

Upper Colorado 1991  
River Commission

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# FORTY-THIRD ANNUAL REPORT

OF THE

# Upper Colorado River Commission



SALT LAKE CITY, UTAH

SEPTEMBER 30, 1991

FISH & WILDLIFE  
ENFORCEMENT  
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FORTY-THIRD ANNUAL REPORT

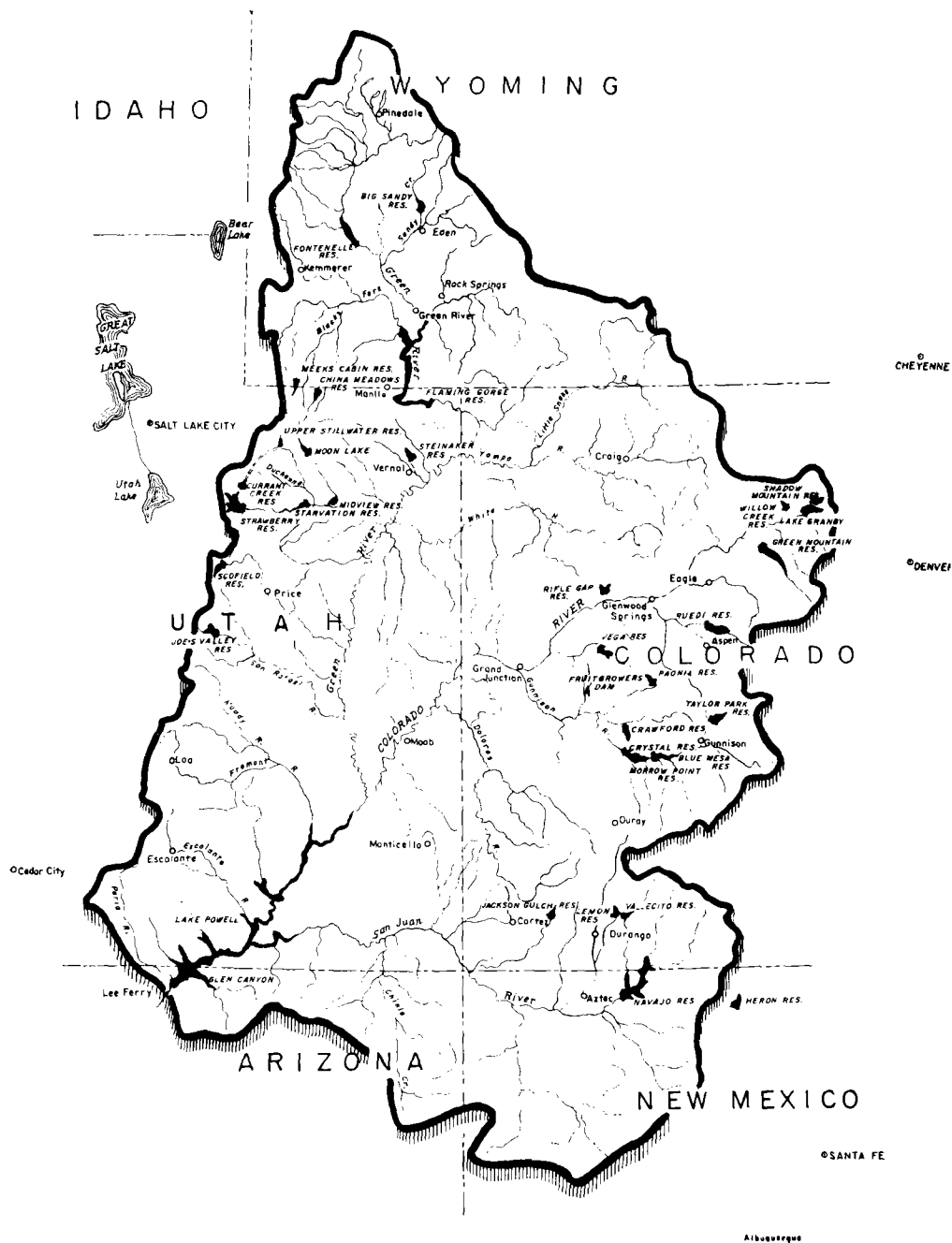
OF THE

# Upper Colorado River Commission



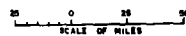
SALT LAKE CITY, UTAH

SEPTEMBER 30, 1991



## UPPER COLORADO RIVER BASIN

UPPER COLORADO RIVER  
COMMISSION





# UPPER COLORADO RIVER COMMISSION

355 South Fourth East Street • Salt Lake City • Utah 84111 • 801-531-1150 • FAX 801-531-9705

Mr. President:

The Forty-Third Annual Report of the Upper Colorado River Commission, as required by Article VIII (d)(13) of the Upper Colorado River Basin Compact, is enclosed.

The budget of the Commission for fiscal year 1993 (July 1, 1992 - June 30, 1993) is included in this report as Appendix B.

This report has also been transmitted to the Governor of each State signatory to the Upper Colorado River Basin Compact.

Respectfully yours,

Wayne E. Cook  
Executive Director

The President  
The White House  
Washington, D. C. 20500

Enclosure

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## **PREFACE**

Article VIII(d)(13) of the Upper Colorado River Basin Compact requires the Upper Colorado River Commission to “make and transmit annually to the Governors of the signatory States and the President of the United States of America, with the estimated budget, a report covering the activities of the Commission for the preceding water year.”

Article VIII(1) of the By-Laws of the Commission specifies that “the Commission shall make and transmit annually on or before April 1 to the Governors of the states signatory to the Upper Colorado River Basin Compact and to the President of the United States a report covering the activities of the Commission for the water year ending the preceding September 30.”

This Forty-Third Annual Report of the Upper Colorado River Commission has been compiled pursuant to the above directives.

This Annual Report includes, among other things, the following:

Membership of the Commission, its Committees, Advisers, and Staff;

Roster of meetings of the Commission;

Brief discussion of the activities of the Commission;

Engineering and hydrologic data;

Pertinent legal information;

Information pertaining to congressional legislation;

Map of the Upper Colorado River Basin;

Status of the Storage Units and participating projects of the Colorado River Storage Project;

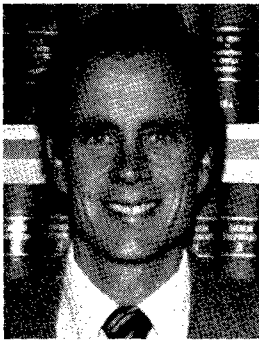
Appendices containing:

Fiscal data, such as: budget, balance sheet, statements of revenue and expense.

Transmountain diversions, etc.



## COMMISSION



**James S. Lochhead**  
Commissioner for  
Colorado



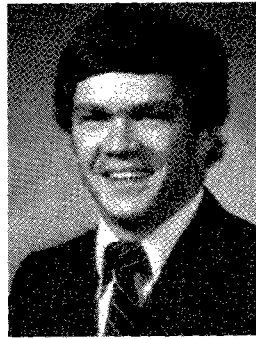
**\*Philip B. Mutz**  
Commissioner for  
New Mexico



**Jack F. Ross**  
Chairman  
Commissioner for  
United States



**D. Larry Anderson**  
Commissioner for  
Utah



**Gordon W. Fassett**  
Commissioner for  
Wyoming

\* Appointed January 1, 1991

## **ALTERNATE COMMISSIONERS**

David W. Walker	State of Colorado
William J. Miller	State of New Mexico
Dallin W. Jensen	State of Utah
Dan S. Budd	State of Wyoming
Aaron H. McGinnis	State of Wyoming

## **OFFICERS OF THE COMMISSION**

Chairman	Jack F. Ross
Vice Chairman	James S. Lochhead
Secretary	Wayne E. Cook
Treasurer	Ronald A. Schulthies
Assistant Treasurer	Christian M. Feinauer

## **STAFF**

Executive Director	Wayne E. Cook
General Counsel	Jane Bird
Chief Engineer	Clinton D. Stevens
Administrative Secretary	P. J. Magura

## COMMITTEES

The Committees of the Commission convened when required during the year. Committees and their membership at the date of this report are as follows (the Chairman and the Secretary of the Commission are ex-officio members of all committees, Article V(4) of the By-Laws):

### **Engineering Committee:**

Barry C. Saunders, Chairman	William J. Miller
Eugene I. Jencsok	Jay C. Groseclose
David H. Merritt	Robert L. Morgan
Jeris A. Danielson	John W. Shields

### **Legal Committee:**

Frank E. (Sam) Maynes, Chairman	Peter White
Gale Norton	Dallin W. Jensen
David W. Walker	Michael M. Quealy
Donald H. Hamburg, Alternate	Milo M. Vukelich

### **Budget Committee:**

Gordon W. Fassett, Chairman	Philip B. Mutz
David W. Walker	D. Larry Anderson

## ADVISERS TO COMMISSIONERS

The following individuals serve as advisers to their respective Commissioner:

### COLORADO

#### Legal:

David W. Walker, Director  
Colorado Water Conservation Board  
Denver, Colorado

Frank E. (Sam) Maynes  
Attorney at Law  
Durango, Colorado

Gale Norton  
Attorney General  
State of Colorado  
Denver, Colorado

Donald H. Hamburg  
General Counsel  
Colorado River Water  
Conservation District  
Glenwood Springs, Colorado

#### Engineering:

Eugene I. Jencsok  
Colorado Water Conservation  
Board  
Denver, Colorado

David H. Merritt  
Colorado River Water  
Conservation District  
Glenwood Springs, Colorado

Jeris A. Danielson  
State Engineer  
Denver, Colorado

### NEW MEXICO

#### Legal:

Peter White  
General Counsel  
New Mexico Interstate Stream  
Commission  
Santa Fe, New Mexico

#### Engineering:

William J. Miller  
Interstate Stream Engineer  
New Mexico Interstate  
Stream Commission  
Santa Fe, New Mexico

Jay C. Groseclose  
New Mexico Interstate  
Stream Commission  
Santa Fe, New Mexico

## UTAH

### Legal:

Dallin W. Jensen  
Attorney at Law  
Salt Lake City, Utah

Michael M. Quealy  
Assistant Attorney General  
Salt Lake City, Utah

### Engineering:

Barry C. Saunders  
Associate Director  
Division of Water Resources  
Salt Lake City, Utah

Robert L. Morgan  
State Engineer  
Division of Water Rights  
Salt Lake City, Utah

### General Advisers:

Don A. Christiansen, Manager  
Central Utah Water Conservancy  
District  
Orem, Utah

David Rasmussen, Manager  
Uintah Water Conservancy  
District  
Vernal, Utah

## WYOMING

### Legal:

Milo M. Vukelich  
Assistant Attorney General  
Cheyenne, Wyoming

### Engineering:

John W. Shields  
Water Resources Engineer  
Interstate Streams Division  
Cheyenne, Wyoming

### General Adviser:

George L. Christopoulos  
Cheyenne, Wyoming

## MEETINGS OF THE COMMISSION

During the Water Year ending September 30, 1991 the Commission met four times as follows:

Meeting No. 212	December 5, 1990	Special Meeting Las Vegas, Nevada
Meeting No. 213	March 18, 1991	Regular Meeting Salt Lake City, Utah
Meeting No. 214	July 16, 1991	Adjourned Regular Meeting Rock Springs, Wyoming
Meeting No. 215	September 16, 1991	Annual Meeting Salt Lake City, Utah

## ACTIVITIES OF THE COMMISSION

Within the scope and limitations of Article I(a) of the Upper Colorado River Basin Compact and under the powers conferred upon the Commission by Article VIII(d), the principal activities of the Commission have consisted of: (A) research and studies of an engineering and hydrologic nature of various facets of the water resources of the Colorado River Basin especially as related to operation of the Colorado River reservoirs; (B) collection and compilation of documents for a legal library relating to the utilization of waters of the Colorado River System for domestic, industrial and agricultural purposes, and the generation of hydroelectric power; (C) legal analyses of associated laws, court decisions, reports and problems; (D) participation in activities and providing comments on proposals that would increase the beneficial consumptive uses in the Upper Basin, including environmental, fish and wildlife, endangered species and water quality activities to the extent that they might impair Upper Basin development; (E) cooperation with water resources agencies of the Colorado River Basin States on water and water-related problems; (F) an education and information program designed to aid in securing appropriations of funds by the United States Congress for the construction, planning and investigation of storage dams, reservoirs and water resource development projects of the Colorado River Storage Project that have

been authorized for construction and to secure authorization for the construction of additional participating projects as the essential investigations and planning are completed; and (G) a legislative program consisting of the analysis and study of water resource bills introduced in the U.S. Congress for enactment, the preparation of evidence and argument, and the presentation of testimony before the Committees of the Congress.

## A. ENGINEERING — HYDROLOGY

### 1. COLORADO RIVER SALINITY PROGRAM

The Upper Colorado River Commission has continued its interest and involvement in the Colorado River Basin salinity problem. The Commission staff has worked with representatives of the Commission's member States in coordinating and correlating activities with other State and Federal agencies, particularly the Colorado River Basin Salinity Control Forum, which is composed of representatives from the seven Colorado River Basin States. The Forum has developed water quality standards and a plan of implementation to meet the Environmental Protection Agency Regulation (40 CFR Part 120, Water Quality Standards—Colorado River System: Salinity Control Policy and Standards Procedures).

Section 303 of the Clean Water Act requires that water quality standards be reviewed from time to time and at least once during each three-year period. The Forum in 1990 reviewed the existing State-adopted and Environmental Protection Agency-approved numeric salinity criteria and found no reason to recommend changes for the three lower mainstem stations.

The values are:

	<u>Salinity in</u> <u>mg/l</u>
Below Hoover Dam .....	723
Below Parker Dam .....	747
Imperial Dam .....	879

The Forum is continuing to study salinity conditions and to develop new salinity projections. The Forum is also developing flow versus salt load relationships that will reflect present and anticipated conditions.

Salinities at each of the three lower mainstem stations for which numeric criteria have been established have decreased since 1972.

## 2. FORECAST OF STREAM FLOW

The April 1, 1991 forecast of inflow to Lake Powell by the National Weather Service, Department of Commerce, for April-July was estimated to be 4,600,000 acre-feet<sup>1</sup>. The unregulated inflow to Lake Powell for the period April-July 1991 amounted to 5,286,000 acre-feet<sup>2</sup>, which was about 70 percent of the 29-year (1963-1991) average flow.

During the April-July 1991 period, changes in storage in Colorado River Storage Project reservoirs including Lake Powell resulted in an overall increase of 1,330,000 acre-feet, with 248,000 acre-feet of evaporation and a 78,000 acre-foot decrease in bank storage<sup>3</sup>.

Actual regulated inflow to Lake Powell for the period April-July 1991 was 4,183,000 acre-feet.

For the period October 1, 1990 through September 30, 1991, the change in reservoir storage, excluding bank storage and evaporation, at selected reservoirs above Lake Powell was: Fontenelle decreased 45,700 acre-feet; Flaming Gorge increased 308,700 acre-feet; Taylor Park increased 5,400 acre-feet; Blue Mesa increased 81,900 acre-feet; Morrow Point decreased 5,400 acre-feet; Crystal decreased 600 acre-feet; and Navajo increased 225,400 acre-feet.

The virgin flow<sup>4</sup> of the Colorado River at Lee Ferry<sup>5</sup> for the 1991 water year amounted to 11,600,000 acre-feet<sup>6</sup>.

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<sup>1</sup>Including water to be stored upstream in other Colorado River Storage Project Reservoirs.

<sup>2</sup>Adjusted for upstream regulation and depletions.

<sup>3</sup>Includes Flaming Gorge Reservoir on the Green River.

<sup>4</sup>Virgin flow is the estimated flow of the stream if it were in its natural state and unaffected by the activities of man.

<sup>5</sup>Lee Ferry, Arizona is the division point between the upper and lower basins of the Colorado River as defined in the Colorado River Compact. It is located about one mile downstream from the mouth of the Paria River and about 16 miles downstream from Glen Canyon Dam.

<sup>6</sup>Based on provisional records subject to revision.



### 3. SUMMARY OF RESERVOIR LEVELS AND CONTENTS

Runoff<sup>7</sup> during the year ending September 30, 1991 ranged from 44.2 percent of the 78-year (1914-1991) mean at the San Juan station near San Juan, Utah to 66.9 percent of the 78-year mean at the Colorado River station near Cisco, Utah. The volumes of runoff at these stations were 1,308,600 acre-feet and 3,630,400 acre-feet respectively. Runoff of the Green River station at Green River, Utah totaled 2,778,800 acre-feet, which was 61.5 percent of the 78-year mean.

Lake Powell's lowest elevation of the 1991 water year occurred on April 12, 1991 when the lake level was at elevation 3,627.12 feet (live content 14,533,200 acre-feet). Lake Powell was at its highest point on June 30, 1991 at elevation of 3,639.02 feet with a content of 15,887,900 acre-feet. Note that beginning in April 1991, the reported contents at Lake Powell reflect an updated reservoir sediment survey which resulted in a reservoir capacity of 24,332,200 acre-feet at elevation 3700.0 feet. The previous survey indicated a content of 25,002,000 acre-feet at elevation 3700.0 feet. In this report, the September 30, 1990 contents of Lake Powell have been adjusted according to the updated survey. This procedure ensures a more accurate estimate of change of reservoir content and virgin flow for water year 1991. A total of 8,230,000 acre-feet was released to the river below Glen Canyon Dam during 1991 water year. The 1982-1991 (10-year) delivery to the Lower Basin (measured at Lee Ferry) was 128,075,000 acre-feet.

Lake Mead, on September 30, 1991, contained 19,232,300 acre-feet<sup>8</sup> of available storage water at elevation 1,173.01 feet. On September 30, 1991, the live storage of Lake Mead was 4,533,200 acre-feet more than the storage in Lake Powell.

Table 1 on page 11 shows the Statistical Data for Principal Reservoirs in the Upper Colorado River Basin. Table 2 on page 12 provides the same information for the Lower Colorado River Basin reservoirs.

The results of the long-range reservoir operation procedures adopted by the Secretary of the Interior for Lake Powell, Flaming Gorge, Fontenelle, Navajo, and Blue Mesa reservoirs in the Upper Colorado River Basin and for Lake Mead in the Lower Basin are illustrated on pages 14-21 for the 1991 water year.

There was no equalization of storage as dictated by Section 602(a) of Public Law 90-537. The drawdown of Lake Powell was governed by factors other than the equalization criteria.

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<sup>7</sup>Adjusted for the change in storage in Colorado River Storage Project Reservoirs.

<sup>8</sup>Based on April 1, 1967 Capacity Table revised according to Sedimentation Survey 1963-1964.

**TABLE 1**

**STATISTICAL DATA FOR PRINCIPAL RESERVOIRS IN COLORADO RIVER BASIN**

(Units: Elevation — feet; capacity — 1,000 acre-feet)

**UPPER BASIN**

**Colorado River Storage Project  
(Total Surface Capacity)**

	Fontenelle		Flaming Gorge		Taylor Park		Blue Mesa		Morrow Point		Crystal		Navajo		Lake Powell	
	Elv.	Cap.	Elv.	Cap.	Elv.	Cap.	Elv.	Cap.	Elv.	Cap.	Elv.	Cap.	Elv.	Cap.	Elv.	Cap.
River elevation at dam (average tailwater) .....	—	—	5,603	0	9,174	0	7,160	0	6,775	0	6,534	0	5,720	0	3,138	0
Dead Storage .....	6,408	0.56	5,740	40	—	—	7,358	111	6,808	0	6,670	8	5,775	13	3,370	1,998
Inactive Storage (minimum power pool) .....	—	—	5,871	273	—	—	7,393	192	7,100	75	6,700	12	5,990 <sup>1</sup>	673	3,490	5,995
Rated Head .....	6,491	234	5,946	1,102	—	—	7,438	361	7,108	80	6,740	20	—	—	3,570	11,105
Maximum Storage (without surcharge) .....	6,506	345	6,040	3,789	9,330	106	7,519	941	7,160	117	6,755	25	6,085	1,709	3,700	26,215

<sup>1</sup> Required for Navajo Indian Irrigation Project.

**TABLE 2**  
**STATISTICAL DATA FOR PRINCIPAL RESERVOIRS**  
**IN COLORADO RIVER BASIN**

(Units: Elevation — feet; capacity — 1,000 acre-feet)

**LOWER BASIN**

(Usable Surface Capacity)

	Lake Mead		Lake Mohave		Lake Havasu	
	Elv.	Capacity	Elv.	Capacity	Elv.	Capacity
River elevation at dam (average tailwater) . . . . .	646	(-2,378)	506	(-8.5)	370	(-28.6)
Dead Storage . . . . .	895	0	533.39	0	400	0
Inactive Storage (minimum power pool) . . . . .	1,050	7,471	570	217.5	440 <sup>1</sup>	439.4
Rated Head . . . . .	1,122.8	13,633	—	—	—	—
Maximum Storage (without surcharge) . . . . .	1,221.4	26,159	647	1,809.8	450	619.4

<sup>1</sup> Contractual minimum for delivery to Metropolitan Water District's Colorado River Aqueduct.

#### 4. FLOWS OF COLORADO RIVER

Table 3 on pages 22 and 23 shows the estimated virgin flow of the Colorado

River at Lee Ferry, Arizona for each water year from 1896 through 1991. Column (4) of the table shows the average virgin flow for any given year within the period computed through water year 1991. Column (5) shows the average virgin flow for a given year within the period computed since water year 1896. Column (6) shows the average virgin flow for each progressive ten-year period beginning with the ten-year period ending on September 30, 1905. The difference between the virgin flow for a given year and the average flow over the 95-year period, 1896 through 1991, is shown in Column (7).

