



# River REPORT

*A project of the Water Education Foundation*

## Modifying Management of the Colorado River: Assembling the Details

*By Sue McClurg*

In February, the seven Colorado River Basin states released a historic proposed agreement on better managing the river to reduce the potential of future drought-related shortages through coordinated operation of Lakes Mead and Powell. The states' plan also includes several ideas to augment the Colorado River's water supplies.

The states' proposal is one of five river re-operation scenarios (including a no-action alternative) identified in a draft alternatives report released in June by the U.S. Bureau of Reclamation (Reclamation). Other alternatives include a "conservation before shortage" plan proposed by a consortium of non-governmental organizations (NGOs); Reclamation officials will now analyze each of the alternatives through an

environmental impact statement (EIS). The draft EIS is scheduled for release in December with a final EIS and Record of Decision scheduled to be adopted by Dec. 31, 2007. "It's doable. I have every confidence that we'll get it done," said Bob Johnson, regional director of Reclamation's Lower Colorado Region.

In its analysis, Reclamation will use the Colorado River's past hydrologic record to model the future scenarios for reservoir levels and water supplies under the various alternatives. "To postulate the future inflows, the common thing we've used on this river system is the historic record," said Terry Fulp, area manager at the Boulder Canyon Operations Office.

As hydrologic modeling and other analyses continue on the alternatives, on-the-ground demonstration projects

will give all the Colorado River stakeholders a better idea of how the states' proposed "intentionally created surplus (ICS)" water program would operate. A centerpiece of the February proposal, ICS water generated through land fallowing and extraordinary conservation programs would be able to be stored in Lake Mead. Reclamation has signed agreements with the Metropolitan Water District of Southern California (MWD) and the Imperial Irrigation District (IID) on demonstration projects in which the districts will store a specific amount of water in Lake Mead in the next two years. These demonstration programs will help the parties better develop a policy and accounting procedure for such activities.

*Continued on page 4*

### In This Issue:

- ▶ Basin Briefs  
page 3
- ▶ Calendar of Events  
page 9
- ▶ From The Headlines  
page 11



## Dear Readers

*The Foundation recently lost a wonderful writer and dedicated staff member. Many of you may have known Glenn Totten through his byline or personally. Before he died of cancer in June, Glenn served as our “special projects coordinator,” a position he had filled since 2003.*

*At the Foundation, Glenn was an integral part of our Colorado River Project, writing about the Colorado River in Western Water and River Report. He also helped organize the biennial Colorado River Symposia and fulfilled his informal title of “grammar guru” in editing the Proceedings.*

*Glenn’s thirst for knowledge about complicated issues helped him become well-versed in water issues, and an expert at distilling facts and figures into compelling articles. His dry sense of humor and observations never faltered during his long illness, and extended to comments to his sources about “projects being finished in my lifetime.”*

***In Glenn’s memory, we have established a fund in his name to help support our “Encouraging Effective Governance” program, which aims to educate staff and members of the California Legislature through lunchtime seminars and scholarships to attend our conferences and tours, including our Lower Colorado River Tour. If you would like to make a contribution to this fund, please contact us.***



### Colorado River Project Advisory Members

Hamlet “Chips” Barry, Denver Water  
Michael Cohen, Pacific Institute  
Herb Guenther, Arizona Department of Water Resources  
Gary Hansen, Colorado River Indian Tribes  
J. Arturo Herrera, Mexican Section, International Boundary and Water Commission  
David Lindgren, Downey Brand  
James Lochhead, Brownstein Hyatt & Farber  
Estevan Lopez, New Mexico Interstate Stream Commission  
Patricia Mulroy, Southern Nevada Water Authority  
Jerome C. Muys, Attorney  
Don Ostler, Upper Colorado River Commission  
Jennifer Pitt, Environmental Defense  
Lester Snow, California Department of Water Resources  
Maureen Stapleton, San Diego County Water Authority  
Gary Weatherford, Weatherford & Taaffe

***River Report*** is a project of the  
*Water Education Foundation*

#### **Editor**

Rita Schmidt Sudman

#### **Writer**

Sue McClurg

#### **Photos**

U.S. Bureau of Reclamation

#### **Graphics and Layout**

Curt Leopold,  
Graphic Communications

The Water Education Foundation thanks all the sources and experts who reviewed this newsletter for balance and accuracy.

The mission of the Water Education Foundation, an impartial, non-profit, organization, is to create a better understanding of water issues and help resolve water resource problems through educational programs.

Water Education Foundation  
717 K Street, Suite 317  
Sacramento, CA 95814  
(916) 444-6240  
fax (916) 448-7699

e-mail: [feedback@watereducation.org](mailto:feedback@watereducation.org)

**Web page:** [www.watereducation.org](http://www.watereducation.org)

#### **President**

Michael D. Armstrong

#### **Executive Director**

Rita Schmidt Sudman



WATER EDUCATION  
FOUNDATION

# Basin Briefs

## UPPER BASIN:

### Officials Celebrate Salinity Control Structure

Federal officials and farmers in Ferron, Utah, joined together in June to celebrate completion of the Ferron Salinity Control Irrigation Project. Thanks to funding from the Colorado River Salinity Control Program, 9,000 acres of farmland in the area are now being irrigated by sprinklers. The new irrigation system is credited with preventing nearly 30,000 tons of salt from entering the Colorado River.

