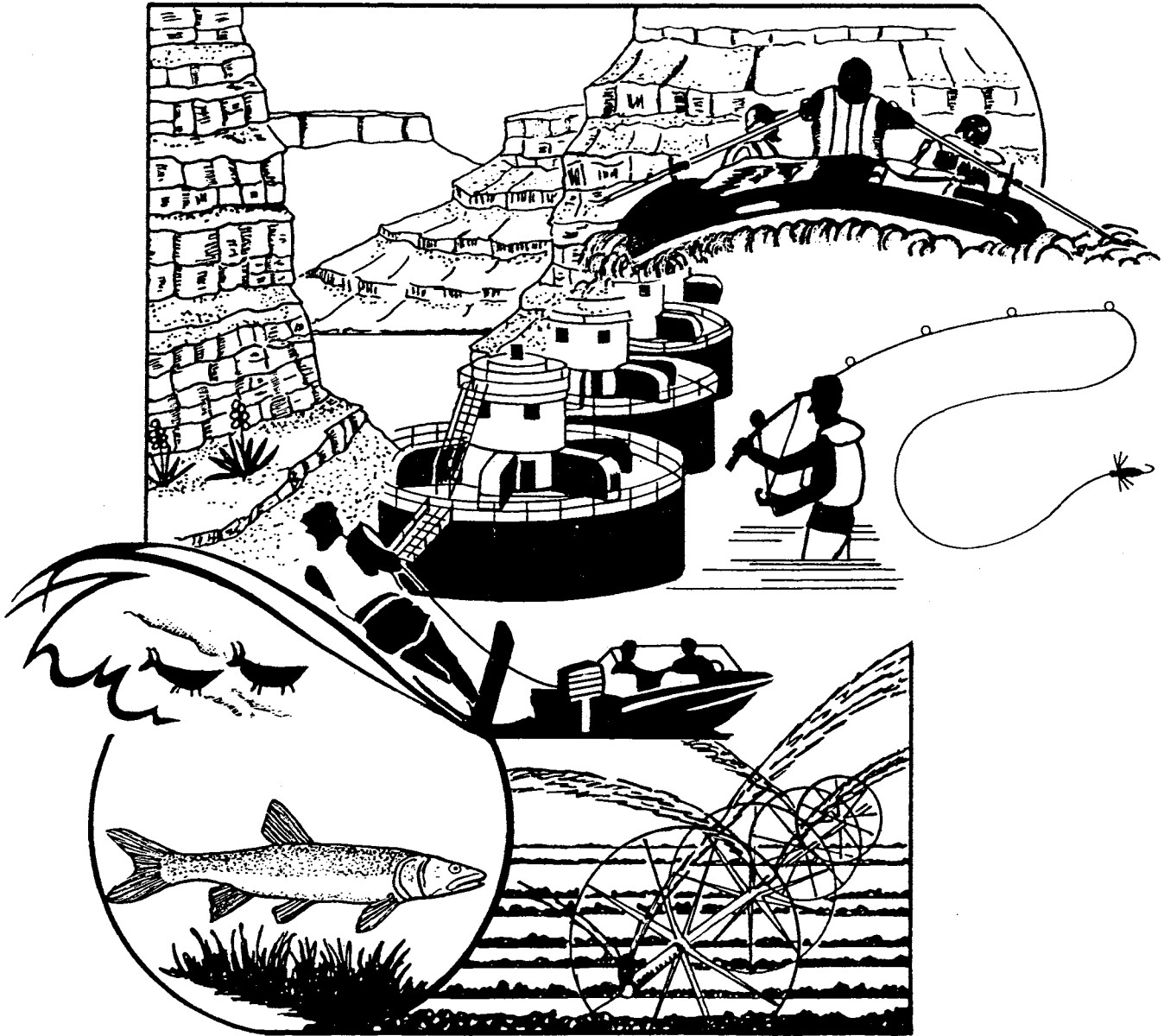
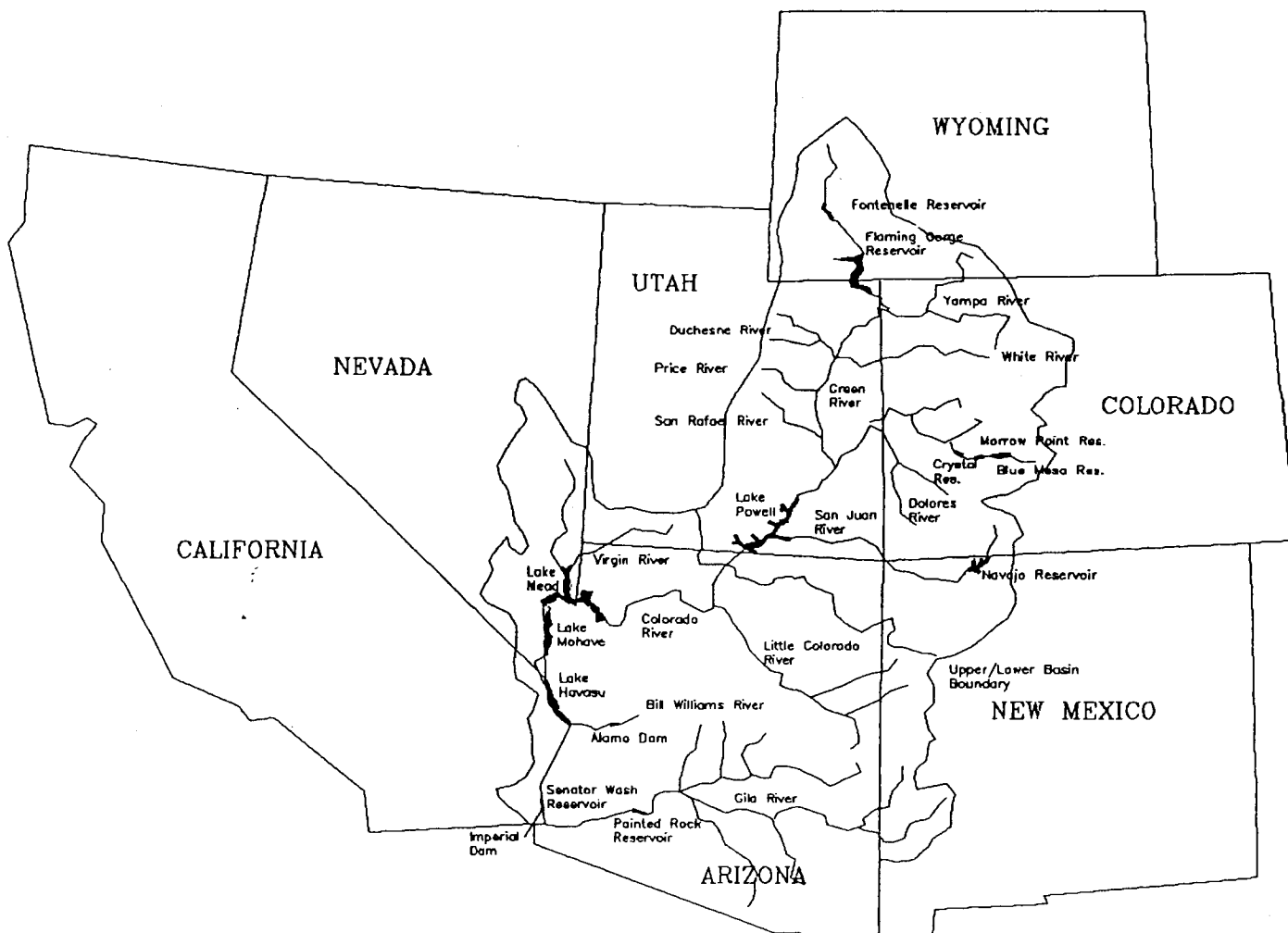


Operation of the Colorado River Basin 1990
Projected Operations 1991



20th Annual Report

Colorado River Basin



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United States
Department of the Interior
Bureau of Reclamation

January 1991

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 ^{twenty first} ~~twentieth~~ Governors of the Colorado River Basin States, the ~~twentieth~~ 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 ¹⁹⁸¹ ~~1980~~ Boulder Canyon Project Adjustment Act during water year ¹⁹⁸¹ ~~1980~~, and the projected operation of these reservoirs during water year ¹⁹⁸² ~~1981~~ 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 ¹⁹⁸¹ ~~1977~~ 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 1990

Climatic conditions in the Colorado River Basin for water year 1990, as in 1988 and 1989, were again dry. Precipitation for the water year was 80 percent of average, for both the Upper Colorado Basin and the Lower Colorado Basin. Because of the extended drought and the associated soil moisture deficit, spring runoff in the Upper Basin was considerably below average. Unregulated April-July inflow to Lake Powell was 3.21 million acre-feet, 70 percent of the long-term average. Unregulated runoff is the inflow to Lake Powell adjusted for the change in storage of the upstream reservoirs. Lake Powell recorded a peak regulated inflow of 26,000 cubic feet per second on June 15, and reached a maximum elevation on July 1 at 3,650.5 feet, with a corresponding storage of 17.9 million acre-feet. The total unregulated runoff into Lake Powell for the water year was 5.48 million acre-feet, 46 percent of the long-term average.

All of the Upper Basin reservoirs recorded below-normal inflows in water year 1990. San Juan River inflow into Navajo Reservoir was 64 percent of the long-term average. Unregulated inflow of the Gunnison River into Blue Mesa Reservoir was 53 percent of normal, while unregulated inflow of the Green River into Flaming Gorge Reservoir was 56 percent of the long term average. Inflow into Fontenelle Reservoir was 67 percent of normal.

Upper Basin reservoirs, Flaming Gorge, Blue Mesa, and Navajo, experienced modest rebounds in storage in water year 1990. These increases in storage occurred because releases

from these reservoirs were primarily constrained to minimum levels. Storage in Lake Powell and Lake Mead, however, is down 3.6 and 1.4 million acre-feet from last year, respectively. The October 1, 1990, system vacant space was approximately 17.6 million acre-feet. Aggregate Colorado River live storage at the end of the year was 43.9 million acre-feet. Aggregate storage decreased in water year 1990 by 4.6 million acre-feet.

Total releases from Glen Canyon Dam (deliveries from the Upper Basin to the Lower Basin) for water year 1990 were 8.25 million acre-feet. Calendar year 1990 was an historic one, as it was the first year that a consumptive use of more than the full basic apportionment for the three Lower Basin states, 7.5 million acre-feet, was requested. The 1990 operation plan allowed the water needs of the Lower Basin states to be satisfied, up to 7.5 million acre-feet of beneficial consumptive use, during the calendar year.

During water year 1990, Mexico received a total delivery of about 1,390,000 acre-feet at the Northerly International Boundary (NIB). Of the 1,390,000 acre-feet of Colorado River water reaching the NIB, about 570,000 acre-feet were delivered through the Pilot Knob Powerplant and Wasteway from the All-American Canal. An estimated 300,000 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.

