MAXIMUM RELEASES



MOST PROBABLE RELEASES

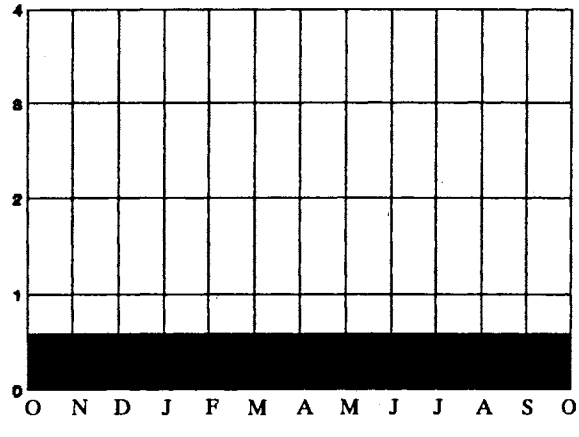


NAVAJO STORAGE

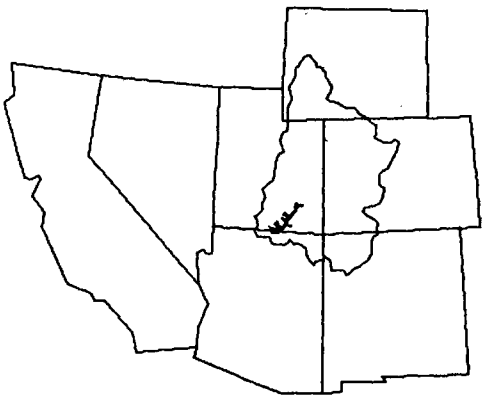


ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES



LAKE POWELL
(COLORADO RIVER)



Water Year 1989

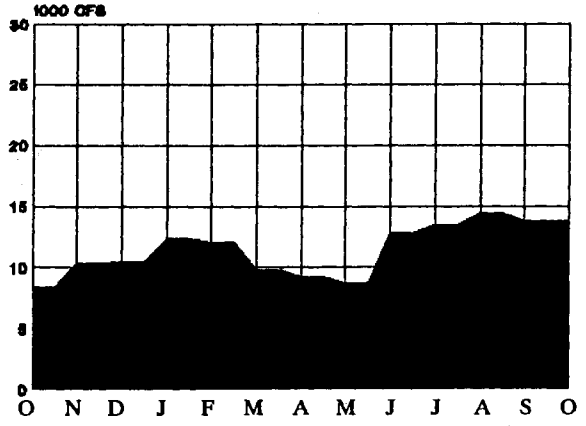
Lake Powell, which is impounded by Glen Canyon Dam, was operated as part of the Colorado River Storage Project (CRSP) in accordance with governing contracts and laws to provide conservation storage, river regulation, power generation, recreation, and fish and wildlife enhancement during water year 1989.

At the start of water year 1989, Lake Powell was 91 percent full with an active storage content of 22,747,000 acre-feet at elevation 3685.6 feet. The most probable operating plan, based on the October unregulated inflow forecast of 10.8 maf, called for total water year releases of 8.50 maf. The reasonable maximum water supply had projected water year releases of 14.10 maf based on an unregulated inflow of 16.84 maf.

On January 1, 1989, Lake Powell was at elevation 3679.7 with an active content of 21,875,000 acre-feet. The January 1 forecast of April through July runoff for Lake Powell was 7.0 maf, or 86 percent of the long-term average. Discharges during January from Glen Canyon powerplant averaged 12,300 cfs, or 37 percent of maximum capacity. The runoff forecast for April through July on each succeeding month declined until, on June 1, it was 3.78 maf, or 46 percent of average. Subsequently, releases were set at 8.23 maf for the year to conserve reservoir storage and to meet minimum objective release requirements. A maximum lake elevation of 3678.6 feet (87 percent full) was reached on June 11 through June 14, with an active content of 21,715,000 acre-feet. Lake Powell received a peak regulated inflow of 18,400 cfs on May 27.

The total 1989 water year unregulated inflow to Lake Powell was 6,253,000 acre-feet which is equivalent to 52 percent of the long-term average. The total water year release below Glen Canyon was 8.23 maf. All releases were passed through the powerplant.

ACTUAL RELEASES **WY 1989**



LAKE POWELL

Reservoir	Acre-feet	Elevation, feet
Maximum Storage	25,002,000	3,700
Rated Head	9,428,000	3,570
Minimum Power	4,126,000	3,490
Surface Area, full		161,390 Acres
Reservoir Length, full		186 Miles

Powerplant	
Number of Units	8
Total Capacity	1,247,000 KW

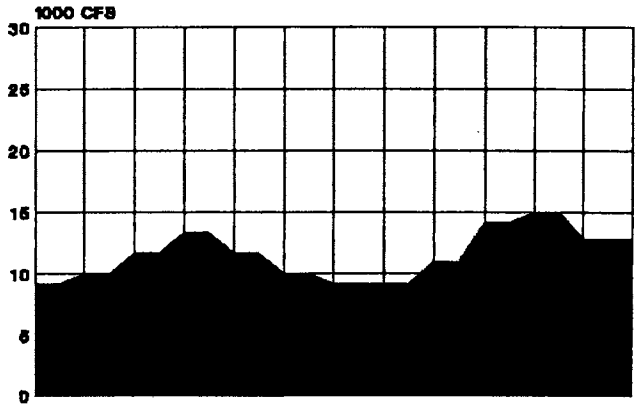
Water Year 1990

Lake Powell began water year 1990 at elevation 3665.2 feet with an active content of 19,805,000 acre-feet (79 percent full). The plan of operation through March is to maintain releases at about 33 percent of powerplant capacity. Assuming a most probable unregulated runoff water year of 8.82 maf, discharges from the powerplant would be decreased to a daily average of 9,200 cfs, or 28 percent of powerplant capacity for April and May, then increased to 33 percent for June. During the months of July through September, the reservoir would be operated with average discharges at about 42 percent of powerplant capacity. Total discharges for the water year would be 8.23 maf. The lowest monthly release in 1990 will be about 500,000 acre-feet and the highest monthly release is projected to be about 900,000 acre-feet. In addition, minimum flow rates will be maintained to serve fishery and recreation needs.

