

**COLORADO RIVER BOARD OF CALIFORNIA**

770 FAIRMONT AVENUE, SUITE 100  
GLENDALE, CA 91203-1068  
(818) 500-1625  
(818) 543-4685 FAX



February 25, 2011

**NOTICE OF REGULAR MEETING OF THE  
COLORADO RIVER BOARD**

**NOTICE IS HEREBY GIVEN** pursuant to the call of the Chairperson, Dana B. Fisher, Jr., by the undersigned, the Acting Executive Director of the Colorado River Board of California, that a regular meeting of the Board Members is to be held as follows:

Date: March 9, 2011, Wednesday
Time: 10:00 a.m.
Place: Vineyard Room
Holiday Inn Ontario Airport
2155 East Convention Center Way
Ontario, CA 91764-4452
TEL: (909) 212-8000, FAX: (909) 418-6703

The Colorado River Board of California welcomes any comments from members of the public pertaining to items included on this agenda and related topics. Oral comments can be provided at the beginning of each Board meeting; while written comments may be sent to Mr. Dana B. Fisher, Jr., Chairperson, Colorado River Board of California, 770 Fairmont Avenue, Suite 100, Glendale, California, 91203-1068.

An Executive Session may be held in accordance with provisions of Article 9 (commencing with Section 11120) of Chapter 1 of Part 1 of Division 3 of Title 2 of the Government Code and in accordance with Sections 12516 and 12519 of the Water Code to discuss matters concerning interstate claims to the use of Colorado River System waters in judicial proceedings, administrative proceedings, and/or negotiations with representatives from other states or the federal government.

Requests for additional information may be directed to: Christopher S. Harris, Acting Executive Director, Colorado River Board of California, 770 Fairmont Avenue, Suite 100, Glendale, CA 91203-1068, or 818-500-1625. A copy of this Notice and Agenda may be found on the Colorado River Board's web page at [www.crb.ca.gov](http://www.crb.ca.gov).

A copy of the meeting agenda, showing the matters to be considered and transacted, is attached.

  
Christopher S. Harris  
Acting Executive Director

attachment: Agenda

Regular Meeting  
COLORADO RIVER BOARD OF CALIFORNIA  
March 9, 2011, Wednesday  
10:00 a.m.

Vineyard Room  
Holiday Inn Ontario Airport  
2155 East Convention Center Way  
Ontario, CA 91764-4452

**A G E N D A**

At the discretion of the Board, all items appearing on this agenda, whether or not expressly listed for action, may be deliberated upon and may be subject to action by the Board. Items may not necessarily be taken up in the order shown.

1. Call to Order
2. Opportunity for the Public to Address the Board (Limited to 5 minutes)  
As required by Government Code, Section 54954.3(a)
3. Administration
  - a. Minutes of the Meeting Held February 9, 2011, Consideration  
and Approval (**Action**) ..... TAB 1
  - b. Annual Statement of Economic Interests Form 700 due by April 1, 2011
4. Agency Managers Meetings
5. Protection of Existing Rights
  - a. Colorado River Water Report(s) ..... TAB 2  
Report from Board Staff on current reservoir storage, reservoir releases, projected water use, forecasted river flows, scheduled deliveries to Mexico, and salinity
  - b. State and Local Water Reports ..... TAB 3  
Reports from Board members on current water supply and use conditions
  - c. Colorado River Operations ..... TAB 4
    - MWD’s Report on SNWA Interstate Account for 2010
    - BLM News Release announced that “BLM will take a fresh look at commercial oil shale rules and plans”
  - d. Basin States Discussions
    - Status of the Colorado River Basin Water Study Report
  - e. Colorado River Environmental Issues ..... TAB 5
    - Department of the Interior News Release, “Glen Canyon Dam High-Flow Experiments Provide Insights for Future Flow Management of the Colorado River”
    - Reclamation’s News Release, “Reclamation Extends Public Review and Comment Period for Two Glen Canyon Dam Draft Environmental Assessments”

## **Agenda (continued)**

### 6. Executive Session

An Executive Session may be held by the Board pursuant to provisions of Article 9 (commencing with Section 11120) of Chapter 1 of Part 1 of Division 3 of Title 2 of the Government Code and Sections 12516 and 12519 of the Water Code to discuss matters concerning interstate claims to the use of Colorado River system waters in judicial proceedings, administrative proceedings, and/or negotiations with representatives from other states or the federal government.

### 7. Other Business

#### a. Next Board Meeting: Regular Meeting

April 13, 2011, Wednesday, starting 10:00 a.m.

Holiday Inn Ontario Airport

2155 East Convention Center Way

Ontario, CA 91764-4452

TEL: (909) 212-8000, FAX: (909) 418-6703

3.a. – Approval February 9, 2011, Board Meeting Minutes

Minutes of Regular Meeting  
COLORADO RIVER BOARD OF CALIFORNIA  
Wednesday, February 9, 2011

A Regular Meeting of the Colorado River Board of California (Board) was held in the Vineyard Room, at the Holiday Inn Ontario Airport, at 2155 East Convention Center Way, Ontario, California, Wednesday, February 9, 2011.

Board Members Present

Dana Bart Fisher, Jr., Chairman  
John V. Foley  
Terese Marie Ghio  
W. D. 'Bill' Knutson  
Henry Merle Kuiper

James B. McDaniel  
John Pierre Menvielle  
  
Jeanine Jones, Designee  
Department of Water Resources

Board Members and/or Alternates Absent

Franz W. De Klotz

Christopher G. Hayes, Designee  
Department of Fish and Game

Others Present

Steven B. Abbott  
Mark D. Beuhler  
James H. Bond  
John Penn Carter  
David Fogerson  
Leslie M. Gallagher  
William J. Hasencamp  
Mark L. Johnson  
Michael L. King  
Thomas E. Levy  
Jan P. Matusak  
Glen Peterson  
Halla Razak

Steven B. Robbins  
Tina L. A. Shields  
Ed W. Smith  
Catherine M. Stites  
Bill D. Wright  
  
Abbas Amirteymoori  
J.C. Jay Chen  
Christopher S. Harris  
Lindia Y. Liu  
Gary E. Tavetian  
Gerald R. Zimmerman

**CALL TO ORDER**

Chairman Fisher announced the presence of a quorum and called the meeting to order at 10:05 a.m.

## **OPPORTUNITY FOR THE PUBLIC TO ADDRESS THE BOARD**

Chairman Fisher asked if there was anyone in the audience who wanted to address the Board on items on the agenda or matters related to the Board. Hearing none, Chairman Fisher moved to the next agenda item.

## **ADMINISTRATION**

### Approval of Minutes

Chairman Fisher requested the approval of the January 12<sup>th</sup> meeting minutes. Mr. Knutson moved January 12<sup>th</sup> minutes be approved. Ms. Jones seconded the motion. Unanimously carried, the Board approved the January 12<sup>th</sup> meeting minutes.

### Distribution of Board Meeting Notice/Agenda and Related Materials

Mr. Harris reported that the Board meeting notice/agenda and materials will continue to be mailed to the Board members and their alternates, but that beginning in March 2011, the Board meeting notice/agenda and materials will no longer be mailed to all other interested parties. Instead, the Board meeting notice/agenda and folder materials will be posted to the Board's website. Mr. Harris expected there to be an annual savings of three to four thousand dollars to the Board by posting the materials online.

## **AGENCY MANAGERS' MEETING**

Mr. Harris reported that the agency managers have not met since the November 2010 Board meeting.

## **PROTECTION OF EXISTING RIGHTS**

### Colorado River Water Report

Mr. Harris reported that precipitation from October 1<sup>st</sup> to January 31<sup>st</sup> was 128 percent of normal. The snow water equivalent was 123 percent of normal. Reclamation's projections of unregulated inflow into Lake Powell were 9.3 million acre-feet (maf) for April through July 2011, or 117 percent of average; and water year projections from October 1, 2010 through September 30, 2011 were 13.0 maf, about 108 percent of average.

Mr. Harris reported that as of January 31<sup>st</sup>, the storage in Lake Powell was 13.8 maf, or 57 percent of capacity. The water surface elevation was 3,620.8 feet. The storage in Lake Mead was 10.8 maf, or 42 percent of capacity, and water surface elevation was 1,091.7 feet. Total System storage was about 32.1 maf, or 54 percent of capacity. Last year at this time, there was 33.1 maf in storage, or 55 percent of capacity. There was about one million acre-feet less in storage than this time last year.

Mr. Harris reported that Reclamation's estimated consumptive use (CU) during calendar year 2010 for the State of Nevada to be below its entitlement of 300,000 acre-feet (243,000 AF); and Arizona's estimated CU to be slightly below its entitlement of 2.8 maf (2.792 maf); and California is expected to be slightly below its basic entitlement of 4.4 maf (4.363 maf). In 2010, the Lower Basin CU was about 7.399 maf.

### State and Local Water Reports

Ms. Jeanine Jones, of the California Department of Water Resources, reported the results from the February 1<sup>st</sup> snow surveys that were recently completed. She noted that January was an exceptionally dry month, however most of the current totals are still above average, especially in the central and southern Sierra, because of the extremely wet storms in the fall. Most of the basins are close to reaching the April 1<sup>st</sup> index. Ms. Jones reported that in the next week to ten days, the weather forecasts some wetness in the northern part of Sierra. A series of cold wet storms are expected in the northern Sierra, the early part of next week. The climate forecast is looking like a La Niña condition for the rest of the year, and that the reservoir conditions are looking much better than this time last year.

Mr. Foley, of The Metropolitan Water District of Southern California (MWD), reported that as of February 1<sup>st</sup>, MWD's combined reservoir storage of Lakes Skinner, Mathews, and Diamond Valley, was about 878,600 acre-feet, or about 85 percent of capacity. As of February 1<sup>st</sup>, Lake Mathews had about 157,600 acre-feet, or 87 percent of capacity. Lake Skinner had about 41,500 acre-feet or about 94 percent of capacity. Diamond Valley Lake had about 679,400 acre-feet in storage, or about 84 percent of capacity. Mr. Foley reported that the system has improved considerably and hopefully will soon reach its maximum storage.