Projected Plan of Operation - Water Year 1991

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, 1991, 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 1991. Representatives of the Republic of Mexico will be kept informed of operating schedules through the United States Section of the Commission.

Projected Plan

A proposed operation plan for water year 1991 for major reservoirs of the Colorado River system was formulated and distributed to representatives of the Colorado River Basin States in November 1990. 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 1991 operation plan reflects the effects of below average reservoir inflow during 1988, 1989 and 1990. However, recognizing the system storage that is available and the beneficial water needs of the basin states, requests for Colorado River water by holders of water delivery contracts with the United States and by holders of other water rights recognized by the decree in *Arizona v. California*, will be satisfied during calendar year 1991 up to 7,500,000 acre-feet of beneficial consumptive use in the Lower Basin.

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 1991 emphasizes the conservation of reservoir storage by providing minimum releases necessary from Colorado River basin reservoirs to satisfy water rights according to "The Law of the River".

For 1991 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 1991 above Lake Powell as 14,702,000, 8,655,000, and 5,391,000 acre-feet for the three scenarios, respectively.

The plan for water year 1991 calls for a total Glen Canyon release of 8.23 million acre-feet 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 1991 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 1991 consumptive use by mainstream Lower Basin users does not exceed 7,500,000 acre-feet.

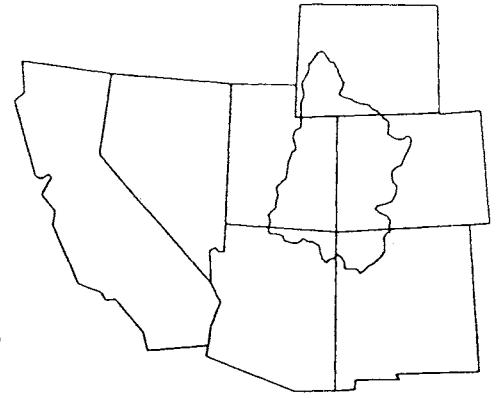
Special long-range studies using Reclamation's Colorado River Simulation System (CRSS) were conducted to test the impact on the risk of future shortages if California, during calendar year 1991, were allowed to use water apportioned to, but unused by, Arizona and Nevada. The studies were conducted using the entire hydrologic record (1906 through 1985), utilizing 80 hydrologic sequences indexed by one year. These studies simulated 50 years into the future to test the risks of shortages to all users of Colorado River water for beneficial purposes and evaluated several specific parameters. These studies indicate that for the next 20 years there are: (1) no increase in the risk of shortages; (2) reduced risk of flood control releases; and (3) expected reduced excess deliveries to Mexico.

Because of the large vacant storage space in the Colorado River system reservoirs at the beginning of water year 1991, 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 1991 is described in the following pages. Charts showing projected releases, inflows and storage, for the three assumed hydrologic conditions, are presented with each reservoir operation.

UPPER BASIN RESERVOIRS

FONTENELLE RESERVOIR (GREEN RIVER)



Water Year 1990

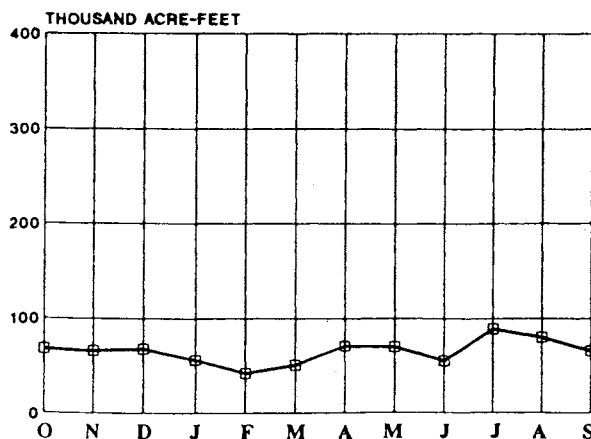
Water year 1990 was the first full year of normal operations for Fontenelle Reservoir in over 5 years due to dam safety concerns. The concrete cutoff wall that was completed in 1988 is performing satisfactorily, having reduced seepage past the dam considerably.

Drier than normal conditions prevailed in the Upper Green River Basin during water year 1990. The April through July runoff into Fontenelle Reservoir was 525,000 acre-feet which was 62 percent of average. Inflow for the entire 1990 water

year was 794,000 acre-feet, 67 percent of average. The total release from Fontenelle Dam for water year 1990 was 782,000 acre-feet.

Fontenelle was the only Colorado River Storage Project (CRSP) reservoir that filled during water year 1990. Peak inflow into Fontenelle Reservoir was 5,080 cubic feet per second on June 26, 1990. The reservoir filled in early July of 1990. Fifteen thousand acre-feet of water bypassed the power plant during July and August of 1990.

ACTUAL RELEASES 1990



FONTENELLE RESERVOIR

Reservoir	Acre-feet	Elevation, feet
Maximum Storage	344,834	6506
Rated Head	233,789	6491
Minimum Power	194,962	6485
Surface Area, full		8,058 Acres
Reservoir Length, full		18 Miles

Powerplant

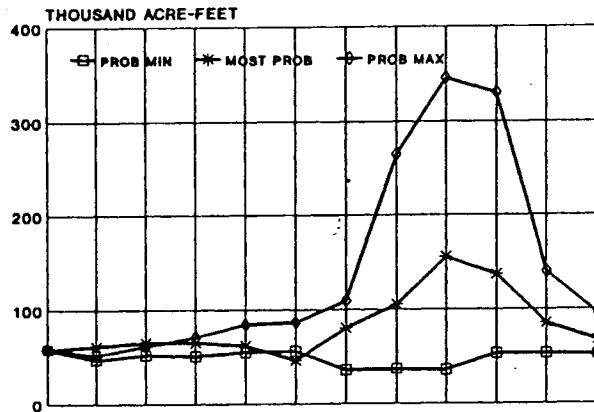
Number of Units	1
Total Capacity	10,000 KW

Water Year 1991

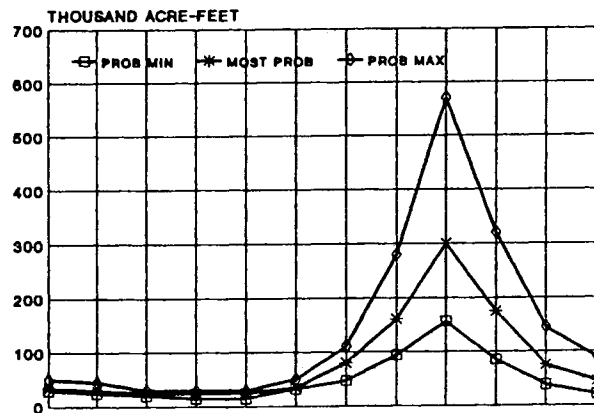
Releases are projected to remain relatively constant this fall and winter as the Wyoming Game and Fish Department conducts tests on the effectiveness of artificial spawning beds for kokanee salmon. These spawning beds were constructed in the river just downstream of the dam as part of the mitigation package for the Seedskadee Project. Releases should average about 900 cubic feet per second through the fall and winter months depending upon fall rainstorms. Releases at this level should provide an appropriate drawdown for the next runoff season. 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.

Since the mean annual inflow of 1.2 million acre-feet far exceeds the storage capacity of 345,000 acre-feet, there is little chance that the reservoir will not fill during water year 1991. In order to minimize the high releases that occur in the spring and to ensure that the reservoir fills, it will be drawn down to an appropriate level this winter, probably to minimum pool elevation (6463 feet) which corresponds to a volume of 93,000 acre-feet.

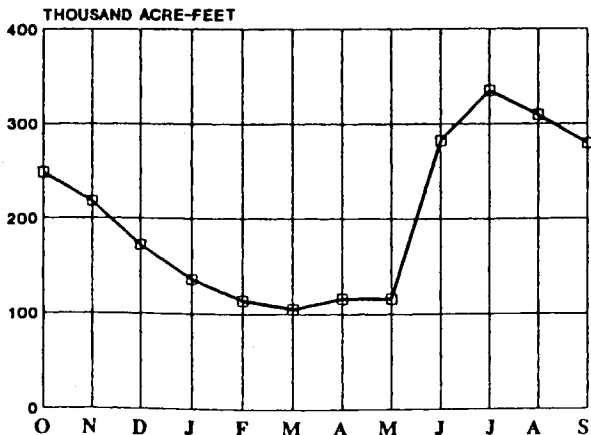
PROJECTED RELEASES 1991



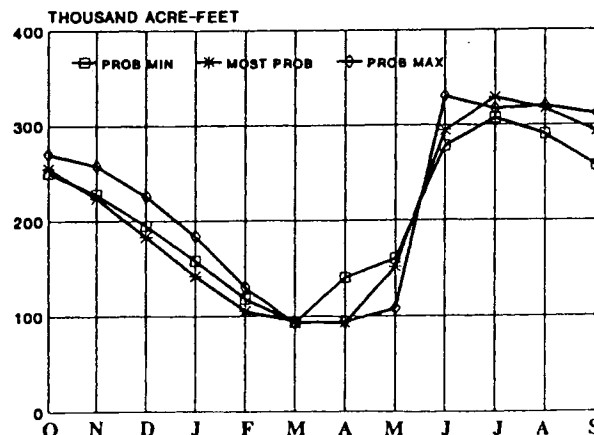
PROJECTED INFLOW 1991



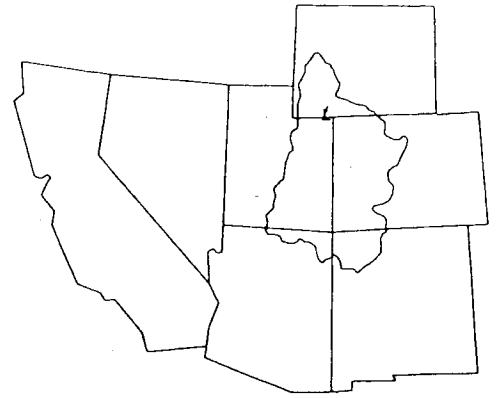
ACTUAL STORAGE 1990



PROJECTED STORAGE 1991



FLAMING GORGE RESERVOIR (GREEN RIVER)



Water Year 1990

The elevation of Flaming Gorge Reservoir at the beginning of water year 1990 was 6019.5 feet with 2,960,000 acre-feet of live storage (79 percent of capacity). At the end of the water year, the elevation was 6022.9. Live storage on September 30, 1990 was 3,082,000 acre-feet (82 percent of capacity).