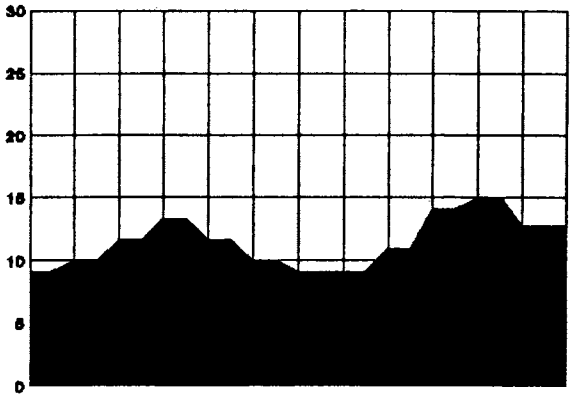
The operation plan for the reasonable maximum inflow and the reasonable minimum inflow is the same as the most probable due to dry basin conditions and reduced reservoir levels. Total water year releases of 8.23 maf would allow Lake Powell to fill to about 93 percent of full, 78 percent full, and 72 percent full; for the reasonable maximum, most probable, and reasonable minimum runoffs, respectively.

The actual releases from Lake Powell after January 1, 1990, will be reevaluated based upon runoff forecasts, reflecting current hydrologic conditions. It is expected that powerplant bypasses will be avoided in all three operating scenarios.

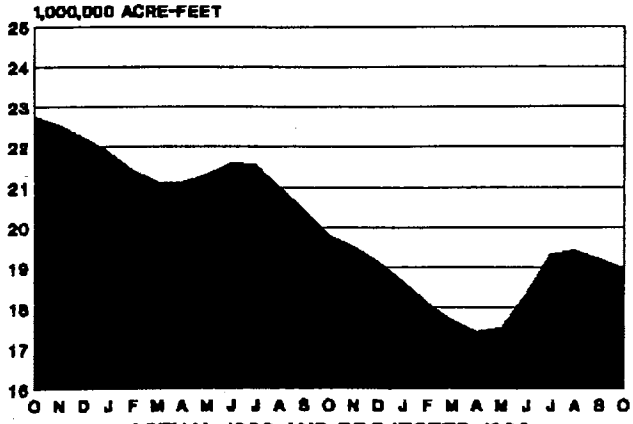
PROJECTED OPERATION 1990
REASONABLE MAXIMUM RELEASES



MOST PROBABLE RELEASES

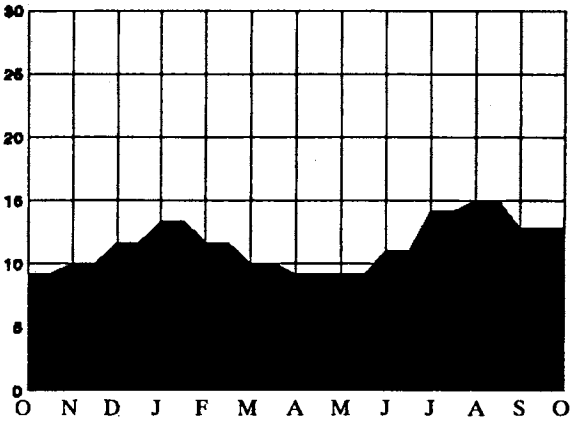


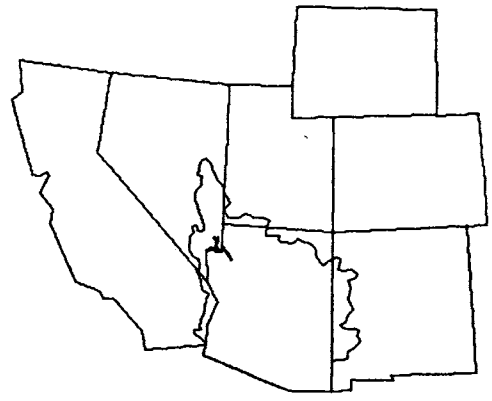
LAKE POWELL STORAGE



ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES





LOWER BASIN RESERVOIRS

LAKE MEAD (COLORADO RIVER)

Water Year 1989

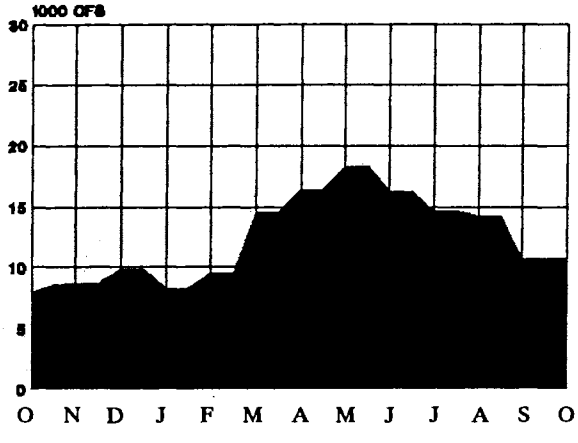
At the beginning of the water year the Lake Mead water surface elevation was 1199 feet with an active storage of 22,795,000 acre-feet. During the winter months, the water level rose to about elevation 1203 feet near the end of February 1989 and then declined to elevation 1193 feet near the end of May 1989. During June, July, and August Lake Mead continued to drop, reaching a low elevation of 1189 feet during the last week of August, with a corresponding active storage of 21,404,000 acre-feet.

During the water year, releases were made to meet downstream water use requirements in the United States and Mexico, scheduled levels of Lakes Mohave and Havasu, and net transit losses which include river and reservoir evaporation, uses by phreatophytes, changes in bank storage, unmeasured inflows, and diversions to the Las Vegas, Nevada, area via the Robert B. Griffith Water Project (Project). The total release from Lake Mead through Hoover Dam during water year 1989 was 9,027,000 acre-feet. All of that amount passed through the turbines for power production. In addition, 243,000 acre-feet were diverted from Lake Mead by the Project. At the end of the water year, Lake Mead had a water surface elevation of 1190 feet and an active storage of 21,528,000 acre-feet, which reflects a decrease in storage during the water year of 1,267,000 acre-feet. On September 30, 1989, the active storage of Lake Mead was 1,722,000 acre-feet greater than the active storage in Lake Powell.

A St. Paul, Minnesota, man, Mr. Richard Fischer, along with his wife, became the 26 millionth visitor to take the guided tour of Hoover Dam on Saturday, February 4, 1989. Tours of the dam began on January 1, 1937. Hoover Dam is the leading tourist attraction among similar multipurpose water projects in the United States. It is estimated that 2 million people visit the dam each year, with approximately 700,000 taking the tour.

Ground was broken in March 1989 for a new $54 million visitor center to be built on the Nevada side of Hoover Dam. When completed, the new center will allow more visitors than ever before to tour one of the world's engineering marvels.