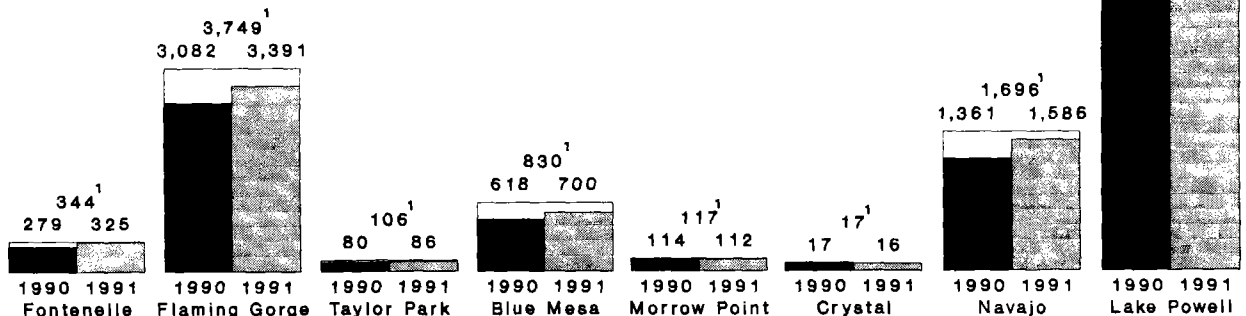
Article III(d) of the Colorado River Compact stipulates that “the States of the Upper Division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years reckoned in a continuing progressive series beginning with the first day of October next succeeding the ratification of this Compact.” Prior to the storage of water in the Colorado River Storage Project reservoirs, which began in 1962, the flow of the river at Lee Ferry in any ten consecutive years was greatly in excess of the 75,000,000 acre-feet required by the Compact. Beginning in 1962, Colorado River Storage Project reservoirs have regulated the river above Glen Canyon Dam. Table 4, on page 24, shows the historic flow at Lee Ferry for the period 1953 through 1991. The historic flow for each progressive ten-year period from 1953 through 1991, beginning with the ten-year period ending September 30, 1962, the commencement of storage in Colorado River Storage Project reservoirs, is shown in Column (3).

In each consecutive ten-year period, the total flow equaled or exceeded the 75,000,000 acre-feet required by the Compact. The flow at Lee Ferry during the ten-year period ending September 30, 1991 was 128,075,000 acre-feet.

# Storage in Principal Reservoirs at the End of Water Year 1991

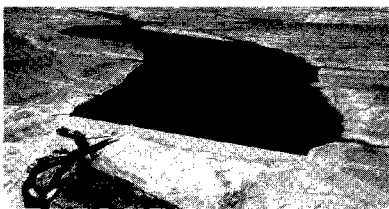
## Upper Basin Live Storage Contents\* (1,000 Acre-Feet)

	Sept. 30 1990	Percent Live Capacity	Sept. 30 1991	Percent Live Capacity	Changes in Contents
Fontenelle	279	81	325	94	46
Flaming Gorge	3,082	82	3,391	90	309
Taylor Park	80	75	86	81	6
Blue Mesa	618	74	700	84	82
Morrow Point	114	97	112	96	-2
Crystal	17	100	16	94	-1
Navajo	1,361	80	1,586	94	225
Lake Powell	15,723	65	14,699	60	-1,024
<b>TOTAL</b>	<b>21,274</b>	<b>68</b>	<b>20,915</b>	<b>67</b>	<b>-359</b>



\* As of September 30, 1991 (excludes bank storage)

<sup>1</sup>Maximum live storage (exclusive of surcharge)

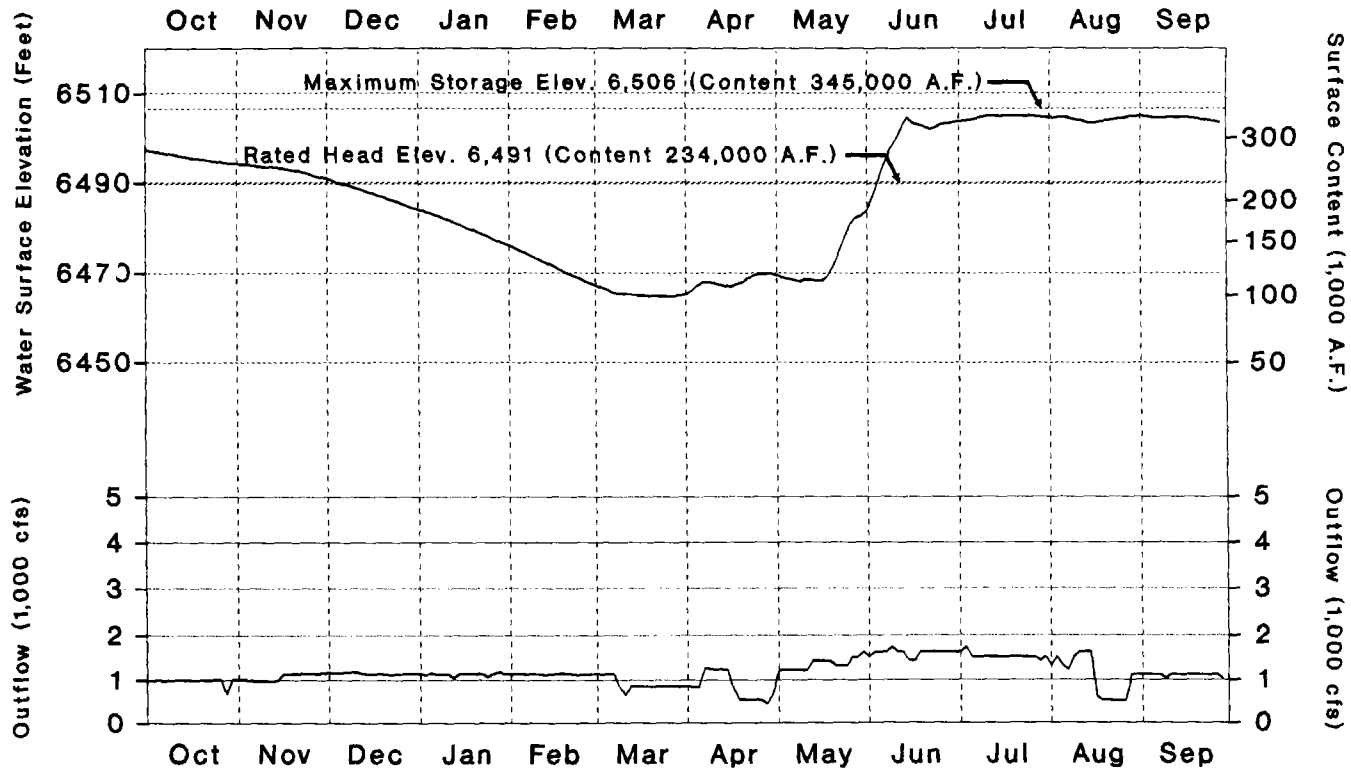


## FONTENELLE

Live Storage Capacity - 344,400 acre-feet

Power Generating Capacity - 13,000 KW

Live Storage 9/30/90 - 325,000 acre-feet



Fontenelle Reservoir  
Water Year 1990-1991

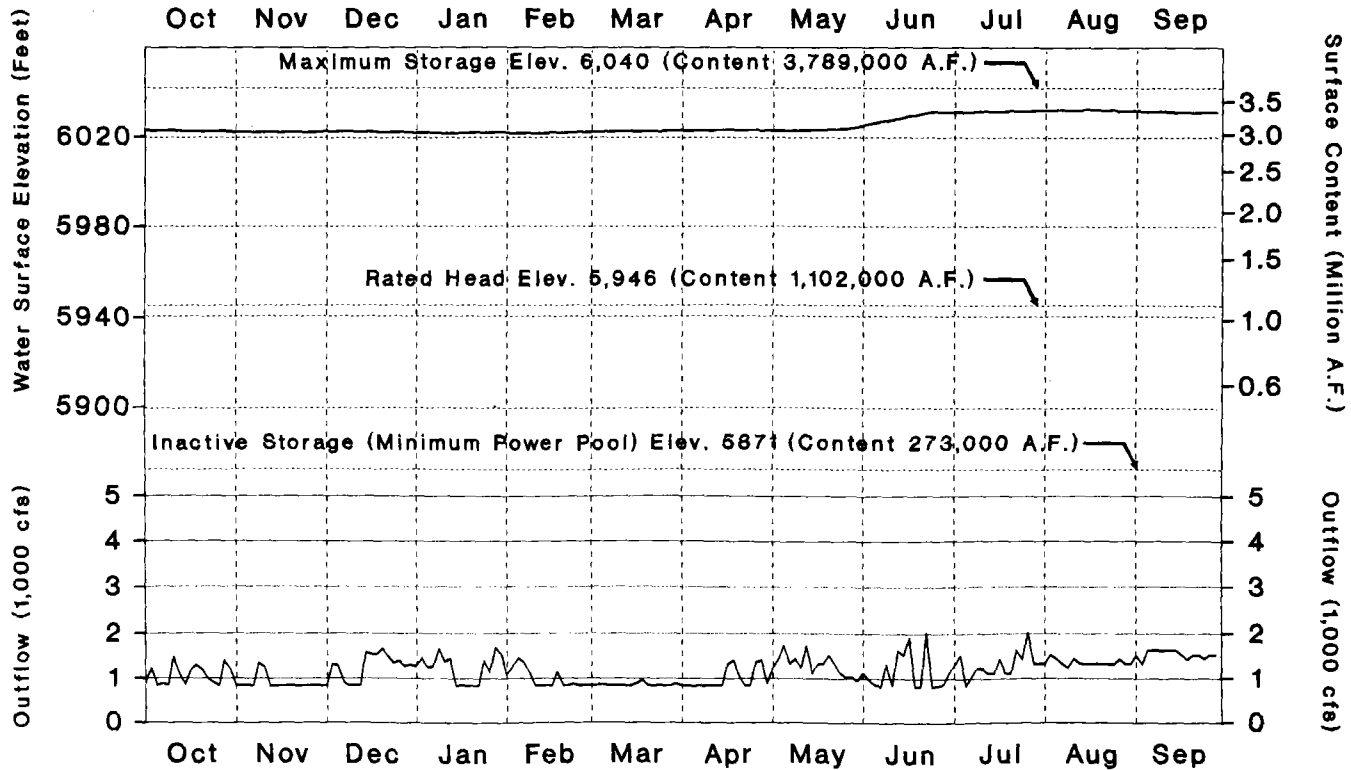


## FLAMING GORGE

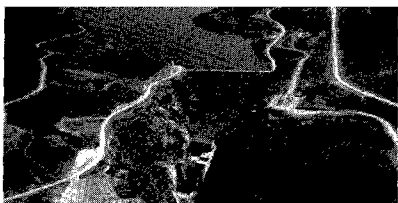
Live Storage Capacity - 3,749,000 acre-feet

Power Generating Capacity - 144,000 KW

Live Storage 9/30/91 - 3,391,000 acre-feet



Flaming Gorge Reservoir

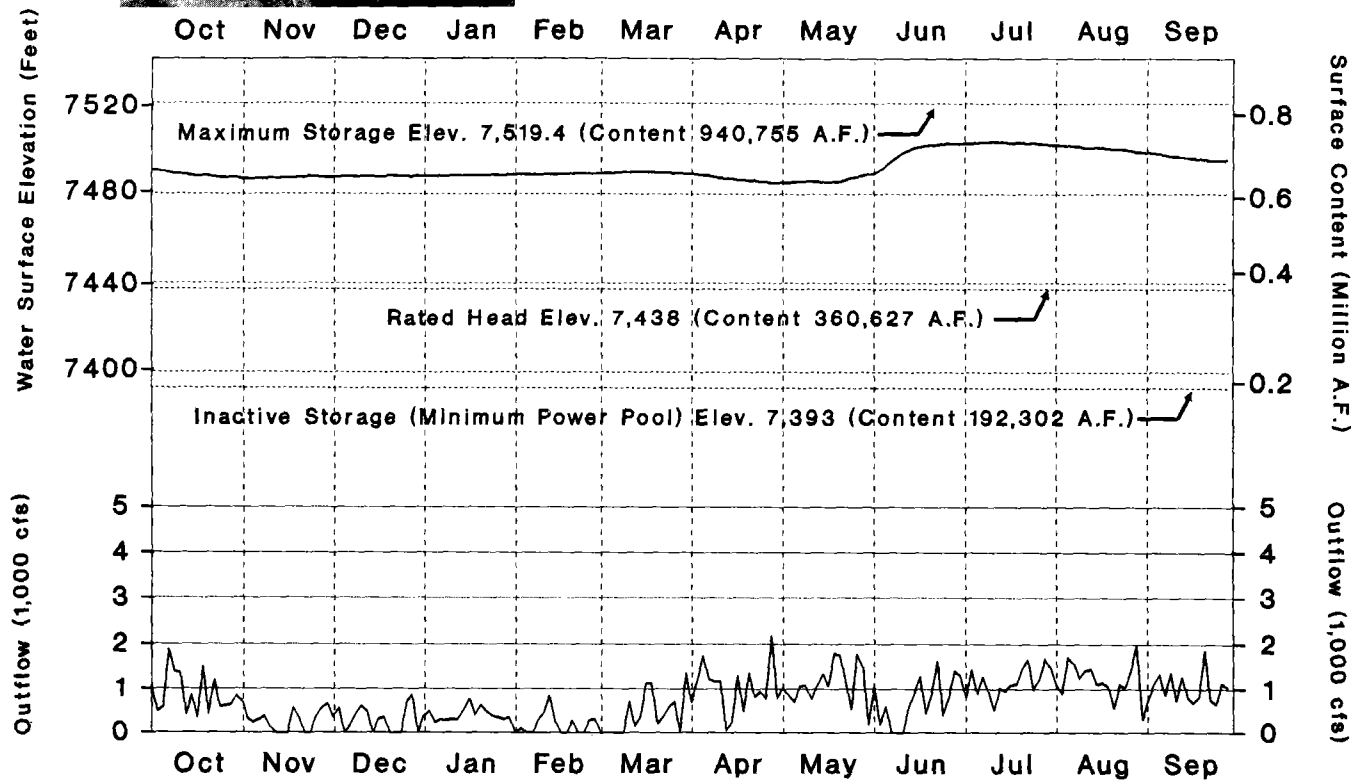


## BLUE MESA

Live Storage Capacity - 830,000 acre-feet

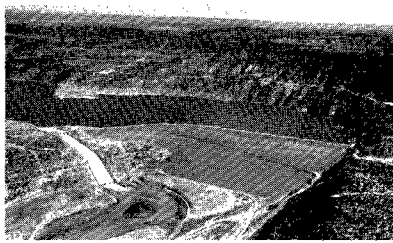
Power Generating Capacity - 96,000 KW

Live Storage 9/30/91 - 700,000 acre-feet



**Blue Mesa Reservoir  
Water Year 1990-1991**



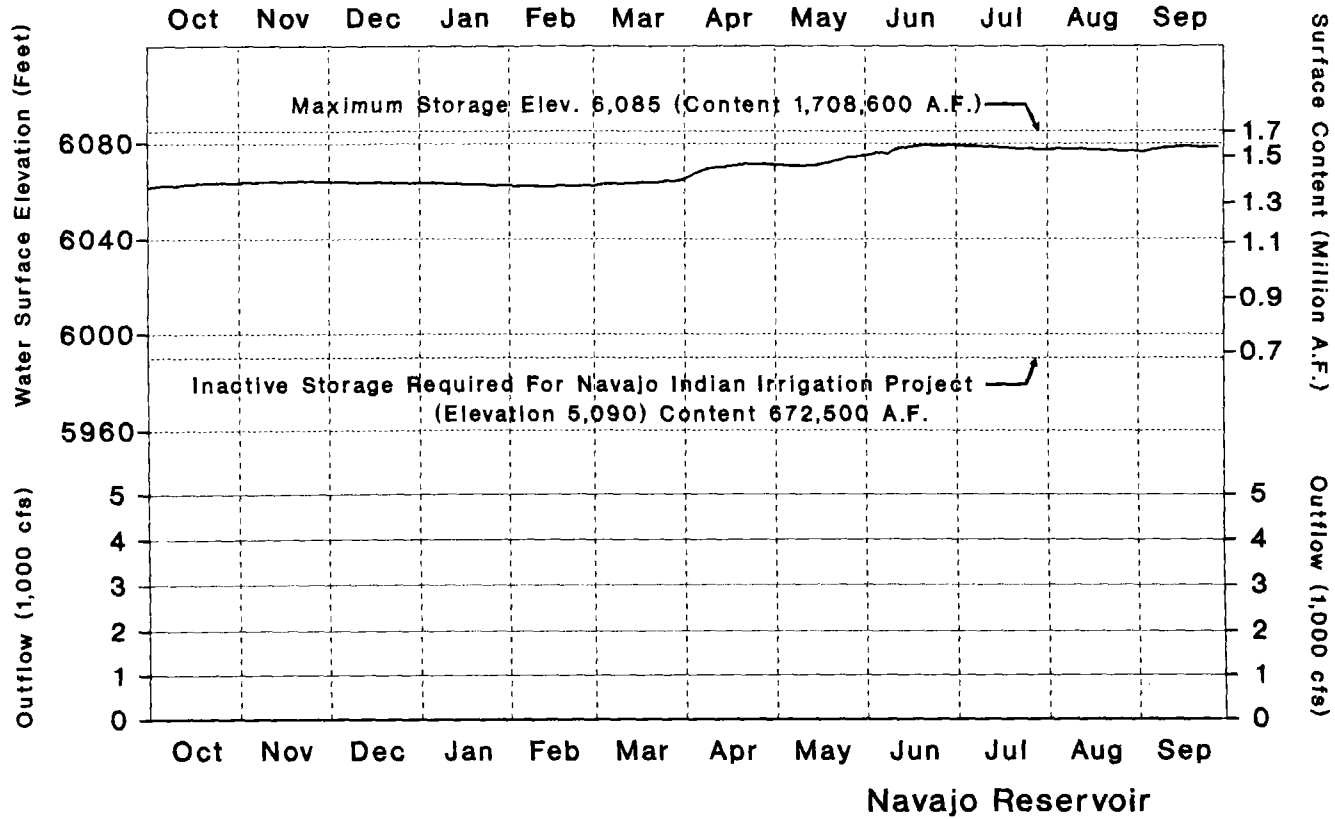


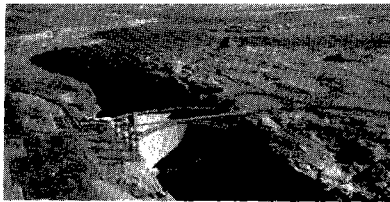
## NAVAJO

Live Storage Capacity - 1,696,000 acre-feet

Power Generating Capacity - 0 KW

Live Storage 9/30/91 - 1,696,000 acre-feet



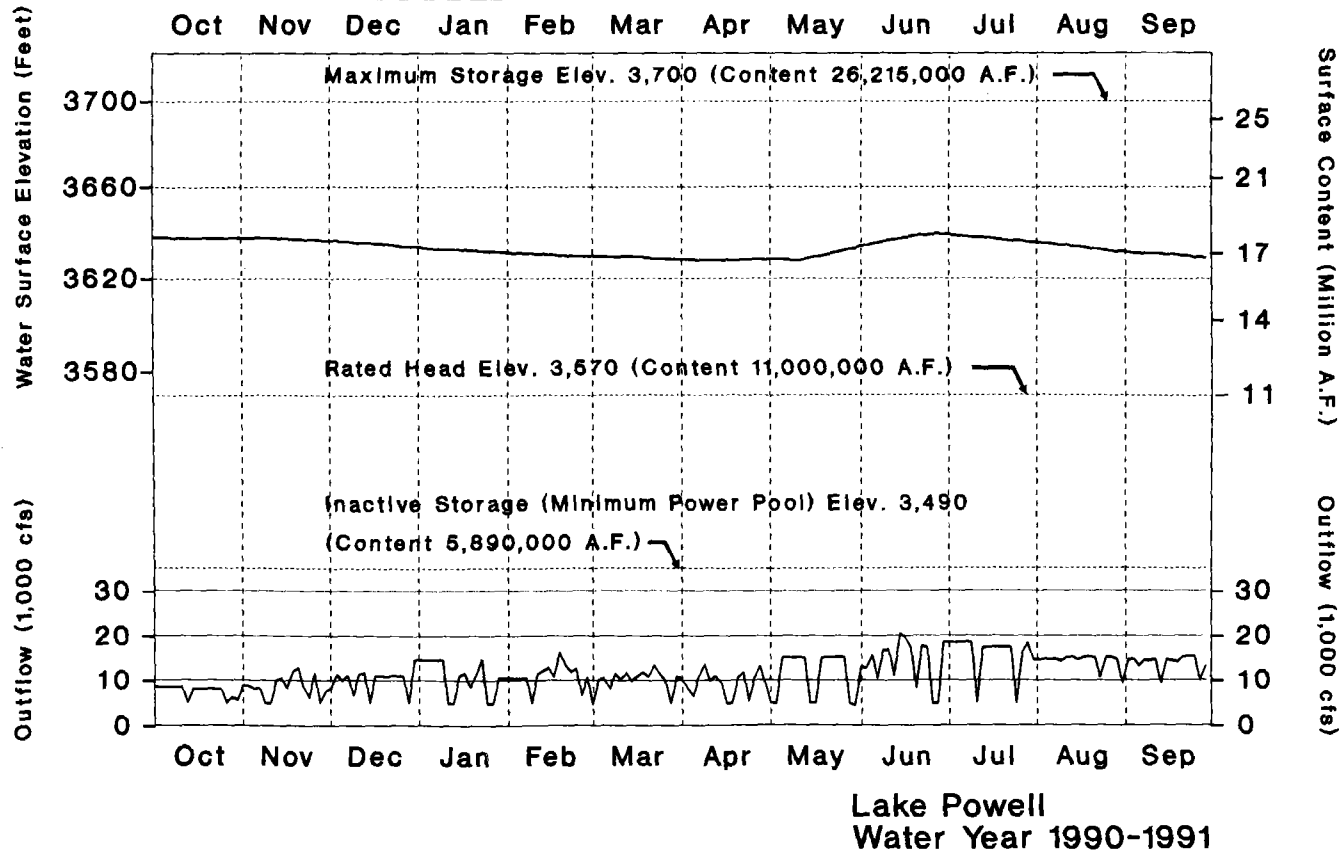


# LAKE POWELL - GLEN CANYON DAM

Live Storage Capacity - 24,322,000 acre-feet

Power Generating Capacity - 1,356,000 KW

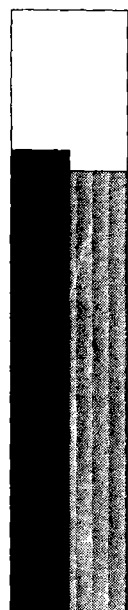
Live Storage 9/30/91 - 14,699,000 acre-feet