Mr. McDaniel, of the City of Los Angeles Department of Water and Power (LADWP), reported that as of February 1<sup>st</sup>, the Eastern Sierra Snow Survey results are similar to the rest of the state, January was flat, with almost no increase of snow during January. Fortunately, December was wetter than usual and the February snow surveys were reported, the overall snowpack was about 108 percent of the season average. If there is no unusual snow sublimation and the runoff remains good, DWP believes, that the season should finish with near average conditions. However, there are still a couple months to go, so the climate conditions could still improve for the eastern Sierra.

### Colorado River Operations

*Government Accounting Office's Report "A Better and Coordinated Understanding of Water Resources Could Help Mitigate the Impacts of Potential Oil Shale Development"*

Mr. Harris reported that the federal Government Accounting Office (GAO) issued a report in October 2010 examining the potential impacts on local and regional water resources through development of oil shale resources in Colorado and Utah. The report indicates that between 40 gallons to as much as 500 gallons of water could be required for each barrel of oil extracted via standard processing techniques. The GAO report indicates that the growth of the industry in Colorado and Utah may be limited due to water supply availability. Water

supplies for this industry may be further limited due to: 1) increased demand in agriculture and municipal and industrial sectors; 2) the potential for reduced water supplies associated with climate change; 3) obligations under existing interstate compacts; and 4) current and future environmental requirements. The full GAO report can be accessed at the GAO's website at: <http://www.gao.gov/new.items/d1135.pdf>.

*Western Governors' Association, Western States Water Council and California Department of Water Resources (DWR) Workshop on 'Climate Impacts on Extreme Events'*

Mr. Harris reported that the Western Governors' Association, Western States Water Council, and California DWR are cosponsoring a workshop on "Climate Impacts on Extreme Events". The purpose of the workshop is to discuss developing methodologies for addressing climate changes and relationships to increased severity of frequency of extreme or severe weather events. The workshop is scheduled for March 21-23, 2011, in San Diego, California. Mr. Harris reported that a registration form was included in the Board folder.

### Basin States Discussion

#### *Status of Binational Discussions and Negotiations with Mexico*

Mr. Harris reported that in a January 28<sup>th</sup> letter, that Commissioner of Reclamation, Michael Conner, updated the current status of binational discussions with Mexico on the Colorado River. The Commissioner reiterated the Department of the Interior's (DOI) appreciation for all of the efforts of the Basin states in assisting in the discussions resulting in the execution of Minute 318 between Mexico and the U.S. and committed to continue seeking the input and support of the Basin states. The Commissioner's letter also indicated that DOI and the International Boundary and Water Commission (IBWC) continue to be fully committed to working with Mexico in achieving a more comprehensive and long-term agreement on Colorado River issues. DOI and IBWC have also communicated with Mexican representatives that the comprehensive package must include discussions on mechanisms that would reduce deliveries to Mexico during periods of low-reservoir conditions in the U.S. caused by ongoing drought.

There was discussion on the negotiations resulting in Minute 318, regarding the relationship between the various levels of representation of both the U.S. and Mexico and how the concerns of both countries will be addressed by the continued efforts of the binational discussions.

#### *Status of the Colorado River Basin Water Study Report Process*

Mr. Harris reported that in late January, Reclamation released a draft of Technical Reports A, B, and D of the "Colorado River Basin Water Supply and Demand Study" (Basin Study). Technical Report C was expected to be available February 9<sup>th</sup>. These four technical reports comprise Interim Report No. 1, which covers Phases 1 and 2 of the Basin Study development process. Copies of the reports have been made available for review and comment by the California agencies participating in the process. The Board will bundle and

forward the collected comments to Reclamation's Project Team on February 8<sup>th</sup>. The Project Team met in San Diego, California, on January 24<sup>th</sup> and 25<sup>th</sup>, to discuss the interim report, review the schedule for remaining tasks, and identify next steps. Reclamation and the Project Team are scheduled to complete the Interim Report No. 1 by mid-March.

Mr. Harris reported that the Project Team also conducted brainstorming sessions: 1) looking at options and strategies associated with addressing imbalances in water supply and demand; 2) identifying opportunities for improving operational efficiencies; 3) initiating the development of a process for the identification and presentation of potential recommendations; and 4) initiating a process to develop "message points" to accompany the roll-out of the draft report.

### Colorado River Environmental Issues

#### *Reclamation's Draft Environmental Assessment "Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 through 2020"*

Mr. Harris reported that on January 14<sup>th</sup>, Reclamation issued a draft Environmental Assessment (DEA) associated with the proposed development and implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam for the period 2011 through 2020. The purpose of the High-Flow Releases Protocol are two-fold: 1) develop and implement a protocol that determines when and under what conditions to conduct experimental high volume releases from Glen Canyon Dam; and 2) evaluate the parameters of high-flow releases in conserving sediment to benefit downstream resources in Glen, Marble, and Grand Canyons.

Mr. Harris reported that on January 28<sup>th</sup>, Reclamation released its DEA for Non-Native Fish Control Downstream of Glen Canyon Dam. The purpose of the Non-Native Fish Control DEA was to analyze actions to minimize the negative impacts of competition and predation on humpback chub (*Gila cypha*) in the Grand Canyon. Comments may be provided to Reclamation's Upper Colorado Regional Office by February 28<sup>th</sup>. Both DEAs can be accessed via Reclamation's website at <http://www.usbr.gov/uc>.

Mr. Harris reported that on February 1<sup>st</sup>, the seven Basin states sent a letter to Reclamation's Upper Colorado Regional Director requesting an extension of the public comment and review period for the High-Flow Release DEA. The states believe that it will take additional time to review both DEAs and related materials in order to ensure the preparation of comments. Reclamation has indicated that it will accept comments on both DEAs and related materials through February 28<sup>th</sup>. Mr. Harris added that at the February 8<sup>th</sup> Basin states meeting, the states have decided to submit a joint seven-state comment letter by February 28<sup>th</sup>.

## *Glen Canyon Dam Long-Term Experimental and Management Plan*

Mr. Harris reported that the Department of the Interior and Reclamation have initiated a public scoping process associated with preparation of the proposed 10-year “Long-Term Experimental and Management Plan” (LTEMP). The LTEMP is intended to guide management decision-making and project implementation in the Glen Canyon Dam Adaptive Management Program. Mr. Harris reported that DOI and Reclamation intend to fold into the LTEMP the results and synthesis of previous actions performed under the existing Record of Decision for Glen Canyon Dam (GCD) operations, as well as the proposed actions being evaluated in the High-Flow Releases Protocol and Non-Native Fish Environmental Assessments.

### **WATER QUALITY**

#### Status of Chromium VI Contamination Cleanup at PG&E Topock Site

Mr. Amireteymoori reported that the Department of Toxic Substances Control (DTSC) had prepared a draft Statement of Basis and Draft Environmental Impact Report (EIR) associated with groundwater remediation at the PG&E Topock Gas Compressor Station. The DTSC’s Final EIR documents its rationale for the preferred remedial alternative. The preferred plan was Alternative E “In-situ Treatment with Freshwater Flushing.” The selected alternative was the one recommended by PG&E in the final December 2009 Corrective Measure Study/Feasibility Study Document. Based on the Final EIR, DTSC has notified PG&E that it has selected the preferred remedial alternative for the Corrective Measures for the Groundwater Clean-up at the Topock site. Mr. Amireteymoori also reported that on January 26, 2011, DOI issued its “Groundwater Record of Decision” for the project and endorsed the preferred alternative.

#### Status of Perchlorate Remediation at Las Vegas Wash

Mr. Amireteymoori reported that the facilities constructed by Tronox for perchlorate removal at Las Vegas Wash continue to perform as expected. He added that Tronox is expected to emerge from bankruptcy soon. Mr. Amireteymoori reported that AMPAC is currently installing another well field to capture groundwater that contains higher concentration of perchlorate. The Nevada Environmental Response Trust (Trust) will be the “responsible party” for environmental liabilities associated with the Tronox site. The Trust will bear the responsibility for the continued remediation activities at the site. Tronox will still operate and will be leasing portions of the site from the Trust.

There was discussion on the cleanup effort while the companies struggle with financial difficulties. There was additional discussion on the Minimum Contaminate Level (MCL) and possible changes in regulatory MCLs.

## **OTHER BUSINESS**

### Next Board Meeting

Chairman Fisher announced that the next meeting of the Colorado River Board will be held on Wednesday, March 9, 2011, at 10:00 a.m., at the Holiday Inn Ontario Airport, at 2155 East Convention Center Way, Ontario, California.

There being no further items to be brought before the Board, Chairman Fisher asked for a motion to adjourn the meeting. Upon the motion of Mr. Kuiper, seconded by Mr. Menvielle, and unanimously carried, the meeting was adjourned 11:14 a.m. on February 9, 2011.