ACTUAL RELEASES WY 1989



LAKE MEAD

Reservoir	Acre-feet	Elevation, feet
Maximum Storage	27,377,000	1,229
Rated Head	13,653,000	1,123
Minimum Power	10,024,000	1,083
Surface Area, full		162,700 Acres
Reservoir Length, full		115 Miles

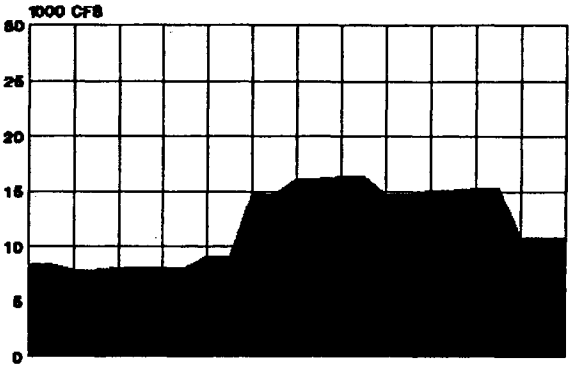
Powerplant	
Number of Units	17
Total Capacity	1,914,000 KW

Water Year 1990

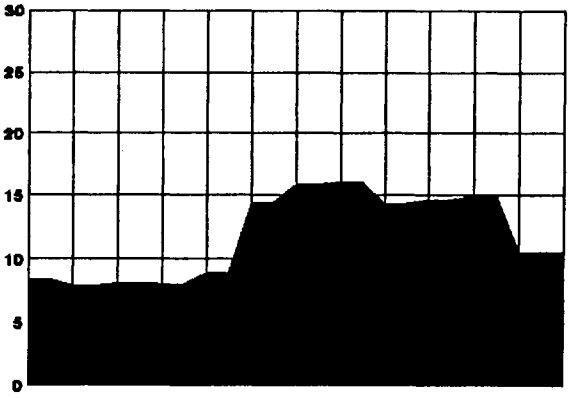
Under most probable inflow conditions during the 1990 water year, the Lake Mead water level is scheduled to be drawn down to elevation 1186 feet at the end of August 1990. At that level, the lake will have an active storage of approximately 20.9 maf. During water year 1990, a total of approximately 8.7 maf is scheduled to be released from Lake Mead under most probable conditions, all passing through the powerplant.

The outlook for lowest and highest monthly releases for 1990 will be about 480,000 acre-feet and 980,000 acre-feet, respectively. Lake Mead drawdown during the peak largemouth bass spawning period in April and May is planned to be within the limits of decline recommended in the July 1982 final report of a 5 year study by the Arizona Game and Fish Department and the Nevada Department of Wildlife.

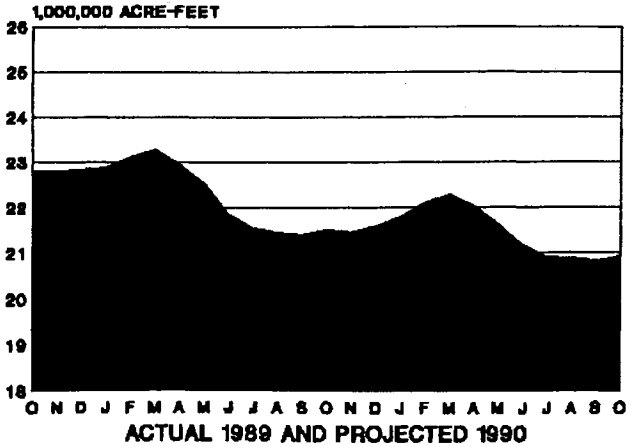
PROJECTED OPERATION 1990
REASONABLE MAXIMUM RELEASES



MOST PROBABLE RELEASES

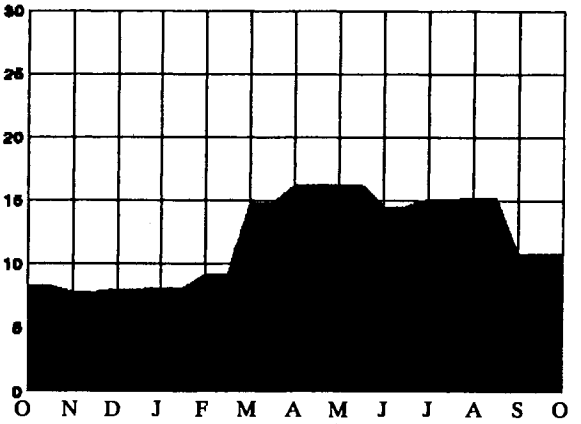


LAKE MEAD STORAGE

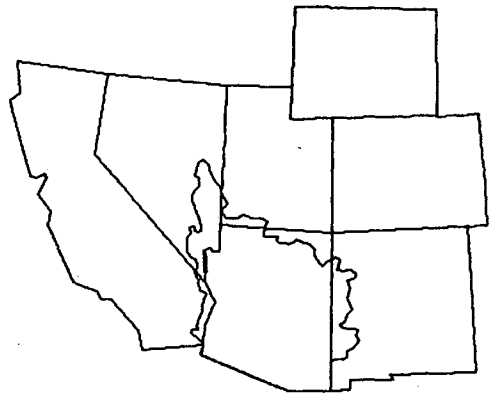


ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES



LAKE MOHAVE
(COLORADO RIVER)



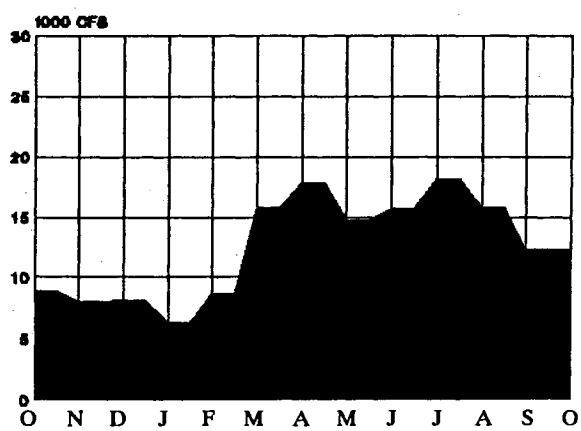
Water Year 1989

At the beginning of water year 1989, the water surface elevation of Lake Mohave, impounded by Davis Dam, was 635.8 feet with an active storage of 1,505,000 acre-feet.

During the winter months, after some fluctuation, the water level rose to 644 feet, with an active storage of 1,738,000 acre-feet in the first part of February 1989. The water level then declined to elevation 637.1 feet during the latter part of April 1989, then rose to an elevation of 645 feet at the end of May, with an active storage of 1,761,000 acre-feet. Lake Mohave was near elevation 646 feet at the end of June and then declined to 639 feet by the end of July 1989. The reservoir ended the water year at an elevation of 631.2 feet with 1,388,000 acre-feet in active storage.