**Storage in Principal Reservoirs at the End of Water Yr. 1991**  
**Lower Basin**  
**Live Storage Contents \***  
**(1,000 Acre-feet)**

	Sept. 30 1990	Percent Live Capacity	Sept. 30 1991	Percent Live Capacity	Change i Content
Lake Mead	20,143	77	19,232	74	-91
Lake Mohave	1,488	82	1,571	87	8
Lake Havasu	562	91	556	90	-
<b>Total</b>	<b>22,193</b>	<b>78</b>	<b>21359</b>	<b>75</b>	<b>-83</b>

26,159<sup>1</sup>  
20,143 19,232



1990 1991  
Lake Mead

1,810  
1,488 1,571



1990 1991  
Lake Mohave

619  
562 556



1990 1991  
Lake Havasu

\* As of September 30, 1991 (excludes bank storage)  
<sup>1</sup> Contents based on April 1967 revised capacity tables  
according to 1963-64 sedimentation survey at Lake Mead



# LAKE MEAD - HOOVER DAM

Live Storage Capacity - 26,159,000 acre-feet

Power Generating Capacity - 1,914,000 KW

Live Storage 9/30/91 - 19,232,000 acre-feet

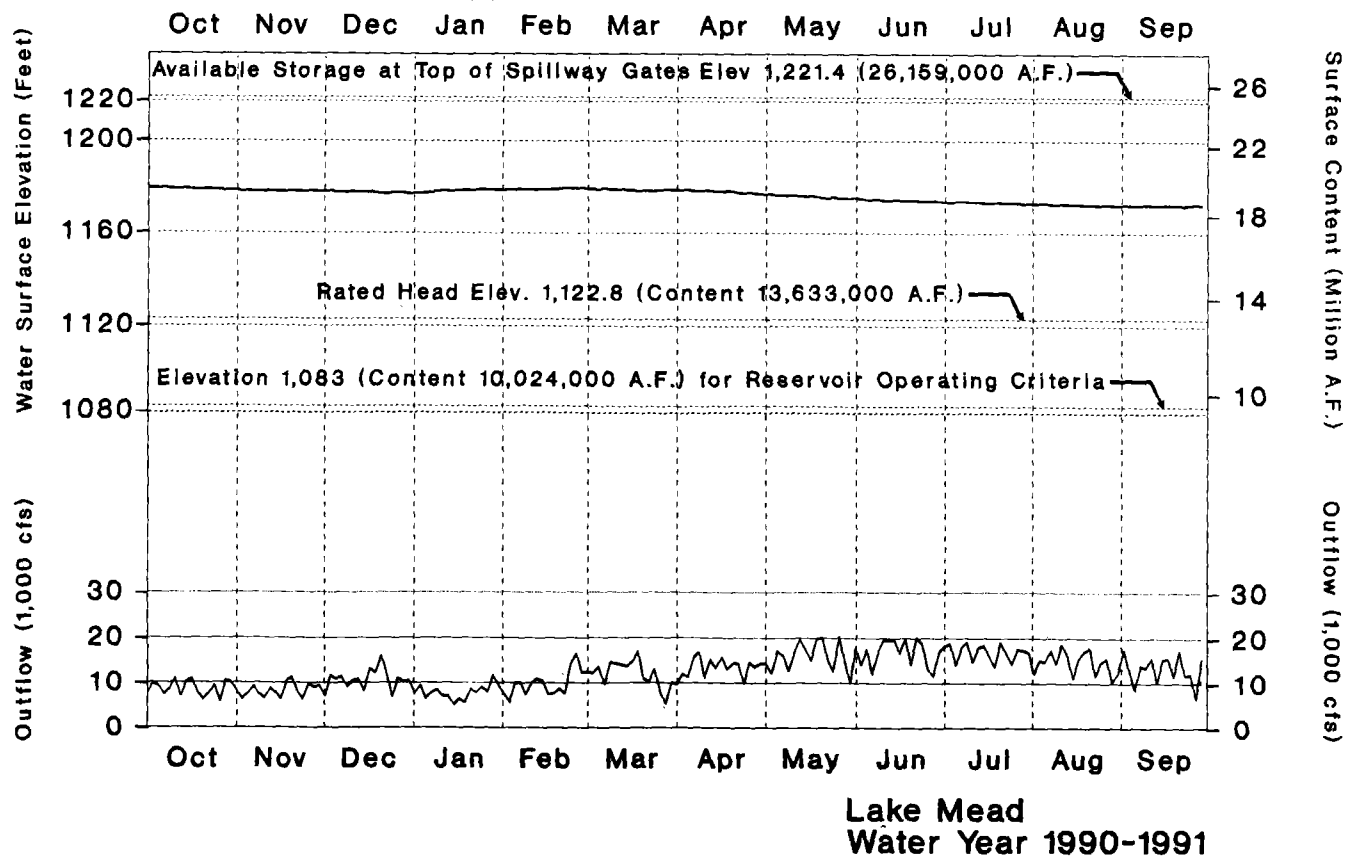


Table 3  
ESTIMATED VIRGIN FLOW AT LEE PERRY  
(million acre-feet)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years to 1990	Year Ending Sept. 30	Estimated Virgin Flow	Average to 1990	Average Since 1896	Progressive 10-year Moving Average	Virgin Flow Minus 95-year Average
96	1896	10.1	14.9	10.1		-4.8
95	97	18.0	15.0	14.1		3.1
94	98	13.8	14.9	14.0		-1.1
93	99	15.9	14.9	14.5		1.0
92	1900	13.2	14.9	14.2		-1.7
91	01	13.6	14.9	14.1		-1.3
90	02	9.4	15.0	13.4		-5.5
89	03	14.8	15.0	13.6		-0.1
88	04	15.6	15.0	13.8		0.7
87	05	16.0	15.0	14.5		1.1
86	06	19.1	15.0	14.0		4.2
85	07	23.4	15.0	15.2		8.5
84	08	12.9	14.9	15.1		-2.0
83	09	23.3	14.9	15.7		-8.4
82	1910	14.2	14.8	15.6		-0.7
81	11	16.0	14.8	15.6		1.1
80	12	20.5	14.8	15.9		5.6
79	13	14.5	14.7	15.8		-0.4
78	14	21.2	14.7	16.1		6.3
77	15	14.0	14.6	16.0		-0.9
76	16	19.2	14.6	16.1		4.3
75	17	24.0	14.6	16.5		9.1
74	18	15.4	14.4	16.4		0.5
73	19	12.5	14.4	16.3		-2.4
72	1920	22.0	14.4	16.5		7.1
71	21	23.0	14.3	16.8		8.1
70	22	18.3	14.2	16.9		3.4
69	23	18.3	14.2	16.9		-0.7
68	24	14.2	14.1	16.6		1.0
67	25	13.0	14.1	16.6		1.0
66	26	15.9	14.1	16.6		3.7
65	27	18.6	14.1	16.7		2.4
64	28	17.3	14.0	16.7		6.5
63	29	21.4	14.0	16.8		-0.0
62	1930	14.9	13.8	16.8		-7.1
61	31	7.8	13.8	16.5		-2.3
60	32	17.2	13.9	16.6		-3.5
59	33	11.4	13.9	16.4		-9.3
58	34	5.6	13.9	16.1		-3.3
57	35	11.6	14.1	16.0		-1.1
56	36	13.8	14.1	15.9		-1.2
55	37	13.7	14.1	16.0		-2.6
54	38	17.5	14.1	16.0		-3.8
53	39	11.1	14.1	15.8		-6.3
52	1940	8.6	14.1	15.7		3.2
51	41	18.1	14.2	15.7		4.2
50	42	19.1	14.1	15.8		-1.8
49	43	13.1	14.0	15.7		0.3
48	44	15.2	14.0	15.7		-1.5
47	45	13.4	14.0	15.6		-4.5
46	46	10.4	14.0	15.6		0.6
45	47	15.5	14.1	15.6		0.6

Table 3  
ESTIMATED VIRGIN FLOW AT LEE PERRY  
(million acre-feet)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years to 1990	Year Ending Sept. 30	Estimated Virgin Flow	Average to 1990	Average Since 1896	Progressive 10-year Moving Average	Virgin Flow Minus 95-year Average
44	48	15.6	14.1	15.6	14.0	0.7
43	49	16.4	14.1	15.6	14.5	1.5
42	1950	12.9	14.0	15.6	15.0	-2.0
41	51	11.6	14.0	15.5	14.3	-3.3
40	52	20.7	14.1	15.6	14.5	5.8
39	53	10.6	13.9	15.5	14.2	-4.3
38	54	7.7	14.0	15.4	13.5	-7.2
37	55	9.2	14.2	15.3	13.1	-5.7
36	56	10.7	14.3	15.2	13.1	-4.2
35	57	20.1	14.4	15.3	13.6	5.2
34	58	16.5	14.3	15.3	13.6	1.6
33	59	8.6	14.2	15.2	12.9	-6.3
32	1960	11.3	14.4	15.1	12.7	-3.6
31	61	8.5	14.5	15.0	12.4	-6.4
30	62	17.3	14.7	15.0	12.1	-2.4
29	63	8.4	14.6	15.0	11.8	-6.5
28	64	10.2	14.8	14.9	12.1	-4.7
27	65	18.9	15.0	14.9	13.1	-4.0
26	66	11.2	14.8	14.9	13.1	-3.7
25	67	11.9	15.0	14.8	12.3	-3.0
24	68	13.7	15.1	14.8	12.0	-1.2
23	69	14.4	15.1	14.8	12.6	-0.5
22	1970	15.4	15.2	14.8	13.0	-0.5
21	71	15.1	15.2	14.8	13.7	0.2
20	72	12.2	15.2	14.8	13.1	-2.7
19	73	19.4	15.3	14.9	14.2	-4.5
18	74	13.3	15.1	14.9	14.6	-1.7
17	75	16.6	15.2	14.8	14.3	-1.6
16	76	11.6	15.1	14.8	14.4	-3.3
15	77	5.8	15.4	14.7	13.8	-9.1
14	78	15.2	16.0	14.7	13.9	-0.3
13	79	17.9	16.1	14.8	14.3	3.0
12	1980	8.2	16.0	14.8	14.5	-2.6
11	81	16.2	15.8	14.7	13.8	-6.7
10	82	24.0	16.6	14.8	14.2	1.3
9	83	24.5	16.6	14.8	14.6	9.1
8	84	20.8	15.7	14.9	15.8	5.9
7	85	21.9	14.4	15.0	16.2	7.0
6	86	16.9	13.4	15.1	17.2	2.0
5	87	11.6	11.7	15.1	18.3	-5.7
4	88	9.2	10.4	15.1	18.0	-6.4
3	89	9.2	9.9	15.0	17.1	-2.8
2	1990	8.5	10.3	14.9	16.3	-2.8
1	91	12.1	12.1	14.9	15.8	-2.8
Maximum		24.5			18.8	9.6
Minimum		5.6			11.8	-9.3
Average		14.9			15.0	0.0

Table 4  
HISTORIC FLOW AT LEE FERRY  
1953-1991

Unit: 1,000 a.f.

1	2	3
Water Year Ending Sept. 30	Historic Flow	Progressive 10-Year Total
1953	8,805	
1954	6,116	
1955	7,307	
1956	8,750	
1957	17,340	
1958	14,260	
1959	6,756	
1960	9,192	
1961	6,674	
1962	14,790	99,990
1963	2,520	93,705
1964	2,427	90,016
1965	10,835	93,544
1966	7,870	92,664
1967	7,824	83,148
1968	8,358	77,246
1969	8,850	79,340
1970	8,688	78,836
1971	8,607	80,769
1972	9,330	75,309
1973	10,141	82,930
1974	8,277	88,780
1975	9,274	87,219
1976	8,494	87,843
1977	8,269	88,288
1978	8,369	88,299
1979	8,333	87,782
1980	10,950	90,044
1981	8,316	89,753
1982	8,323	88,746
1983	17,520	96,125
1984	20,518	108,366
1985	19,109	118,201
1986	16,866	126,573
1987	13,450	131,754
1988	8,231	131,616
1989	7,995	131,278
1990	7,952	128,280
1991	8,111	128,075

Storage in Flaming Gorge and Navajo Reservoirs began in 1962.

Storage in Glen Canyon Reservoir began in 1963.

Storage in Fontenelle reservoir began in 1964.

Based upon provisional streamflow records subject to revision.

Note: The 1991 flow is 8,101,600 a.f. at Lees Ferry, Arizona  
and 9,670 a.f. at the Paria River.

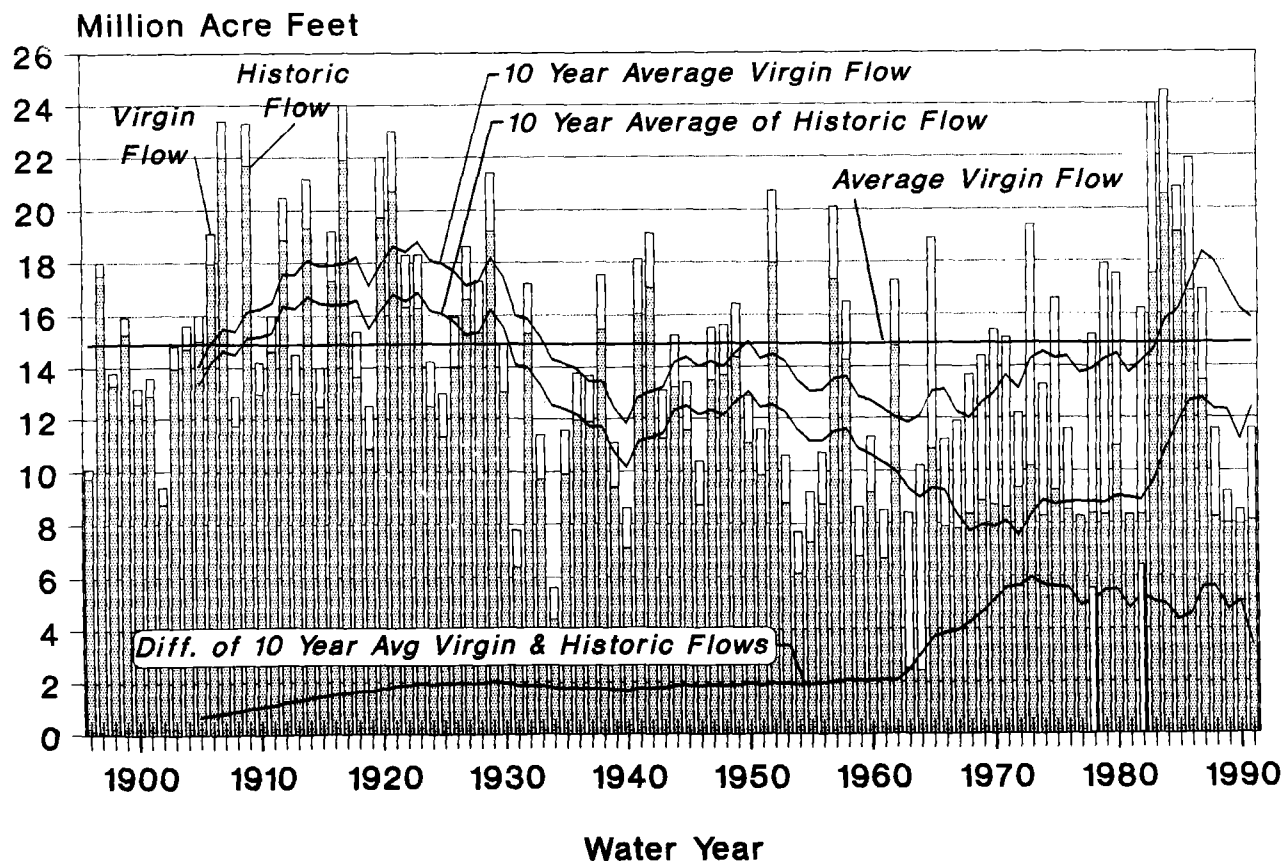
The charts on pages 26 and 27 illustrate some of the pertinent historical facts related to the amounts of water produced by the Colorado River System above Lee Ferry, Arizona, the compact division point between the Upper and Lower Colorado River Basins. The first chart, on page 26, is entitled Colorado River Flow at Lee Ferry, Arizona. The top of each vertical bar represents the estimated virgin flow of the river, i.e., the flow of the river in millions of acre-feet past Lee Ferry for a given year had it not been depleted by activities of man. Each vertical bar has two components: The lower shaded part represents the estimated or measured historic flow at Lee Ferry, and the difference between the two sections of the bar in any given year represents the stream depletion, or the amount of water estimated to have been removed by man from the virgin supply upstream from Lee Ferry. It is worth noting that in 1977 and again in 1981 the historic flow at Lee Ferry exceeded the virgin flow. Beginning in 1962, part of this depletion at Lee Ferry was caused by the retention and storage of water in storage units of the Colorado River Storage Project. The horizontal line (at approximately 15 million acre-feet) shows the long-term average virgin flow from 1896 through 1991. Because the Colorado River Compact is administered on the basis of running averages covering periods of ten years, the progressive ten-year average historic and virgin flows are displayed on this chart.

The second chart on page 27, entitled Lee Ferry Average Annual Flow for Selected Periods, is a graphical representation of historic and virgin flow averages for several periods of record. The periods of water years selected were those to which reference is usually made for various purposes in documents pertaining to the Colorado River System.



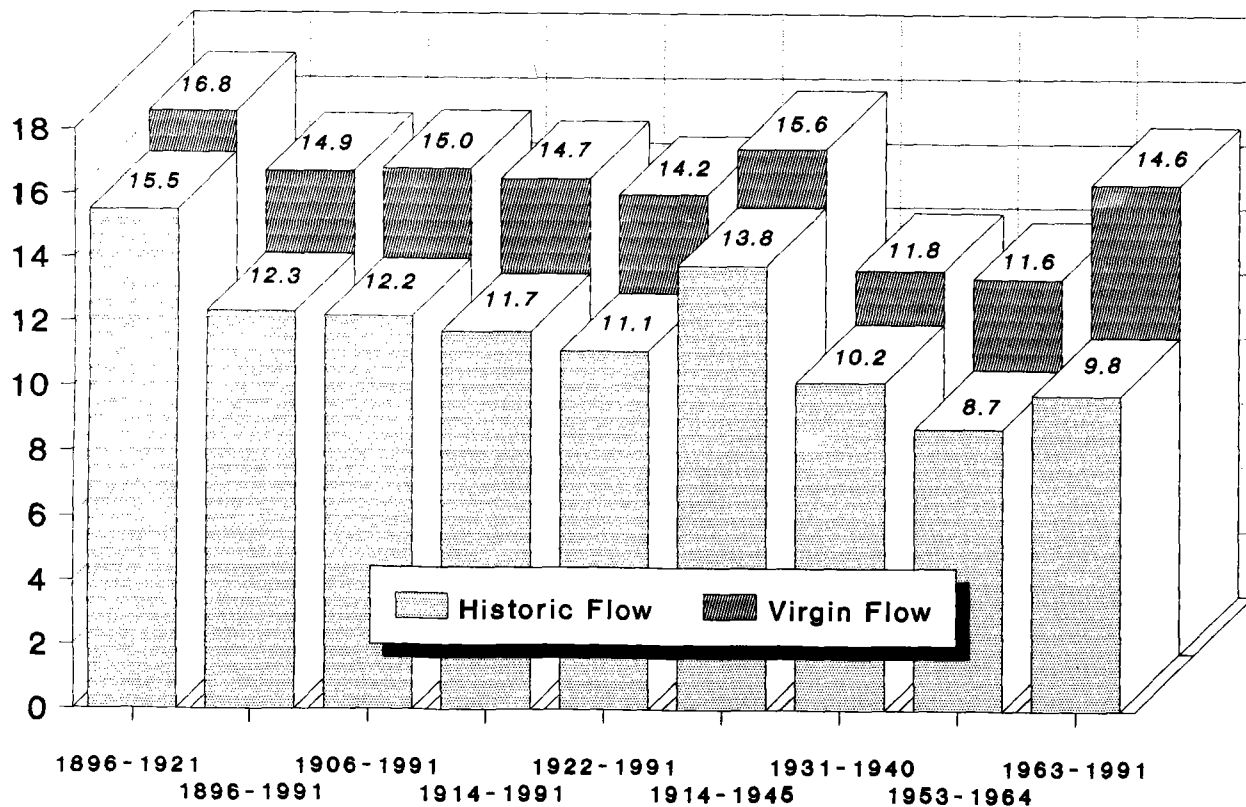
# Colorado River Flow

## At Lee Ferry, Arizona



# Lee Ferry Average Annual Flow For Selected Periods

Million Acre-Feet



Several important hydrologic facts are apparent from these two charts on pages 26 and 27.