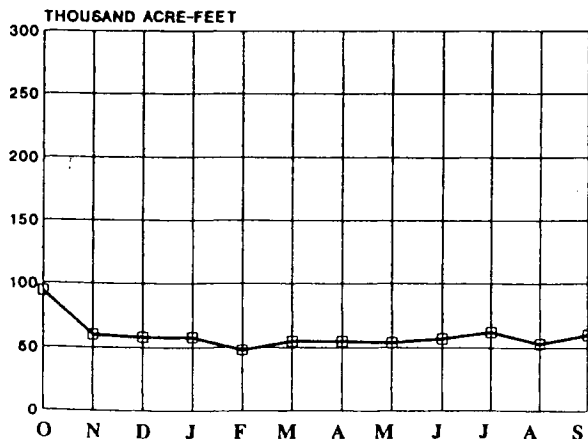
As with other drainage areas in the Upper Colorado River Basin, precipitation in the Green River Basin was below normal. Unregulated inflow into Flaming Gorge Reservoir for water year 1990 was 930,000 acre-feet, 56 percent of normal. Actual regulated inflow was 918,000 acre-feet.

Releases from Flaming Gorge Reservoir were maintained near the minimum level of 800 cubic feet per second for most of water year 1990. Because of the initiation of research releases at Glen Canyon Dam, releases from Flaming Gorge

were increased above minimum levels during the latter part of the water year. This was done to give Western Area Power Administration (WAPA) more flexibility in maintaining the power system in the event of an emergency. Even with this increase, releases from Flaming Gorge Reservoir averaged only 1,000 cubic feet per second for the water year. Although hydrologic conditions were dry, the maintenance of these releases facilitated a modest increase in storage for the reservoir during water year 1990.

Specific releases for research and data collection for studies concerning endangered fish survival requirements were provided from Flaming Gorge in 1990. The Colorado Squawfish is currently being studied as part of the Recovery Implementation Program in the Upper Colorado River Basin.

ACTUAL RELEASES 1990



FLAMING GORGE RESERVOIR

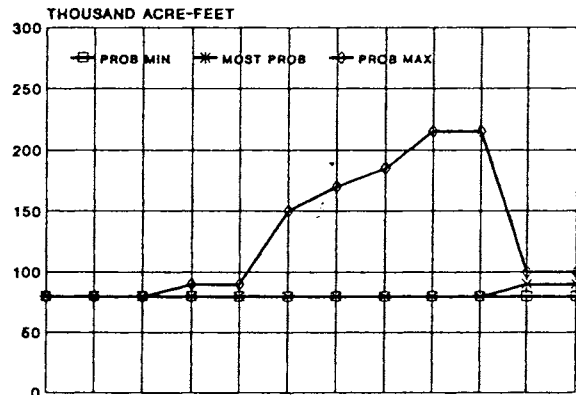
Reservoir	Acres	Elevation, feet
Maximum Storage	3,749,000	6040
Rated Head	1,062,000	5946
Minimum Power	233,000	5871
Surface Area, full		42,020 Acres
Reservoir Length, full		91 Miles
Powerplant		
Number of Units		3
Total Capacity		108,000 KW

Water Year 1991

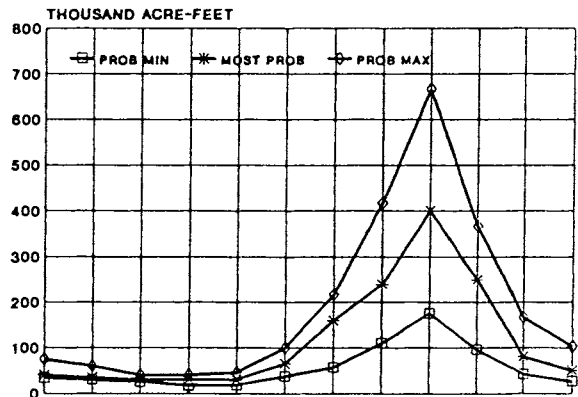
Releases for water year 1991 will again be maintained at, or moderately above, the minimum level of 800 cubic feet per second under most probable and probable minimum scenarios. Under most probable inflow conditions Flaming Gorge Dam will not fill until the summer of 1992.

The Green River below Flaming Gorge Dam has been determined to be habitat of Colorado Squawfish. Restrictions on releases from Flaming Gorge Reservoir have been implemented to improve habitat conditions for young Colorado Squawfish. During water year 1991, these same release restrictions will be maintained. The release restrictions, as recommended by the U. S. Fish and Wildlife Service, include the following guidelines. Total monthly releases should be limited to no more than 100,000 acre-feet. Maximum releases should be limited to 2,600 cubic feet per second with the exception that up to 4,000 cubic feet per second can be released for up to two hours per day. The minimum release should be 800 cubic feet per second. During the months of July through October, releases from Flaming Gorge should be patterned so that average daily flows at the Jensen gaging station, located below the confluence of the Green and Yampa Rivers, should be within 25 percent of a 1,700 cubic feet per second target value.

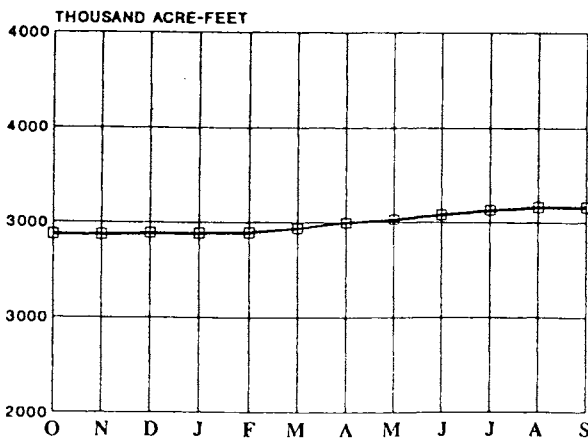
PROJECTED RELEASES 1991



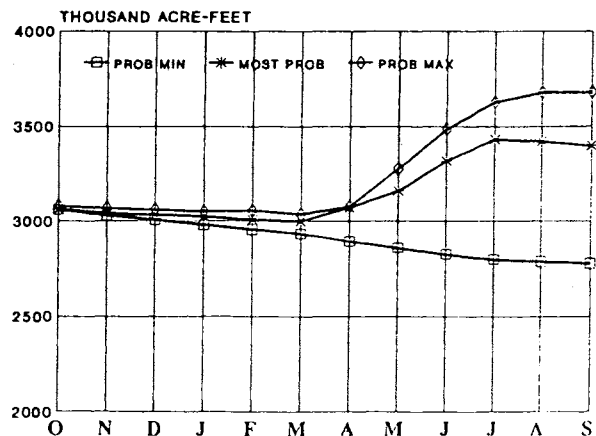
PROJECTED UNREGULATED INFLOW 1991



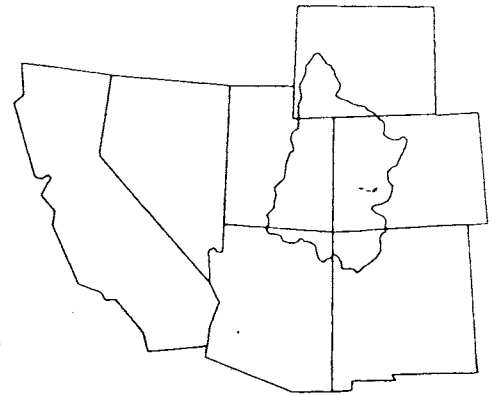
ACTUAL STORAGE 1990



PROJECTED STORAGE 1991



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



Water Year 1990

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 for all three powerplants. Morrow Point provides peaking power, and thus has highly variable releases. The primary function of Crystal Reservoir is to regulate the variable Morrow Point releases. Live storage capacities for Morrow Point and Crystal Reservoirs are 117,000 and 17,500 acre-feet respectively.

The Gunnison River Basin has experienced below average runoff for water years 1988, 1989 and 1990. At the start of water year 1989, live storage at Blue Mesa Reservoir was 449,000 acre-feet (54 percent of capacity). Blue Mesa Reservoir began water year 1990 at elevation 7490.4 feet with a live storage of 585,000 acre-feet (71 percent of capacity). At the end of the water year, the elevation was 7494.7 with a live storage of 618,000 acre-feet (75 percent of capacity). This recovery in storage, during a dry period, has been accomplished by limiting releases from Crystal Reservoir to provide minimum streamflows of 300 cubic feet per second through the Black Canyon of the Gunnison River.

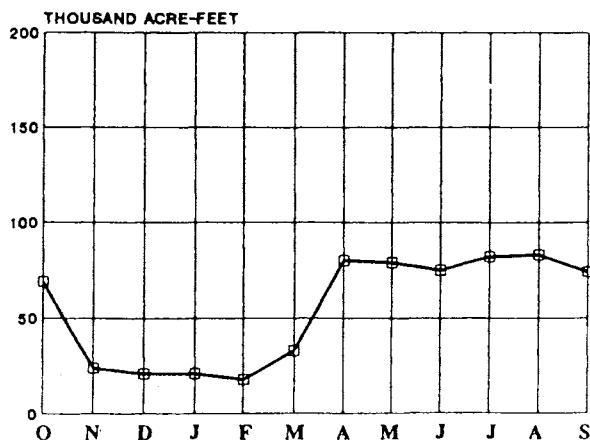
April through July unregulated runoff into Blue Mesa Reservoir was 384,000 acre-feet, or 50 percent of average. The

total unregulated inflow for water year 1990 inflow was 571,000 acre-feet, or 53 percent of average. The peak regulated inflow into Blue Mesa was 4,500 cubic feet per second on June 11, 1990. Releases from Blue Mesa Reservoir totaled 527,000 acre-feet for the water year. All water released passed through the powerplant.

Morrow Point Reservoir was operated between elevations 7152 and 7160 feet. Side inflow into Morrow Point Reservoir for water year 1990 was 43,000 acre-feet, or 61 percent of average. A total of 562,000 acre-feet was released during the water year, with all but 5,000 acre-feet passing through the powerplant.

Crystal Reservoir was operated to meet minimum downstream commitments during water year 1990. Side inflow to Crystal was 92,000 acre-feet, which was 77 percent of average. A total of 617,000 acre-feet was released during the water year, of which only 42,000 acre-feet bypassed the powerplant. During water year 1990 the maximum daily release from Crystal Reservoir was 1,450 cubic feet per second.

ACTUAL CRYSTAL RELEASES 1990



BLUE MESA RESERVOIR

Reservoir	Acre-feet	Elevation, feet
Maximum Storage	829,523	7519
Rated Head	249,395	7438
Minimum Power	81,070	7393
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

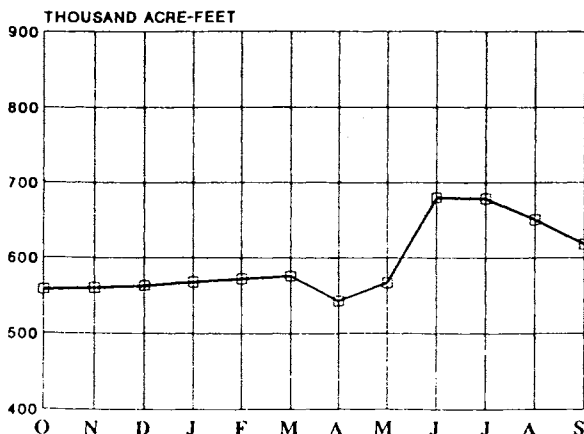
Water Year 1991

Blue Mesa powerplant will be operated during the water year to meet downstream requirements and to minimize powerplant bypasses at Crystal Dam. The powerplant may also be used occasionally to mitigate electrical emergencies caused by research releases from Glen Canyon Dam. Assuming most probable average inflow, Blue Mesa Reservoir will fill in July of 1991.