Christopher S. Harris  
Acting Executive Director

5.a. – Colorado River Water Reports

**SUMMARY WATER REPORT  
COLORADO RIVER BASIN  
March 1, 2011**

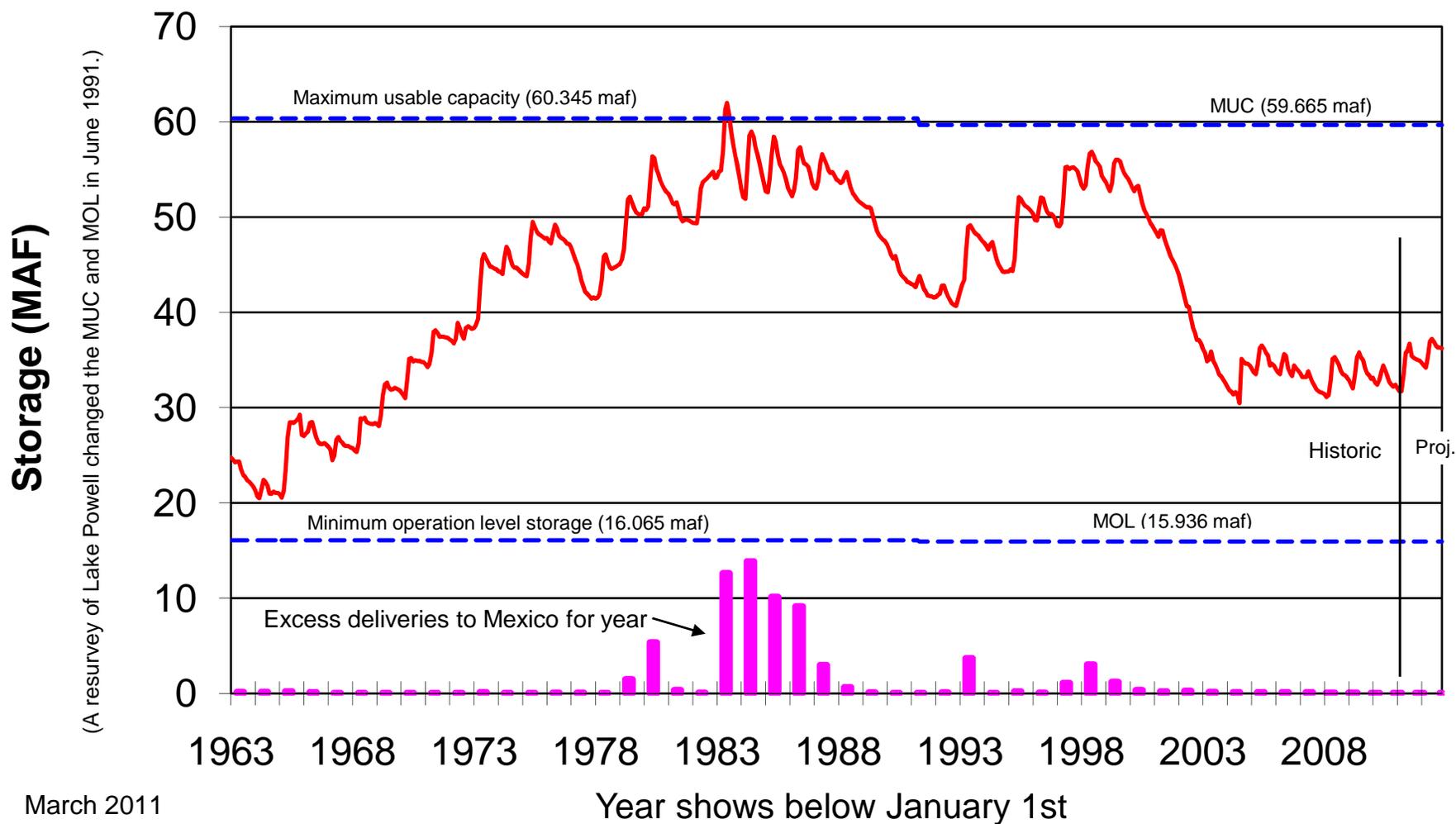
RESERVOIR STORAGE (as of February 28)	January 31, 2011					
	MAF	ELEV. IN FEET	% of Capacity	MAF	ELEV. IN FEET	% of Capacity
<b>Lake Powell</b>	13.235	3,615.0	<b>54</b>	13.852	3,620.8	<b>57</b>
<b>Flaming Gorge</b>	3.104	6,023.5	<b>83</b>	3.112	6,023.7	<b>83</b>
<b>Navajo</b>	1.328	6,058.4	<b>78</b>	1.343	6,059.6	<b>79</b>
<b>Lake Mead</b>	11.117	1,095.8	<b>43</b>	10.758	1,091.7	<b>42</b>
<b>Lake Mohave</b>	1.699	643.1	<b>94</b>	1.663	641.7	<b>92</b>
<b>Lake Havasu</b>	0.567	447.3	<b>91</b>	0.547	446.2	<b>88</b>
<b>Total System Storage</b>	<b>31.866</b>		<b>53</b>	<b>32.141</b>		<b>54</b>
<b>System Storage Last Year</b>	<b>32.125</b>		<b>54</b>	<b>33.087</b>		<b>55</b>

				January 31, 2011	
WY 2011 Precipitation (Basin Weighted Avg) 10/01/10 through 2/28/11			<b>123 percent (18.9")</b>		<b>128 percent (15.6")</b>
WY 2011 Snowpack Water Equivalent (Basin Weighted Avg) on day of 2/28/11			<b>121 percent (17.1")</b>		<b>123 percent (13.5")</b>
(Above two values based on average of data from 116 sites.)					
				January 31, 2011	
February 15, 2011 Forecast of Unregulated Lake Powell Inflow		MAF	% of Normal	MAF	% of Avg.
2011 April through July unregulated inflow		9.000	<b>113 %</b>	9.300	<b>117%</b>
2011 Water Year forecast		12.574	<b>104 %</b>	12.994	<b>108%</b>

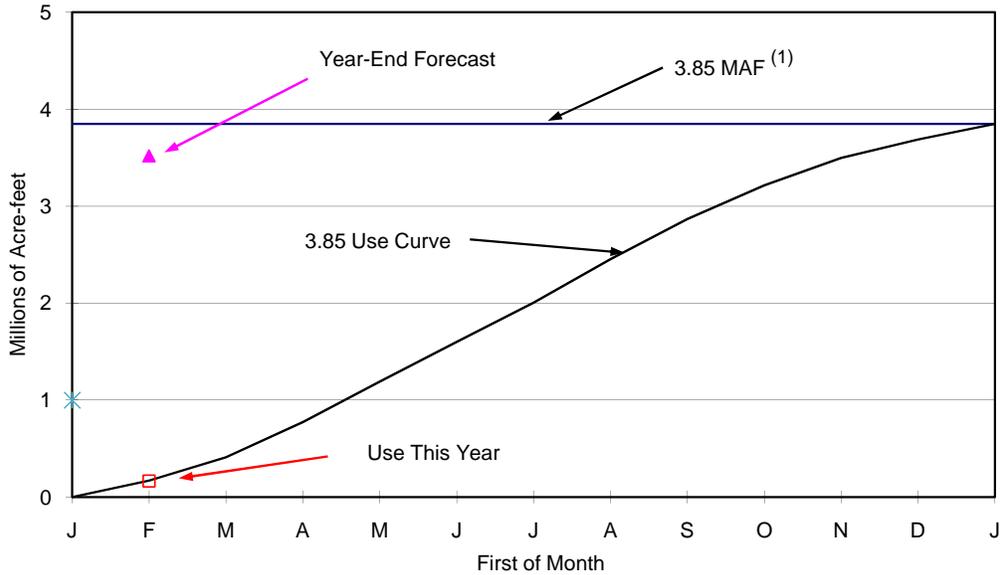
USBR Forecasted Year-End 2011 and 2010 Consum. Use, February 28, 2011 a.					MAF	
			2011		2010	
			Diversion	- Return =	Net	
Nevada (Estimated Total)			0.493	0.213	0.280	0.243
Arizona (Total)			3.674	0.865	2.808	2.792
CAP Total					1.558	1.653
<i>Az. Water Banking Authority</i>					0.134	0.134
OTHERS					1.251	1.140
California (Total) b./			4.714	0.622	4.092	4.363
MWD					0.559	1.099
3.85 Agriculture						
	<u>Total</u>	<u>Conserved</u>			<u>Forecasted</u>	<u>Estimated</u>
	IID c./	3.126	-0.360		2.766	2.547
	CVWD d./	0.399	-0.031		0.368	0.304
	PVID	0.333	0		0.333	0.274
	YPRD	0.045	0		0.045	0.039
	Island e./	0.007	0		0.007	0.006
	<i>Total Ag.</i>	<i>3.910</i>	<i>-0.391</i>		<i>3.519</i>	<i>3.170</i>
Others					0.014	0.094
PVID-MWD following to storage (to be determined)					--	0
<b>Arizona, California, and Nevada Total f./</b>			<b>8.881</b>	<b>1.701</b>	<b>7.181</b>	<b>7.399</b>

- a./ Incorporates Jan. USGS monthly data and 75 daily reporting stations which may be revised after provisions data reports are distributed by USGS. Use to date estimated for users reporting monthly and annually.
- b./ California 2011 basic use apportionment of 4.4 MAF has been adjusted to 4.174 MAF for payback of Inadvertent Overrun and Payback Policy overruns (-1,213 AF), Intentionally Created Surplus Water by IID (-25,000 AF), Creation of Extraordinary Conservation ICS MWD (-200,000 AF)
- c./ 0.105 MAF conserved by IID-MWD Agreement as amended in 2007: 105,000 AF conserved for SDCWA under the IID-SDCWA Transfer Agreement as amended, 80,000 AF of which is being diverted by MWD; 16,000 AF required to conserved for CVWD under the IID-CVWD Acquisition Agreement, 67,700 AF conserved by the All-American Canal Lining Project.
- d./ 30,850 acre-feet conserved by the Coachella Canal Lining Project.
- e./ Includes estimated amount of 6,530 acre-feet of disputed uses by Yuma Island pumpers and 0 acre-feet by Yuma Project Ranch 5 being charged by USBR to Priority 2.
- f./ Includes unmeasured returns based on estimated consumptive use/diversion ratios by user from studies provided by Arizona Dept. of Water Resources, Colorado River Board of California, and Reclamation.