- (1) A vast majority of the high flows occurred prior to 1929.
- (2) Since the 1924-1933 decade, the progressive ten-year average virgin flow has not exceeded the average virgin flow except in the 1941-1950 and the exceptionally wet 1975-1984 and 1981-1991 decades.
- (3) For the period 1896-1921, which is prior to the Colorado River Compact of 1922, the average virgin flow was estimated to be 16.8 million acre-feet per year, which is considerably greater than for any other period selected, including the long-term average. A stream-gaging station at Lees Ferry, Arizona was not installed until 1921. Thus, the virgin flow at Lees Ferry prior to the 1922 Compact is estimated based upon records obtained at other stations, e.g. the stream gage on the Colorado River at Yuma, Arizona for the period 1902-1921.
- (4) For the longest period shown, 1896-1991, the estimated average annual virgin flow is 14.9 million acre-feet and the average annual historic flow is 12.3 million acre-feet.
- (5) For the next longest period, 1906-1991, the estimated average annual virgin flow is 15.0 million acre-feet and the average annual historic flow is 12.2 million acre-feet. Many of the early records for this series of years, as well as for the 1896-1991 period, are based upon the estimates of flows made at other gaging stations, as mentioned in (3) above. This average is about equal to the 15.0 million acre-feet estimated for the 1906-1967 period which was used as the basis for justification of a water supply for the Central Arizona Project authorized in 1968.
- (6) The estimated average annual virgin flow during the 1914-1991 period is 14.7 million acre-feet. This period is an extension of the 1914-1965 period used in the Upper Colorado Region Comprehensive Framework Studies of 1971. The average annual virgin flow for the 1914-1965 time period is 14.6 million acrefeet.
- (7) The average annual virgin flow for the period 1914-1945 is 15.6 million acre-feet. This was the period of record used by the negotiators of the Upper Colorado River Basin Compact of 1948.
- (8) For the period 1922-1991, which is the period of record since the signing of the Colorado River Compact, the average annual virgin flow is

14.2 million acre-feet and the average annual historic flow is 11.1 million acre-feet. Records for this series of years are based upon actual measurements of flows at Lees Ferry. The ten-year moving average flow since 1922 is considerably less than the ten-year moving average flow prior to 1922.

(9) Two completely unrelated ten-year periods of minimum flows have occurred since 1930. During these periods, 1931-1940 and 1954-1963, the average annual virgin flow amounts to only 11.8 million acre-feet.

(10) For a 12-year period, 1953-1964, the average annual virgin flow amounts to only 11.6 million acre-feet.

(11) Since Glen Canyon Dam was closed in 1963, the estimated virgin flow for the subsequent 28 years is 14.6 million acre-feet. The estimated historical flow for the same period (1963-1991) is 9.8 million acre-feet.

## **B. LEGAL**

### **1. WATER NEWSLETTER**

The legal staff continues to inform the Commissioners, their advisers, and other interested parties about developments in the courts, Congress, and certain Federal agencies through the Water Newsletter. Current information can be found in the newsletter. In addition, the legal staff has prepared legal memoranda on matters needing more detailed treatment.

### **2. COURT CASES**

Action has been taken in a number of cases of importance to the Upper Colorado River Basin States. These cases include:

*Oklahoma and Texas v. New Mexico*, 501 U.S. \_\_\_\_, 115 L.Ed.2d 207, 111 S.Ct. \_\_\_\_\_. This case arose out of a dispute over the interpretation of various provisions of the Canadian River Compact, which was ratified by New Mexico, Oklahoma and Texas in 1951 and consented to by Congress in 1952. In this opinion the Court rules on the States' exceptions to the Special Master's report. Oklahoma filed an exception to the Master's recommendation in Part VI of his report that the Compact Article IV(b) limitation on "conservation storage" be interpreted to apply only to the quantity of water New Mexico actually stores at Ute Reservoir for conservation purposes, contending that the term should apply to the physical capacity of the reservoirs below Conchas Dam. The Court

overruled Oklahoma's objection, holding that nothing on the face of the Compact indicates a clear intention to base New Mexico's limitation on available reservoir capacity when Texas' limitation is based on stored water. New Mexico excepted to Part VII of the Master's Report, in which the Master recommended that water spilling or released from Conchas Dam, as well as return flow and seepage from the Tucumcari Project, be subject to Article IV(b)'s 200,000 acre-feet limitation on conservation storage if the water is impounded in Ute Dam or other downstream dams in New Mexico. The Court overruled New Mexico's exception, holding that under the Compact, New Mexico is entitled to 200,000 acre-feet of storage below Conchas Dam, so if New Mexico has at any time stored more than that amount, it was not entitled to do so. The Court found that any water in excess of 200,000 acre-feet should have been allowed to flow through Ute Dam to be put to use by the downstream States rather than being impounded in New Mexico. Finally, the Court ruled on Oklahoma and Texas' exception to the Master's recommendation that the Court remand to the Canadian River Commission the question whether certain water that New Mexico has stored in Ute Reservoir and designated a "desilting pool" is exempt from the Article IV(b) limitation. The Court sustained the States' exception, holding that there was no legal basis for the Master's refusal to decide this question, since there is an actual, existing controversy among the States over this issue and there was no claim that the "desilting pool" issue was not properly presented. Therefore, the Court remanded the "desilting pool" issue to the Master for further proceedings.

*Upper Snake River Chapter of Trout Unlimited v. Hodel*, 9th Cir., 921 F.2d 232. Affirming the decision of the district court (706 F.Supp. 737), the Ninth Circuit held that the National Environmental Policy Act (NEPA) did not require the Bureau of Reclamation to prepare an environmental impact statement (EIS) before periodically adjusting the flow of water from the Palisades Dam in Idaho in response to water supply conditions. The Court found that when an ongoing project undergoes changes amounting to "major federal action," the operating agency must prepare an EIS, but the Bureau's decision to reduce water flows from the dam was part of an ongoing operation and is a routine managerial action that is outside NEPA's EIS provisions. Since the Bureau was doing "nothing new, nor more extensive, nor other than that contemplated when the project was first operational," the Ninth Circuit held that preparation of an EIS was not required.

### **3. LEGISLATION**

In the First Session of the 102nd Congress (without regard to the water year), Congress enacted the following statutes that are important to the Upper Colorado River Basin States:

Public Law 102-154, approved November 13, 1991, making appropriations for the Department of the Interior and related agencies for the fiscal year ending September 30, 1992.

Public Law 102-142, approved October 28, 1991, making appropriations for Agriculture, Rural Development, Food and Drug Administration and Related Agencies programs for the fiscal year ending September 30, 1992.

Public Law 102-104, approved August 17, 1991, Energy and Water Development Appropriations Act, 1992.

## **C. EDUCATION—INFORMATION**

### **1. GENERAL COOPERATION**

The Upper Colorado River Commission has directed its Education and Information program toward promoting interstate cooperation, harmony, and united efforts; developing an understanding in other sections of the United States of the problems of the Upper Colorado River Basin; and the creation of a favorable attitude on the part of Congress with respect to the development of the industrial and agricultural resources of the Upper Colorado River Basin.

The Commission has continued to cooperate with members of the Congressional delegations from the Upper Colorado River Basin States and with officials of the Department of the Interior and the Bureau of Reclamation in seeking appropriations of funds by the Congress for the construction of the Storage Units and participating projects authorized for construction, as well as funds for the investigations of additional participating projects that are given priority in planning in the Colorado River Storage Project Act. As part of this cooperation, the Commission's Executive Director has been in Washington, D. C. at intermittent periods, acting as liaison between the Congress and the States and various departments of government, supplying information, arranging and taking part in Congressional hearings, and providing other assistance requested.

## **2. LIBRARY**

Efforts are being continued to accumulate all types of engineering, legal, economics, and semi-technical documents related to the Colorado River Basin to comprise a well-equipped and efficiently-operating permanent library. As materials are collected for inclusion in the library, they are cataloged in the Commission's computer system. Also, many thousands of pages of documents have been placed on microfiche. Information in the Commission's library will be available to any of its member States on short notice should a need arise. Studies are being made, supplemented, or collected to address the many problems associated with the development, utilization, and conservation of water and hydroelectric resources of the Colorado River Basin.

The continuing program of library expansion has been maintained. Emphasis is placed on the acquisition of information which illumines that growing body of law known as the "law of the river." Since the Environmental Protection Agency and the Western Area Power Administration have assumed an increasing importance in the water development field, documents from those agencies are being monitored and acquired as a part of the Commission's library.

## **3. RELIEF MODEL**

The Relief Model of the Upper Colorado River Basin and the adjacent areas is available for display at conventions and other public events.

# **COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS**

## **A. AUTHORIZED STORAGE UNITS**

*(Information relative to Storage Units and participating projects has been obtained from reports on investigations and activities of the United States Department of the Interior, Bureau of Reclamation.)*

The Colorado River Storage Project was authorized for construction by the United States Congress in the Act of April 11, 1956, (70 Stat. 105). Four storage units were authorized by this Act: Glen Canyon Dam and Reservoir (Lake Powell) on the Colorado River in Arizona and Utah, Navajo Dam and Reservoir on the San Juan River in New Mexico and Colorado, Flaming Gorge Dam and Reservoir on the Green River in Utah and Wyoming and the Wayne N. Aspinall Storage Unit (Aspinall Unit), formerly named the Curecanti Storage Unit and rededicated in July of 1981, on the Gunnison River in Colorado. The Aspinall Unit consists of three dams and reservoirs: Blue Mesa, Morrow Point and Crystal. Combined, the four storage units provide about 33,583,000 acre-feet of water storage capacity. The Act authorized the construction of eleven participating projects. Ten additional participating projects have been authorized by subsequent congressional legislation.

The storage units and participating projects are described in the twenty-seventh and earlier annual reports of the Upper Colorado River Commission. Progress in construction, planning, operation and investigation of the storage units and participating projects accomplished during the past water year are briefly outlined as follows:

### **1. GLEN CANYON STORAGE UNIT**

Glen Canyon Dam and Reservoir (Lake Powell) comprises the key storage unit of the Colorado River Storage Project (CRSP) and is the largest of the initial four, providing about 80 percent of the storage and generating capacity. Glen Canyon Dam was completed in 1964.



**a. Glen Canyon Dam Environmental Impact Statement and Glen Canyon Environmental Studies**

In 1982 the Department of the Interior (DOI) initiated the Glen Canyon Environmental Studies (GCES) to quantify and qualify the environmental and recreational impacts of the operations of Glen Canyon Dam. Phase I of these studies was completed in 1988. Upon review by DOI, it was determined that additional data were required on the impacts of low and fluctuating flows before any conclusions could be made. Phase II of the GCES was directed to begin in November of 1988 and was completed in draft form in December of 1991. The final report is scheduled for completion in March of 1992.

On July 27, 1989, the Secretary of the Interior directed that an environmental impact statement (EIS) be prepared on the operation of Glen Canyon Dam. The Bureau of Reclamation (Reclamation) was directed to be the lead agency, with other agencies having jurisdictional responsibilities in the area as cooperating agencies. The number of cooperating agencies has grown from the original four to eleven. These include: the Arizona Game and Fish Department, the Department of the Interior's Bureau of Indian Affairs (BIA), Reclamation (lead agency), National Park Service, Office of Environmental Affairs, and U.S. Fish and Wildlife Service (Service); the Native American Havasupai, Hopi, and Hualapi tribes and the Navajo Nation; and the Western Area Power Administration (WAPA).

The primary objective of the Glen Canyon Dam Environmental Impact Statement (GCDEIS), as stated in the GCDEIS Management Plan, is to evaluate the impacts of current and alternative dam operations on the downstream environment and ecological resources of the Glen Canyon National Recreation Area and Grand Canyon National Park. The alternative dam operations to be examined will range from those that emphasize the potential to conserve and maintain the downstream resources to those that emphasize peaking power production.

The EIS will identify and quantify, to the fullest extent possible, the benefits, values and application of the dam and the resources affected by the dam, including, but not limited to, water supply, water quality, recreation, cultural resources, hydroelectric power generation and fish and wildlife (including threatened and endangered species), in light of the statutory responsibilities of the Secretary of the Interior.

The focus of the EIS is to evaluate alternative operations of the dam. In addition, other mitigation measures may be identified to minimize impacts to resources of concern. Alternative dam operations and potential structural and institutional mitigation measures will be considered to formulate the range of reasonable alternatives.

Alternative dam operations may result in off-site cumulative impacts. Given the best available information, the magnitude of these impacts will be identified so that the Secretary of the Interior is informed of the consequences and options available to address these issues.

Ten preliminary alternatives were formulated as a result of the March - May 1990 EIS scoping process and scientific data. These preliminary alternatives were presented to the public in a March 1991 newsletter distributed to over 20,000 entities and at public meetings conducted in April of 1991 in Flagstaff, Arizona; Phoenix, Arizona; and Salt Lake City, Utah. Using the comments received from the 456 letters on the preliminary alternatives and additional scientific research data, seven alternatives were selected for detailed analysis in the EIS. Evaluation of these alternatives will include additional elements that may be added to any alternative. These elements include: Sand pumping, beach protection, beach/habitat building flows, reduced flood frequency, multi-level intake structure and power system adjustments.

The EIS team will be performing impact analysis and writing the EIS in 1992.

#### **b. Recreational Use**

The extensive recreational use of Glen Canyon National Recreation Area, which surrounds Lake Powell, is demonstrated by the fact that for the first 11 months of 1991, 3,132,448 people visited the area. The National Park Service has concession-operated facilities at Wahweap, Dangling Rope, Halls Crossing, Hite and Bullfrog Basin on the reservoir and Lees Ferry, 16 miles below the dam on the Colorado River. The San Juan Marina, which was operated on Lake Powell by the Navajo Nation, is now closed due to a flood in 1989.

From 1909 through 1961, an estimated total of 20,972 people visited Rainbow Bridge. When access to the bridge by water was made available through completion of the dam in 1963, visitation rapidly increased. In 1966, 20,468 people visited Rainbow Bridge, almost as many people as had visited the site during the previous 53 years. Through November of

1991, 255,857 people visited Rainbow Bridge.

## **2. FLAMING GORGE STORAGE UNIT**

Flaming Gorge Dam and Powerplant were completed in 1963. A contract was awarded to uprate the Flaming Gorge Dam generators. Uprating of the units began in the fall of 1990 with completion scheduled for the summer of 1992. This uprate will increase the plant nameplate capacity from 108 megawatts (MW) to about 151 MW. Plans have been developed for the visitor center and dam tour areas to be retrofitted to make the facilities fully accessible to persons with disabilities.

Flaming Gorge National Recreation Area, which surrounds the Flaming Gorge Dam and Reservoir, recorded 2,200,000 visitors during 1990 (latest available figures). The site is administered by the Ashley National Forest. Fishing is an important recreational activity on both the reservoir and in the Green River below the dam.

## **3. NAVAJO STORAGE UNIT**

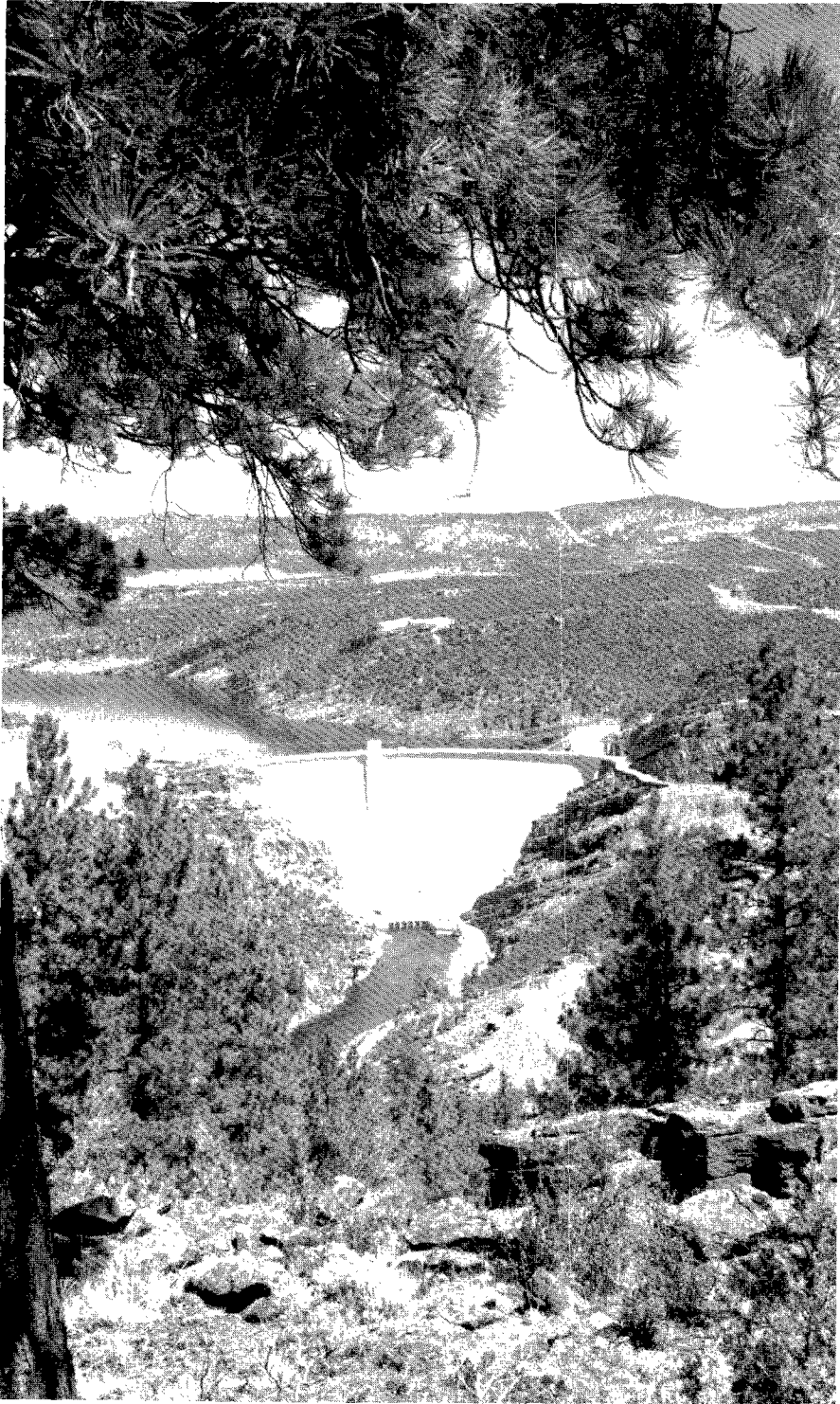
The major purposes of Navajo Dam and Reservoir are to regulate the flows of the San Juan River and to provide a water supply for the authorized Navajo Indian Irrigation Project near Farmington, the San Juan-Chama Participating Project in the Rio Grande Basin and the Hammond Participating Project, all in New Mexico. Part of the water is also used for municipal and industrial (M&I) purposes in northwestern New Mexico. Navajo Dam was completed in 1963.

The Colorado Division of Parks and Outdoor Recreation (CDPOR) and Reclamation have entered into a Memorandum of Agreement (MOA) for water and wastewater improvements at Navajo State Park. The agreement also provides for the rehabilitation of five existing sites administered by CDPOR on Reclamation projects lands on the Western Slope.

## **4. WAYNE N. ASPINALL STORAGE UNIT**

The Wayne N. Aspinall Storage Unit includes three major dams and power plants in the canyon of the Gunnison River downstream from Gunnison, Colorado and upstream from the Black Canyon of the Gunnison National Monument. The three dams are Blue Mesa, Morrow Point and Crystal.

Uprating of Morrow Point Dam generator number one was completed during water year 1990. Testing of the uprated generator revealed that



Flaming Gorge Dam, Colorado River Storage Project, Utah

*-Bureau of Reclamation Photo*

the maximum capacity was only 55 MW instead of the expected 78 MW. The contract was terminated for non-performance. Reclamation has now awarded a new contract to redo the generator and to uprate the second generator. Upgrading of Morrow Point No. 1 is now underway.

The National Park Service administers recreational facilities. In 1990 there were 1,102,283 visitors (latest available figures).

## **5. STORAGE UNITS FISHERY INFORMATION**

The Flaming Gorge, Wayne N. Aspinall, Glen Canyon, and Navajo Units continue to provide excellent warm and cold-water fishing, both in the reservoirs and in tailwater streams below the dams. Use on the reservoirs currently totals approximately 945,477 angler days each year. Lake Powell provides approximately half of the total use, with the remainder coming from the other reservoirs. Angling use on the reservoirs appears to be constant, while demand and use for the four tailwaters is increasing dramatically.

Lake Powell is almost exclusively a warm-water fishery with striped bass, crappie, walleye, channel catfish, and smallmouth and largemouth bass as the harvested species.

Navajo and Flaming Gorge provide both warm-water and cold-water fishing, with rainbow trout and kokanee the predominant cold-water harvest and catfish, bass, and crappie (at Navajo only) the preferred warm-water fishes. Flaming Gorge also provides a world-class lake trout fishery. The Aspinall reservoirs are exclusively cold-water fisheries, with kokanee and rainbow trout the predominant catch.

The four tailwaters have provided "blue ribbon" trout fishing that many view as some of the best in the western United States. Combined, the annual use of these tailwaters is approximately 500,000 angler days annually. The Green River (below Flaming Gorge Dam) receives about half of the total use with the Colorado River (below Glen Canyon Dam), the San Juan River (below Navajo Dam), and the Gunnison River (below Crystal Dam) providing the remainder.

Restrictions on fishing gear and the allowable harvest have been required on these rivers to insure quality use as fishing pressure increases annually. Estimates of the value of a day's fishing on these quality streams range from \$20 to \$100 per day, based on travel cost studies. Using those estimates, the value of these tailwater fisheries could approach \$50 million

annually. Even more importantly, these values tend to increase each year as trout fishing opportunities become better known. Additionally, guides work all these rivers and reservoirs, generating further income.

## B. TRANSMISSION DIVISION

The power system includes high voltage transmission lines that interconnect to the CRSP hydro-powerplants and deliver power to major load centers or to other delivery points. The system is interconnected with adjacent Federal, public and private utility transmission systems. The Transmission Division was transferred to the Western Area Power Administration (WAPA), Department of Energy, in fiscal year 1978.

Generation at CRSP powerplants amounted to 4.68 billion kilowatt hours during water year 1991. The major portion, 3.64 billion kilowatt hours, was produced at Glen Canyon Dam. The balance was produced at Flaming Gorge, Blue Mesa, Morrow Point, Crystal and Fontenelle Dams.