Lake Mohave releases satisfied downstream water use requirements, including diversions by The Metropolitan Water District of Southern California (MWD) and by the Central Arizona Project (CAP). During the water year, 9,440,000 acre-feet were released at Davis Dam, all of which passed through the turbines for power production. Of that amount, 1,198,000 acre-feet were then pumped from Lake Havasu by MWD and 747,000 acre-feet were pumped for the CAP.

ACTUAL RELEASES **WY 1989**



LAKE MOHAVE

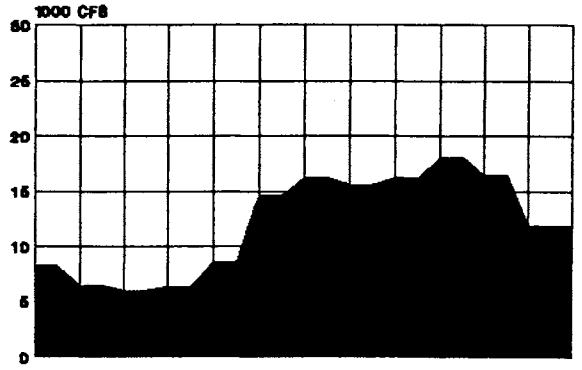
Reservoir	Acre-feet	Elevation, feet
Maximum Storage	1,810,000	647
Rated Head	1,188,000	623
Minimum Power	217,500	570
Surface Area, full		28,200 Acres
Reservoir Length, full		67 Miles
Powerplant		
Number of Units		5
Total Capacity		240,000 KW

Water Year 1990

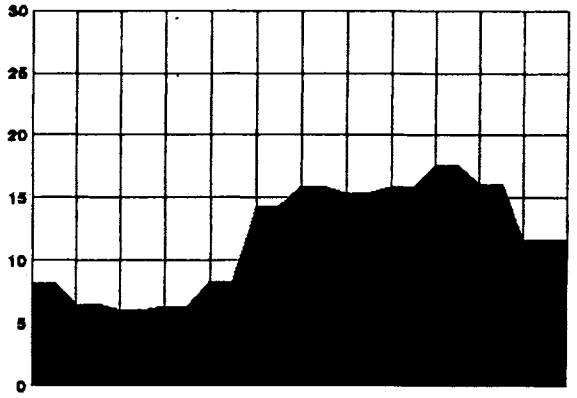
Both Mohave and Havasu Reservoirs are scheduled to be drawn down in the winter months to provide storage space for local storm runoff and will be filled in the spring to meet higher summer water needs. This drawdown will also correspond with maintenance at both Davis and Parker Powerplants which is scheduled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

Under most probable inflow conditions the water level of Lake Mohave is scheduled to reach an elevation of about 643 feet by the end of January 1990 and then rise to elevation 645 feet by the end of May. The reservoir will gradually drop to an elevation of approximately 630 feet by the end of the water year. During the water year a total of 8.7 maf is scheduled to be released from Davis Dam powerplant to meet all downstream requirements.

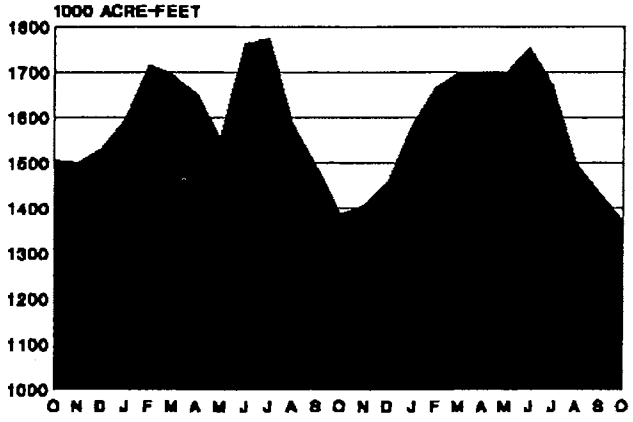
PROJECTED OPERATION 1990
REASONABLE MAXIMUM RELEASES



MOST PROBABLE RELEASES

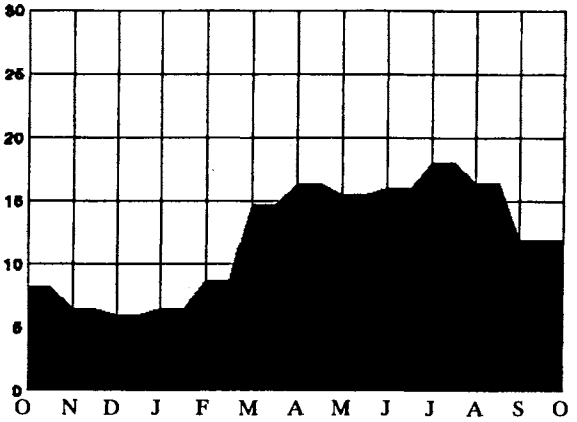


LAKE MOHAVE STORAGE

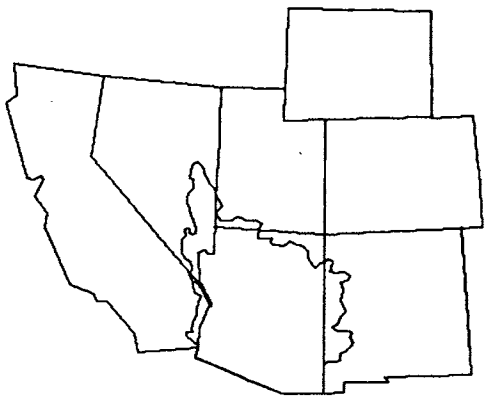


ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES



LAKE HAVASU
(COLORADO RIVER)



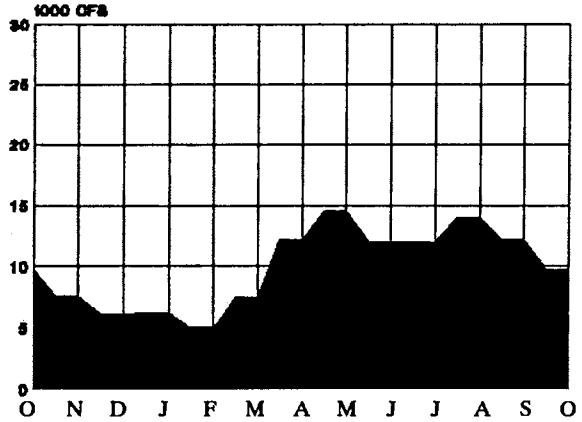
Water Year 1989

At the beginning of water year 1989, the water level of Lake Havasu, impounded by Parker Dam, was at an elevation of 447 feet, with an active storage of 560,000 acre-feet. During the winter the reservoir was drawn down to an elevation of 445 feet to provide vacant space for runoff from the drainage area between Davis and Parker dams. The water level was then raised to an elevation of 450 feet near the middle of May, with an active storage of about 624,000 acre-feet. At the end of the water year, Lake Havasu was at an elevation of 447 feet with an active storage of 563,000 acre-feet.