# Monthly Total Colorado River Basin Storage



**FIGURE 1**  
**MARCH 1, 2011 FORECAST OF 2011 YEAR-END COLORADO RIVER WATER USE**  
**BY THE CALIFORNIA AGRICULTURAL AGENCIES**



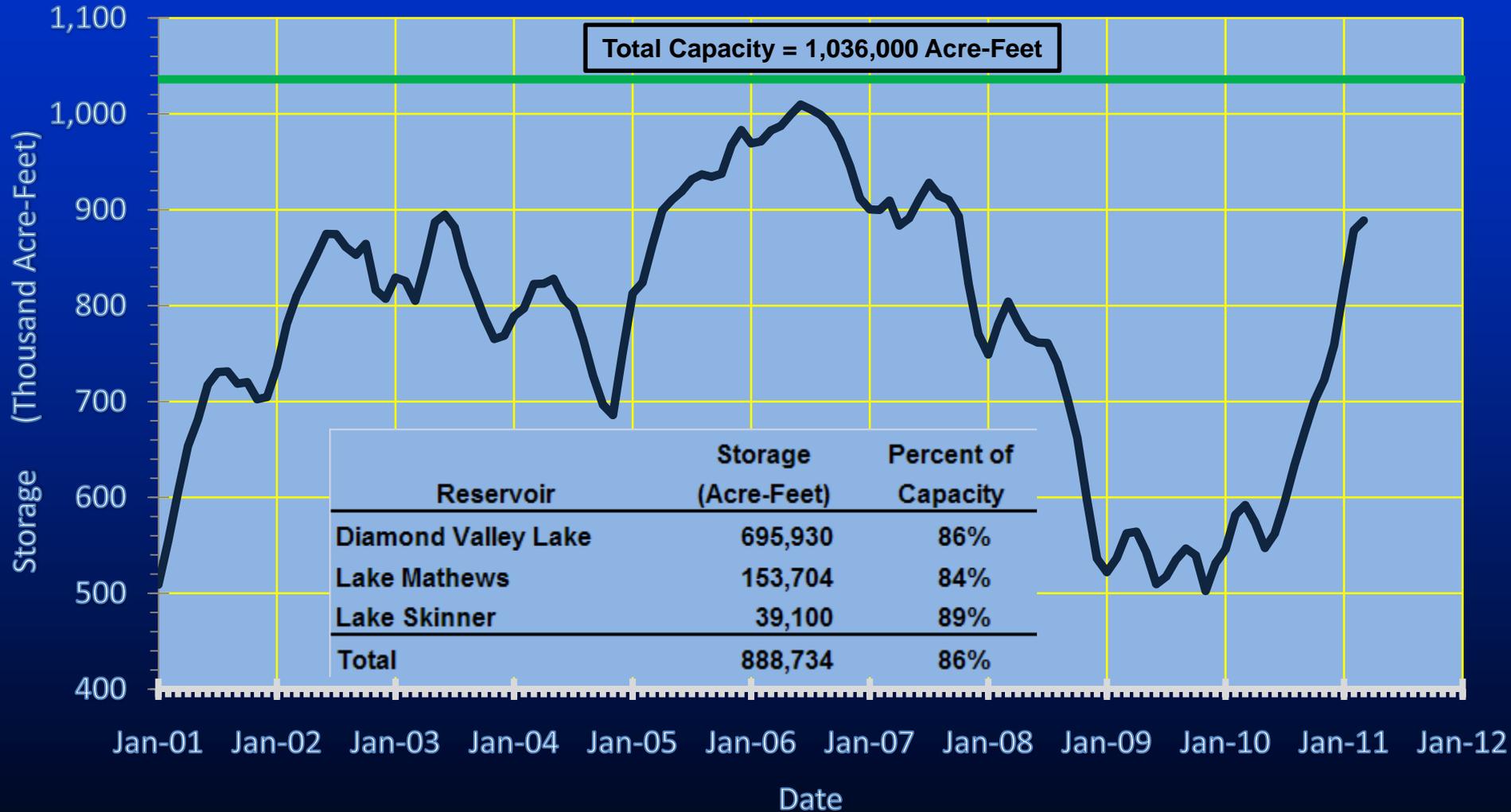
Forecast of Colorado River Water Use by the California Agricultural Agencies (Millions of Acre-feet)			
Month	Use as of First of Month	Forecast of Year End Use	Forecast of Unused Water (1)
Jan	0.000	-----	-----
Feb	0.167	3.519	0.023
Mar			
Apr			
May			
Jun			
Jul			
Aug			
Sep			
Oct			
Nov			
Dec			
Jan			

(1) The forecast of unused water is based on the availability of 3.542 MAF under the first three priorities of the water delivery contracts. This accounts for the 85,000 af of conserved water available to MWD under the 1988 IID-MWD Conservation agreement and the 1989 IID-MWD-CVWD-PVID Agreement as amended; 80,000 AF of conserved water available to SDCWA under the IID-SDCWA Transfer Agreement as amended being diverted by MWD; an estimated 29,000 AF of conserved water available to SDCWA and MWD as a result of the Coachella Canal Lining Project, 67,700 AF of water available to SDCWA and MWD as a result of the All American Canal Lining Project; 14,500 AF of water IID and CVWD are forbearing to permit the Secretary of the Interior to satisfy a portion of Indian and miscellaneous present perfected rights use and 25,000 AF of water IID is conserving to create Extraordinary Conservation Intentionally Created Surplus. 0 AF has been subtracted for IID's Salton Sea Salinity Management in 2011. As USBR is charging uses by Yuma island pumpers to priority 2, the amount of unused water has been reduced by those uses - 6,530 AF. The CRB does not concur with USBR's viewpoint on this matter.

5.b. – State and Local Water Reports

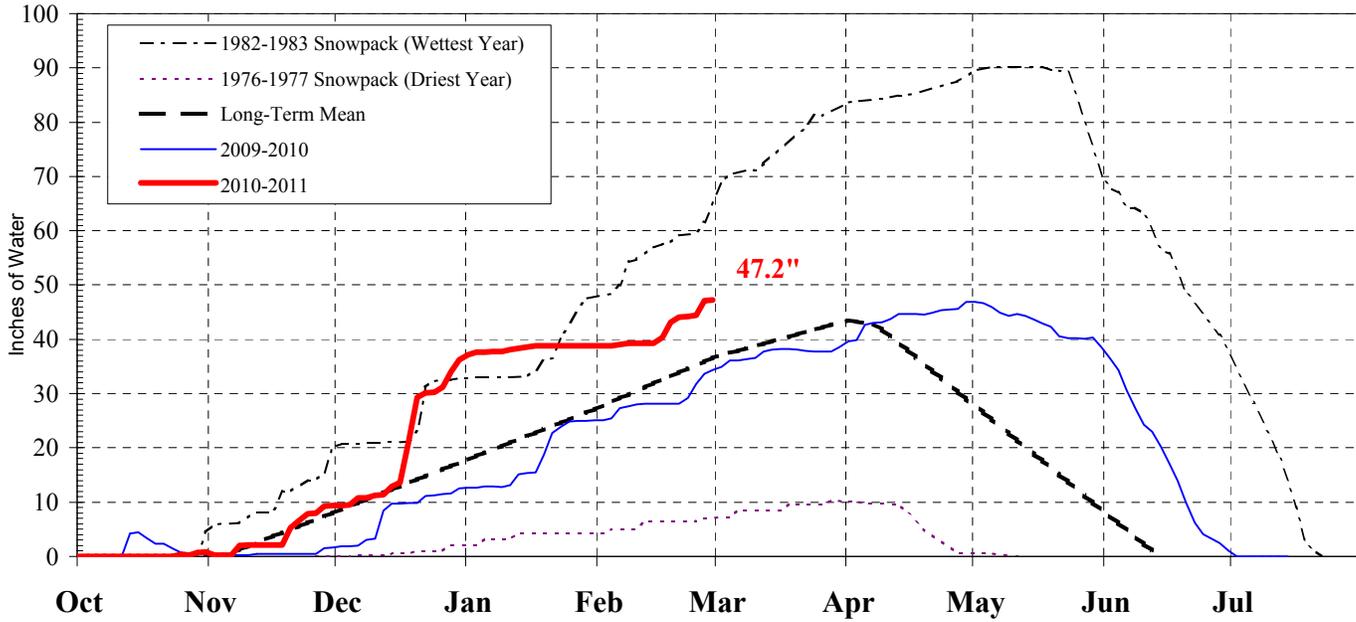
# MWD's Combined Reservoir Storage as of March 1, 2011