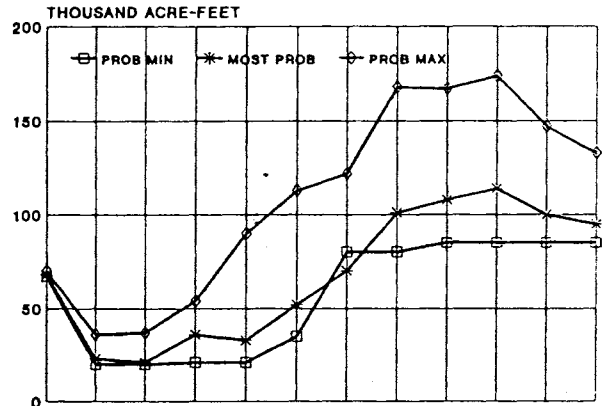
Morrow Point Reservoir releases are expected to fluctuate up to powerplant capacity during water year 1991. Crystal Reservoir will be operated to regulate releases from Morrow Point Reservoir, to meet downstream requirements for diversions through the Gunnison Tunnel, and to protect the blue ribbon trout 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 1991 will be constantly monitored to achieve this objective.

Assuming most probable inflow conditions, releases from Crystal Reservoir will range from 300 cubic feet per second to the maximum powerplant capacity of 1,700 cubic feet per second. Minimum releases from Crystal Reservoir, providing a minimum 300 cubic feet per second flow to the Black Canyon of the Gunnison, are projected to continue until January of 1991. Flows to the Black Canyon will be increased as storage in Blue Mesa Reservoir recovers. Under most probable hydrologic conditions, flows in the Black Canyon will increase to approximately 800 cubic feet per second by May of 1991 and will continue at this level for the duration of the water year.

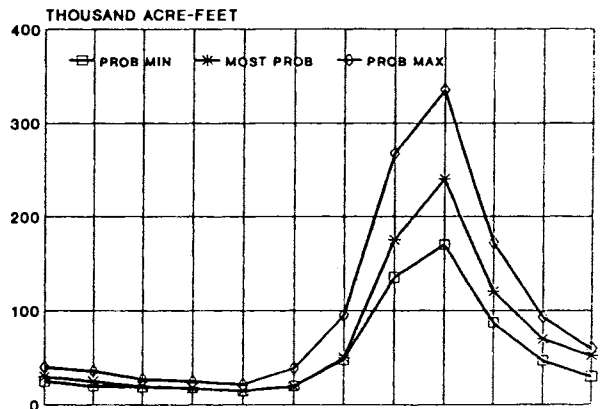
ACTUAL BLUE MESA STORAGE 1990



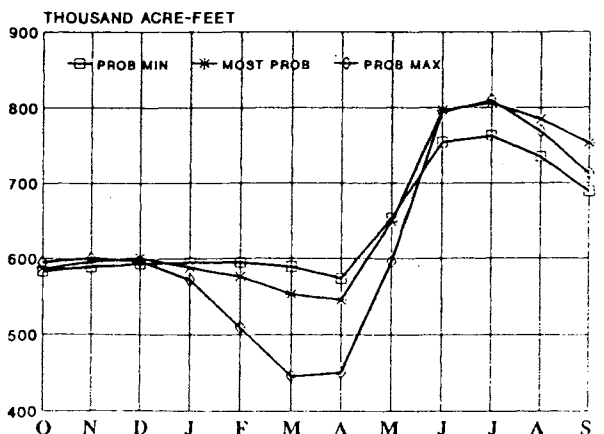
PROJECTED CRYSTAL RELEASES 1991



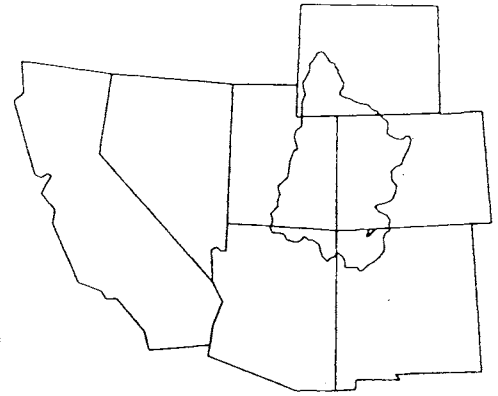
BLUE MESA UNREGULATED INFLOW 1991



PROJECTED BLUE MESA STORAGE 1991



NAVAJO RESERVOIR (SAN JUAN RIVER)



Water Year 1990

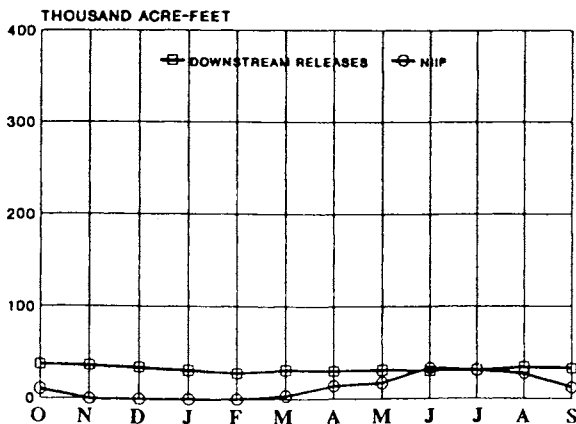
The elevation of Navajo Reservoir at the beginning of the water year was 6057.3 feet with 1,310,000 acre-feet of live storage (77 percent of capacity). At the end of water year 1990, the elevation was 6061.3 with 1,361,000 acre-feet of live storage (80 percent of capacity).

As with other drainage areas in the Upper Colorado River Basin, precipitation in the San Juan Basin was below normal. Climate conditions were extremely dry until May of 1990. The May 1, 1990 forecast predicted that the spring runoff would be only 36 percent of normal. May and June were wet months, however, and this increased the runoff significantly. Actual

inflow into Navajo Reservoir for water year 1990 was 612,000 acre-feet, 64 percent of normal. Peak inflow to Navajo Reservoir occurred on June 12, 1990 at 5,540 cubic feet per second. The reservoir reached a peak elevation of 6062.7 feet on July 17, 1990.

Downstream releases from Navajo Reservoir were maintained near the minimum level of 500 cubic feet per second for the entire water year of 1990. Diversions to Navajo Indian Irrigation Project (NIIP) totaled 147,000 acre-feet for the water year.

ACTUAL RELEASES 1990



NAVAJO RESERVOIR

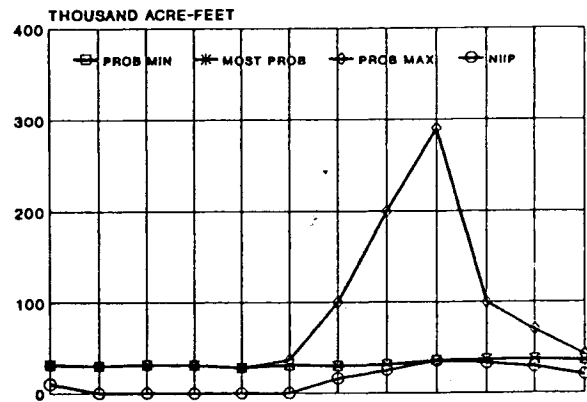
Reservoir	Acre-feet	Elevation, feet
Maximum Storage	1,696,400	6085
Inactive Storage	660,500	5990
Surface Area, full		15,610 Acres
Reservoir Length, full		33 Miles

Water Year 1991

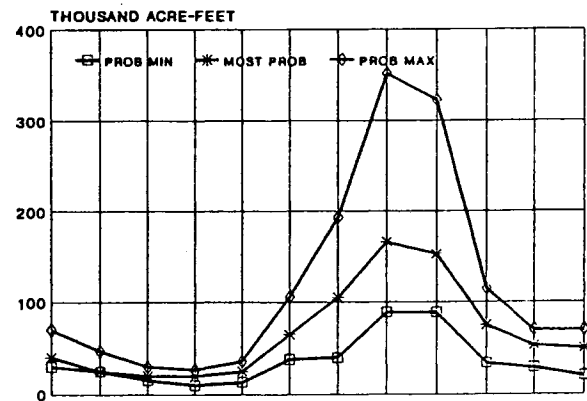
Downstream releases for water year 1991 will again be maintained at, or moderately above, the minimum level under most probable and probable minimum scenarios. Diversions for NIIP will likely be 168,000 acre-feet under all three scenarios in water year 1991. Under most probable conditions, live storage in Navajo Reservoir is expected to be 1,580,000 acre-feet (93 percent full), at the end of water year 1991.

Navajo Reservoir storage was reduced in 1987 and 1988 to approximately one million acre-feet to accommodate the construction of a concrete cutoff wall designed to reduce excessive seepage. Construction of the cutoff wall was completed in September 1988. The cutoff wall is performing well, having reduced seepage from the reservoir by approximately 70 percent. The 1990 Annual Operation Plan projected that Navajo Reservoir would fill in the summer of 1991. Due to continued dry conditions in the San Juan River Basin, this is no longer likely. Navajo Reservoir has not been full since the summer of 1986, and under most probable hydrologic conditions, it will not fill again until 1992.