The following table lists the gross generation for fiscal years 1990 and 1991 and the percentage of change:

GROSS GENERATION KWH			
POWERPLANT	FY 1990	FY 1991	PERCENT CHANGE
GLEN CANYON	3,793,819,000	3,644,883,000	- 3.9
FLAMING GORGE	260,302,000	305,850,000	+ 1.2
BLUE MESA	149,329,000	236,476,000	+ 36.8
MORROW POINT	197,203,000	289,637,000	+ 31.9
CRYSTAL	91,181,000	143,098,000	+ 36.3
FONTENELLE	58,753,000	62,298,000	+ 5.7
TOTAL:	4,550,587,000	4,682,242,000	+ 2.8

## C. AUTHORIZED PARTICIPATING PROJECTS

Twenty-one participating projects have been authorized by Congress. Eleven were authorized by the initial authorizing Act of April 11, 1956 (70 Stat. 105); two were authorized by the Act of June 13, 1963 (76 Stat. 96); three were authorized by the Act of September 2, 1964 (78 Stat. 852); and five were authorized by the Act of September 30, 1968 (82 Stat. 886). Eleven are in Colorado, three in New Mexico, two in Utah, three in Wyoming, one in both Colorado and Wyoming, and one in both Colorado and New Mexico. Participating projects develop, or would develop, water in the Upper Colorado River System for irrigation, M&I uses and other purposes and participate in the use of revenues from the Upper Colorado River Basin Fund to help repay the costs of irrigation features that are beyond the ability of the water users to repay.

The following are completed, or nearly completed, participating projects:

Project	State	Dam	Year Completed
Paonia	Colorado	Paonia	1962
Smith Fork	Colorado	Crawford	1962
Florida	Colorado	Lemon	1963
Silt	Colorado	Rifle Gap	1966
Bostwick Park	Colorado	Silver Jack	1971
Dallas Creek	Colorado	Ridgway	1991
Hammond	New Mexico	—	1962
Vernal Unit, CUP	Utah	Steinaker	1961
Emery County	Utah	Joes Valley	1966
Eden	Wyoming	Big Sandy	1952
Eden	Wyoming	Eden	1959
Lyman	Wyoming	Meeks Cabin	1971
Lyman	Utah	Stateline	1979
Seedskadee	Wyoming	Fontenelle	1968

The present status of construction or investigation for the remaining participating projects follows:

## **1. COLORADO**

### **a. Fryingpan-Arkansas Project**

Although the Fryingpan-Arkansas Project is not a participating project of the Colorado River Storage Project because it does not participate in the Upper Colorado River Basin Fund, it is sometimes referred to as a limited participating project because it does utilize water diverted from the Upper Colorado River System to the eastern slope of Colorado.

The Eastern Colorado Projects Office, located in Loveland, Colorado directs the operation and maintenance activities of the Colorado-Big Thompson and Fryingpan-Arkansas Projects. A field office is located in Pueblo to coordinate with the Southeastern Colorado Water Conservancy District and the State Division Engineer and to administer remaining construction contracts in the area.

Work has essentially been completed on Phase II of the Pueblo Fish Hatchery. During 1991, the following species and numbers of fish were produced at the hatchery: Blue catfish, 154,698; blue, 2,050; channel catfish, 1,376,243; hybrid striped bass, 544,033; largemouth bass, 32,714; McCunaughy rainbow trout, 710,432; Pikes Peak native trout, 17,457; rainbow trout, 84,676; saugeye, 183,297; striped bass, 3,592; Tiger muskie, 169,139; walleye, 14,317,712, for a total fish production of 17,596,043.

National Environmental Policy Act (NEPA) compliance was approved on August 1, 1989 for the Round II sale of an additional 51,500 acre-feet of water from Ruedi Reservoir. The 51,500 acre-feet under the approved plan will be reduced by 5,000 acre-feet to be released for the endangered fish of the Colorado River and by the 7,850 acre-feet of Round I sales. Round II water sales will likely resume in 1992.

Contents of reservoirs within the Fryingpan-Arkansas Project as of September 30, 1991, were as follows: Ruedi Reservoir, 90,800 acre-feet; Turquoise Lake, 119,362 acre-feet; Mt. Elbert Forebay, 8,625 acre-feet; Twin Lakes, 114,058 acre-feet, and Pueblo Reservoir, 73,382 acre-feet.

Transmountain diversions from the Colorado River Basin in Colorado during water year 1991 for the Colorado-Big Thompson and Fryingpan-Arkansas projects were as follows: Alva B. Adams Tunnel, 198,900 acre-feet, and Charles H. Boustead Tunnel, 60,000 acre-feet.



## **b. Dolores Project**

Construction of the Pleasant View - Ruin Canyon - Hovenweep pumping plants and laterals was completed in 1990. Construction of Dove Creek Canal, Reach Three is substantially complete.

A \$19.3 million contract for the construction of Reach One of the Towaoc Canal was awarded on September 11, 1989. It will include construction of approximately 8.8 miles of canal with an additional 2.7 miles of pipe laterals. Construction is scheduled for completion in April of 1992.

A \$14.5 million contract for construction of Towaoc Canal Reach Two was awarded on July 24, 1990. Work includes construction of approximately 11.2 miles of canal with associated control and delivery features. Construction will be completed by January of 1993.

The Towaoc Canal is designed to serve the Ute Mountain Ute Indian tribal lands southwest of Cortez, Colorado along with the Montezuma Valley Irrigation Company. The canal will also help to reduce salinity by replacing the existing Lower Hermana Lateral, the Highline Ditch and the Rocky Ford Ditch. The canal will be constructed in three reaches.

A \$5.9 million contract was awarded on May 3, 1989 to install the turbine and generator of the Towaoc Powerplant. The contract calls for complete installation and testing of the power plant equipment by June of 1992. A \$14.4 million contract was awarded on September 6, 1990 for construction of the power plant building and penstock. Towaoc Powerplant will have an installed capacity of 11.4 MW and will generate an estimated 30,300,000 kilowatt-hours during each irrigation season from April to October. Power will be used for irrigation pumping on the Dolores Project. Any excess power will be combined with other CRSP power to be marketed by WAPA.

A \$2.6 million construction contract for the McPhee Dam Powerplant was awarded on May 29, 1990, with completion scheduled in 1992. The plant will have a capacity of 1.35 MW.

A \$5.2 million contract to construct Dove Creek Pumping Plant in Cross Canyon and Monument Creek lateral systems was awarded on February 15, 1990. The contract is scheduled for completion by September 30, 1992.

A contract was awarded in September of 1989 to install the master computer control system and is scheduled for completion during the summer of 1992. A contract to install the communications system for the master computer control system was awarded in July of 1989 with completion also scheduled for the summer of 1992.

A contract for construction of the recreational facilities below McPhee Dam along the Dolores River was awarded in September of 1989. The contract performance period will continue through fiscal year 1992.

The first payment for Block Notice Number One, issued on March 23, 1987 to the Dolores Water Conservancy District, was received in February of 1990. That notice is for all irrigable land using supplemental water within the Montezuma Valley Irrigation Company's system.

Block Notice Number Four was issued on September 4, 1990 and covers all irrigable lands within the Fairview and Cahone full-service pipeline lateral delivery systems. The notice is for 27,644 acre-feet of water. Repayment will begin on February 1, 1997.

Block Notice Number Five was issued to the Ute Mountain Ute Indian Tribe for 1,000 acre-feet of M&I water. Pursuant to the Colorado Ute Indian Water Rights Settlement Act of 1988, the first repayment on February 1, 1991 will be for 160 acre-feet of water. Repayment on the remaining 840 acre-feet will be held until the water is first used.

Block Notice Number Two was issued on May 29, 1987, and Block Notice Number Three was issued on February 22, 1988.

#### **c. Fruitland Mesa Project**

Reclamation has requested that all the lands previously withdrawn for the Fruitland Mesa Project be terminated in their entirety. Through the Withdrawal Review Report submitted to the Bureau of Land Management (BLM), Reclamation has recommended that approximately 22,600 acres be returned to the public domain.

#### **d. San Miguel Project - West Divide Project**

Both projects have been found to be economically unjustified at this time. No activity has occurred on either project since 1982.

#### **e. Florida Project**

The Florida Water Conservancy District commenced generation at Lemon Dam with its 110 KW generator under a lease of power privilege from the Department of the Interior.

#### **f. Dominquez Project (Whitewater)**

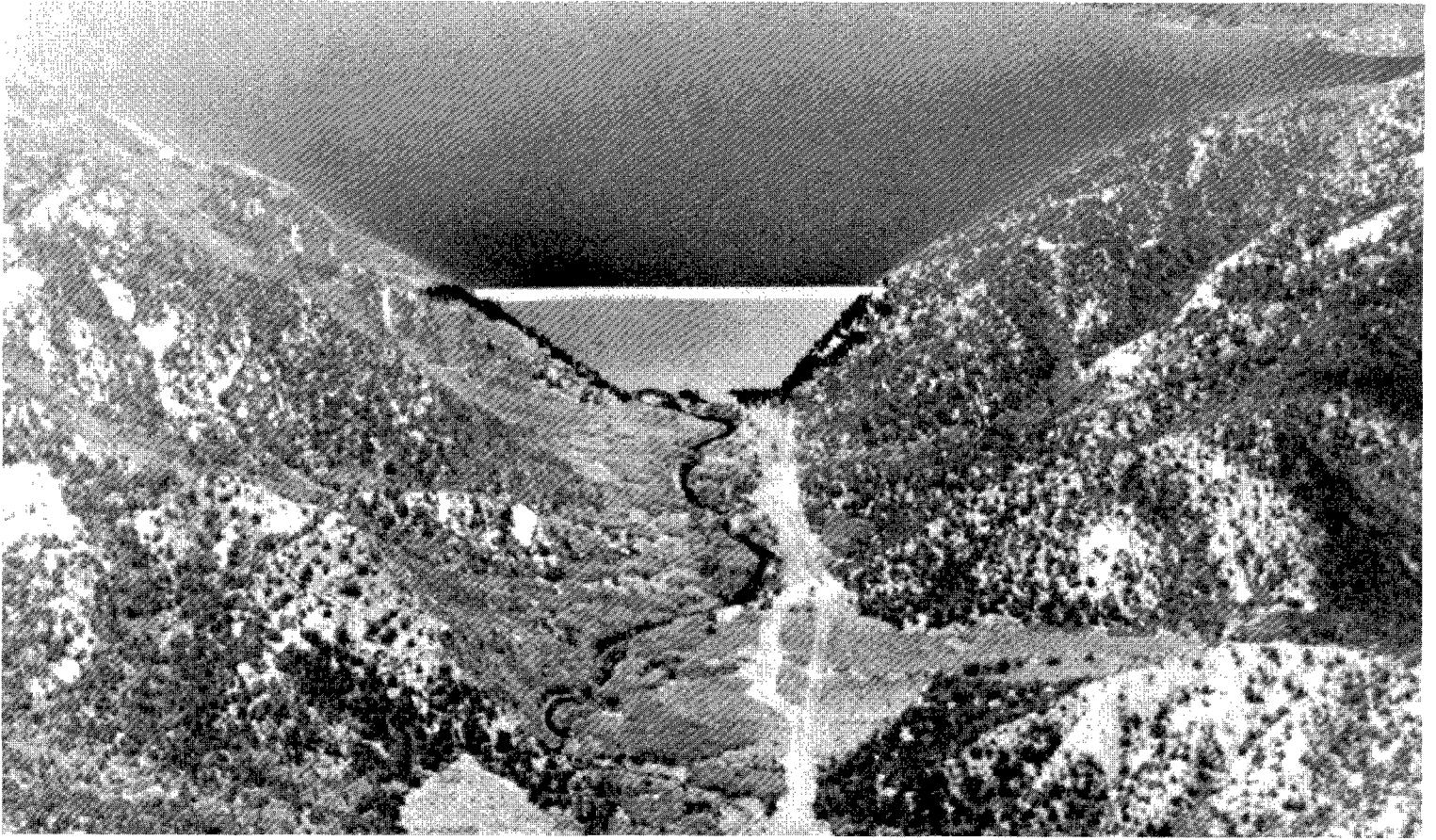
All 28,445 acres of withdrawn Dominquez Project lands have been recommended by Reclamation for termination through the Withdrawal Review Report that was submitted to BLM on December 29, 1988.

#### **g. Dallas Creek Project**

Block Notice Number Two was issued to Tri-County Water Conservancy District for the Dallas Creek Project on March 21, 1990. The notice includes all irrigation waters for the project, involving 11,200 acre-feet. The first payment under the repayment contract will be made in February of 1993.

Block Notice Number One was issued on May 31, 1989, covering all M&I water use. The notice involves 28,100 acre-feet of water. Repayment on that notice began in 1990.

Recreation development at Ridgway Reservoir (Ridgway State Park) continued in fiscal year 1991 with an expenditure of approximately \$2.1 million dollars. Development in fiscal year 1991 focused on the construction of the Dallas Day Use Area. This area is expected to be opened to the public in the spring of 1992. To date, nearly \$11 million has been spent on recreation developments at Ridgway State Park. Development of the recreation facilities is expected to be completed in fiscal year 1994, at a total cost of over \$19 million. Emphasis is placed on handicapped accessibility at Ridgway State Park. In fact, Ridgway is possibly one of the most handicapped accessible parks in the country. Reclamation received an award in 1989 from the group "Physically-Challenged Access to the Woods" (PAW) for Reclamation's efforts in accessibility. In addition, Reclamation received recognition from the Great Outdoors Colorado Citizens Committee in January of 1991 for Ridgway State Park as "exemplifying creativity and cooperation in the enhancement of Colorado's outdoor resources."



Artist Rendering of Animas La-Plata Project, Colorado

—*Bureau of Reclamation Photo*

## **2. COLORADO AND NEW MEXICO**

### **a. Animas-La Plata Project**

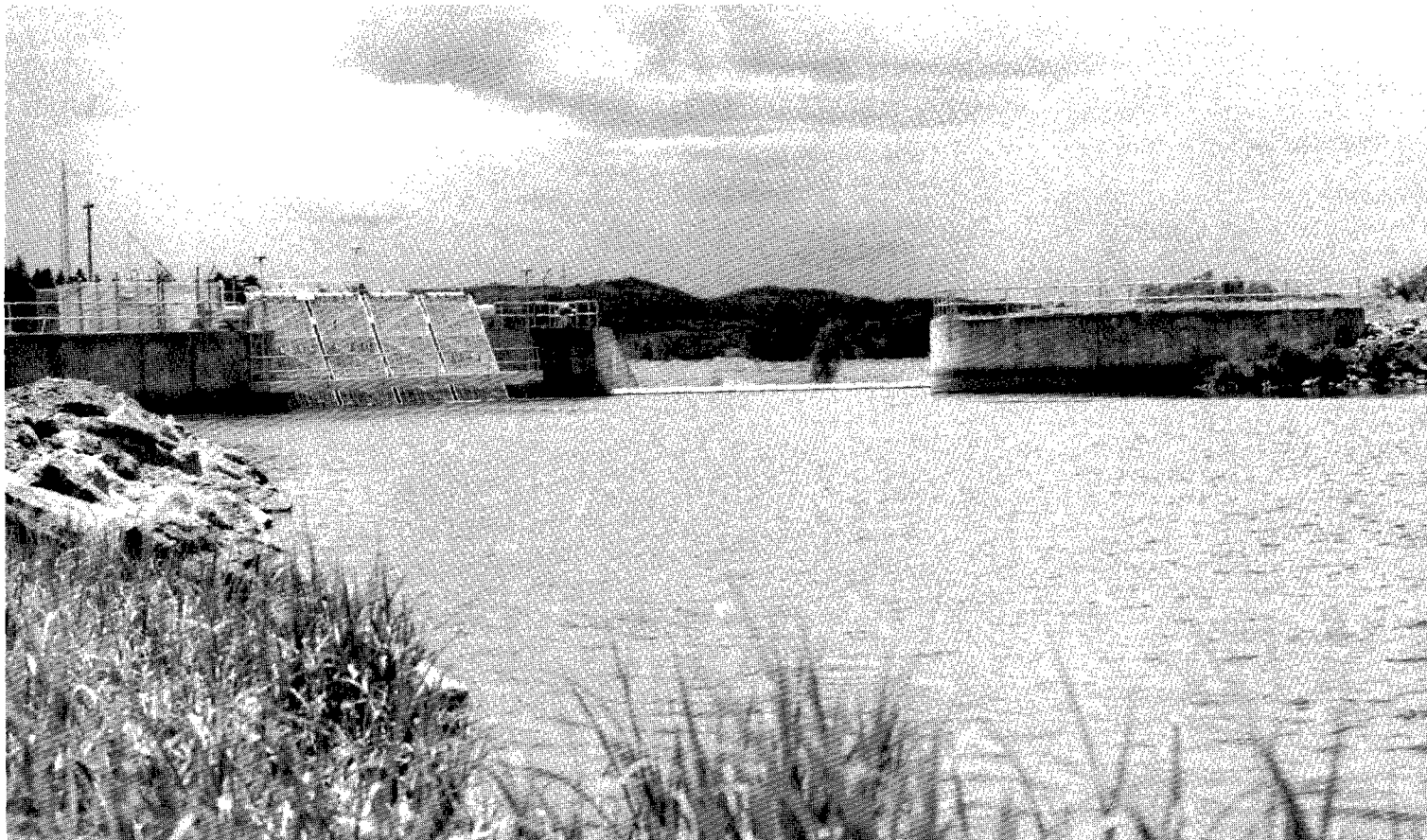
In 1979, the U.S. Fish and Wildlife Service (Service) provided a non-jeopardy opinion on the project. However, between 1986 and 1989, additional data were collected concerning the Colorado squawfish in the San Juan River in New Mexico. That data reaffirmed the existence of a small population of the fish.

As a result, in February of 1990, Reclamation requested re-initiation of consultation under the Endangered Species Act. In May of 1990, the Service rendered a draft Biological Opinion that contained a jeopardy opinion with no reasonable and prudent alternatives.

Following exhaustive consultation between Reclamation and the Service, a revised draft Biological Opinion was issued on March 21, 1991, that would allow for construction of Ridges Basin Dam and Durango Pumping Plant and inlet pipeline. A final opinion was issued on October 25, 1991 by the Service following the October 24, 1991 signing of a Memorandum of Understanding (MOU) by the States of Colorado, New Mexico and Utah, the Secretary of the Interior, the Southern Ute and Ute Mountain Ute Indian Tribes, and the Jicarilla Apache Tribe. The MOU provides for a Recovery Implementation Program for the endangered fish and makes possible the initiation of construction of the project. The MOU also provides for the protection of San Juan River flows through the occupied habitat stretch of the river.

The Biological Opinion contains five elements:

1. An initial depletion of 57,100 acre feet per year is anticipated. This depletion will allow construction of Ridges Basin Dam and Reservoir and Durango Pumping Plant and inlet pipeline.
2. Seven years of research on the San Juan River and its tributaries to collect critical information about the endangered fish and their habitats will initially be funded by Reclamation until the Recovery Implementation Plan is in place. Further Section 7 consultation will be required before beginning construction of any project facilities that would require the depletion of more than 57,100 acre-feet.
3. Over the next seven years, Navajo Dam will be operated under study guide lines to mimic a natural hydrograph, including test flows that consist of high spring flows followed by low summer, fall and winter flows.



Oso Diversion Dam, San Juan—Chama Project—Colorado/New Mexico

—*Bureau of Reclamation Photo*

4. At the end of the seven year research period, Navajo Dam would be operated to mimic a natural hydrograph based on research flow recommendations.

5. Reclamation affirms that releases of water from Navajo Dam specifically for the purpose of restoring or enhancing the endangered fish must be legally protected before any depletions occur from the Animas-La Plata Project.

In addition, a Recovery Implementation Program for the San Juan River Basin is under development and should be completed within the next year.

### **3. COLORADO AND WYOMING**

#### **a. Savery-Pot Hook Project**

Reclamation has submitted a Withdrawal Review Report to the BLM that will terminate all the withdrawn lands, totaling 11,303 acres, that were previously withdrawn from the public domain for construction of the Savery Pot-Hook Project.

### **4. NEW MEXICO**

#### **a. Navajo Indian Irrigation Project**

Reclamation is continuing to progress toward completion of the Navajo Indian Irrigation Project in San Juan County, New Mexico.

Reclamation is providing design and construction management for the Bureau of Indian Affairs (BIA). In this process, funding is sought by BIA in its budget appropriation rather than by Reclamation.

Congress has continued its efforts to have the project completed. The fiscal year 1992 budget includes a \$16.1 million budget for the project.

By the end of 1991, 6 blocks were completed that are capable of irrigating 60,000 acres of land. Construction of Block 7, Schedule 3, is underway and nearly complete. Block 7, Schedule 4, is scheduled to be awarded in late December of 1991 or early January of 1992. The completion of Block 7 will add about 10,000 more acres of irrigated land to the project.

The entire project involves 11 blocks of construction and will have a total of 110,630 acres of irrigated land.

## 5. UTAH

### a. Central Utah Project

The Central Utah Project will provide water for irrigation, M&I uses and power generation. Benefits will also be realized in the fields of outdoor recreation, fish and wildlife conservation, flood control, water quality control and area development. The Initial Phase consists of six units. The largest of these is the Bonneville Unit, which involves the diversion of water from the Uintah Basin, a part of the Colorado River Basin, to the Great Basin, with associated resource developments in both Basins. The other five units, Vernal, Uintah, Upalco, Jensen and Ute Indian, provide for local development in the Uintah Basin.

i. **Bonneville Unit.** Stage II construction of Jordanelle Dam is well underway. The embankment is 25 feet above ground. During the winter months, crews are working in the river outlet tunnel. Work on the embankment will resume after the spring thaw.

Construction is still on schedule for a 1992 completion of embankment work. Work in 1993 will include installation of the gates and control structures. Filling will begin in 1994.