Lake Skinner, Lake Mathews, and Diamond Valley Lake

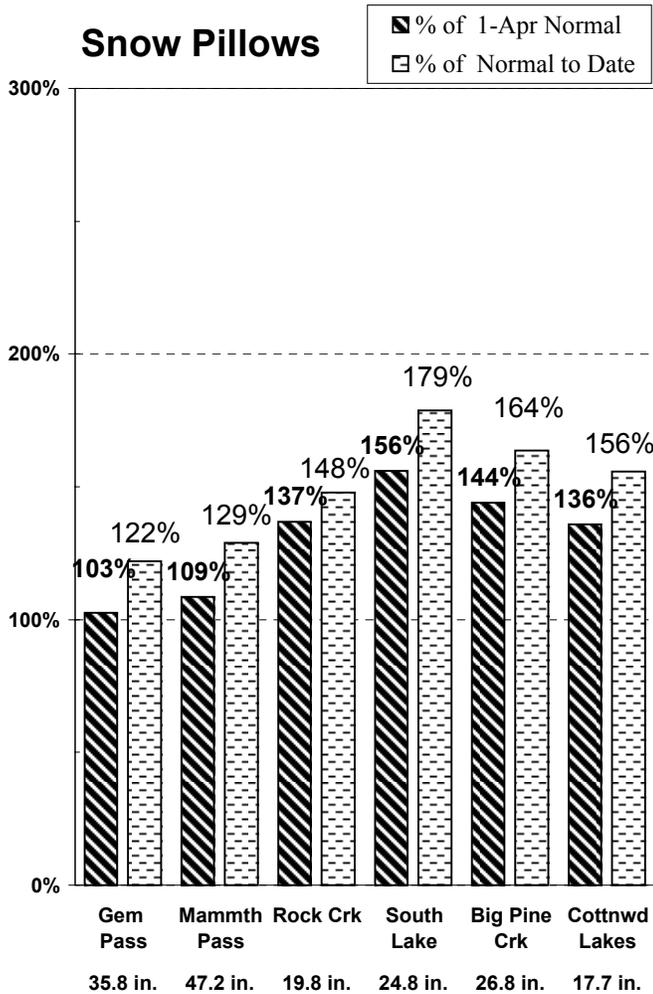


# EASTERN SIERRA CURRENT PRECIPITATION CONDITIONS As of March 1, 2011

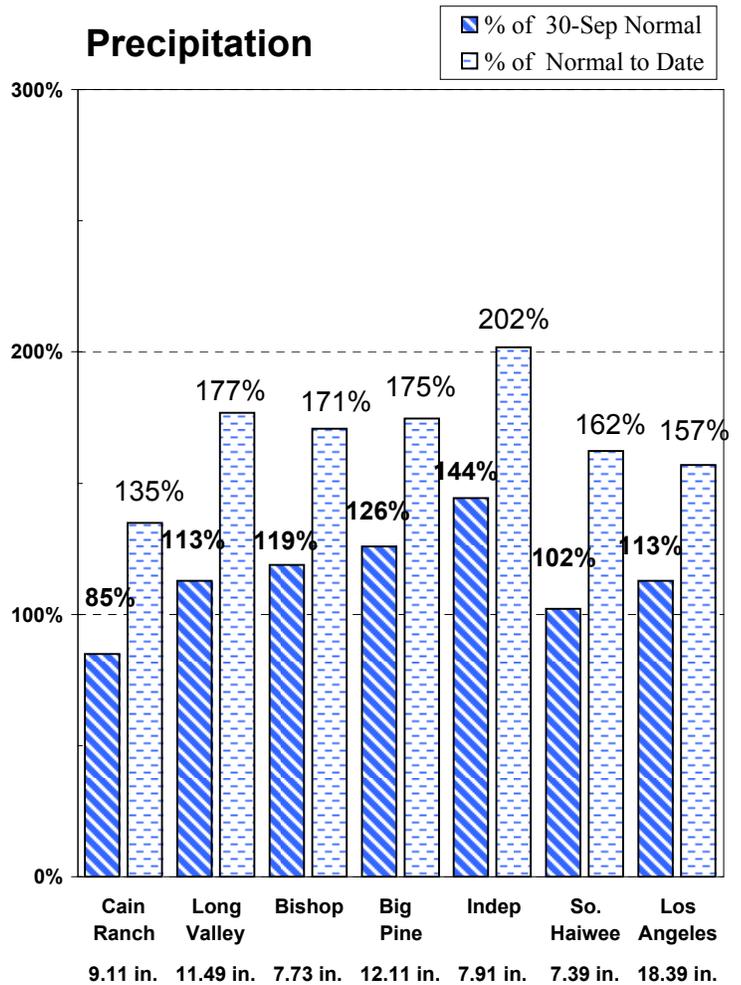
## Mammoth Pass Snowpack



## Snow Pillows



## Precipitation



Measurement as Inches Water Content

*Precipitation totals are cumulative for water year beginning Oct 1*

## EASTERN SIERRA SNOW SURVEY RESULTS

March 1, 2011

### MAMMOTH LAKES AREA

<u>Course</u>	<u>Water Content</u>	<u>Normal to Date</u>	<u>April 1 Normal</u>	<u>% of Normal to Date</u>	<u>% of April 1 Normal</u>
Mammoth Pass	49.1	36.6	43.5	134%	113%
Mammoth Lakes	26.0	18.7	21.1	139%	123%
Minarets 2	35.9	26.0	30.1	138%	119%
<b>Average:</b>	<b>37.0</b>	<b>27.1</b>	<b>31.5</b>	<b>137%</b>	<b>117%</b>

### ROCK CREEK AREA

<u>Course</u>	<u>Water Content</u>	<u>Normal to Date</u>	<u>April 1 Normal</u>	<u>% of Normal to Date</u>	<u>% of April 1 Normal</u>
Rock Creek 1	14.1	8.4	7.4	168%	190%
Rock Creek 2	15.7	10.3	10.5	152%	150%
Rock Creek 3	18.3	13.4	14.4	137%	127%
<b>Average:</b>	<b>16.0</b>	<b>10.7</b>	<b>10.8</b>	<b>150%</b>	<b>149%</b>

### COTTONWOOD AREA

<u>Course</u>	<u>Water Content</u>	<u>Normal to Date</u>	<u>April 1 Normal</u>	<u>% of Normal to Date</u>	<u>% of April 1 Normal</u>
Cottonwood Lakes 1	17.1	11.4	13.0	150%	131%
Trailhead*	18.5	11.9	13.7	155%	135%
<b>Average:</b>	<b>17.8</b>	<b>11.6</b>	<b>13.3</b>	<b>153%</b>	<b>133%</b>

### EASTERN SIERRA OVERALL SNOW PACK

<u>Average of all Snow Courses</u>	<u>Water Content</u>	<u>Normal to Date</u>	<u>April 1 Normal</u>	<u>% of Normal to Date</u>	<u>% of April 1 Normal</u>
	23.6	16.5	18.6	143%	127%

Normals are based on the 1956-2005 period

\* Trailhead has only been measured since 1982.

5.c. – Colorado River Operations



THE METROPOLITAN WATER DISTRICT  
OF SOUTHERN CALIFORNIA

Office of the General Manager

February 16, 2011

Ms. Lorri Gray  
Regional Director  
Lower Colorado Regional Office  
U.S. Bureau of Reclamation  
P.O. Box 61470  
Boulder City, NV 89006-1470

Mr. Chris Harris  
Acting Executive Director  
Colorado River Board of California  
770 Fairmont Avenue, Suite 100  
Glendale, CA 91303-1035

Ms. Sandra A. Fabritz-Whitney  
Acting Director  
Arizona Department of Water Resources  
3550 North Central Avenue  
Phoenix, AZ 85012-2129

Mr. George Caan  
Director  
Colorado River Commission of Nevada  
555 East Washington Avenue, Suite 3100  
Las Vegas, NV 89101-1065

Dear Meses. Gray and Fabritz-Whitney, Messrs. Harris and Caan:

Report on Southern Nevada Water Authority Interstate Account for  
2010 Administered by the Metropolitan Water District of Southern California

Pursuant to Section 6.2.2 of the October 22, 2004 Storage and Interstate Release Agreement among the Secretary of the Interior, the Metropolitan Water District of Southern California (Metropolitan), the Southern Nevada Water Authority (SNWA), and the Colorado River Commission of Nevada, enclosed is a final verified accounting for the SNWA Interstate Account administered by Metropolitan through calendar year 2010.

If you have any questions regarding the accounting, please contact Mr. Harry Ruzgerian at (213) 217-6082.

Very truly yours,

Handwritten signature of Roger K. Patterson in cursive.

Roger K. Patterson  
Assistant General Manager

HMR:tt

Enclosure

Mses. Gray and Fabritz-Whitney, Messrs. Harris and Caan

Page 2

February 16, 2011

cc: Ms. Patricia Mulroy  
General Manager  
Southern Nevada Water Authority  
100 City Parkway, Suite 700  
Las Vegas, NV 89106-4615

## Final Accounting through Calendar Year 2010

February 16, 2011

<b>Year</b>	<b>Beginning Balance</b> (acre feet)	<b>Amount Diverted and stored for the Benefit of SNWA</b> (acre feet)	<b>Debits for Water Withdrawn for Purposes of Developing ICUA</b> (acre feet)	<b>End of Year Net Balance</b> (acre feet)	<b>Cumulative Credits</b> (acre feet)
2004	0	10,000	0	10,000	10,000
2005	10,000	10,000	0	10,000	20,000
2006	20,000	5,000	0	5,000	25,000
2007	25,000	0	0	0	25,000
2008	25,000	45,000	0	45,000	70,000
2009	70,000	0	0	0	70,000
2010	70,000	0	0	0	70,000



**Release Date:** 02/15/11

**Contacts:** Kendra Barkoff (DOI), 202-208-6416  
 Matt Spangler (BLM), 202-912-7414

## Salazar: Technology, Water Supplies, and Fair Return Must Guide Nation's Oil Shale Program

### *USGS to Launch Water Resource Analysis*

**Washington, D.C.** -- Secretary of the Interior Ken Salazar and Bureau of Land Management (BLM) Director Bob Abbey announced today that the BLM will take a fresh look at commercial oil shale rules and plans issued under the previous Administration and, if necessary, update them based on the latest research and technologies, to account for expected water demands in the arid West and to ensure they provide a fair return to taxpayer.

Following the **recommendations** of the Government Accountability Office (GAO), the United States Geological Survey (USGS) will also undertake an **analysis** of baseline water resources conditions to improve the understanding of groundwater and surface water systems that could be affected by commercial-scale oil shale development.

"For more than a century, and through many busts, we in the West have been trying to unlock oil shale resources to help power our country," said Secretary Salazar. "If we are to succeed this time, we must continue to encourage RD&D, determine whether the technologies would be viable on a commercial scale, and find a way to develop the resources in a way that protects water supplies in the arid West. With commercial oil shale technologies still years away, now is the time to ensure that our rules and plans reflect the latest information and will deliver a fair return to the American taxpayer."