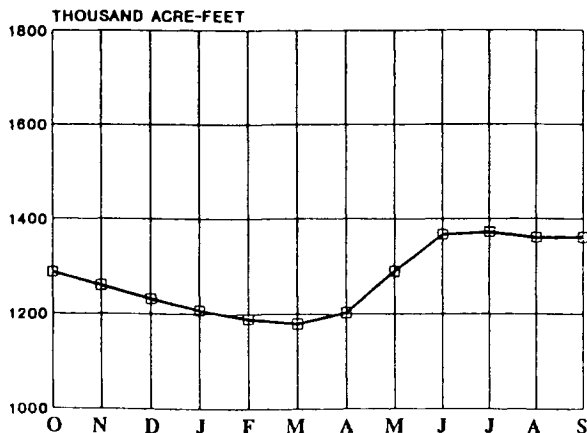
PROJECTED RELEASES 1991



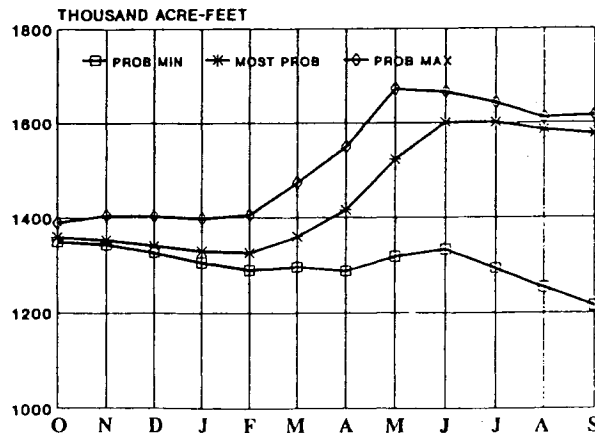
PROJECTED INFLOW 1991



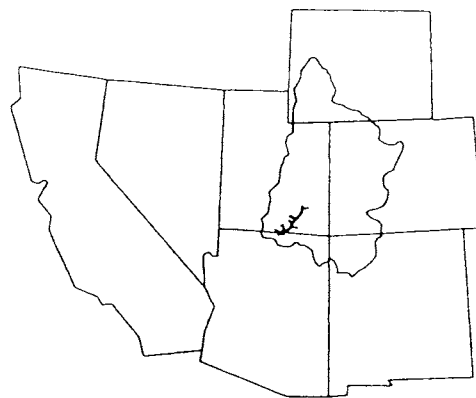
ACTUAL STORAGE 1990



PROJECTED STORAGE 1991



LAKE POWELL (COLORADO RIVER)



Water Year 1990

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

Lake Powell began water year 1990 at elevation 3665.2 feet with a live content of 19,805,000 acre-feet (79 percent full). April through July unregulated inflow into Lake Powell was 3,211,000 acre-feet (40 percent of average). Total unregulated inflow into Lake Powell in water year 1990 was 5,477,000 acre-feet, only 46 percent of the 11,900,000 acre-feet unregulated average. Actual regulated inflow for water year 1990 was 5,135,000 acre-feet. Regulated inflow into Lake Powell peaked at 26,000 cubic feet per second on June 15, 1990. Lake Powell has a minimum annual release of 8.23 million acre-feet, as set forth in the Operating Criteria. The

delivery of the 8.23 million acre-feet, coupled with continued below normal inflow, reduced live storage at the end of water year 1990 to 16,252,000 acre-feet (65 percent full). The reservoir elevation on September 30, 1990 was 3637.6 feet, over 60 feet below the maximum pool elevation of 3700 feet.

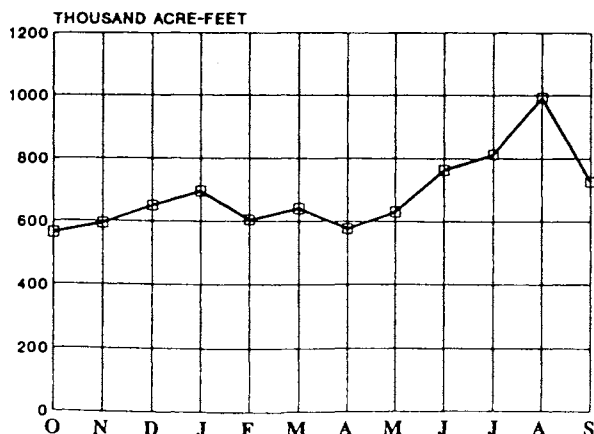
Special releases for the research efforts of Glen Canyon Environmental Studies began in June of 1990. A constant release of 5,000 cubic feet per second was released the first four days of June. Subsequent research releases consisted of several days of fluctuating releases followed by several days of 5,000 cubic feet per second constant releases. There were a total of 52 days on which research releases took place in water year 1990. These research releases were performed to evaluate the effects of fluctuating flows on riverine and riparian zones downstream of the dam.

Water Year 1991

The reservoir is projected to continue to drop through the fall and winter, reaching its seasonal low point in March 1991, about 75 feet from full with a live storage of 14,600,000 acre-feet. During water year 1991, the minimum release of 8.23 million acre-feet will be made in an effort to preserve reservoir storage at Lake Powell. The operation plan for Glen

Canyon releases will be the same for probable minimum, most probable and probable maximum inflow conditions (except September of 1991) due to dry upper basin conditions and reduced reservoir levels. Total water year releases of 8.23 million acre-feet would allow Lake Powell to fill to about 82 percent of full, 62 percent full, and 54 percent full; for the

ACTUAL RELEASES 1990



LAKE POWELL

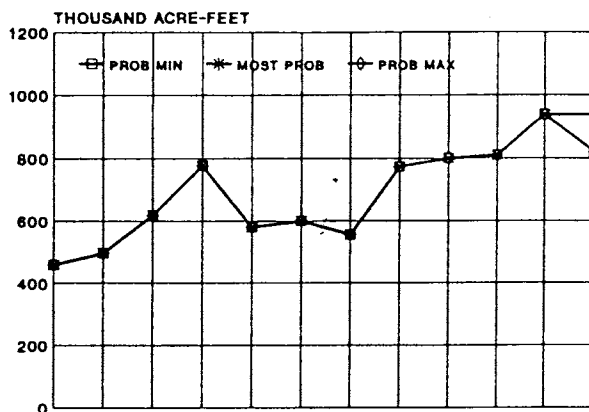
Reservoir	Acre-feet	Elevation, feet
Maximum Storage	25,002,000	3700
Rated Head	9,428,000	3570
Minimum Power	4,126,000	3490
Surface Area, full		161,390 Acres
Reservoir Length, full		186 Miles
Powerplant		
Number of Units		8
Total Capacity		1,247,000 KW

probable maximum, most probable, and probable minimum runoffs, respectively. Under most probable conditions, the reservoir will not reach a storage level in 1991 that exceeds that of 1990 due to the refilling of upstream reservoirs. The 1990 Annual Operating plan projected that Lake Powell would refill in the spring of 1991 under most probable conditions. Due to the extended drought, this is no longer expected. Several years of average inflow will be required to refill Lake Powell.

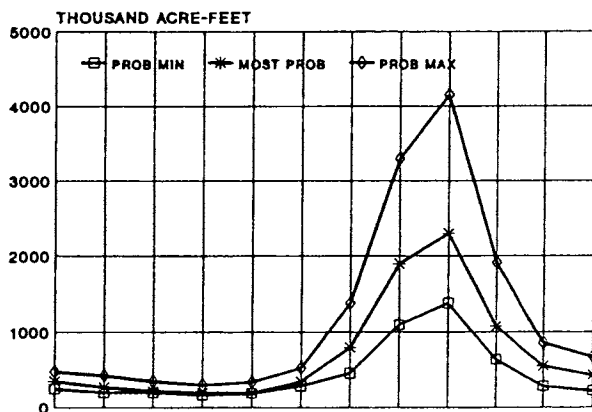
Following the high runoff years of 1983 through 1986, research by the Glen Canyon Environmental Studies office identified releases greater than powerplant capacity as detrimental to the ecology of the Grand Canyon and recommended that steps be taken to limit the frequency of these "flood" releases. Within the constraints of the existing Operating Criteria, Glen Canyon Dam is operated to reduce the probability of releases greater than powerplant capacity. Because the level of Lake Powell has dropped considerably since 1987, the risk of releases greater than powerplant capacity during water year 1991 is negligible.

Monthly releases in water year 1991 will be adjusted slightly to meet the research flows for the Glen Canyon Environmental Studies that are currently in progress. These research flows were carefully selected in order to give researchers specific release patterns and also meet the minimum release objective of 8.23 million acre-feet. The research effort at Glen Canyon is aimed to improve understanding of the environmental consequences of different release patterns from Glen Canyon Dam. Reclamation, Western, and the Basin States are committed to the cooperative effort required to complete the Glen Canyon Environmental Studies.

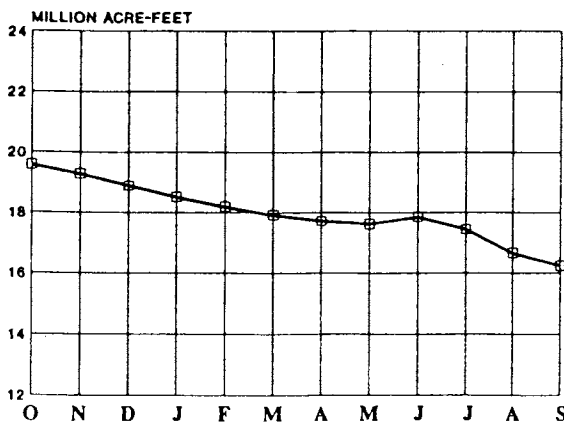
PROJECTED RELEASES 1991



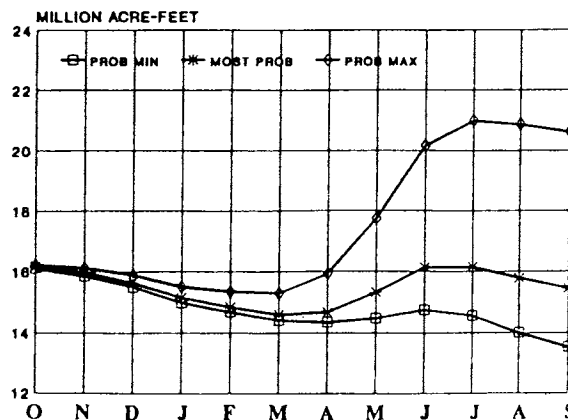
PROJECTED UNREGULATED INFLOW 1991



ACTUAL STORAGE 1990

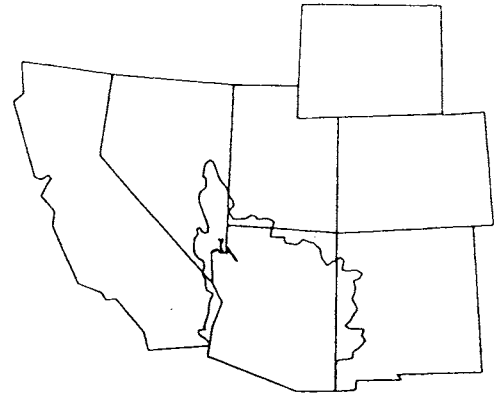


PROJECTED STORAGE 1991



LOWER BASIN RESERVOIRS

LAKE MEAD (COLORADO RIVER)



Water Year 1990

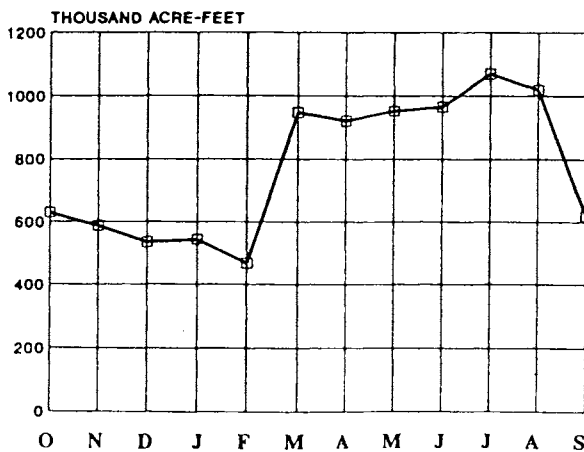
At the beginning of water year 1990, Lake Mead, impounded by Hoover Dam, had a water surface elevation of 1190 feet and an active storage of 21,543,000 acre-feet. During the winter months, the water level gradually rose to about 1192 feet during the early part of March 1990 and then gradually declined to 1184 feet near the end of May 1990. During June, July and August, Lake Mead continued to drop, reaching a low elevation of about 1179 feet during the last week of August, with a corresponding active storage of 19,986,000 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 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 1990 was approximately 9,322,000 acre-feet. All of the amount passed through the turbines for power production.