Significant progress has been made concerning future recreation use at Jordanelle. The Jordanelle Master Plan was scheduled for completion in October of 1990. A contract for recreation management by the Utah Division of Parks and Recreation was signed in December of 1990. An Architectural and Engineering contract for the design of recreation facilities was awarded in February of 1991. Designs should be completed by July 1, 1992. The recreation construction contract should be awarded in late 1992 with completion by July of 1994.

The Supplement to the Final Environmental Statement for the Diamond Fork System was filed on February 26, 1990. The document addresses revisions to the proposed system that would provide the conveyance facilities for the Irrigation and Drainage System of the Bonneville Unit.

Legislation was reintroduced in 1991 by the Utah congressional delegation to increase the ceiling for the Colorado River Storage Project, primarily to allow completion of the participating Central Utah Project Bonneville Unit. That legislation has passed the House and is being considered by the Senate as part of an Omnibus Reclamation Bill.



The construction of a boat ramp access road and campground at Upper Stillwater Reservoir was completed. Planning/construction costs in fiscal year 1991 were \$202,775.42. Additional work will take place in 1992 at Upper Stillwater Dam.

Recreation facilities at Starvation Reservoir including development of a water system, campground, beach area, landscaping, sprinkler system and shelters were completed. Planning/construction costs in fiscal year 1991 were \$801,522.

**ii. Vernal Unit.** Reclamation is presently gathering design data for designing modifications to Steinaker Dam as part of the Safety of Dams program. While the existing dam is structurally sound, modifications will enable the dam to better withstand an earthquake. It has been determined that during a strong earthquake, portions of the dam's foundation could liquefy. A structural modification of the dam is necessary to prevent that from happening. Tentative plans call for a construction contract for modifying the dam in June of 1992. Construction is expected to last one season, starting in the fall of 1992 and ending the following spring.

Work at Steinaker Dam will be timed so that there should be no interruption of water supplies from the dam to irrigators. The modification work will be timed such that activity requiring the drawdown of the water level will be performed in the fall after the irrigation season, with completion before spring runoff.

## **6. WYOMING**

### **a. Lyman Project**

Drilling activities at Meeks Cabin Dam under the Safety of Dams program concluded during the summer of 1987. A Modification Decision Analysis Report was completed in 1989. It has been determined that a structural modification is necessary to lessen seepage and eliminate the potential for a piping failure. It is expected that a construction contract for the appropriate modification will be awarded in December of 1992, or early in 1993.



Fontenelle Dam, Seedskaadee Project, Wyoming

—*Bureau of Reclamation Photo*

## D. RECREATIONAL USES AT PARTICIPATING PROJECT RESERVOIRS

The following estimated recreation days occurred in 1990 (latest available figures) at the reservoirs listed below:

RESERVOIR	YEAR FIRST VISITED	1990
Curecanti (Aspinall)	1966	1,102,283
Currant Creek	1982	62,730
Crawford	1963	81,712
Flaming Gorge	1962	2,200,000
Fontenelle	1965	14,500
Heron	1973	114,639
Huntington North	1967	62,590
Joes Valley	1967	92,681
Lake Powell	1962	3,103,431
Lemon	1964	32,100
McPhee	1985	160,455
Meeks Cabin	1973	1,642
Nambe Falls	1977	37,425
Navajo	1963	448,793
Paonia	1962	12,783
Red Fleet	1982	33,689
Ridgway	1989	243,107
Rifle Gap	1967	67,556
Silver Jack	1973	87,455
Starvation	1970	24,117
Stateline	1982	5,600
Steinaker	1962	13,024
Strawberry [enlargement]	1985	118,992
<b>TOTAL</b>		<b>8,121,304</b>

## **E. POTENTIAL PARTICIPATING PROJECTS**

In carrying out further investigation of projects under Federal Reclamation laws in the Upper Colorado River Basin, the Secretary of the Interior is directed to give priority to completion of planning reports on a number of potential projects. Reclamation, so far as limited funds and personnel will permit, is continuing studies on these projects.

### **1. COLORADO**

#### **a. Grand Mesa Project**

No activity has occurred on this project since 1982. A planning report concluding the study was approved on July 13, 1982.

### **2. UTAH**

#### **a. Central Utah Project, Ute Indian Unit**

No activity has occurred on this unit since 1980. A concluding report was approved on May 30, 1980.

### **3. WYOMING**

#### **a. Sublette Project**

A concluding report was approved on April 24, 1980.

## **F. STATUS OF OTHER BUREAU OF RECLAMATION PROJECTS IN THE UPPER COLORADO RIVER BASIN**

### **1. COLORADO**

#### **a. Fruitgrowers Dam Project**

Reclamation has recently entered an agreement with the Audubon Society to manage the lands around Fruitgrowers for wildlife habitat enhancement and viewing.

#### **b. Uncompahgre Project**

The Final Environmental Impact Statement for the AB Lateral Hydropower Project was filed on August 28, 1990, and the Record of

Decision recommending that development proceed was signed on December 20, 1991. The proposed 43 MW facility would be privately funded and operated by Montrose Partners and the Uncompahgre Valley Water Users Association.

Under the Technical Assistance to the States program, Reclamation is providing guidance and expertise in the development of a hiking/biking trail in Delta, Montrose and Ouray Counties. When complete, this 60-mile long trail will connect the communities of Delta, Olathe, Montrose, Colona, Ridgway and Ouray, Colorado. The trail will be located on existing public and cooperating landowners' rights-of-way, utilizing as much as possible an abandoned railroad grade once used by the old Denver and Rio Grande Western Narrow Gauge Railroad. Uncompahgre Riverway, Inc., a non-profit organization made up of several community groups, is promoting the development of the trail. Reclamation's role in this project is to identify and coordinate the acquisition of rights-of-way for the trail.

## **G. INVESTIGATIONS**

The fiscal year 1991 budget for the planning program is about \$2.6 million, with about 80 percent being directed within the Upper Colorado River Basin. Active studies include the salinity control efforts for the Price-San Rafael, Glenwood-Dotsero Springs, and San Juan River Units, plus additional studies in areas such as diffuse source control, industrial use, and co-generation/desalination opportunities in the basin.

Other active studies are: Upper Gunnison-Uncompahgre Basin, Sevier River Water Management, Four Corners Water Assessment, Utah Area Water Demand Model and the New Mexico Regional Water Resource Study. New studies beginning this year include the Eastern New Mexico Water Supply Study, Dolores River Water Quality Study and the Middle Rio Grande Water Assessment Management Study. Reclamation also continues to provide assistance, as requested, through Technical Assistance to the States activities as well as activities of environmental and interagency coordination and other minor work. A program for evaluating system optimization on some existing projects is continuing this year, with several projects scheduled for evaluation.

## **1. COLORADO**

### **a. Upper Gunnison-Uncompahgre Basin Study**

Phase I of this study was conducted by the Colorado Water Resources and Power Development Authority, with assistance from Reclamation, and was completed in 1989. Phase I involved an appraisal-level study of the recreation and water supply development opportunities in the basin including the potential for transmountain diversion of water to the east slope for M&I uses.

Phase II was initiated in 1990. It is co-sponsored by seven Federal, State and local entities and will define the hydrology and water rights in the basin and develop two computer models. One model will be a water accounting spreadsheet that will accurately reflect the daily administration of the major water rights and exchanges in the Gunnison Basin. The second will be a computer based planning model for the basin. Reclamation investigation funds are being used in fiscal year 1991 to continue the study.

### **b. Four Corners Water Assessment**

This investigation began in fiscal year 1990 and continued in fiscal year 1991 to investigate and recommend more effective management and use of water resources in the Four Corners area. The study will also characterize water quality and environmental problems associated with water development and supply facilities.

## **2. UTAH**

### **a. Sevier River Water Management Studies**

These studies continued in fiscal year 1991. A status report was completed in 1990. Included in the studies is the installation of a system to accelerate data collection and the distribution of data to water managers, the development of a system of computer graphics to facilitate data interpretation and the evaluation or development of real-time models to assist decision makers with water accounting and operation. The operating models would be useful for water deliveries, minimizing flood damage, protecting aquatic habitat, improving water quality and maximizing power generation.

### **b. Utah Area Water Demand Model**

This study will continue in fiscal year 1992. A status report was

completed in March of 1991. The study will develop an interactive computer model to be used by water managers and planners to forecast changing municipal and industrial water demands, to evaluate water conservation implementation strategies and to develop drought contingency plans. The model will be a critical element in developing long-term forecasts and prioritizing future water resource strategies involving system optimization and water conservation options and impacts. It will also assist in evaluating the short-term options necessary to better operate the existing urban infrastructure.

## **H. RESERVOIR OPERATIONS**

Water year 1991 marked the fifth consecutive year of below normal flow in the Colorado River Basin. Although basin wide precipitation during 1991 was over 95 percent of normal, runoff into Lake Powell was only 60 percent of normal. This illustrates the effect that the previous years of low precipitation have had on the basin. Even though inflow on the Colorado River was below normal during water year 1991, there has been an improvement in the condition of the basin above Lake Powell. This is demonstrated by the fact that most of the reservoirs located upstream from Lake Powell nearly filled during the year and the Palmer drought index improved from a severe drought to a moderate drought.

During water year 1991, the drawdown of the Colorado River system reservoirs that began in 1988 continued. An additional 1.7 million acre-feet was lost from storage in the entire Colorado River storage system during 1991. The October 1, 1991 system vacant space was about 17.4. This large vacant space is a result of the five lowest successive years of inflow into Lake Powell on record (1987 through 1991). During this drawdown period, objective deliveries of water have been maintained in accordance with the "Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs" (Operating Criteria).

### **1. ANNUAL OPERATING PLAN DEVELOPMENT**

On October 23, 1990, Secretary of the Interior Manuel Lujan, Jr. transmitted letters approving an Annual Operating Plan for water year 1991. The Operating Plan was developed through the cooperation of representatives of the seven Basin States, Reclamation, WAPA and other agencies.

The Annual Operating Plan was developed with "appropriate consid-

eration of the uses of the reservoirs for all purposes, including flood control, river regulation, beneficial consumptive uses, power production, water quality control, recreation, enhancement of fish and wildlife, and other environmental factors” (Operating Criteria Article I (2)). The Annual Operating Plan stated that a “normal” water supply was available for beneficial use in the Colorado River Basin.

During water year 1991:

1. The minimum release objective of 8.23 million acre-feet was made from Lake Powell.
2. No flood control releases were made from Lake Mead.
3. The guaranteed annual quantity of 1.5 million acre-feet was delivered to Mexico.
4. All requests by Lower Basin mainstream holders of surplus water contracts in the U.S. are expected to be fully satisfied as California water contract holders were allowed to use water apportioned to but not used by the States of Arizona and Nevada.
5. Salinity provisions of Minute 242 were met.

## 2. RUNOFF AND RESERVOIR CONTENTS AND RELEASES

In 1991, the snowmelt inflow into Lake Powell during the April through July period totaled 5.3 maf or approximately 65 percent of the 1906-1985 average. The computed unregulated discharge at Lees Ferry for the water year ending September 30, 1991 was 8.4, which is approximately 71 percent of the 1906-1985 average. The following tabulation lists the breakdown of discharges in acre-feet in the Upper Colorado River Basin:

	<b>Acre-feet</b>
Net change in surface storage	-359,000
Net change in bank storage	-105,000
Net evaporation	591,000
Glen Canyon releases	8,230,000
Paria River discharge	<u>10,000</u>
Total Unregulated Discharge at Lees Ferry	8,367,000



In water year 1991, Lake Mead storage decreased by 911,000 acre-feet since the minimum release objective of 8,230,000 acre-feet was released from Lake Powell and water delivered out of Lake Mead totalled 9,227,000 acre-feet.

In water year 1991, most of the reservoirs upstream of Lake Powell filled and are currently being drawn down in anticipation of a near-normal runoff in 1992; however, the lingering dry basin conditions are expected to affect the quantity of runoff into Lake Powell in 1992.

**a. Lake Powell**

Lake Powell reached its high content of 15,887,900 acre-feet on June 30, 1991, and its low content of 14,533,200 acre-feet on April 12, 1991.

At Lees Ferry, the calculated discharge for the water year ending September 30, 1991 was 8,111,000 acre-feet, including approximately 10,000 acre-feet from the Paria River.

Lake Powell finished the 1991 water year with a measured annual release of 8.23 maf all of which went through the power plant except 17,000 acre-feet.

On July 31, 1991, the test flows for the Glen Canyon Environmental Studies (GCES) were completed on schedule. On August 1, 1991, the Secretary of the Interior announced that test interim flows controlling minimum, maximum and fluctuating releases would be implemented at Glen Canyon. These test interim flows were developed using the best available information and were implemented at that time in order to test the feasibility of limiting releases on an interim basis until the completion of the GCEIS. After a favorable completion of the test interim flows and the completion of exception criteria, interim flows were implemented at Glen Canyon Dam on November 1, 1991. The interim flows will remain in effect until completion of the GCEIS in order to reduce the alleged effects of power operations on downstream natural resources.

In 1992, the most probable April through July runoff into Lake Powell is expected to be 5,700,000 acre-feet or approximately 70 percent of the long term average. The most probable maximum content of Lake Powell is expected to be approximately 15.9. Considering the current amount of storage and the level of expected runoff, the risk of spilling is negligible.

## **b. Flaming Gorge Reservoir**

The 1991 annual inflow into Flaming Gorge Reservoir was approximately 78 percent of the long term average. This level of inflow combined with slightly above minimum releases, allowed the elevation of Flaming Gorge to recover 12 feet. But, even with this recovery, the reservoir was 8 feet short of filling in 1991.

The special releases at Glen Canyon for the environmental studies resulted in releases from Flaming Gorge being above minimum levels in 1991. This increase in release was necessary to give WAPA more flexibility in keeping the power system whole in the event of an emergency. The releases were increased with the understanding that Flaming Gorge will only be used as a last resort, i.e., power from other sources could not be purchased.

A limited number of specific releases were provided in 1991 for research and data collection for studies concerning aquatic resources located below the dam. Colorado squawfish young-of-the-year were found in the mainstream of the Green River in mid-July of 1991 and, as recommended by the Fish and Wildlife Service (Service), restrictions on releases were implemented in order to provide better habitat for the young Colorado squawfish. During 1991, these restrictions were met, and Reclamation fully expects to meet these and any additional reasonable recommendations for releases that will improve the habitat of threatened or endangered fish located downstream of the reservoir in 1992.

Under all but the most adverse inflow scenarios, Flaming Gorge is expected to fill in the summer of 1992 and releases are expected to be well above minimum levels.

## **c. Fontenelle Reservoir**

Water year 1991 marked the second full year of normal operations of the dam since installation of the concrete cutoff wall. The cutoff wall is still performing very satisfactorily, since seepage has been considerably reduced. With the inflow during water year 1991 at about 83 percent of average, the reservoir easily filled. Approximately 150,000 acre-feet of water bypassed the turbines. Since the mean annual inflow of 1.2 maf far exceeds the storage capacity of 345,000 acre-feet, there is little chance that the reservoir will not fill during water year 1992. In order to minimize spring high releases and to maximize downstream fishery resources and power production, the reservoir will probably be drawn down to mini-

mum pool elevation (6,463.5 feet) which corresponds to a volume of 93,000 acre-feet of live storage.

To meet these operational objectives, a constant release of approximately 1,200 cfs will be made through the fall and winter months. Releases at this level will provide an appropriate level of drawdown for next season, provide greater fishery benefits and also improve water quality for downstream municipal and industrial uses. Under all but the most adverse inflow assumption, the reservoir is expected to fill in the summer of 1992.

#### **d. Navajo Reservoir**

With 1991 inflow at 89 percent of normal, the storage of Navajo Reservoir recovered to normal levels, although the reservoir was approximately 90,000 acre-feet short of filling. During May of 1991, releases of 3,000 cfs were made in order to accommodate studies for endangered fish and to flush silt that has accumulated over the past two years of minimal release levels from the river bed. After the completion of the specific releases, discharge from the reservoir was reduced to 600 cfs. The objective is to maintain a release of 500 cfs from the reservoir to meet downstream water rights and to preserve the blue ribbon sport fishery located immediately downstream of the reservoir. The release of 500 cfs is an objective only and is not a minimum flow requirement.

Under all but the most adverse inflow scenarios, Navajo Reservoir should fill in 1992. Releases from the reservoir will be held near 600 cfs through the fall and winter months, and large releases will be made in May and June in order to provide better spawning conditions for endangered Colorado squawfish located in the San Juan River. Additionally, specific releases will be made from the reservoir in order to study habitat requirements of the Colorado squawfish. These specific releases will be part of a seven-year study that is proposed by the Service to study the habitat needs of the Colorado squawfish in the San Juan River Basin.

#### **e. Blue Mesa, Morrow Point and Crystal Reservoirs (Aspinall Unit)**

Even though water year 1991 inflow was only 77 percent of normal, the Aspinall Unit filled in early June. The filling of the unit during 1991 was the result of only minimum releases being made during 1989 and 1990. The minimum release objective of the unit is to meet the delivery requirements of the Uncompahgre Valley Project and to keep a minimum of 300 cfs flowing through the Black Canyon of the Gunnison National Monument.

During 1991, flows of over 4,000 cfs were experienced in the Black Canyon as inflows of over 8,000 cfs occurred. To protect the blue ribbon trout fishery in the Black Canyon, releases were carefully planned to minimize large fluctuations in the daily and monthly flows. This was accomplished with only minimal amounts of water bypassing the powerplants at Blue Mesa and Morrow Point.

By December of 1992, Blue Mesa Reservoir will be drawn down to at least an elevation of 7,495.0 feet in order to minimize icing problems in the Gunnison River. Blue Mesa will continue to be drawn down through April of 1992 to a level that will accommodate the most probable inflow scenario and accomplish the release objectives with a minimum of power plant bypasses.

Under all but the most adverse inflow scenarios, Blue Mesa is expected to fill in the summer of 1992. The filling of the reservoir next year will insure that reasonable specific releases required to study the protection and improvement of habitat for endangered fish can be accommodated. The forecasted runoff during the spring of 1992 will be constantly monitored to achieve these objectives.

## **I. FISH AND WILDLIFE**

The Colorado River Endangered Fishes Recovery Program is in its fourth year of implementation. Approximately 35 projects have been funded for Fiscal Year 1992, totaling almost \$2.97 million. Two additional projects were funded under the Drought Assistance Program administered by Reclamation. These two projects are designed to develop refuge ponds on the Green and Colorado Rivers that can be used during drought or low flow conditions, offering protection for the endangered fish of the Colorado River System during these adverse conditions. Research activities initiated in 1991, including the investigation of chemical cues believed to be important in the migration and spawning of several endangered species and the taxonomic status of the three species of chub, will continue in fiscal year 1992. Activities in the area of genetics and propagation of the various stock of Colorado squawfish and razorback sucker also continue to be a high priority. These activities remain the most important in future recovery activities in the Upper Colorado Basin.

The Service is expecting to issue a draft opinion on the operation of Flaming Gorge Dam early in January of 1992. The opinion is expected

to request “mimicry” of the natural hydrograph: Flows in the spring will be high and timed with run-off of the Yampa River, followed by flows in the summer and fall. Such releases are believed to provide for the life history needs of the four endangered fish.

Studies will continue on the Green River to monitor effects of the recommendations made in the opinion and to refine the recommendations at the end of the five year research period. Specific research on effects of the operation of Aspinall will be initiated in 1992. Consultation on the operation of the Aspinall Unit is expected to be completed in five years.

Efforts are still on-going to acquire water rights on the Yampa and 15-mile reach of the Colorado River from the confluence of the Gunnison River to Grand Valley Diversion. The State of Colorado is expected to file for an instream flow right for the 15-mile reach in early 1992.

Reclamation and the Service completed consultation on the Animas-La Plata Project in October of 1991. The Secretary of the Interior signed a Memorandum of Understanding with the States of Colorado, Utah and New Mexico, and various Native American Tribes for the development of a Recovery Implementation Program for the San Juan River. The Service, Reclamation and interested parties are currently working on the formulation of the San Juan River Recovery Program. The goal of the San Juan River Recovery Implementation Program would be to protect and recover the endangered fish in the San Juan River while providing a consultation process for water development consistent with State and Federal laws.

In the interim, Reclamation and the BIA have committed to fund research for fiscal year 1992 on the San Juan River as a condition of the reasonable and prudent alternative for the Animas-La Plata opinion and for blocks 7-8 of the Navajo Indian Irrigation Project.

## **J. APPROPRIATION OF FUNDS BY THE UNITED STATES CONGRESS**

The funds appropriated for fiscal year 1992 for construction of the Colorado River Storage Project, participating projects, and recreational and fish and wildlife activities totaled \$126,371,000, including \$186,000 for drainage and minor construction. Recreation and fish and wildlife activities received a total of \$31,278,000, with \$13,642,000 for recreation and the balance for fish and wildlife.

In addition, under the Colorado River Basin Salinity Control Program, \$16,371,000 were appropriated for the Grand Valley Unit, \$4,410,000 for the Paradox Valley Unit, and \$6,998,000 for Stage 1 of the Lower Gunnison Unit.

Table 5, page 64, illustrates a general recapitulation of action by the First Session of the 102nd Congress pertaining to appropriations of funds for the construction program of the Colorado River Storage Project and participating projects.

Table 6, page 65, shows the total funds appropriated by the U. S. Congress for the Colorado River Storage Project and participating projects and chargeable against the limitations of various authorizing Acts (P.L. 485, 84th Congress, Colorado River Storage Project Act, as amended in 1972 by P.L. 32-370 and in 1988 by P.L. 100-563; P.L. 87-485, San Juan-Chama and Navajo Indian Irrigation Projects Act; P.L. 88-568, Savery-Pot Hook, Bostwick Park, Fruitland Mesa Projects Act; P.L. 90-537, Colorado River Basin Project Act).