BLM Director Bob Abbey said the agency, which recently solicited and received a **second round of nominations** for research, demonstration and development (RD&D) leases for oil shale on public land in Colorado and Utah, is committed to helping companies develop their technologies to determine their viability on a commercial scale and to ascertain what their water and power needs might be as well as their potential environmental impacts.

"The BLM's RD&D program has laid the foundation for companies to begin research, demonstration and development projects on public land, and to help determine how and whether their technologies might be viable on a commercial scale," said Director Abbey. "As companies apply their bench-scale technologies on those RD&D leases, we need to ensure that our commercial oil shale regulations and plans keep pace with the latest information. With commercial development of oil shale several years down the road, we have a window in which to consider how we might improve the 2008 regulations and plans for commercial development."

In November 2008, the previous Administration amended 8 of the BLM's land use plans in Colorado, Utah, and Wyoming to make public lands available for potential commercial-scale oil-shale development, and two other land use plans to expand the acreage available for potential tar-sands leasing in Utah, where these resources are located. These actions made nearly 2 million acres available for potential development. It also issued regulations that fix the royalty rate for oil shale at 5% for the first 5 years of commercial production, rising 1% every year thereafter until the rate reaches a possible maximum of 12.5%.

Abbey said that over the coming months, the public will have an opportunity to provide input on whether to update the existing commercial oil shale regulations. The public process will allow the Department to consider whether the royalty rate for commercial oil shale production should be set after more is known about emerging oil shale technologies, whether future applications to lease should include specified resource protection plans, and whether aspects of the existing regulations should be clarified.

Secretary Salazar noted that the Government Accountability Office (GAO) recently determined that several fundamental questions about oil shale technologies remain unanswered, including critical questions about water demands. An October, 2010 **GAO report** determined that: "Oil shale development could have significant impacts on the quality and quantity of water resources, but the magnitude of these impacts is unknown because technologies are years from being commercially proven, the size of a future oil shale industry is uncertain, and knowledge of current water conditions and groundwater flow is limited." The Department is implementing an action plan, which includes USGS's analysis of baseline water resources, to **address the GAO's recommendations**.

Director Abbey said the BLM will also conduct further environmental analysis to determine whether to amend existing land use plans for oil shale and tar sands resources. The public process associated with the planning initiative will allow the Department to take a fresh look at what public lands are best suited for this kind of development.

Abbey said that BLM's review of its commercial oil shale regulations and programs should have no effect on existing R&D leases. "We remain very supportive of RD&D efforts as we seek to develop critical information about the commercial viability of oil shale technologies," said Abbey.

Today's announcement reflects the fact that BLM is also moving to resolve through settlement two lawsuits that are pending before the Federal District Court in Colorado.

A Fact Sheet on Oil Shale is online at <http://blm.gov/5m5c>

--BLM--

Office of the Secretary of the Interior 1849 C Street N.W. Washington, DC 20240

Last updated: 02-16-2011

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5.c. – Colorado River Environmental Issues



OFFICE OF THE SECRETARY  
**U.S. Department  
of the Interior**

www.doi.gov

## News Release

### Glen Canyon Dam High-Flow Experiments Provide Insights for Future Flow Management of the Colorado River

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02/08/2011

Contact: Lara Schmit (USGS) 928-556-7327  
Joan Moody (DOI) 202-208-6416

**FLAGSTAFF, Ariz.** – High-volume water releases from Glen Canyon Dam can increase sandbar area and volume, but may also result in large increases in non-native rainbow trout downstream of the dam, according to a new U.S. Geological Survey report released today.

The report, *Effects of Three-High Flow Experiments on the Colorado River Ecosystem Downstream from Glen Canyon Dam, Arizona*, documents the effects of high-flow experiments (HFEs) on resources in Glen Canyon National Recreation Area and the Grand Canyon National Park. The U.S. Department of the Interior conducted HFEs at Glen Canyon Dam in March 1996, November 2004 and March 2008.

“This important scientific research has paved the way for better management of Glen Canyon Dam to enhance protection of downstream resources,” said Anne Castle, Assistant Secretary for Water and Science in the Department of the Interior. “The report pulls together the results from three different high-flow releases so that such events in the future can be targeted for optimal resource benefits and minimizing adverse effects.”

Grand Canyon sandbars provide habitat for wildlife, serve as camping beaches for recreationists, and supply sand that may preserve vegetation and help protect archaeological sites. High flows also create areas of low-velocity flow, or backwaters, used by young native fishes, including endangered humpback chub.

“Research and long-term monitoring of the effects of three high-flow experiments have allowed scientists to unravel some of the many uncertainties about how these Glen Canyon Dam releases affect downstream river resources,” said Dr. Ted Melis, deputy chief of the USGS Grand Canyon Monitoring and Research Center and the report’s editor. “We believe that the scientific findings presented in the report will allow managers to better plan future flow operations to meet desired resource goals.”

HFEs, also known as artificial or controlled floods, are effective at increasing both sandbar area and volume when they are conducted soon after “new” sand has been supplied to the system by flooding from tributaries downstream of the dam. In the absence of new sand supplies, as was the case in 1996, HFEs may still build sandbars, but only by eroding the lower portions of existing sandbars. In other words, sandbars became higher and not wider in 1996.

According to the report, the best possibility for rebuilding and maintaining sandbars is to time HFEs to follow the seasonal flooding of tributaries downstream of the dam. During years of below-average upper Colorado River Basin precipitation, allowing multiple new sand inputs to accumulate before conducting an HFE would result in the greatest sandbar building, the report said. However, during years of wetter upper basin hydrology, HFEs might be more effective immediately following or even during tributary flooding.

Sandbars are built relatively quickly (hours to a few days) when new sand is available from tributaries, as occurred in 2004 and 2008, but they also tend to erode within days to several months under normal dam operations following an HFE. Despite this ongoing erosion, long-term monitoring indicates that about 75 percent of sandbars measured in Marble and Grand Canyons were larger in October 2008 than in February 1996, before the first HFE was conducted.

The 2008 HFE was followed by large increases in non-native rainbow trout in the Lees Ferry reach, the sport fishery immediately downstream of the dam. These fish moved downstream and into areas that support native fishes, including the area with the largest population of endangered humpback chub.

The eight-fold increase of rainbow trout that occurred in 2008 is of particular note, the report said, because rainbow trout are known predators of young humpback chub and may also compete with native fish for limited food resources. Overall, the studies found that HFEs have had no measurable positive effects on juvenile or adult humpback chub populations.

The report is a product of the Glen Canyon Dam Adaptive Management Program, a federally authorized initiative to ensure the mandate of the Grand Canyon Protection Act of 1992 is met through advances in information and resource management. The USGS Grand Canyon Monitoring and Research Center has responsibility for scientific monitoring and research efforts for the program. The Bureau of Reclamation provides financial support for the program that is derived from hydropower revenues from Glen Canyon Dam operations.

The Bureau of Reclamation recently released for public comment two draft Environmental Assessments (EAs) related to topics addressed by this report (1) Development and Implementation of a protocol for High-Flow Experimental Releases from Glen Canyon Dam, Ariz., 2011 through 2020 and (2) Nonnative Fish Control Downstream from Glen Canyon Dam.

- The report
- 4-page Fact Sheet

###

# Three Experimental High-Flow Releases from Glen Canyon Dam, Arizona—Effects on the Downstream Colorado River Ecosystem

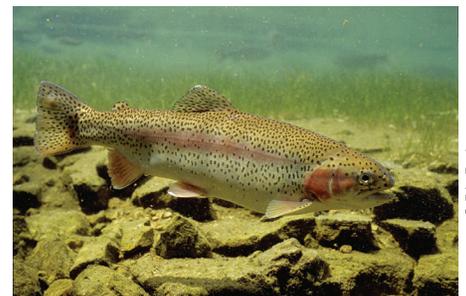
**T**hree high-flow experiments (HFEs) were conducted by the U.S. Department of the Interior at Glen Canyon Dam, Arizona, in March 1996, November 2004, and March 2008. Also known as artificial or controlled floods, these scheduled releases of water above the dam’s powerplant capacity were designed to mimic pre-dam seasonal flooding on the Colorado River. The goal of the HFEs was to determine whether high flows could be used to benefit important downstream resources in Glen Canyon National Recreation Area and Grand Canyon National Park that have been affected by the existence and operation of Glen Canyon Dam. These downstream resources include native fish, particularly endangered humpback chub (*Gila cypha*), terrestrial and aquatic sandbar habitats, cultural sites, and recreational resources. This Fact Sheet summarizes HFE-related studies published since 1996 and outlines a possible strategy for implementing future HFEs.