During the water year, approximately 7,030,000 acre-feet were released through Parker Dam powerplant. In addition to the releases from Parker Dam, approximately 1,198,000 acre-feet were diverted from Lake Havasu by MWD. Diversions from Lake Havasu for the CAP were 747,000 acre-feet during the water year.

Space in the top 10 feet of Lake Havasu (about 180,000 acre-feet) is reserved by the United States for the control of floods and other uses, including river regulation. Recently, only about the top 4 feet, or 77,000 acre-feet of space, have been required for this purpose since construction of the Alamo Reservoir on the Bill Williams River has provided additional flood control.

ACTUAL RELEASES **WY 1989**



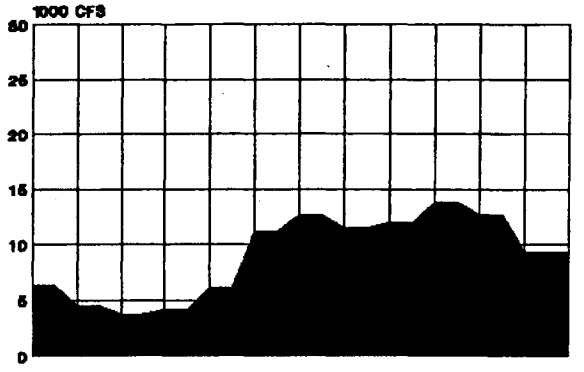
LAKE HAVASU

Reservoir	Acre-feet	Elevation, feet
Maximum Storage	619,400	450
Rated Head	619,400	450
Minimum Power	439,400	440
Surface Area, full		20,400 Acres
Reservoir Length, full		35 Miles
Powerplant		
Number of Units		4
Total Capacity		120,000 KW

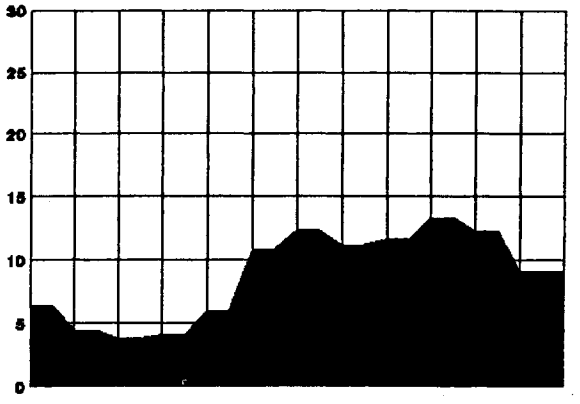
Water Year 1990

Lake Havasu is scheduled at the highest levels, consistent with the requirements for maintaining reservoir regulation space. The yearly low elevation of approximately 446 feet is scheduled for the October through February high flood hazard period. The yearly high of about 450 feet is scheduled for the low flood hazard months of May and June. During water year 1990, a total of approximately 6.5 maf is scheduled to be released from Lake Havasu to meet all downstream and flood control requirements. All of that amount is scheduled to pass through the Parker Powerplant.

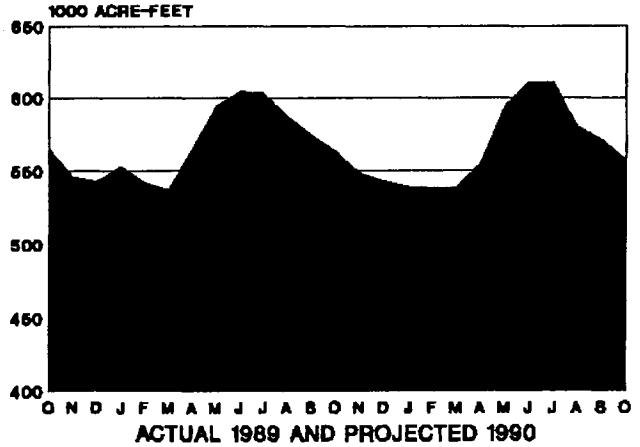
PROJECTED OPERATION 1990
REASONABLE MAXIMUM RELEASES



MOST PROBABLE RELEASES

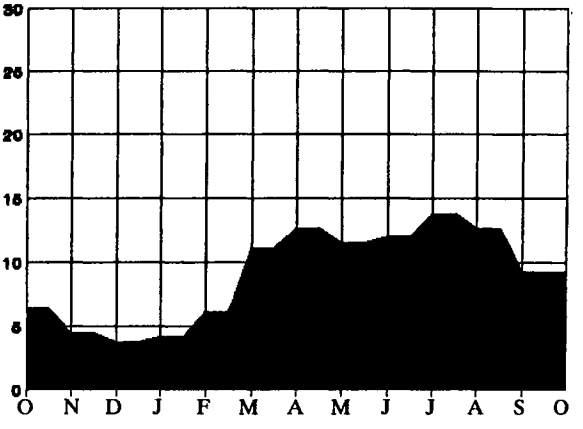


LAKE HAVASU STORAGE



ACTUAL 1989 AND PROJECTED 1990

REASONABLE MINIMUM RELEASES



River Regulation

The runoff into Lake Powell during water year 1988 was approximately 70 percent of normal and water year 1989 runoff was approximately 54 percent of normal. The low runoff years of 1988 and 1989 have caused a drawdown in each of the Colorado River system reservoirs. The October 1, 1989, system vacant space was approximately 13.1 maf. This vacant space has resulted from the two successive years of low inflow and the requirement to maintain the minimum deliveries to meet obligations pursuant to "The Law of the River."

Daily releases are provided from the storage reservoirs in the Lower Basin to meet the needs of water user agencies, for river regulation and as needed for flood control. When possible, all water passes through the powerplant units. The daily releases are regulated on an hourly basis to meet, as nearly as possible, the power needs of the hydroelectric power customers. At appropriate locations, minimum instream flow objectives have been established, which preserve the present aquatic resources downstream of certain Colorado River dams. In many cases, these resources were poor or nonexistent prior to the time of dam construction, and the subsequent minimum, cool water releases have provided an improved environment for aquatic resources and sport fisheries. In general, controlled releases allow for an extended recreation season, and reduce the high flow periods in May and June. Water years 1988 and 1989 have been drier than normal and a return to more normal runoff levels in future years will provide increased benefits to fish, wildlife and recreation uses as it will to the other project purposes.