In addition, 267,000 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 1180 feet and an active storage of 20,144,000 acre-feet which reflects a decrease in storage during the water year of 1,374,000 acre-feet. On September 30, 1990, the active storage of Lake Mead was 3,891,000 acre-feet greater than the active storage in Lake Powell.

ACTUAL RELEASES 1990



LAKE MEAD

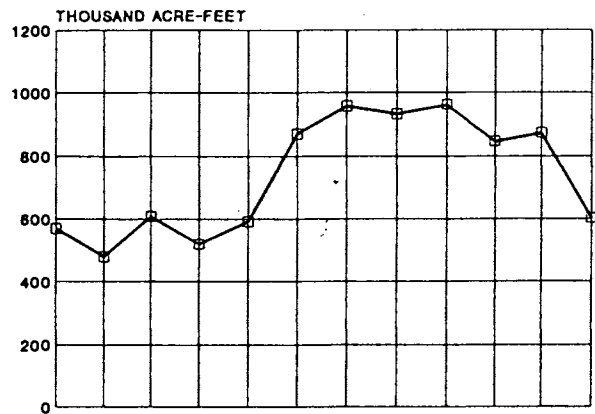
Reservoir	Acre-feet	Elevation, feet
Maximum Storage	27,377,000	1229
Rated Head	13,653,000	1123
Minimum Power	10,024,000	1083
Surface Area, full		162,700 Acres
Reservoir Length, full		115 Miles
Powerplant		
Number of Units		17
Total Capacity		1,944,000 KW

Water Year 1991

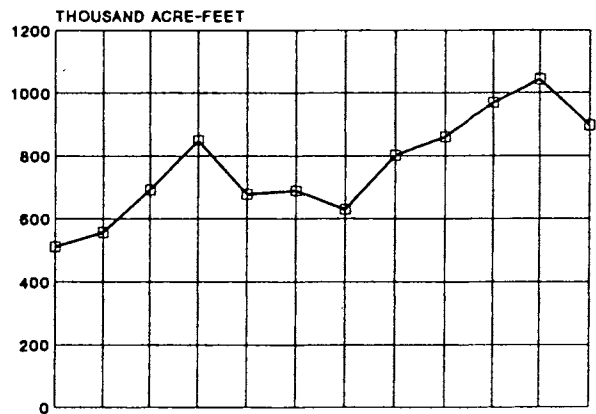
Under most probable inflow conditions during the 1991 water year, the Lake Mead water level is expected to be drawn down to elevation 1173 feet at the end of June 1991. At that level, the lake will have in active storage approximately 19.2 million acre-feet. During water year 1991, a total of approximately 8.8 million acre-feet 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 1991 will be about 480,000 acre-feet and 960,000 acre-feet, respectively. Drawdown, during the peak large mouth bass spawning period in April and May, is expected 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 (a drawdown rate of less than 2 inches per day).

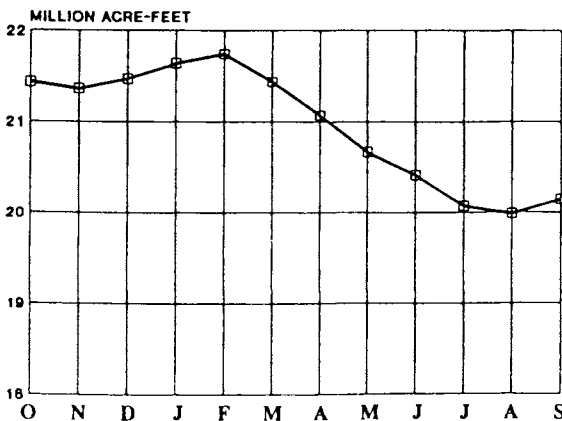
MOST PROBABLE RELEASES 1991



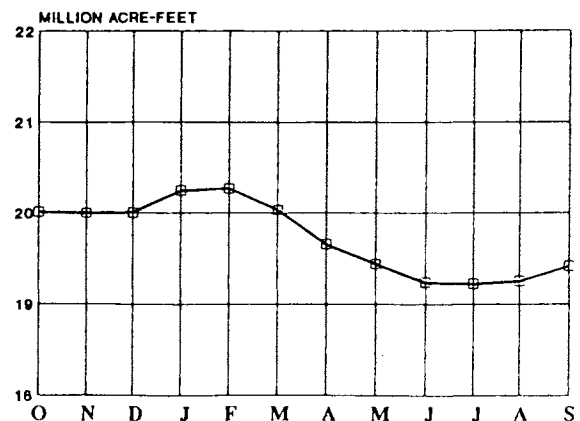
MOST PROBABLE REGULATED INFLOW 1991



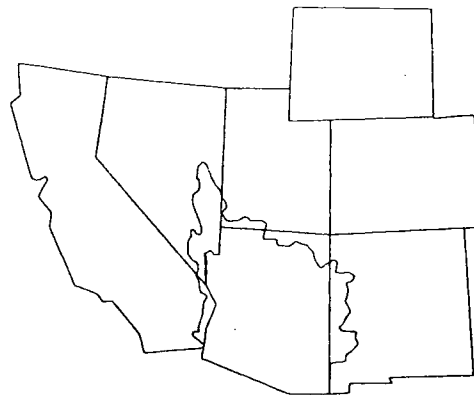
ACTUAL STORAGE 1990



MOST PROBABLE STORAGE 1991



LAKE MOHAVE (COLORADO RIVER)



Water Year 1990

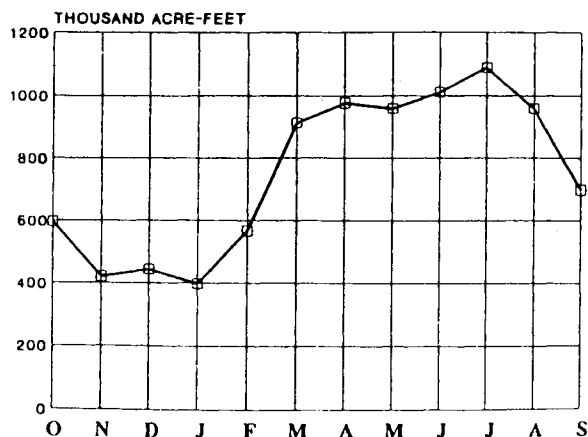
At the beginning of water year 1990, the water surface elevation of Lake Mohave, which is impounded by Davis Dam, was 630.8 feet, with an active storage of approximately 1,379,000 acre-feet.

During the winter months, after some fluctuation, the water level was gradually raised to approximately 645 feet, with an active storage of approximately 1,760,000 acre-feet in the first part of February 1990. The water level was then lowered during the remainder of February, March, April, and May. The reservoir declined to elevation 639 feet during the latter part of May 1990. During June and July, Lake Mohave gradually lowered further to an elevation of 635 feet, with an active storage of approximately 1,487,000 acre-feet, in the middle of July. Lake Mohave fluctuated around the elevations of 635 and 636 feet during August and then gradually rose to

an elevation of 639 feet by the middle of September. The reservoir ended the water year at an elevation of 635 feet, with 1,488,000 acre-feet in active storage.

Lake Mohave releases were made for downstream water use requirements, including diversions by users in the vicinities of Laughlin, Nevada; Bullhead City, Arizona; and Needles, California, by The Metropolitan Water District of Southern California (MWD), the Central Arizona Project (CAP), and the users downstream from Parker Dam. During the water year, total releases of approximately 9,140,000 acre-feet were made at Davis Dam, all of which passed through the turbines for power production. Of that amount approximately 1,240,000 acre-feet were then pumped from Lake Havasu by MWD, and 779,000 acre-feet were pumped for the CAP.

ACTUAL RELEASES 1990



LAKE MOHAVE

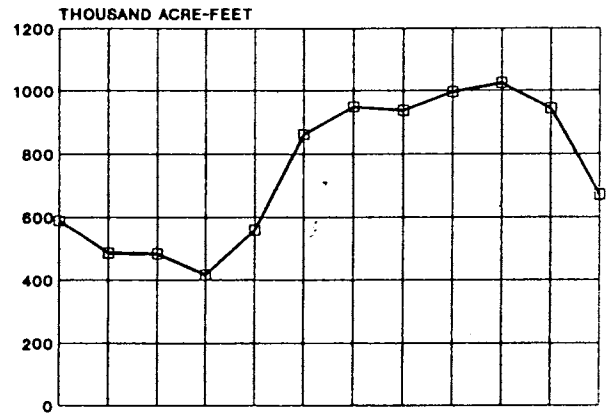
Reservoir	Acre-feet	Elevation, feet
Maximum Storage	1,810,000	647
Rated Head	1,188,000	623
Minimum Power	217,500	570
Surface Area, full		28,200 Acres
Reservoir Length, full		67 Miles
Powerplant		
Number of Units		5
Total Capacity		240,000 KW

Water Year 1991

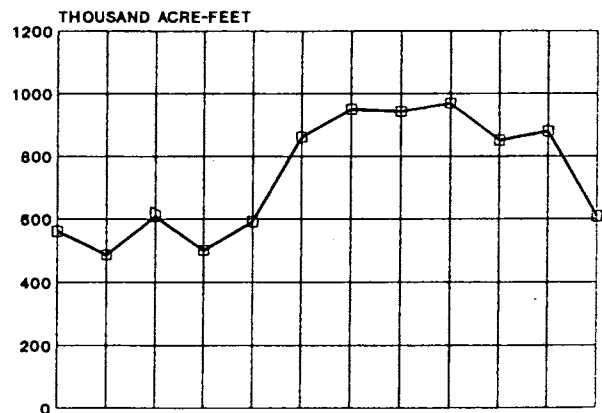
Both Lake Mohave and Lake Havasu are scheduled to be drawn down in the winter months to provide storage space for local storm runoff and will be filled in the spring to meet higher summer water needs. This drawdown will also correspond with maintenance at both Davis and Parker Powerplants which is scheduled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

Under most probable inflow condition, the water level of Lake Mohave is scheduled to reach an elevation of about 643 feet by the end of February 1991 and then remain at that elevation until 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 8.9 million acre-feet is scheduled to be released from Lake Mohave to meet all downstream requirements. All of that total is scheduled to pass through the powerplant.