Anne Phillips, USGS



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## Background

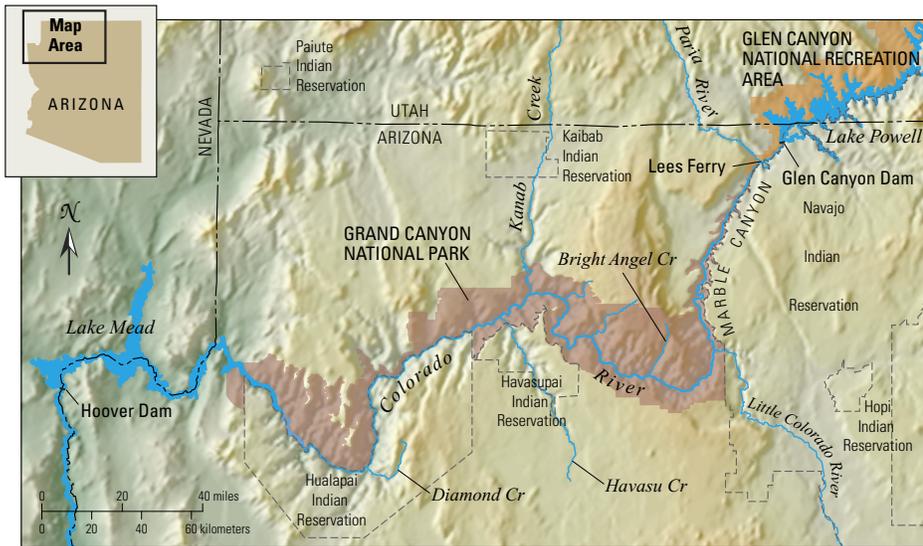
The construction and operation of dams results in numerous physical and ecological changes to river systems. Since its completion in 1963, Glen Canyon Dam, Arizona (lat 36.9375° and long -111.4843°), traps in Lake Powell all of the upstream sediment—gravel, sand, silt, and clay—formerly carried by the Colorado River through Grand Canyon National Park. Additionally, the dam reduced the magnitude and duration of flooding downstream, and dam operations result in a dominance of moderate flows compared to pre-dam seasonal floods and periods when flows were reduced to a relative trickle. Before the dam was built, Colorado River flow gradually increased from mid-December to

March, precipitously increased in April and May, and reached its peak in early June. This pre-dam seasonal flooding moved sand from the riverbed to the shoreline, creating and maintaining sandbars. Jet tubes at Glen Canyon Dam release Colorado River water on the morning of March 5, 2008, during a high-flow experiment (HFE). This and two similar HFEs sought to determine whether high flows could be used to move sand from the riverbed to Grand Canyon sandbars, used as camping beaches (lower left), and to benefit other resources. Following the 2008 HFE, rainbow trout (*Oncorhynchus mykiss*; lower right) numbers increased, which may adversely affect native humpback chub (*Gila cypha*), an endangered species.

March, precipitously increased in April and May, and reached its peak in early June. This pre-dam seasonal flooding moved sand from the riverbed to the shoreline, creating and maintaining sandbars.

Dam-induced changes in the Colorado River’s temperature, flow, and sediment-carrying capacity have been implicated in losses of native fish, invasion of nonnative species, sandbar erosion, and the narrowing of rapids. Through the periodic use of high-flow experiments (HFEs), which are scheduled releases

of water from the dam above powerplant capacity, managers have attempted to benefit key resources by simulating one aspect of the pre-dam river—floods. Three HFEs, also known as artificial or controlled floods, were conducted by the U.S. Department of the Interior at Glen Canyon Dam in March 1996, November 2004, and March 2008. Research and long-term monitoring have allowed scientists to unravel many, but not all, of the uncertainties that existed about how HFEs might affect downstream river resources.



Map of the Colorado River downstream of Glen Canyon Dam showing the river corridor between Lake Powell and Lake Mead reservoirs.

## Physical Processes

Studies conducted in conjunction with each HFE have allowed scientists to better understand the physical processes of the post-dam Colorado River, especially how the river transports and reworks the now greatly reduced sand supply (about 10 percent of historical values). With the upstream sand supply trapped behind Glen Canyon Dam, the Paria and Little Colorado Rivers, tributaries that enter the river downstream of the dam, are the primary sources of sand to the system. Sand provided by these and other, smaller tributaries is deposited on the riverbed and eventually carried downstream to Lake Mead, particularly during high-volume dam releases. Because HFEs to some extent mimic natural flooding, they have been conducted to evaluate their ability to benefit sediment-dependent resources, including sandbars and camping beaches, marsh and riverside vegetation, and aquatic habitats such as backwaters, which are nearshore areas of low-velocity flow used as rearing habitat by native fish. Sandbars are of particular concern because they eroded from the time the dam was completed in 1963 to 1991. During this period, the dam was operated to meet required downstream water transfers and to maximize the generation of electricity around peak daily demand, causing daily flows to vary greatly (from ~1,000 to ~25,000 ft<sup>3</sup>/s) and resulting in sandbar erosion. Constraints were placed on dam operations starting in 1991, in part to reduce sandbar erosion and increase retention of sediment from tributaries.

The first HFE took place between March 26 and April 7, 1996, including a 7-day steady peak release at 45,000 ft<sup>3</sup>/s—a peak flow about 50 percent greater than power-plant capacity. Scientists learned after this HFE that the sand delivered from tributaries does not accumulate on the riverbed over multiple years during typical operations. It had been thought that tributary-supplied sand would be stored on the riverbed in response to the 1991 operational changes and that this stored sand would be the primary source of sand available to rebuild sandbars during HFEs. Although the 1996 HFE demonstrated that high flows can build sandbars, sandbars at higher elevations were built from sand scoured from the lower elevation portions of existing sandbars rather than from sand stored on the riverbed. In other words, in these cases sandbars became higher but not wider. On the basis of these findings, the 2004 and 2008 HFEs were shorter in duration and strategically timed to follow tributary floods that provided “new” sand to the system before it was carried downstream. Research indicates that from February 1996 to October 2008—the span of the three HFEs—75 percent of the sandbars at long-term study sites in Grand Canyon experienced net increases in volume, despite ongoing sandbar erosion between HFEs.

Three conclusions related to sediment have important implications for designing future HFEs. First, HFEs build sandbars by eroding existing low-elevation portions of sandbars or by using tributary-supplied sand.

Second, HFEs conducted soon after new sand has been supplied to the river channel by tributary floods are effective at increasing sandbar area and volume and less likely to result in the erosion of low-elevation portions of sandbars. Sandbars are built relatively quickly (hours to a few days) under these sand-enriched conditions, but they also tend to erode quickly (days to several months) following an HFE. Third, monitoring data show that sandbars erode more quickly as release volumes and daily fluctuations increase, whereas the rate of erosion is reduced when tributary sand inputs continue to occur following sandbar building.

## Biological Processes

As the Colorado River flows downstream from Glen Canyon Dam, the management goals for aquatic resources shift from maintaining naturally reproducing populations of nonnative fish to maintaining or attaining viable populations of native fish, particularly the endangered humpback chub (*Gila cypha*). The Lees Ferry reach, a 16-mile-long stretch of the river immediately downstream from the dam in Glen Canyon National Recreation Area, supports a nonnative rainbow trout (*Oncorhynchus mykiss*) sport fishery. Despite management efforts to benefit native fish in the main stem within Grand Canyon National Park, rainbow trout are the dominant fish in the main stem as far downstream as its confluence with the Little Colorado River. Most humpback chub are found in the Little Colorado River and near its confluence with the Colorado River. Native flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*Catostomus discobolus*), and nonnative common carp (*Cyprinus carpio*) dominate downstream reaches of the Colorado River as it nears Lake Mead.

It had been thought that HFEs would benefit native fish by creating nearshore backwater habitats that might serve as important rearing environments. On the other hand, scientists also anticipated that HFEs would displace both native and nonnative fish downstream and that some rainbow trout eggs and juvenile fish would experience mortality. Research associated with the 2008 HFE, however, indicates that high flows actually benefit rainbow trout populations by improving spawning and rearing habitats in the Lees Ferry reach. Survival rates of juvenile rainbow trout in this reach in 2008 were more than four times higher

than observed in years before the experiment for which data are available (2003 to 2007). This response persisted into 2009, with juvenile survival rates that were twice those in pre-HFE years; in 2010, however, juvenile rainbow trout survival was much lower and similar to levels between 2003 and 2007. This pattern indicates that the effect of an HFE on early life stages of trout may persist for as long as 2 years. Increased survival rates recorded in 2008 and 2009 appear to be the result of HFE-induced increases in aquatic invertebrates, such as midges and black flies, which are high-quality food items preferred by trout. These high survival rates led to increases in adult populations of rainbow trout throughout the river.

Downstream migration of the large number of rainbow trout that were spawned in the Lees Ferry reach in 2008, as well as spawning that may have occurred downstream, contributed to a roughly 800 percent increase in rainbow trout densities between 2007 and 2009 in the main stem near the confluence with the Little Colorado River, where most humpback chub are found. This large increase followed efforts to control nonnative fish in this reach that resulted in the removal of about 20,000 rainbow trout from 2003 through 2006. Because rainbow trout are known predators of young humpback chub and may also compete with them for limited food resources, the increase of rainbow trout in the vicinity of the Little Colorado River has been cause for concern. Although the HFEs have been shown to result in temporary increases in the number and size of backwater habitats, corresponding beneficial effects on humpback chub populations have not been documented.

Research related to the 1996 and 2008 experiments<sup>1</sup> indicates that HFEs conducted during early spring and late winter can be a tool for maintaining native marsh and riparian plant communities and reducing nonnative vegetation. One of the primary concerns regarding HFE timing is the risk of dispersing seeds of nonnative species, especially tamarisk (*Tamarix* spp.). The 1996 and 2008 HFEs occurred before tamarisk begins producing seeds—seed production generally occurs between April and September. Thus, the establishment of tamarisk seedlings was low (less than 2 percent) in 1996 and 2008. Plants that

<sup>1</sup> No published research is available about the effects of the November 2004 HFE on vegetation.

recovered quickly following the 2008 HFE were those well adapted to burial. Clonal wetland plants also quickly occupied bare sandbars and shorelines following both the 1996 and 2008 HFEs. Therefore, reductions in campsite area because of vegetation recovery and expansion following HFEs might offset the temporary increases in campsite area that resulted from sandbar building during HFEs.

Three biological conclusions have important implications for designing future HFEs. First, on the basis of 2008 HFE research, spring-timed HFEs have the potential to significantly increase the rainbow trout population in the Lees Ferry reach and in downstream reaches that support native fish. Second, the large increases of rainbow trout documented in the Colorado River near its confluence with the Little Colorado River may adversely affect adult populations of endangered humpback chub. Third, HFEs have had no measurable positive impacts on juvenile or adult humpback chub populations.