TABLE 5  
COLORADO RIVER STORAGE PROJECT  
FISCAL YEAR 1992 PROGRAM

Project and State	Budget Estimate	House Allowance	Senate Allowance	P. L. 102-104 Aug. 17, 1991
Construction Program				
CRSP Participating Projects:				
Animas-La Plata - Colorado	\$ 3,000,000	\$ 3,000,000	\$ 3,000,000	\$ 3,000,000
Central Utah Project - Utah				
Bonneville Unit	27,577,000	27,577,000	34,577,000	34,577,000
Uintah Unit*	50,000	50,000	50,000	50,000
Dolores Project - Colorado	<u>54,280,000</u>	<u>54,280,000</u>	<u>54,280,000</u>	<u>54,280,000</u>
	\$ 84,907,000	\$ 84,907,000	\$ 91,907,000	\$ 91,907,000
Drainage and Minor Construction				
CRSP Participating Projects:				
Dallas Creek Project - Colorado	<u>186,000</u>	<u>186,000</u>	<u>186,000</u>	<u>186,000</u>
	\$ 186,000	\$ 186,000	\$ 186,000	\$ 186,000
TOTAL - Upper Colorado River Basin Fund	<u>\$ 85,093,000</u>	<u>\$ 85,093,000</u>	<u>\$ 92,093,000</u>	<u>\$ 92,093,000</u>
Recreational and Fish and Wildlife Facilities				
Recreational Facilities	\$ 13,642,000	\$ 13,642,000	\$ 13,642,000	\$ 13,642,000
Fish and Wildlife Facilities	<u>16,636,000</u>	<u>23,636,000</u>	<u>17,636,000</u>	<u>17,636,000</u>
	\$ 30,278,000	\$ 37,278,000	\$ 31,278,000	\$ 31,278,000
TOTAL - Colorado River Storage Project	<u>\$115,371,000</u>	<u>\$122,371,000</u>	<u>\$123,371,000</u>	<u>\$123,371,000</u>

\* Limited to preconstruction activities.

Table 6

APPROPRIATIONS BY THE CONGRESS  
for the  
COLORADO RIVER STORAGE PROJECT AND  
PARTICIPATING PROJECTS

<u>Fiscal Year</u>	<u>Amount</u>
1957 .....	\$13,000,000
1958 .....	35,142,000
1959 .....	68,033,335
1960 .....	74,459,775
1961 .....	58,700,000
1962 .....	52,534,500
1963 .....	108,576,000
1964 .....	94,036,700
1965 .....	55,800,000
1966 .....	45,328,000
1967 .....	46,648,000
1968 .....	39,600,000
1969 .....	27,700,000
1970 .....	25,740,000
1971 .....	24,230,000
1972 .....	27,284,000
1973 .....	45,770,000
1974 .....	24,426,000
1975 .....	22,967,000
1976 .....	38,160,000
Transition Quarter (July, August, September 1976) .....	15,562,000
1977 .....	55,200,000
1978 .....	67,051,000
1979 .....	76,799,000
1980 .....	81,502,000
1981 .....	125,686,000
1982 .....	130,063,000
1983 .....	132,942,000
1984 .....	161,104,000
1985 .....	163,503,000
1986 .....	97,412,000
1987 .....	110,929,000
1988 .....	143,143,000
1989 .....	174,005,000
1990 .....	163,653,000
1991 .....	145,063,000
1992 .....	92,093,000

TOTAL .....\$2,863,845,310

Plus: Navajo Indian Irrigation Project Appropriations ..... 281,379,491

TOTAL APPROPRIATIONS .....\$3,145,224,801

Exclusive of non-reimbursable funds for fish and wildlife, recreation, etc., under Section 8 of P.  
L. 485, 84th Congress.



## **WATER QUALITY PROGRAM IN THE UPPER COLORADO RIVER BASIN**

*(Information relative to the Water Quality Program in the Upper Colorado River Basin has been obtained from the United States Department of the Interior, Bureaus of Reclamation and Land Management, and the United States Department of Agriculture, Soil Conservation Service.)*

Title II of the Colorado River Basin Salinity Control Act, Public Law 93-320 (approved June 24, 1974) authorized and directed the Secretary of the Interior to construct, operate and maintain four salinity control units as the initial stage of the Colorado River Basin Salinity Control Program and to expedite completion of the planning reports on twelve units. Title II also provided for the establishment of the Colorado River Basin Salinity Control Advisory Council. Public Law 98-569, the Colorado River Basin Salinity Control Act, Amendment, was passed by the 98th Congress and signed by the President on October 30, 1984.

The 1984 Amendments to the Colorado River Salinity Control Act required the Secretary of the Interior to develop a comprehensive program to minimize salt contributions from lands administered by the Bureau of Land Management (BLM). The July 1987 Report to Congress, "Salinity Control on BLM-Administered Public Lands in the Colorado River Basin," addressed the extent of salt contributed from public lands, current actions and future recommendations to achieve the objective of minimizing salinity contributions while recognizing multiple-use objectives and authorized uses.

During the 1991 water year, BLM established a salinity strategy for future project funding and implementation beginning in 1994. The strategy provisions include: Phase I - ranking of watersheds in the Colorado River Basin by interagency teams; Phase II - reconnaissance plans of watersheds by interagency multidisciplinary teams who determine which areas have the best potential for improvement. The results will use Pacific Southwest Interagency Committee (PSIAC) procedures to determine soil loss, sediment and quantify benefits of potential treatments; Phase III - comprehensive plans will use the Revised Universal Soil Loss Equation (RUSLE) to estimate soil erosion. Planning will involve all users and interested publics to ensure coordination and implementation; economic analysis will be cost-effectiveness and comparable with Reclamation and USDA procedures; Phase IV - implementation will be accomplished as rapidly as funding is available, and all after 1994 will have

gone through these procedures: Phase V - maintenance will assure continued functioning of treatments: Phase VI - monitoring will be designed for efficient and effective progress evaluations and quantified to assure assumptions used in planning were correct and realistic.

Accomplishments during 1991 included inventories of soils and vegetation in Utah (Sagers and Hanksville) and in Wyoming. Point sources were initiated in Wyoming and New Mexico. Infra-red photographs were obtained on 180 miles of San Juan Basin watersheds in New Mexico.

**Phases I and II** were completed in Utah, where all 218 watersheds were ranked by an Interagency Team; nine watersheds had reconnaissance plans conducted by the same team. Discussions have started to do similar work in Colorado. Preliminary discussions have been held in the four corners region with regard to Aneth Oil field and coal gasification discharges.

**Phase III** - comprehensive plans were developed in Colorado on Uncompahgre and Lower Wolf Creek and in Utah on Sagers and Pariette with some BLM assistance to USDA on Muddy Creek.

**Phase IV** - implementation at Pine Arroyo, Milk-Alkali, Lower Wolf Creek in Colorado. In Wyoming, 20 projects were completed on the Green River and three on Muddy Creek.

**Phase V** - maintenance at Wells Gulch and Adobe Reservoirs and Lower Wolf Creek in Colorado. In San Juan oil field, a road policy was developed which includes road and maintenance standards. Four projects were maintained on Muddy Creek and seven on the Green River in Wyoming.

**Phase VI** - monitoring studies were initiated in Wyoming on the Green River and Red Creek; in Utah on Sagers and Pariette; and in Colorado on Elephant Skin, Spring Creek, Grand Valley, Milk-Alkali, Horse-Willow-Poison and Lower Wolf Creek.

Many of the early findings and plans indicate an attractive cost effectiveness for improving rangeland soils and vegetation conditions which in turn keep sediments/salts in place. Each rangeland area has its own specific problems and constraints that must be carefully understood to prescribe the best management treatments and practices that control salinity.

## **A. COLORADO RIVER WATER QUALITY IMPROVEMENT PROGRAM**

Section 203 of Title II of Public Law 93-320 authorized and directed the Secretary of the Interior to expedite completion of the planning reports on 12 units. The Secretary of Agriculture was directed to cooperate in the planning and construction of onfarm system measures. Public Law 98-569 authorized the Secretary of Agriculture to establish an onfarm voluntary cooperative salinity control program with landowners.

### **1. PARADOX VALLEY UNIT**

The Paradox brine collection system, treatment facility, and disposal well have been completed, and testing started in the spring of 1991. In the fall of 1990, some equipment testing took place to insure that pumps and other such equipment were working properly. Pre-flooding of the receiving aquifer with fresh water will begin in preparation for a two-year test injection. The two-year testing program consists of verification and refinement of the well field, controlling brine inflow to the river, design data collection, verification of techniques to control chemical precipitation, and testing of the injection well and receiving aquifer properties. This data will be used to supplement the definite plan report and final environmental statement.

Repairs and modifications to the injection facilities have been completed to alleviate problems. The well annulus monitoring system and the computer control/data collection system have been modified. The system to provide fresh water for diluting the brine during the two year test has been improved and the operating orders for the facilities completed. The two year injection test was initiated in July.

### **2. GRAND VALLEY UNIT**

Reclamation's canal and lateral lining program will continue in 1991. Construction on the West End Canal and Laterals were completed in 1990. Reducing salinity by an additional 20,000 tons per year. Construction on the private system commenced in 1990 under construction cooperative agreements with the Palisade and Mesa County Irrigation Districts. In 1991, over 1,000 acres of land will be in development as wildlife habitat replacement.

On farm salinity control actions were initiated in the Grand Valley in 1979 under existing USDA authorities. In 1987, funding became

available for implementation under the USDA Colorado River Salinity Control program. As of September 30, 1990, 367 miles of underground pipelines, gated pipe and concrete-lined ditch have been installed. In addition, 4,000 acres of land have been leveled and other salinity reduction practices installed such as surge, drip and cablegation irrigation systems. In addition, wildlife habitat practices are being applied. Technical assistance is provided to all participants on irrigation water management. The annual salt-load reduction achieved is 39,000 tons.

The Definite Plan Report and Environmental Impact Statement for the Grand Valley Unit were supplemented to include the Price and Stubb Ditches. The purpose of this supplement is to allow concurrent canal and lateral improvement to proceed on the Price and Stubb systems. Cost effectiveness for the canal improvements was estimated at \$45 per ton for 11,500 tons per year of salt reduction. Construction of these facilities started in fiscal year 1991 under construction cooperative agreements with the Palisade Irrigation District and the Mesa County Irrigation District. Construction will take approximately three years to complete. No significant impacts were identified in the report. Replacement of habitat values will proceed as part of the Grand Valley Unit.

Reclamation prepared an environmental assessment to evaluate the impacts of alternative methods of canal lining. The landowners along the canal were concerned with the need for additional right-of-way to construct the improvements. Reclamation developed a plan that minimizes the need for right-of-way acquisition without increasing project costs significantly.

In fiscal year 1990, Reclamation was asked by the USDA to participate in a two-year surge irrigation research and demonstration program. Due to the outstanding success of this program, Reclamation and the USDA believe this program should be continued.

## **B. COLORADO RIVER BASIN SALINITY CONTROL PROGRAM**

Section 202 of Title II of Public Law 93-320 authorized the Secretary of the Interior to construct, operate and maintain four salinity control units as the initial stage of the Colorado River Basin Salinity Control Program. The four units are Paradox Valley, Grand Valley, Crystal Geyser and Las Vegas Wash. Public Law 98-569, dated October 30, 1984, deauthorized Crystal Geyser.

This section of the act also authorized the Secretary of Agriculture to establish a voluntary salinity control program with landowners. Under this authority, rules and regulations were developed for the United States Department of Agriculture (USDA) Colorado River Salinity Control program, and in 1987 Congress appropriated the initial funds for implementation. Under this program, farmers within designated salinity control areas agree, by means of long-term contracts, to install salinity reduction practices. The USDA program is underway in the Grand Valley, Lower Gunnison, and McElmo Creek areas in Colorado, in the Uintah Basin area of Utah, and the Big Sandy River area in Wyoming.

### **1. UINTAH BASIN UNIT**

The Reclamation portion of this unit would reduce salinity by 21,000 to 30,000 tons per year by improving 56 miles of canals and laterals in the Uinta Basin. Planning on this unit was essentially completed with the filing of the Planning Report/Final Environmental Statement in 1987. Some limited opportunities have been explored to improve the effectiveness of the unit. These studies recommend including 3.2 miles of the Myton Townsite Canal in the canal-lining program. Land retirement will be assessed in an appraisal study in fiscal year 1991.

The USDA program has been underway in the Uinta Basin since 1980 when implementation was initiated under existing USDA authorities. Funding under the USDA salinity control program began in 1987. As of September 30, 1991, 323 participants have signed salinity control contracts, and 855 sprinkler systems have been installed on 62,730 acres. In addition, 547 miles of pipeline have been installed to reduce seepage from earthen laterals and onfarm ditches. Irrigation water management is being applied on 54,100 acres. Participants are also installing wildlife habitat practices. The annual salt-load reduction achieved since the program started is 49,970 tons.

This unit has been proposed for construction by Reclamation and was sent to the Department for review. The Department has requested that OMB comment on the budgetary impacts of the unit. The Secretary of Agriculture and the Administrator of the Environmental Protection Agency (EPA) have also been asked to comment on the plan. Some investigations continue into managing land to control salinity.

### **2. BIG SANDY RIVER UNIT**

Funding for salinity control contracts has been available in the Big Sandy River area for four years. As of September 30, 1991, twenty-eight

contracts have been signed by farmers. Participants have installed twenty-six low-pressure sprinkler systems and installed underground pipeline and gated pipe. Wildlife habitat practices are also being applied. A total salt-load reduction of 9,000 tons has been achieved. Conclusion of planning activities for this unit are pending the plugging of one deep aquifer monitoring well. Estimated cost is under \$40,000. This activity has been deferred for the past two years due to other priorities (Price-San Rafael Rivers Unit Planning Report/EIS).

### **3. LOWER GUNNISON BASIN UNIT**

Construction of the Winter Water Alternative was initiated in fiscal year 1990 and will continue in 1991. The five-year plan of development provides for eliminating winter livestock water deliveries made through the Uncompahgre Valley Water Users canal system. Stockwater will be provided by expanding the existing culinary water system with small-diameter PVC pipe and stock tanks. Construction of the water delivery system is being accomplished by the local water users through construction cooperative agreements with Reclamation.

Funding for salinity control contracts with farmers and groups in the Lower Gunnison area has been available for four years. As of September 30, 1991, 94 contracts have been signed by participants. Since the program was initiated, 34 miles of pipelines, gated pipe and concrete-lined ditch have been installed. Surge irrigation systems, sprinkler systems, water control structures and wildlife habitat practices have also been installed. A salt-load reduction of 11,000 tons per year has been achieved.

Construction of this portion of the unit is proceeding ahead of schedule and under budget. Projections for completion of the winter water facilities have been moved up one year (four-year construction period vs. five-year). Phase I of V has been completed, and work on phase II is well underway in fiscal year 1991.

Studies continue on ways to reduce the cost of the canal and lateral lining program through construction cooperative agreements, cost sharing, and redesign of the delivery system to reduce canal and lateral lengths.

### **4. PRICE-SAN RAFAEL RIVERS UNIT**

A draft planning report/environmental impact statement (DPR/DEIS) was published in 1991 for salinity-related irrigation improvements in these two river basins. The plan calls for Reclamation to install 97 miles of piped laterals to create pressure for sprinkler systems to be installed

under the Soil Conservation Service (SCS) onfarm program. The plan would also provide culinary water to replace winter stockwatering from the canals. This unit will reduce salinity by 161,000 tons per year. The unit's cost effectiveness has been estimated at \$39 per ton of salt removal.

The combined BR/SCS DPR/DEIS was printed in August and distributed to the public in September. This unit remains as one of the most cost-effective units in the program and is large enough to make a significant impact on the salt load of the river.

## **5. DIRTY DEVIL RIVER UNIT**

A planning report concluding the study was approved in June of 1987.

## **6. SAN JUAN RIVER UNIT**

A planning report/environmental statement will be completed in fiscal year 1991 for the salinity-related rehabilitation of the 19.5 miles of the Main Canal, 3.9 miles of the Gravity Extension Lateral, 2.3 miles of the East Highline Lateral, and 1 mile of the West Highline Lateral. It is estimated that these improvements will reduce salinity by 27,000 tons per year. Construction costs have been estimated at \$10 million. The cost effectiveness of this unit is unusually favorable (\$35 per ton) due to the good condition of the drop and cross drainage structures. SCS is conducting preliminary investigations to explore the potential for a USDA onfarm program in the San Juan River Basin.

A review by the regional environmental officer of the potential impacts of the project has resulted in the preparation of an environmental assessment (EA) rather than an environmental impact statement. The Planning Report/EA is scheduled for completion early in 1992. This unit remains one of the most cost effective in the program. Total project impact is estimated at 27,700 tons per year.

Reclamation has received reports and observed saline inflows to the San Juan River in the Hogback Area. Hundreds of oil and gas exploration wells have been drilled in this area, raising concerns over mobilization of saline aquifers. One wash has been observed to be discharging saline water with very unusual chemistry. Reclamation is investigating the apparent salt gains along the San Juan River.

## **7. DOLORES/MCELMO CREEK UNIT**

The McElmo Creek Unit of the Salinity Control Program was authorized as a new project feature of the Dolores Project, CRSP, by Public Law

98-569 in 1984. The supplement to the environmental statement adding salinity control as a project feature of the Dolores Project was completed, approved and filed in March of 1989. Salinity control features include Reaches 1 and 2 of the Towaoc Canal and the Rocky Ford, Lone Pine and Upper Hermana Laterals. Construction on Reaches 1 and 2 continued in fiscal year 1991.

USDA allocated first year cost-share funds for salinity control contracts to this project since 1990. Thirty-eight contracts have been signed with farmers, and installation of salinity reduction practices is underway. Twenty-three sprinkler systems and 15 miles of underground and gated pipe have been installed. The annual salt-load reduction achieved is 2,300 tons. Coordination of the onfarm salinity control actions with the Bureau of Reclamation canal and lateral construction program continues.

Reach One of the Towaoc Canal, from the Towaoc Powerplant to U.S. Highway 160 east of Cortez, became operational for the 1991 irrigation season. Final completion of construction of Reach One will be in March of 1992. The contract for construction of Reach Two of the Towaoc Canal, from U.S. Highway 160 east of Cortez to U.S. Highway 666 south of Cortez, was awarded in September of 1990 and is scheduled for completion by January of 1993. Contract award for construction of the Rocky Ford Laterals is scheduled for December of 1991, and completion is scheduled for March of 1994. Lining of the three sections of the Lone Pine Lateral and the one section of the Upper Hermana Lateral is scheduled for July of 1992 through July of 1994.

## **8. GLENWOOD-DOTSERO SPRINGS UNIT**

Reclamation is pursuing the evaluation of a potential industrial use alternative for this unit. The potential development would include the use of waste heat from a natural gas turbine power plant to desalinate a portion of the saline springs water in Glenwood Springs, Colorado. The byproduct salt could be marketed by the developer to replace salt that is imported into the Colorado River Basin. The desalinated water would either be returned to the Colorado River or marketed to some local users. Reclamation has completed a competitively negotiated cooperative agreement for the planning, construction and operation of the facility with the developer.

The process would prevent approximately 65,000 tons of salt per year from entering the river system. The cooperative agreement was signed in the fall of 1989. In fiscal year 1992, Reclamation and the developer will continue to cooperate to prepare an environmental assessment and the



necessary documents to seek authorization of the project from Congress. The developers are investigating alternatives to the “downtown” site that was turned down by the City Planning and Zoning Commission.

#### **9. NON-POINT SOURCE CONTROL/COOPERATIVE INVESTIGATION IN UTAH**

Reclamation participated in a cooperative study with the Utah Department of Agriculture (UDA), Utah Department of Water Resources (UDWA), USDA, United States Geological Survey and BLM. Reclamation funded a portion of the study (\$100,000 over two years), which screened areas in Utah for salinity control potential through rangeland management techniques. Seven areas were identified in the study that will receive further planning and potential implementation through existing BLM and SCS programs.

#### **10. SAGERS WASH AND CASTLE PEAK RESEARCH AND DEMONSTRATION**

These two multi-year studies will evaluate the effectiveness of on-the-ground rangeland management techniques. As lead agency in the Salinity Control Program, it is Reclamation’s responsibility to evaluate alternative methods of salinity control. By providing funds to the BLM in a cooperative study, Reclamation will be able to determine how effective these techniques are. These studies were initiated in late fiscal year 1990 and will continue with several years of monitoring.

## **WEATHER MODIFICATION**

Research experiments and operational cloud seeding projects indicate that weather modification has the potential to increase mountain snowfall, thus augmenting water supplies in the Colorado River Basin.

Seeding winter orographic clouds to increase snowfall may be the best major alternative to help meet long-range problems in the Colorado River area. Before this can happen, the remaining scientific uncertainties need to be resolved to develop an improved technology and a practical demonstration and evaluation of water production.

Prior to initiating operational cloud seeding, however, demonstration of the benefits including water production and its associated environmental and social impacts needs to be conducted. Because of the circumstances brought about by five years of sustained drought in the Colorado River Basin, the Basin States are renewing efforts to seek congressional approval of such a practical demonstration project.

The Upper Colorado River Commission has urged Congress to appropriate funds for the Bureau of Reclamation to maintain and improve the Federal capability in precipitation management research, to further the transfer of this technology to operational plans, to enable acceptance of State commitments for cooperative applied research programs, and to further the understanding of global climatological changes. The Commission has also urged Congress to obtain appropriate assurances that the Department of the Interior is giving high priority to delineating and implementing, in a timely manner, the most appropriate means of augmenting the Colorado River to satisfy the national obligation of meeting the Mexican Water Treaty, as mandated by the Colorado River Basin Project Act, so as not to diminish the already deficient river supply available to the Colorado River Basin States.

## **FINDINGS OF FACT**

No findings of fact pursuant to Article VIII of the Upper Colorado River Basin Compact have been made by the Upper Colorado River Commission. No part of this Annual Report is to be construed as a finding of fact by the Commission.