Remedial modifications, including construction of a relief well and seepage collection system downstream of Senator Wash Dam, were completed and a seepage evaluation program performed in March of 1989. Normal water conservation operations of Senator Wash reservoir have resumed; however, the collector ditch required some further modification to meet design specifications. Senator Wash reservoir was drawn down for about a month at the beginning of water year 1990 to accomplish these modifications. Water deliveries were lower during this period, and the cooler fall temperatures promoted health and safety of the work force and resulted in a lesser impact on fish and wildlife resources. The water conservation operation of Senator Wash will now allow regulation of water deliveries to Mexico without over-deliveries except during rainstorm events.

Operational objectives at and below Laguna Dam are to conserve water, control sediment, and maintain the river channel. Storage of water above Laguna Dam in the reservoir, in surcharge, and in bank storage provides for controlled flows in the river at Yuma, which combined with seepage and drainage, allows a continuous live stream serving recreational and fish and wildlife purposes. On a few occasions each year, higher daily flows below Laguna, caused by rainstorms or user rejected water orders, are used to maintain sufficient river channel capacity. This occasional practice reduces channel maintenance expense without impairment to water conservation or power production.

Because of existing reservoir conditions and river regulation operations below Hoover Dam, the total water year 1989 delivery to Mexico was approximately 200,000 acre-feet in excess of the scheduled treaty delivery of 1,500,000 acre-feet for the calendar year. Of that amount, 136,000 acre-feet of drainage waters were bypassed to the Gulf of California via the Bypass Drain during water year 1989. This bypass channel was constructed pursuant to provisions of Minute No. 242 of the International Boundary and Water Commission.

Flood Control

Lake Mead is operated in accordance with updated flood control regulations which are specified in the Field Working Agreement between Reclamation and the Corps of Engineers, signed in 1982. The regulations stipulate the minimum release levels needed from Lake Mead to route the reasonable maximum inflow. The reasonable maximum inflow is the estimated inflow volume that, on the average, will not be exceeded 19 out of 20 times. This volume is derived by adding an "uncertainty" term to the most probable runoff forecast. In 1983, unusual hydrometeorological events resulted in unprecedented large forecasting errors. Subsequent reassessment of the estimate of the "uncertainty" term led to adoption of larger values for use in determining the reasonable maximum inflow in 1984 and thereafter.

No flood control releases are scheduled for 1990, but in future years, as Lake Mead refills and flood control releases are again required by the Hoover Dam flood Control Regulations, consideration will be given to making those releases over the fall and winter months to avoid high flow rates during the January to July runoff season. This distribution of water reduces the chance of bypassing hydroelectric powerplants below Hoover Dam and avoids the adverse impacts of higher flood control releases on fish and wildlife, recreation, water quality, and river stabilization.

Routine maintenance and repair of bankline damage was carried out during water year 1989. As in the previous year, some bankline erosion was experienced in the Lower Basin of the Colorado River. In some river reaches, especially the Mohave Valley, greater than normal bankline repair was necessitated in part by increased wave action from boating and other recreational river traffic. During water year 1989, the river channel in the Lower Basin has remained in good balance, neither aggrading nor degrading significantly in any particular reach.

Total Colorado River reservoir system storage at the start of water year 1989 was approximately 52,404,000 acre-feet and about 48,183,000 acre-feet at the end of the water year, representing a 4,221,000 acre-foot increase in total remaining available reservoir space.

Alamo Dam on the Bill Williams River (in the Lower Basin) received minor flood inflow during water year 1989. During water year 1990, Painted Rock (Gila River) and Alamo Reservoirs are scheduled to be operated in accordance with established flood control criteria to maximize the available flood control space in their respective reservoirs.

Beneficial Consumptive Uses

An extensive discussion of consumptive uses is treated in detail in Reclamation's draft "Colorado River System Consumptive Uses and Losses Report, 1981-1985." That report was prepared jointly by the Upper and Lower Colorado Regional Offices and was scheduled for release in 1988, but has not yet been published due to technical review questions. The report presents estimates of the consumptive uses and losses from the Colorado River System for each year from 1981 through 1985. The table on the following page was created by the provisional data from that report, which summarizes annual water use from the system by States, including water use supplied by ground-water overdraft. The next report, 1986-1990, is expected to be available in 1992.

Upper Basin Uses and Losses

The three largest categories of consumptive use and losses in the Upper Colorado River Basin are agricultural uses within the basin, transbasin diversions to adjacent drainages, and evaporation losses from the major reservoirs of the Colorado River System. During water year 1989, the estimated use for municipal, industrial and agriculture supplies in the Upper Basin was about 3.0 maf. Estimated evaporation losses were about 720,000 acre-feet from mainstem reservoirs. Approximately 680,000 acre-feet was diverted for use in adjacent drainages. Total estimated consumptive use amounted to about 3.9 maf. Storage in the Upper Basin mainstem reservoirs decreased by 2.6 maf during water year 1989.

Lower Basin Uses and Losses

During water year 1989, an estimated 5.5 maf of water were released from Lake Havasu 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.

The major water diversions above Parker Dam were by MWD and the CAP. MWD pumped approximately 1,198,000 acre-feet from Lake Havasu during water year 1989 and approximately 747,000 acre-feet were pumped for the CAP.

Releases of approximately 7.7 maf were made from Lake Mohave during water year 1989, to provide for releases to meet minimum downstream needs in the United States at Parker Dam; to supply diversion requirements of MWD and CAP, miscellaneous contractors, and other users; to offset evaporation and other transit losses between Davis and Parker dams; and to maintain the scheduled levels of Lake Havasu.

During water year 1989, releases of approximately 7.5 maf were made from Lake Mead at Hoover Dam to regulate the levels of Lake Mohave, to provide for the small users from Lake Mohave, and to provide for releases at Davis Dam to meet needs in the United States. In addition, 243,000 acre-feet were diverted from Lake Mead for use by the Lake Mead National Recreation Area, Boulder City; Basic Management, Inc.; and contractors of the Colorado River Commission of Nevada. Total releases and diversions from Lake Mead during water year 1989 were an estimated 9,270,000 acre-feet.

For water year 1990, a total release of 6.5 maf from Lake Havasu is projected, including consumptive use requirements in the United States below Parker Dam, transit losses and regulation in the river between Parker Dam and the Mexican Border, and treaty deliveries to Mexico.

During water year 1990, MWD is expected to divert 1,312,000 acre-feet by pumping from Lake Havasu. The CAP is expected to pump approximately 848,000 acre-feet. Consumptive uses by small users, river losses or gains, and reservoir losses between Davis Dam and Parker Dam are projected to be a net loss of 46,000 acre-feet.

There are no major users between Hoover Dam and Davis Dam. During water year 1990, diversions from Lake Mead are projected at 196,000 acre-feet. Evaporation from Lake Mead is projected to be about 900,000 acre-feet and net gain between Glen Canyon Dam and Lake Mead is expected to be about 950,000 acre-feet.