### A Science-Based Strategy for Future High-Flow Experiments

The U.S. Department of the Interior directed the U.S. Geological Survey (USGS) to develop a science-based strategy for conducting future HFEs as part of the Department's efforts to produce a new protocol for these experiments. The strategy outlined below is based on adaptive management, or "learning by doing," meaning that the strategy is anticipated to change as new scientific findings improve the understanding of how HFEs affect the river ecosystem. The primary goal of the strategy is to sustainably rebuild and maintain Grand Canyon sandbars, but it would also assist scientists to better understand the effects of HFEs on biological resources, particularly rainbow trout and humpback chub.

Although HFEs can rebuild sandbars by depositing a fraction of new tributary sand at higher elevations along shorelines, higher flows also efficiently export available sand supplies downstream. An important objective of any HFE strategy would be to achieve a neutral sand budget, so that the total sand exported downstream does not exceed ongoing tributary sand inputs over the long term. Sand storage in the main stem is greatest immediately following tributary floods, before downstream export results from daily dam releases. With only about 10 percent of the pre-dam sand sup-



March 4, 2008 (before the HFE)



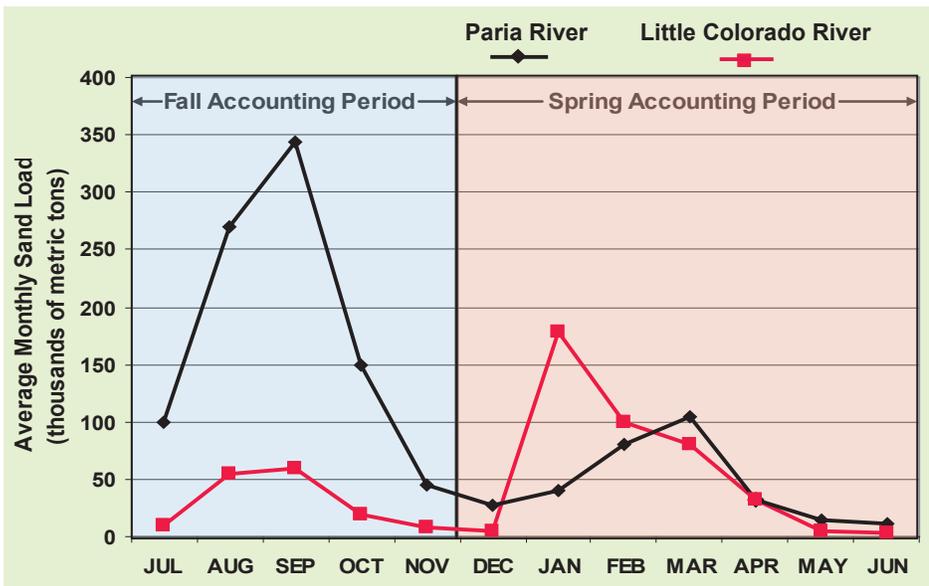
March 11, 2008 (immediately after the HFE)



September 30, 2008 (about 6 months after the HFE)

Repeat photographs of a long-term sandbar study site on the Colorado River about 45 miles downstream from Lees Ferry, Arizona, showing how that sandbar was affected by the 2008 high-flow experiment (HFE) and by erosion in the subsequent 6 months. All of the photographs were taken by a remote camera at about 4 p.m. and at a water level associated with a flow rate from Glen Canyon Dam of about 8,500 cubic feet per second (ft<sup>3</sup>/s). The river flows from left to right. Boat (18 feet long) in bottom photo indicates scale.

ply still entering Grand Canyon, primarily from the Paria and Little Colorado Rivers, the best possibility for rebuilding and maintaining sandbars is conducting frequent HFEs following tributary floods that deliver large quantities of sand to the river. This is



Historical data on sand delivery to the Colorado River from flooding on the Paria and Little Colorado Rivers support a high-flow experiment (HFE) strategy with spring and fall releases from Glen Canyon Dam for the purpose of building and maintaining sandbars in Marble and Grand Canyons.

because (1) typical dam operations do not allow multiyear accumulation of tributary sand inputs on the riverbed and (2) new sandbars are eroded by typical dam releases following each HFE. If future HFEs are strategically timed to follow tributary floods, and the duration and magnitude of HFEs are designed to match the volume of new sand delivered to the river (short-duration, low-magnitude HFEs when sand inputs are small and long-duration, high-magnitude HFEs when sand inputs are large), then it may be possible to enlarge and maintain sandbars through time.

Paria River flooding is the primary source of new sand inputs, and these floods typically occur from mid-summer through early fall. Therefore, conducting HFEs in the fall, following the typical Paria River flood pattern, would likely maximize sandbar building. On rare occasions, the Paria River floods between December and April, so spring-timed HFEs would maximize sandbar building in that situation. Because of the typical timing of Paria River flooding, about two-thirds of future HFEs would occur during the fall, if resource managers were to implement this strategy. The Little Colorado River also delivers sand to Grand Canyon at various times during the year, so managers could also consider timing HFEs to coincide with flooding on that tributary.

During years when dam release volumes are below average and downstream sand

transport occurs more slowly, allowing multiple new sand inputs to accumulate before an HFE would likely result in the greatest sandbar-building response. This accumulate-and-release strategy is likely to be most effective if the magnitude and duration of each HFE are designed in response to the volume and location of new sand in the system. However, during years of average or wet upper Colorado River Basin hydrology, when releases from Glen Canyon Dam are higher and sand is exported downstream more rapidly, HFEs might be more effectively conducted immediately following or even during tributary flooding. This option would be particularly appropriate when new sand would otherwise be rapidly exported downstream (days to weeks) because of large-volume dam releases required to meet downstream water delivery requirements. Although the science-based strategy described above was developed on the basis of monitoring data and published results, uncertainties exist about its ability to maximize future sandbar building and how HFEs will affect other resources over the long term. Climate change and consequent changes to dam operations add to these uncertainties.

Experimentation, monitoring, research, and adaptive management are the necessary tools for implementing a long-term science-based strategy for improving sandbar resources while simultaneously ensuring that trends for native fish are, at

least, neutral. For example, if monitoring indicates that sandbars continue to erode or cannot be rebuilt and sustained at a desired level using this strategy, then managers may choose other experimental options, such as further constraining daily and seasonal water-release patterns, augmenting the Colorado River's sand supply from sources in Lake Powell, or both. Monitoring and research associated with other key resources, such as native and nonnative fish, cultural sites, and recreational resources, would allow managers to detect any adverse effects resulting from HFEs and make changes as appropriate. Managers, for example, might choose to alter the timing of future HFEs to try to reduce the rainbow trout response, if ongoing monitoring indicates that the large increase in rainbow trout associated with the 2008 HFE is negatively affecting the adult population of humpback chub or other native fish. Although the described strategy does not guarantee success, sandbar trends without HFEs are one of the few outcomes that can be predicted with certainty—sandbar size will decrease through time without HFEs that follow tributary sand inputs.

A fuller exposition of these HFE-related research results can be found in Melis, T.S., editor, (in press), *Effects of Three High-Flow Experiments on the Colorado River Ecosystem Downstream from Glen Canyon Dam, Arizona* (U.S. Geological Survey Circular 1366).

*Theodore S. Melis, Paul E. Grams, Theodore A. Kennedy, Barbara E. Ralston, Christopher T. Robinson, John C. Schmidt, Lara M. Schmit, Richard A. Valdez, and Scott A. Wright*

Edited by  
*Peter H. Stauffer*  
Graphic design by  
*Judy Weathers*

**For more information contact:**

U.S. Geological Survey  
Southwest Biological Science Center  
Grand Canyon Monitoring and Research Center  
Flagstaff, Arizona  
928-556-7094

This Fact Sheet and any updates to it are available online at  
<http://pubs.usgs.gov/fs/2011/3012/>

National Park Service  
U.S. Department of the Interior



Grand Canyon National Park

## Reclamation Extends Public Review and Comment Period for Two Glen Canyon Dam Draft Environmental Assessments

**Date:** March 2, 2011

**Contact:** **Lisa Iams BOR**, 801-524-3673

**Contact:** **Beverley Hetteiman**, 801-524-3721

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The Bureau of Reclamation has extended the public review and comment period for two recently released draft environmental assessments associated with Glen Canyon Dam to Friday, March 18, 2011.

Reclamation is extending the deadline to ensure stakeholders and the public have sufficient opportunity to thoroughly review both the Draft EA for the Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, from 2011 through 2020 and the Draft EA for Non-Native Fish Control Downstream from Glen Canyon Dam, and to submit comments that will be considered prior to completion of final decision documents.

Both draft EAs were prepared in accordance with the National Environmental Policy Act and are available at [www.usbr.gov/uc](http://www.usbr.gov/uc) under the "Environmental Documents" link. Printed copies of the reports are available at the Bureau of Reclamation Upper Colorado Regional Office, 125 South State Street, room 7218, Salt Lake City, Utah 84138.

Written comments for the high-flow protocol EA may be provided to the above address or via e-mail at [e-mail us](mailto:denis.kubly@usbr.gov). For more information, or to request a printed or CD-ROM copy of the EA, please contact Dennis Kubly at (801) 524-3715.

Written comments for the non-native fish control EA may also be provided to the above address or via e-mail at [e-mail us](mailto:glen.knowles@usbr.gov). For more information, or to request a printed or CD-ROM copy of the EA, please contact Glen Knowles at (801) 524-3781.

###

Reclamation is the largest wholesale water supplier and the second largest producer of hydroelectric power in the United States, with operations and facilities in the 17 Western States. Its facilities also provide substantial flood control, recreation, and fish and wildlife benefits. Visit our website at [www.usbr.gov](http://www.usbr.gov).

### Relevant Links:

[High Flow Protocol Environmental Assessment](#)

[Non-Native Fish Control Environmental Assessment](#)



**Did You Know?**

There are 373 species of birds found in Grand Canyon National Park. Endangered bird species include the southwestern willow flycatcher, the Yuma clapper rail and the California condor.

[more...](#)

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