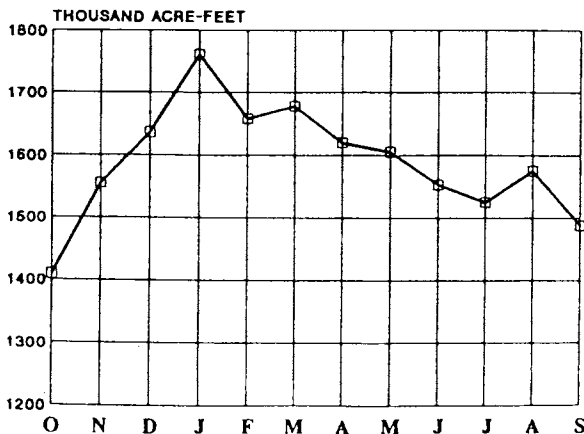
MOST PROBABLE RELEASES 1991



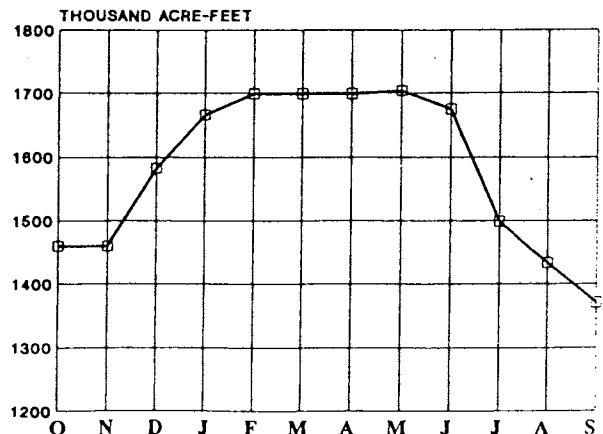
MOST PROBABLE REGULATED INFLOW 1991



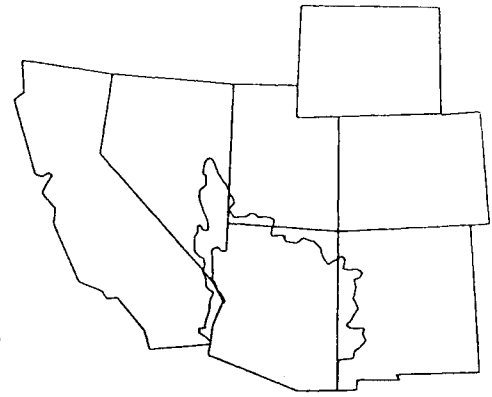
ACTUAL STORAGE 1990



MOST PROBABLE STORAGE 1991



LAKE HAVASU (COLORADO RIVER)



Water Year 1990

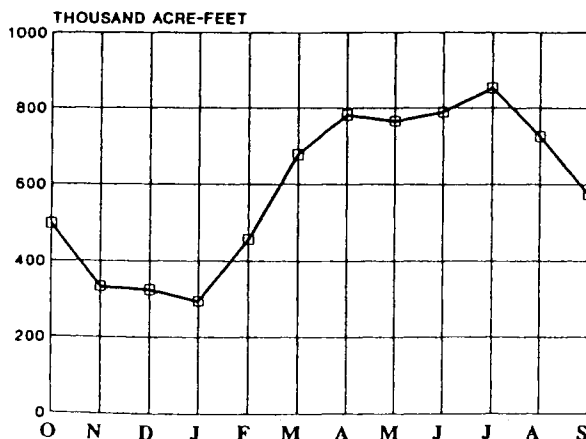
At the beginning of water year 1990, the water level of Lake Havasu, impounded by Parker Dam, was at an elevation of about 447 feet with an active storage of approximately 560,000 acre-feet. During October and November 1989, the reservoir fluctuated between elevations 446 feet and 447 feet. By March 1990, the reservoir was at an approximate 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 by the middle of May with an active storage of about 610,000 acre-feet. At the end of the water year, Lake Havasu was at an elevation of about 447 feet with an active storage of 562,000 acre-feet.

During the water year, approximately 6,994,000 acre-feet were released at Parker Dam, all of which passed through the

turbines for power production. In addition to the releases from Parker Dam, approximately 1,240,000 acre-feet were diverted from Lake Havasu by The Metropolitan Water District of Southern California. Diversions from Lake Havasu for the Central Arizona Project were 779,000 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 control of floods and other uses, including river regulation. Normally, only about the top 4 feet, or 77,000 acre-feet of space, have been used for this purpose since the Alamo Reservoir on the Bill Williams River has been in operation.

ACTUAL RELEASES 1990



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		

Powerplant

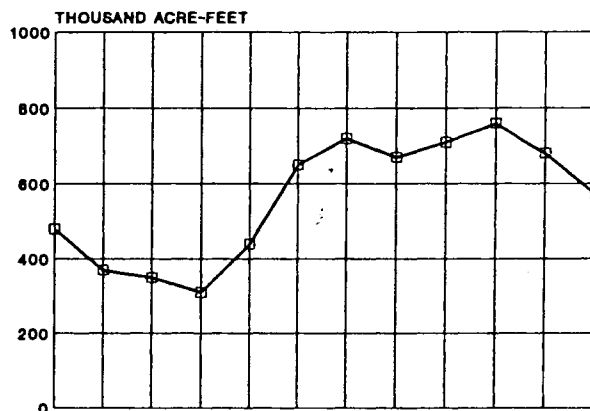
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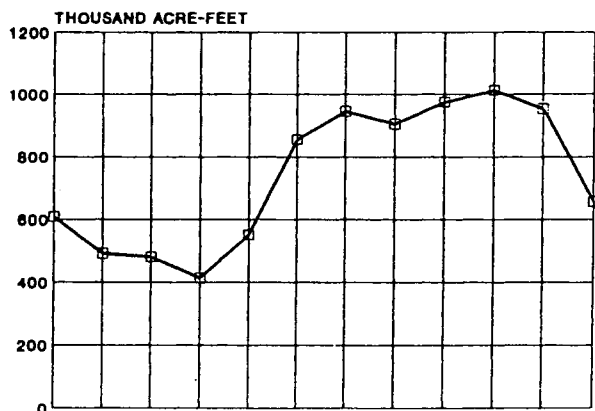
Water Year 1991

Lake Havasu is scheduled at the highest levels consistent with the requirements for maintaining reservoir regulation space. A yearly low elevation of approximately 446 feet is scheduled for October through February to provide storage space for local storm runoff. The yearly high of about 450 feet is scheduled in the spring to meet higher summer water needs. During water year 1991, a total of approximately 6.7 million acre-feet is scheduled to be released from Lake Havasu to meet all downstream requirements. All of that amount is scheduled to pass through the Parker Powerplant.

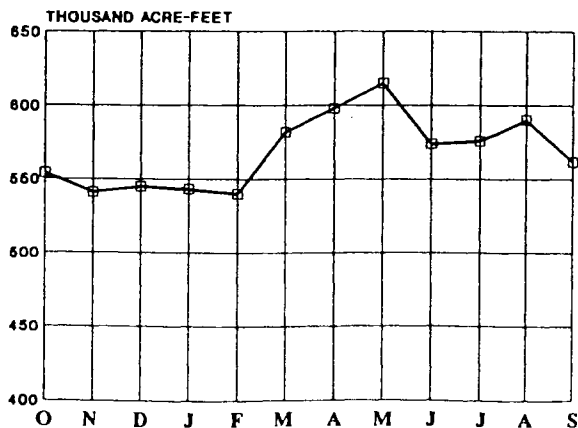
MOST PROBABLE RELEASES 1991



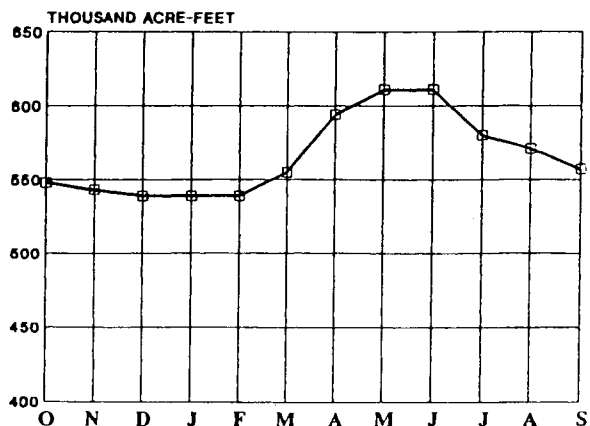
MOST PROBABLE REGULATED INFLOW 1991



ACTUAL STORAGE 1990



MOST PROBABLE STORAGE 1991



River Regulation

The runoff into Lake Powell for water year 1990 continued to be well below normal for the third straight year. Unregulated inflow into Lake Powell was 46 percent of normal for water year 1990. Unregulated inflows for water years 1988 and 1989 were 70 percent of normal and 54 percent of normal respectively. Upper Basin reservoirs, Flaming Gorge, Blue Mesa, and Navajo, experienced modest rebounds in storage in water year 1990. These increases in storage occurred because releases from these reservoirs were primarily constrained to minimum levels. Storage in Lake Powell and Lake Mead, however, is down considerably. The October 1, 1990, system vacant space was approximately 17.6 million acre-feet. This vacant space has resulted from three 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, 1989 and 1990 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.

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 1990 delivery to Mexico was approximately 23,000 acre-feet in excess of the scheduled treaty delivery of 1,500,000 acre-feet for the calendar year. In addition, 136,000 acre-feet of drainage waters were bypassed to the Gulf of California via the Bypass Drain during water year 1990. 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 1991, 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 1990. 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 1990, 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 1990 was approximately 48.5 million acre-feet and about 43.9 million acre-feet at the end of the water year, representing a 4.6 million 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 1990. During water year 1991, 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 is prepared jointly by the Upper and Lower Colorado Regional Offices. The report was scheduled for release in 1988, but has not yet been published due to technical review questions. The report is currently receiving final review and will likely be published in the first part of 1991. 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 the most recent draft copy of the Consumptive Uses and Losses Report (September 1990), which summarizes annual water use from the system by States, including water use supplied by ground-water overdraft. The 1986-1990 report, 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. Estimated evaporation losses were about 630,000 acre-feet from mainstem reservoirs in water year 1990. In water year 1989, 737,500 acre-feet were diverted for use in adjacent drainages. The total for transbasin diversions in water year 1990 has not yet been tabulated but the figure is expected to be similar to the 1989 total.

Lower Basin Uses and Losses in the United States

During water year 1990, an estimated 5.6 million acre-feet 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 The Metropolitan Water District (MWD) of Southern California and the Central Arizona Project (CAP). MWD pumped approximately 1,240,000 acre-feet from Lake Havasu during water year 1990, and approximately 779,000 acre-feet were pumped for the CAP.