Water Use by States

(Provisonal)*

(1,000 acre-feet)

State	1981	1982	1983	1984	1985	Average 1981-85
Arizona	6,896	5,609	4,533	5,508	5398	5,589
Californa	4,836	4,346	3,950	4,676	4,707	4,503
Colorado	2,235	2,227	2,043	1,973	2,113	2,118
Nevada	212	212	195	206	209	207
New Mexico	345	477	477	444	440	437
Utah	836	795	762	810	933	827
Wyoming	327	316	331	289	320	317
Other	1,548	1,483	1,716	1,657	1,713	1,623
Total Colorado River Basin	17,235	15,465	14,007	15,563	15,833	15,621
Water Passing to Mexico						
Treaty	1,751	1,495	1,646	1,694	1,671	1,651
Minute 242	131	146	166	138	131	142
Excess Releases	2,115	176	7,970	15,160	11,594	7,403
Total Water Passing to Mexico	3,997	1,817	9,782	16,992	13,396	9,196
Total - Colorado River System and Water Passing to Mexico	21,232	17,282	23,789	32,555	29,229	24,817

NOTE:

Onsite consumptive uses and losses; includes water uses satisfied by groundwater overdrafts. "Other" water uses represents mainstem reservoir evaporation in the Upper Basin and mainstem reservoir evaporation below Lee Ferry in the Lower Basin.

* Source - Draft Report "Colorado River System Consumptive Uses and Losses Report, 1981-1985"

Power Operations and Major Maintenance Activities

Upper Basin - Colorado River Storage Project

During water year 1989 the Blue Mesa generators were uprated and Siemans-Allis Corporation completed work on the Crystal turbine replacement in January 1989. Morrow Point generators are scheduled for uprating during water year 1990.

The following table summarizes CRSP generation, purchases, disposition, and revenues from power operations for fiscal year 1989, and present projections for fiscal year 1990. A breakdown by percent of power sources, disposition, and revenues for the fiscal year is shown on the opposite page. The total revenue from power operations in fiscal year 1989 was $79,875,973.

CRSP Power Generation

Water Year 1989

Sources of Energy	**Kilowatt-hours**
Net Generation	
Blue Mesa	153,751,497
Crystal	95,300,693
Flaming Gorge	249,485,110
Fontenelle	23,235,485
Glen Canyon	3,956,096,938
Morrow Point	200,498,220
Sub-total-Net Generation	4,678,367,943
Miscellaneous	**Kilowatt-hours**
Purchases	1,393,668,481
Interchange Receipts	1,273,000,000
Energy Charges to Transmission Service Customers	241,000,000
Sub-total-Miscellaneous	2,907,668,481
Total Energy From All Sources	7,586,036,424
Disposition of Energy	**Kilowatt-hours**
Firm Energy Sales	5,753,371,000
Nonfirm Energy Sales Emergency Fuel Replacement (Oil Conservation)	633,468,000
Interchange Deliveries	409,000,000
System Losses	790,197,424
Total Energy Distributed	7,586,036,424

Revenue	**Dollars**
Firm Power Sales	$ 63,620,434
Non Firm Power Sales Emergency Fuel Replacement (Oil Conservation)	11,453,378
Reserve Capacity	-0-
Parker-Davis Project Firming	-0-
Transmission Service	4,217,897
Rental of Substation Facilities	168,098
Miscellaneous Revenue	416,166
Total Gross Revenue	$ 79,875,973

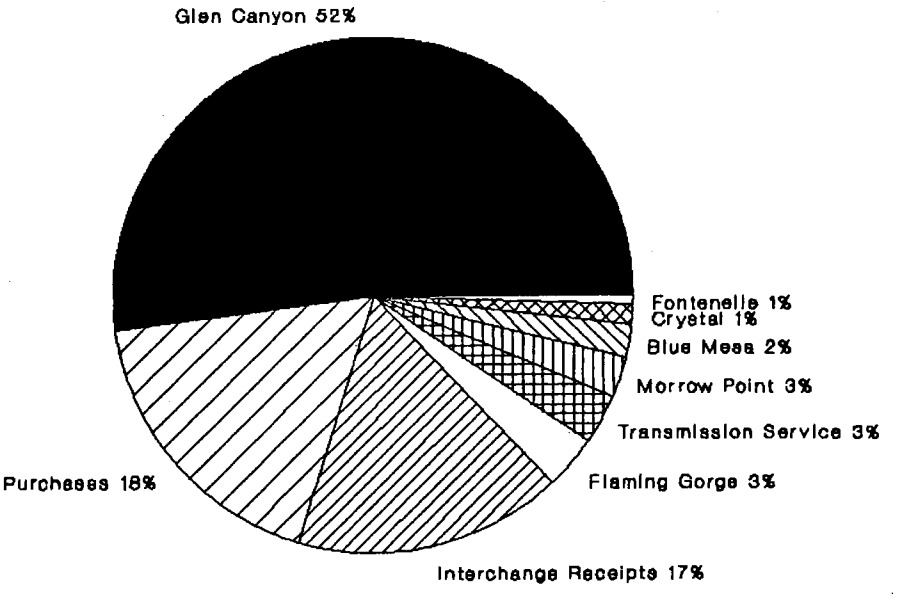
Water Year 1990

(Projected)	**Kilowatt-hours**
Estimated Firm Energy Sales	5,800,000,000
Estimated Nonfirm Sales	650,000,000
Estimated Purchases	1,400,000,000
Estimated Peaking Capacity Sales (Per Month)	
Winter 1989-90	100,000
Summer 1990	40,000
Estimated Revenue	$ 90,000,000

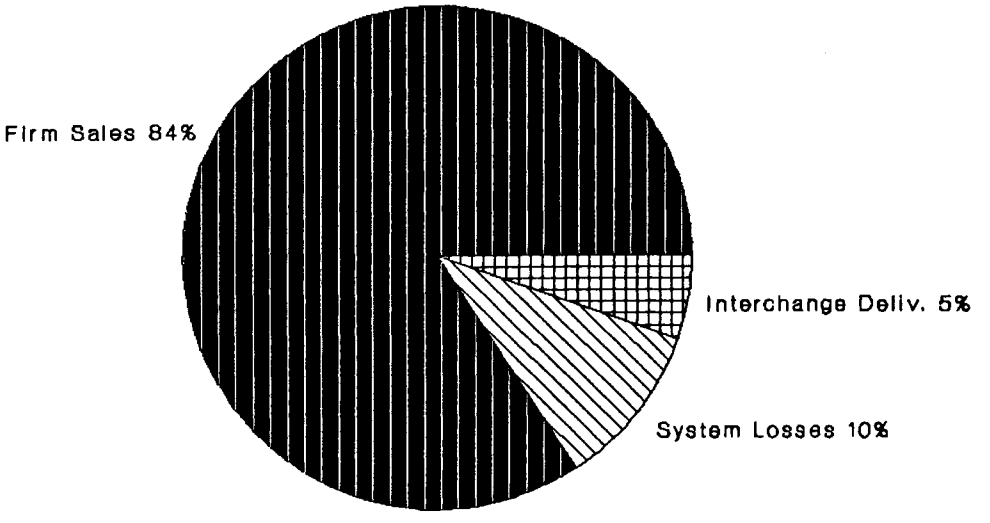
Colorado River Storage Project Power Operations