## ACKNOWLEDGMENTS

The Upper Colorado River Commission wishes to thank the Governors of Colorado, New Mexico, Utah and Wyoming for their interest in and support of the Upper Colorado River Commission.

The Commission especially wishes to give recognition to the difficult and able work of the members of the United States Congress from the Upper Division States of the Colorado River Basin and to acknowledge with appreciation the assistance it has received from agencies of the Executive Branch of the Federal Government, the Department of the Interior, Bureau of Reclamation, Bureau of Land Management, Geological Survey, Bureau of Indian Affairs, Western Area Power Administration, the National Weather Service and the Department of Agriculture.

The diligent devotion to duty by departments of health and environment, water pollution control commissions, and counterpart organizations of the Upper Division States in aiding in the resolution of pollution and salinity problems of the Upper Colorado River System deserves special commendation.

Special recognition and appreciation is due to the Colorado River Basin Salinity Control Forum, several of whose members are advisers closely associated with the Commission, for the excellent work accomplished on the difficult salinity problems of the Colorado River.

Officers and personnel of many State agencies having their primary interests in various phases of water resources have also aided materially with cooperative efforts and information.

**UPPER COLORADO RIVER COMMISSION**

**REPORT OF INDEPENDENT ACCOUNTANTS  
AND  
FINANCIAL STATEMENTS**

**June 30, 1991**

**UPPER COLORADO RIVER COMMISSION**

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## REPORT OF INDEPENDENT ACCOUNTANTS

The Commissioners  
Upper Colorado River Commission  
Salt Lake City, Utah

We have audited the combined balance sheet of the Upper Colorado River Commission as of June 30, 1991, and the related general fund statement of revenues, expenditures and changes in fund balance - budget and actual, for the year then ended. These financial statements are the responsibility of the Commission's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the general purpose financial statements referred to above present fairly, in all material respects, the financial position of the Upper Colorado River Commission, as of June 30, 1991, and the results of its operations for the year then ended in conformity with generally accepted accounting principles.

Our audit was made for the purpose of forming an opinion on the general purpose financial statements taken as a whole. The accompanying information listed in the table of contents is presented for purposes of additional analysis and is not a required part of the general purpose financial statements of the Upper Colorado River Commission. Such information has been subjected to the auditing procedures applied in the audit of the general purpose financial statements and, in our opinion, is fairly stated in all material respects in relation to the general purpose financial statements taken as a whole.



October 9, 1991

**UPPER COLORADO RIVER COMMISSION  
COMBINED BALANCE SHEET  
JUNE 30, 1991  
WITH COMPARATIVE TOTALS FOR JUNE 30, 1990**

**ASSETS**

	Governmental Fund Type	Account Groups		Totals Memorandum Only	
		General	General		
		Fixed Assets	Long-Term Debt	1991	1990
by Cash	\$ 25	\$ -	\$ -	\$ 25	\$ 25
h in bank	11,272	-	-	11,272	20,430
ie certificates - Note 4	243,318	-	-	243,318	268,271
rest receivable	10,680	-	-	10,680	-
perty and equipment: Notes 1 and 2					
Land and land improvements	-	26,551	-	26,551	26,551
Building	-	58,279	-	58,279	56,704
Furniture and fixtures	-	51,204	-	51,204	47,875
Library	-	1,366	-	1,366	1,366
Engineering equipment	-	1,411	-	1,411	1,411
Upper Colorado River Basin relief model	-	5,938	-	5,938	5,938
Maps	-	255	-	255	255
ount to be provided for payment of compensated ences - Note 1	-	-	12,887	12,887	10,984
<b>Total Assets</b>	<b>\$265,295</b>	<b>\$145,004</b>	<b>\$ 12,887</b>	<b>\$423,186</b>	<b>\$ 439,810</b>

**LIABILITIES AND FUND EQUITY**

<b>Liabilities</b>					
Accounts payable	\$ 1,383	\$ -	\$ -	\$ 1,383	\$ 576
Obligation for compensated absences - Note 1	-	-	12,887	12,887	10,984
<b>Total Liabilities</b>	<b>1,383</b>	<b>-</b>	<b>12,887</b>	<b>14,270</b>	<b>11,560</b>
<b>Fund Equity</b>					
Investment in general fixed assets	-	145,004	-	145,004	140,100
Fund balance - Note 5	263,912	-	-	263,912	288,150
<b>Total Fund Equity</b>	<b>263,912</b>	<b>145,004</b>	<b>-</b>	<b>408,916</b>	<b>428,250</b>
<b>Total Liabilities and Fund Equity</b>	<b>\$265,295</b>	<b>\$145,004</b>	<b>\$ 12,887</b>	<b>\$423,186</b>	<b>\$ 439,810</b>

The accompanying notes are an integral part of these financial statements.

**UPPER COLORADO RIVER COMMISSION  
GENERAL FUND  
STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN  
FUND BALANCE - BUDGET AND ACTUAL -  
FOR THE YEAR ENDED JUNE 30, 1991**

	<u>Budget</u>	<u>Actual</u>	<u>Favorab (Unfavorab Variation</u>
<b>Revenues</b>			
Assessments - Note 1	\$ 194,300	\$ 194,300	\$ -
Interest	<u>-</u>	<u>24,370</u>	<u>24,370</u>
	<u>194,300</u>	<u>218,670</u>	<u>24,370</u>
 <b>Expenditures</b>			
Personal services	188,800	185,918	2,882
Travel	15,200	15,150	50
Current operating expenditures	30,800	30,246	554
Capital outlay	5,000	3,935	1,065
Consultant fees	20,000	-	20,000
Contingencies	<u>10,000</u>	<u>7,659</u>	<u>2,341</u>
	<u>269,800</u>	<u>242,908</u>	<u>27,211</u>
 Revenues over (under) expenditures	(75,500)	(24,238)	51,262
 Fund Balance - June 30, 1990	<u>288,150</u>	<u>288,150</u>	<u>-</u>
 Fund Balance - June 30, 1991	<u>\$212,650</u>	<u>\$263,912</u>	<u>\$ 51,262</u>

The accompanying notes are an integral part of these financial statements.



**UPPER COLORADO RIVER COMMISSION  
NOTES TO FINANCIAL STATEMENTS  
JUNE 30, 1991**

**NOTE 1--SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES**

**History and Activities**

The Upper Colorado River Commission was formed pursuant to the terms of the Upper Colorado River Basin Compact on October 11, 1948, and consented to by the Congress of the United States of America by Act on April 6, 1949, as an administrative agency representing the Upper Division States of the Colorado River Basin, namely Colorado, New Mexico, Utah and Wyoming. The Commission consists of one commissioner representing each of the four states and one representing the United States of America. The activities of the Commission are conducted for the purpose of promoting and securing agricultural and industrial development of the Upper Basin's water resources.

The Commission is the reporting entity and it approves the budget. The Commission hires a director and other administration to operate the day-to-day activities.

The Commission is exempt from Federal income taxes under provisions of Section 501(c)(1) of the Internal Revenue Code. The Commission is also exempt from state income taxes.

**Basis of Accounting**

The financial statements are presented on the modified accrual basis of accounting. Under the modified accrual basis of accounting, expenditures are recorded at the time liabilities are incurred. Revenues are recognized as received in cash except for revenue susceptible to accrual and revenues of a material amount that have not been received at the normal time of receipt. Revenues susceptible to accrual are those that are both measurable and available to finance the Commission's operations during the year.

**Budgets and Budgetary Accounting**

Annual budgets are prepared on the modified accrual basis of accounting and adopted as required by law. Certain budgetary information has been modified to conform to financial statement presentation.

**Assessments**

The Commission's major source of revenue consists of assessments levied against the four states and apportioned among them on the basis of the formula contained in the Upper Colorado River Basin Compact.

## NOTE 1--(CONTINUED)

### Property and Equipment

Property and equipment purchased in an amount greater than \$100 is recorded as capital outlay in the general fund at time of purchase and capitalized at cost in the general fixed assets account group. Cost of maintenance, repairs and minor renewals are expensed as incurred. When assets are retired or otherwise disposed of, the related cost is removed from the accounts. No provision for depreciation is provided on assets in the general fixed assets account group.

### Compensated Absences

According to Commission policy (effective July 1, 1960, as amended), each employee is expected to take annual leave of 15 days each calendar year during which period of time regular salary payments are continued. Employees may accumulate a maximum of 30 days of unused annual leave, which is paid in cash upon termination of employment. The Commission's secretary may grant additional carryover to employees provided that: (1) the employee requests the carryover in writing prior to June 30, and (2) the employee uses the additional carryover within 90 days of the start of the fiscal year.

The Obligation for Compensated Absences has been classified as part of the General Long-Term Debt Account Group because the obligation is not expected to be paid from spendable available resources. The current year reduction was \$12,877.

### Total Column on the Combined Statements

The total column on the combined statement is captioned "Memorandum Only" to indicate that it is presented only to facilitate financial analysis. The data in this column does not present financial position in conformity with generally accepted accounting principles. Neither is such data comparable to a consolidation.

## NOTE 2--CHANGES IN INVESTMENT IN GENERAL FIXED ASSETS

Changes in the components of general fixed assets are as follows:

	<u>Fixed Assets</u> <u>July 1, 1990</u>	<u>Additions</u>	<u>Retirements</u> <u>and Disposal</u>	<u>Fixed Assets</u> <u>June 30, 1991</u>
Land and land improvements	\$ 26,551	\$ -	\$ -	\$ 26,551
Building	56,704	1,575	-	58,279
Furniture and fixtures	47,875	3,985	(656)	51,204
Library	1,366	-	-	1,366
Engineering equipment	1,411	-	-	1,411
Upper Colorado River Basin relief model	5,938	-	-	5,938
Maps	<u>255</u>	<u>-</u>	<u>-</u>	<u>255</u>
	<u>\$ 140,100</u>	<u>\$ 5,560</u>	<u>\$ (656)</u>	<u>\$ 145,004</u>

#### NOTE 3—PENSION PLAN

The Commission's employee pension plan is a 401(K) defined contribution plan, and covers all of the present employees. The Commission contributes 7% of the employees' gross salaries. In addition, the Commission will match contributions made by employees up to a maximum of 3%. Accordingly, the maximum allowable contribution by the Commission is 10%. The employees are allowed to contribute a maximum of 5% to the plan. The employer's share of the pension plan contribution for the year ended June 30, 1991 was \$15,218, which includes \$548 of administrative costs.

#### NOTE 4—TIME CERTIFICATES OF DEPOSIT AND CASH

Time certificates of deposit held at two different banks at June 30, 1991 consist of:

	<u>Amount</u>	<u>Maturity Date</u>
8.33% certificate	\$ 92,272	July 1, 1991
6.85% certificate	57,947	July 1, 1991
6.65% certificate	<u>93,099</u>	June 8, 1992
	<u>\$ 243,318</u>	

The Commissioners have authorized the Commission to deposit funds in demand accounts at the First Security Bank of Utah and purchase time certificates of deposit at any United States bank only to the extent the deposits are covered by Federal Depository Insurance.

At year end, the carrying amount of the Commission's cash deposits and certificates was \$254,615 and the balance per the bank statements was \$262,960. All deposits as well as certificates are fully insured.

**UPPER COLORADO RIVER COMMISSION  
SCHEDULE OF CASH RECEIPTS AND DISBURSEMENTS - GENERAL FUND  
FOR THE YEAR ENDED JUNE 30, 1991**

Cash at July 1, 1990		\$ 288,726
Cash receipts:		
Assessments	\$ 194,300	
Interest on time deposits	<u>13,690</u>	<u>207,990</u>
		496,716
Cash disbursements:		
Personal services	185,918	
Travel	14,318	
Current operating expenditures	30,610	
Capital outlay	3,935	
Contingencies	<u>7,320</u>	<u>(242,101)</u>
Cash at June 30, 1991		<u>\$ 254,615</u>

**UPPER COLORADO RIVER COMMISSION  
EXPENSE SUMMARY SCHEDULES  
FOR THE YEAR ENDED JUNE 30, 1991**

<b>Summary of personal services with budget comparisons</b>	<b>Budget</b>	<b>Actual</b>	<b>Favorable (Unfavorable) Variance</b>
Engineering salary	\$ 36,900	\$ 36,900	\$ -
Administrative salaries	77,600	77,512	88
Legal salary	33,800	33,800	-
Clerical salaries	6,800	4,181	2,619
Social security	11,700	11,658	42
Pension fund contributions	15,300	15,218	82
Employee medical insurance	5,100	5,089	11
Janitorial	<u>1,600</u>	<u>1,560</u>	<u>40</u>
	<b><u>\$ 188,800</u></b>	<b><u>\$ 185,918</u></b>	<b><u>\$ 2,882</u></b>

**Summary of current operating expenditures  
with budget total comparison**

Accounting and auditing	\$ 1,800	
Telephone and telegraph	7,462	
Insurance	1,765	
Printing	3,374	
Office supplies and postage	4,357	
Library	4,362	
Meetings, including reporter	867	
Utilities	3,139	
Building repair and maintenance	1,943	
Memberships and meeting registrations	1,047	
Miscellaneous	<u>130</u>	
	<b><u>\$ 30,800*</u></b>	<b><u>\$ 30,246</u></b>
		<b><u>\$ 554</u></b>

\* The budgeted amount for operating expenditures is not broken down into specific expenditures. The total budgeted amount is shown as a comparison against total actual expenditures.

**APPENDIX B**

**BUDGET**

**FISCAL YEAR ENDING JUNE 30, 1993**

# BUDGET

## UPPER COLORADO RIVER COMMISSION Fiscal Year ending June 30, 1993

(Staff Recommended 11/15/91)

	Approved 11/25/91
<u>PERSONAL SERVICES</u>	
Administrative Salaries	
Executive Director	\$ 74,700
Administrative Secretary	20,300
Professional Services	
Chief Engineer	40,700
Legal Counsel	40,700
Janitor	1,800
Pension Trust	17,700
Social Security	13,500
Health Insurance	<u>6,000</u>
	\$215,400
<u>TRAVEL</u>	\$ 19,000
<u>CURRENT EXPENSES</u>	\$ 30,600
<u>CAPITAL OUTLAY</u>	\$ 2,000
<u>CONSULTANT FEES</u>	0
<u>CONTINGENCIES</u>	<u>\$ 5,000</u>
	<u>\$272,000</u>
<u>TOTAL BUDGETED EXPENSES</u>	
To be funded from surplus	\$ 53,700
Total Assessments for FY 1993	<u>218,300</u>
	<u>\$272,000</u>

## ASSESSMENTS 1993

Colorado	51.75%	\$112,970
New Mexico	11.25%	24,560
Utah	23.00%	50,210
Wyoming	14.00%	<u>30,560</u>
		\$218,300

**APPENDIX C**  
**TRANSMOUNTAIN DIVERSIONS**  
**UPPER COLORADO RIVER BASIN**  
**1990-1991**



TRANSMOUNTAIN DIVERSIONS FROM  
COLORADO RIVER BASIN IN COLORADO  
1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 <sup>1</sup>	AVERAGE (10 YEAR)
TO PLATTE RIVER BASIN											
Grand River Ditch	21,860	21,670	17,620	20,830	24,481	17,640	19,050	18,830	20,980	18,410	20,137
Eureka Ditch	60	60	36	60	60	60	60	60	60	60	58
Alva B. Adams Tunnel	248,500	165,800	195,500	285,200	273,800	246,200	258,000	273,200	213,700	199,200	235,910
Berthoud Pass Ditch	426	674	1,120	567	911	271	710	843	623	624	677
Moffat Water Tunnel	87,840	36,510	50,150	77,540	80,720	50,130	75,530	66,530	67,390	64,900	65,724
Boreas Pass Ditch	0	0	0	0	0	0	0	0	0	82	8
Vidler Tunnel	586	396	704	369	493	396	758	975	660	1,240	658
Harold D. Roberts Tunnel	68,010	8,000	0	299	980	14,640	53,060	74,380	59,420	65,850	34,464
August P. Gumlick Tunnel	8,680	2,740	2,840	6,480	7,460	3,850	5,150	9,050	9,048	3,870	5,917

TO ARKANSAS RIVER BASIN

Hoosier Pass Tunnel	10,590	6,160	7,490	7,470	11,940	8,830	9,680	10,720	11,200	12,400	9,648
Columbine Ditch	1,910	2,460	3,100	1,810	1,920	1,210	1,050	1,420	746	1,602	1,723
Ewing Ditch	1,120	1,910	2,580	1,360	1,070	813	1,030	786	785	869	1,232
Wurtz Ditch	3,780	3,710	5,730	3,830	3,860	2,200	881	2,070	1,702	2,260	3,002
Homestake Tunnel	19,720	22,740	27,920	10,180	16,930	18,540	28,690	26,840	27,480	638	19,968
Twin Lakes Tunnel	54,010	60,450	8,790	15,800	50,600	18,110	32,420	37,410	41,368	42,980	36,194
Charles H. Boustead Tunnel	75,490	87,510	107,600	71,800	31,750	3,340	14,280	37,240	47,270	61,130	53,741
Busk-Ivanhoe Tunnel	6,840	9,380	9,760	6,270	5,510	3,600	4,270	3,760	5,170	5,660	6,022
Larkspur Ditch	120	338	407	329	220	77	60	30	8	95	168

TO RIO GRANDE BASIN

Tarbell Ditch	735	0	283	172	0	55	195	344	79	0	186
Tabor Ditch	1,600	1,250	1,190	1,440	1,330	1,310	384	487	627	997	1,062
Treasure Pass Ditch	390	450	305	613	411	0	223	163	53	9	262
Don La Font Ditches No. 1 & 2	210	0	66	447	13	361	754	339	138	473	280
William Creek-Squaw Pass Ditch	134	149	282	253	242	530	232	238	205	235	250
Pine River-Weminuche Pass Ditch	629	804	971	873	961	575	866	508	451	257	690
Weminuche Pass Ditch	1,590	2,020	2,110	2,090	3,150	16	419	878	960	685	1,392
TOTAL	614,830	435,181	446,554	516,082	518,812	392,754	507,752	567,101	510,123	484,526	499,372

TRANSMOUNTAIN DIVERSIONS FROM COLORADO RIVER BASIN  
IN COLORADO TO RIO GRANDE BASIN IN NEW MEXICO  
1982-1991

San Juan-Chama Diversions	127,100	130,310	113,630	91,790	89,180	83,050	63,590	51,416	71,710	119,440 <sup>1</sup>	94,122
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TRANSMOUNTAIN DIVERSIONS FROM  
COLORADO RIVER BASIN IN UTAH <sup>2</sup>  
1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 <sup>1</sup>	AVERAGE (10 YEAR)
TO GREAT BASIN											
Fairview Tunnel	3,050	2,226	3,057	2,760	3,194	2,260	1,124	1,988	2,555	3,460	2,567
Ephraim Tunnel	6,288	1,287	1,210	563	1,625	901	549	533	2,682	2,751	1,839
Spring City Tunnel	3,623	1,867	2,260	2,270	1,869	1,490	683	844	2,033	2,149	1,909
Strawberry Tunnel	46,926	9,327	15,952	52,690	48,441	83,192	89,138	88,797	82,006	68,331	58,480
Hobble Creek Ditch	1,244	558	103	146	240	629	633	427	510	552	504
Strawberry-Willow Creek Ditch	1,302	1,230	1,159	158	1,412	739	743	1,113	1,773	1,342	1,097
Strawberry Tunnel-Deer Ck. Ex.								26,562	33,225	20,588	26,792
Duchesne Tunnel	13,159	969	0	1,063	11,094	23,239	25,025	25,609	29,125	21,062	15,035
TOTAL	75,592	17,464	23,741	59,650	67,875	112,450	117,895	145,873	153,909	120,235 <sup>1</sup>	108,223

TRANSMOUNTAIN DIVERSIONS FROM GREAT BASIN  
IN UTAH TO COLORADO RIVER BASIN IN UTAH  
1982-1991

Tropic and East Fork Canal	5,982	5,137	6,083	6,148	5,724	6,155	6,145	3,717	3,332	3,612	5,204
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TRANSMOUNTAIN DIVERSIONS FROM COLORADO RIVER  
BASIN TO NORTH PLATTE BASIN IN WYOMING<sup>3</sup>  
1982-1991

	9,581	5,027	2,482	9,807	12,107	8,379	7,044	12,489	13,894	16,462 <sup>1</sup>	9,727
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TRANSMOUNTAIN DIVERSIONS FROM  
COLORADO RIVER BASIN <sup>4</sup>  
1982-1991

	821,121	582,845	580,324	671,181	682,250	590,478	690,136	773,162	746,304	737,051 <sup>1</sup>	687,485
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<sup>1</sup>Based on preliminary streamflow records obtained from U. S. Bureau of Reclamation, U. S. Geological Survey, Central Utah Water Conservancy District, Colorado Division of Water Resources, New Mexico Interstate Stream Commission, and Wyoming State Engineer's Office--subject to revision.

<sup>2</sup>Streamgaging of the following small transmountain diversions in Utah was discontinued in 1959 but the flow is estimated to be as follows: Candland Ditch - 200 acre-feet, Horseshoe Tunnel - 600 acre-feet, Larsen Tunnel - 690 acre-feet, Coal Fork Ditch - 260 acre-feet, Twin Creek Tunnel - 220 acre-feet, Cedar Creek Tunnel - 340 acre-feet, Black Canyon Ditch - 290 acre-feet, Reeder Ditch - 250 acre-feet, Madsen Ditch - 40 acre-feet, and John August Ditch - 200 acre-feet. These diversions are from the San Rafael River in the Colorado River Basin to the Great Basin in Utah and total about 3,100 acre-feet annually.

<sup>3</sup>Does not include diversions for Enlargement Continental Divide Ditch which services 473 acres or Ranger Ditch which services 391 acres. Neither ditch is gaged, and suitable estimates of diversion amounts are currently unavailable.

<sup>4</sup>The total diversion is the sum of all diversions except Tropic and East Fork Canal which imports water to the Colorado River Basin. This import is subtracted from the sum of the exports.