Releases of approximately 7.7 million acre-feet were made from Lake Mohave during water year 1990, 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 1990, releases of approximately 8.0 million acre-feet were made from Lake Mead at Hoover Dam to regulate the levels of Lake Mohave, to provide for the small users that reservoir, and to provide for releases at Davis Dam to meet needs in the United States. In addition, 267,000 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. Of the diversions from Lake Mead, approximately 150,000 acre-feet were consumptively used and the remainder returned to Lake Mead. Total releases and diversions from Lake Mead during water year 1990 were an estimated 9,590,000 acre-feet.

For water year 1991, a total release of 6.7 million acre-feet 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.

Based on studies made in October 1990, it is expected that MWD will divert 1,100,000 acre-feet by pumping from Lake Havasu during water year 1991. Similarly, the CAP is expected to pump approximately 1,060,000 acre-feet. These figures may change as the water year progresses. 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 66,000 acre-feet.

There are no major users between Hoover Dam and Davis Dam. During water year 1991, diversions from Lake Mead are projected at 312,000 acre-feet. Evaporation from Lake Mead is projected to be about 840,000 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

(Provisional)*

State	(1,000 acre-feet)					
	1981	1982	1983	34	1985	Average 1981-85
Arizona	6,167	5,143	4,237	3,411	4,867	5,091
California	4,839	4,349	3,953	4,679	4,710	4,506
Colorado	1,890	1,917	1,716	1,686	1,803	1,802
Nevada	350	352	339	355	372	354
New Mexico	296	412	411	382	377	375
Utah	705	669	640	677	781	695
Wyoming	318	311	325	288	316	311
Other	1,601	1,401	1,894	1,199	1,785	1,572
Total						
Colorado River Basin	16,166	14,554	13,515	14,307	15,011	14,818
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	20,163	16,371	23,297	31,299	28,406	23,907

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 Act

Upper Basin - Colorado River Storage Project

During water year 1990, work was performed to uprate Unit 1 at Morrow Point. Units 1 and 3 at Flaming Gorge are scheduled for uprating during water year 1991. Seal rings on Unit 2 at Glen Canyon are also scheduled to be replaced in water year 1991.

CRSP generation, purchases, power operations for fiscal years for fiscal year 1991. A list of power sources, disposition, and disposition for the fiscal year is shown on the opposite page. The total gross revenue from power operations in fiscal year 1990 was \$72,692,102.

CRSP Power Generation

Water Year 1990

Sources of Energy	Kilowatt-hours
Net Generation	
Blue Mesa	148,773,000
Crystal	90,759,000
Flaming Gorge	257,839,000
Fontenelle	58,274,000
Glen Canyon	3,792,563,000
Morrow Point	<u>260,949,000</u>
Sub-total-	
Net Generation	4,609,157,000

Miscellaneous	Kilowatt-hours
Purchases	1,079,000,000
Interchange Receipts	818,000,000
Energy Charges	
to Transmission	
Service Customers	<u>144,843,000</u>

Sub-total-Miscellaneous	<u>2,041,843,000</u>
Total Energy From All Sources	6,651,000,000

Disposition of Energy	Kilowatt-hours
Firm Energy Sales	5,738,355,000
Nonfirm Energy Sales	
Emergency	
Fuel Replacement (Oil Conservation)	252,073,000
Interchange Deliveries	139,000,000
System Losses	<u>521,572,000</u>
Total Energy Distributed	6,651,000,000

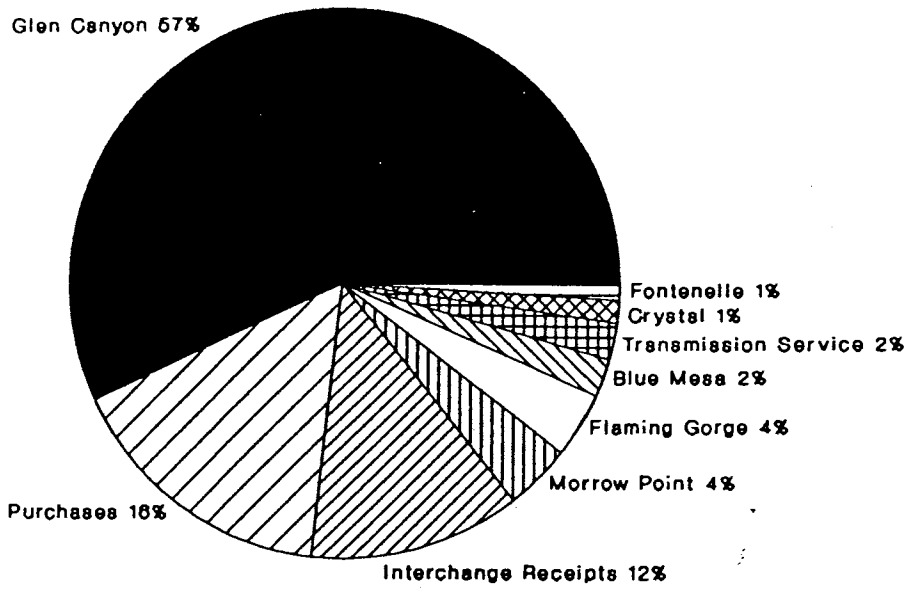
Revenue	Dollars
Firm Power Sales	\$ 58,442,888
Non Firm Power Sales	
Emergency	
Fuel Replacement (Oil Conservation)	6,920,433
Reserve Capacity	0
Parker-Davis Project	
Firming	0
Transmission Service	6,559,352
Rental of Substation Facilities	0
Miscellaneous Revenue	<u>769,429</u>
Total Gross Revenue	\$ 72,692,102

Water Year 1991

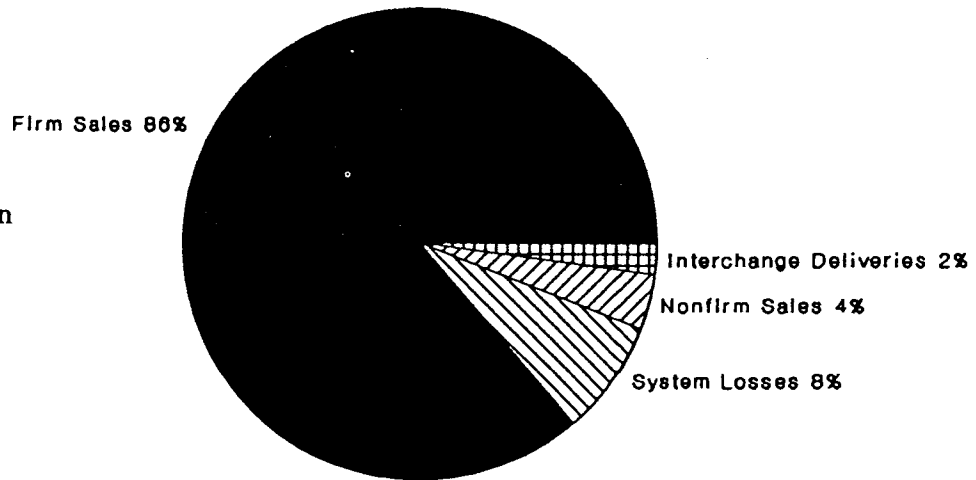
(Projected)	Kilowatt-hours
Estimated Firm Energy Sales	5,700,000,000
Estimated Nonfirm Sales	0
Estimated Purchases	2,700,000,000
Estimated Peaking	
Capacity Sales (Per Month)	
Winter 1990-91	170,000
Summer 1991	140,000
Estimated Revenue	\$ 130,000,000

Colorado River Storage Project Power Operations
 (Water Year 1990)

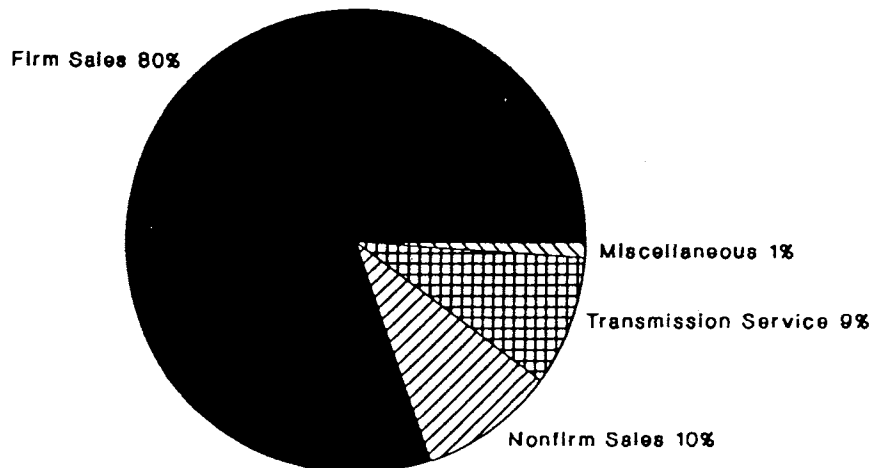
Energy Sources



Energy Disposition



Revenue



Power Operations [Cont.]

Lower Basin

Water Year 1990

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 Edison 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 powerplant 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 1990 operating year (October 1, 1989 through September 30, 1990) was 4,338,148,000 kilowatt-hours. Of that amount, the Schedule A allottees received 3,604,457,000 kilowatt-hours and the Schedule B allottees received 733,691,000 kilowatt-hours. Schedule C allottees received no deliveries in the 1990 operating year.

In water year 1990, one generating unit, N6, at Hoover Powerplant was uprated. This increased the usable capacity by 30 megawatts and brought the total plant capacity to 1,944 megawatts. Of the 17 generating units at Hoover Powerplant, 12 have been uprated.

Five generating units remain to be uprated. Units A8 and A9 are in the process of being uprated and are scheduled to be completed in March of 1991. Unit A3 is scheduled for completion in December of 1991. Unit N8 has recently had

the contract awarded and is scheduled for completion in April of 1992. Unit A4 is scheduled for completion in August of 1992. All uprating is scheduled to be completed by August of 1992. The total Hoover powerplant capability at the completion of uprating is estimated to be a maximum of 2,074 megawatts. 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 are released per kilowatt generated. These improved data will help in better control for optimized operation and improved efficiency of the powerplants. At Parker Powerplant, the power transformers for Units 1, 2, and 3 have been replaced and Unit 4 is in the process of being replaced. These replacements will improve the reliability of the resource and decrease transformed losses. This will in turn increase the customer's usable energy.

Water Year 1991

In operation studies of Lake Mead and Lake Powell for the operating year which ends September 30, 1991, the amounts released at Hoover Dam have been projected to satisfy both downstream water requirements, including diversions by The Metropolitan Water District and the Central Arizona Project, 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 1991 total 8.8 million acre-feet. It is estimated that generation from these Hoover releases will result in delivery to the approved contractors of approximately 4.0 billion kilowatt-hours 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 August 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.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources, and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for the American Indian reservation communities and for people who live in Island Territories under U.S. administration.