(Water Year 1989)

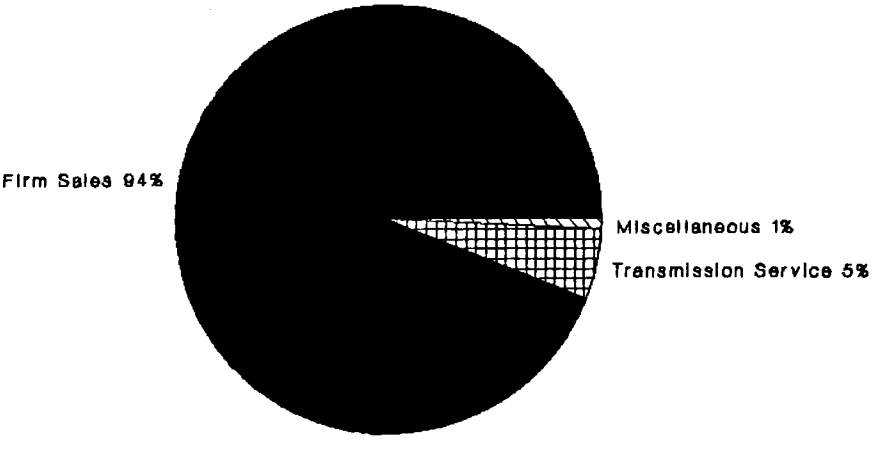
Energy Sources



Energy Disposition



Revenue



Power Operations [Cont.]

Lower Basin

Water Year 1989

On June 1, 1987, the United States assumed operation and maintenance responsibility of Hoover Powerplant and associated switching stations, after the 50-year contract with operating agents (The City of Los Angeles and its Department of Water and Power, and Southern California Edision Company, Ltd.) expired. The "General Regulations for Generation and Sale of Power in Accordance with the Boulder Canyon Project Adjustment Act," promulgated on May 20, 1941, provided the basis for computation of charges for electrical energy generated at Hoover Dam through May 31, 1987. The Department of Energy Organizational Act of 1977 transferred the responsibility for the power marketing and transmission functions of the Boulder Canyon Project from the Bureau of Reclamation (Reclamation) to the Western Area Power Administration (Western). The power marketing functions of Western include the responsibility for promulgating charges for the sale of power. The construction, power generation, operation, maintenance, and replacement responsibilities associated with the Hoover Powerplant and appurtenant works remained with Reclamation. Marketing of Parker-Davis power and operating the transmission system are the responsibility of Western. Reclamation continues to operate and maintain the dams and their powerplants, a function of the Lower Colorado Dams Project Office.

Davis and Parker powerplants continue to be operated by remote control from Western's Supervisory Control and Data Acquisition (SCADA) computer system located at their Phoenix District Office. The SCADA system monitors and remotely controls the generating units to adhere to water schedules provided by Reclamation's water scheduling branch located at the Lower Colorado Dams Project, Hoover Dam. Routine maintenance was performed at Davis and Parker powerplants.

The total energy delivered to the Hoover allottees during the 1989 operating year (October 1, 1988, to September 30, 1989) was 4,122,181,000 kWh. Of that amount, the Schedule A allottees received 3,426,837,000 kWh and the Schedule B allottees received 695,344,000 kWh. Schedule C allottees received no deliveries in the 1989 operating year.

In water year 1989, six generating units (A1, A2, A6, A7, N2, and N5) at Hoover Powerplant were uprated. This increased the capacity by 180 MW. This brings the total plant capacity to 1,914 MW as of January 1990. Of the 17 generating units at Hoover Powerplant, 11 have been uprated.

A $9,442,300 Reclamation contract was awarded to Marine Limited, Quebec, Canada, for the uprating of Units N1, N2, N5, and N6. Work on Unit N6 began in September 1989 and is scheduled to be completed in February 1990. Five generating units at Hoover powerplant will remain to be uprated after Unit N6 is completed. Unit A8 is scheduled for October 1990, Unit A9 is scheduled for January 1991, Unit A3 is scheduled for May 1991, Unit N8 is scheduled for October 1991, and Unit A4 is scheduled for January 1992. All uprating is scheduled to be completed by June 1992. The total capacity at the completion of uprating is expected to be a maximum of 2,074 MW.

Principal work under the contract includes conducting a study of the existing generator design, furnishing and installing necessary new components, and modifying the generators, as required, to accomplish the proposed uprating. The objective is to uprate the generators by the optimum amount, based on water availability and economic feasibility. Studies show that sufficient water, head, and turbine capacity are available to produce significantly more generator output than the existing generator ratings will allow.

At Davis and Parker powerplants acoustic flowmeters were installed on each unit. The data from these flowmeters will be used to calculate how many cubic feet of water is released per kilowatt generated. These improved data will help in better control for optimized operation and improved efficiency of the powerplants.

Water Year 1990

In operation studies of Lake Mead and Lake Powell for the operating year which ends September 30, 1990, the amounts released at Hoover Dam have been projected to satisfy both downstream water requirements, including diversions by MWD and CAP, while also complying with the overall requirements to meet Compact, flood control, and operating criteria release provisions. The water scheduled to be released will generate Schedules A and B energy. The estimated monthly Hoover releases during water year 1990 total 8.7 maf. It is estimated that generation from these Hoover releases will result in delivery to the approved contractors of approximately 4.0 billion kWh of electrical energy.

Normal routine maintenance at Hoover Powerplant has been scheduled around the uprating program outages, and upon completion of the uprating program in June of 1992, maintenance will return to a more normal schedule. The four main penstocks are scheduled for inspection and repair during the next 2 years.

The Hoover Uprating Program was authorized by the Hoover Powerplant Act of 1984 (Act), which finalized a historic three-State agreement on the marketing of Hoover power after the original contracts terminated on May 31, 1987. The Act also requires that the Hoover Uprating Program be undertaken with funds advanced by the non-Federal purchasers of Hoover power.