Flood irrigation was commonly used by ranchers and farmers in the area for nearly 100 years. The flood irrigation resulted in large salt accumulations in Ferron Creek, a tributary to the San

Rafael and Colorado River. Salt buildup caused extensive damage to the once productive agricultural soils.

In addition to the more efficient irrigation system, eliminating seepage from canals and ditches and reducing deep percolation has helped control salinity in the area. Prior to these efforts, according to the U.S. Bureau of Reclamation, the overall efficiency of flood irrigating agricultural soils was about 30 percent. Today, after the development of new control measures, efficiency has increased to 67 percent.

Because much of the Colorado Plateau region was once covered by an inland sea, a virtually limitless amount of marine created, salt-bearing shale underlies the

topsoil in the plateau. Annually, some 9 million tons of salts flow into Lake Powell. The river's saltiness increases as it flows downstream through natural leaching of salts from the basin's saline soils and geologic formations, and return flows from agriculture and other human activities.

Salinity control efforts have focused primarily on the Upper Basin – with the goal of keeping salt out of the river. Projects undertaken such as lining and piping irrigation and drainage conveyances in the Upper Basin have helped reduce salt loads in the river by more than 800,000 tons per year, cutting salinity concentrations well below levels seen in the 1970s. •

## LOWER BASIN:

### All-American Canal Lining Stopped

One month after a Las Vegas federal judge ruled in favor of a project to line the All-American Canal and days before construction was set to begin; work was halted by the 9th U.S. Circuit Court of Appeals. The court issued an emergency injunction in late August stopping the project to allow for a hearing on an appeal filed by Mexican farmers and two environmental groups.

The Economic Development Council of Mexicali (CDEM) and two U.S. environmental groups, Citizens United for Resources and the Environment (CURE) and Desert Communities Against Pollution, had originally sued to block the lining project in July 2005. In their lawsuit, CDEM and CURE said that Mexicali has a historic right to the 67,000 acre-feet of water that now leaks from the unlined canal and seeps across the U.S.-Mexico border where it recharges groundwater aquifers used by farmers in the Mexicali Valley.

Federal court Judge Philip Pro ruled there was no merit to the lawsuit and

that the Mexicali group had no grounds by which to file such a case in the United States. The groups appealed that ruling. The 9th U.S. Circuit Court is not expected to hold a hearing on that appeal until December.

The canal lining was authorized by Congress in 1988. The project entails constructing a parallel lined canal section adjacent to 23 miles of existing unlined canal. The lining project is part of the complicated Quantification Settlement Agreement designed to help California live within its 4.4 million acre-feet per year allocation of Colorado River water. •

### Reclamation Clears Way for Land Acquisition

A plan to acquire 73 acres of Southwest willow flycatcher habitat will have no significant impact, U.S. Bureau of Reclamation (Reclamation) officials said in issuing a final environmental assessment in August.

Purchase of the land, located along the San Pedro River, approximately 9 miles south of San Manuel in Pinal

County, Ariz., is intended to benefit the endangered flycatcher. The action is being carried out as partial fulfillment of the requirements included in a 1996 Biological Opinion issued by the U.S. Fish and Wildlife Service on Reclamation's modifications to Theodore Roosevelt Dam for water conservation and flood control, which adversely affected occupied willow flycatcher habitat.

The land is just south of and adjacent to the 140-acre Spirit Hollow Preserve owned and managed by the Salt River Project (SRP), and Reclamation has proposed a management agreement under which SRP would be responsible for managing the additional 73 acres as part of the Spirit Hollow Preserve. •

**NOW AVAILABLE!**

**2005 Colorado River Symposium Proceedings**

Order today on-line at  
[www.watereducation.org](http://www.watereducation.org)

## FEATURE

*Continued from front page*

Adding urgency to the effort to develop a strategy for managing the system's two major reservoirs in a more coordinated fashion is the re-emergence of the Colorado River Basin's drought. After a year when inflow into Lake Powell was 105 percent of average, hot weather and an early snow melt in the upper reaches of the Colorado River has reduced the projected runoff for the water year. (The water year runs from Oct. 1 to Sept. 31.)

April, May and June were warm, dry months in the Upper Colorado River Basin. Average precipitation in April and May was only 65 percent and 35 percent of average, respectively. In addition, the warm weather brought an early snowmelt and runoff into Lake Powell declined dramatically. Unregulated inflow to Lake Powell in April, May, June and July was 103, 89, 53, and 40 percent of average, respectively.

Projected unregulated inflow to Lake Powell for water year 2006 is 8.78 million acre-feet – 73 percent of average.

"It's a reminder that climate and Mother Nature rule the system," said Rick Clayton, a hydraulic engineer for Reclamation's Fontenelle and Flaming Gorge units.

The low inflow is expected to cause Lake Powell's water surface elevation to decline until this winter; as of late July, Lake Powell's elevation was 3,607 feet. Meanwhile, Lake Mead's elevation was 1,126 feet on July 27. At their lowest points during the recent drought, Powell's elevation dropped to 3,550 feet in July 2005 and Mead's elevation dropped to 1,125 feet in July 2004.

Lake Powell and Lake Mead operations are currently coordinated only under high reservoir conditions through storage equalization. The draft alternatives consider various options designed

*"We are interested in anything that gets more water into the Colorado River system."*

*– Kay Brothers*

to better utilize existing reservoir storage under lower reservoir conditions, both to enhance water supplies and

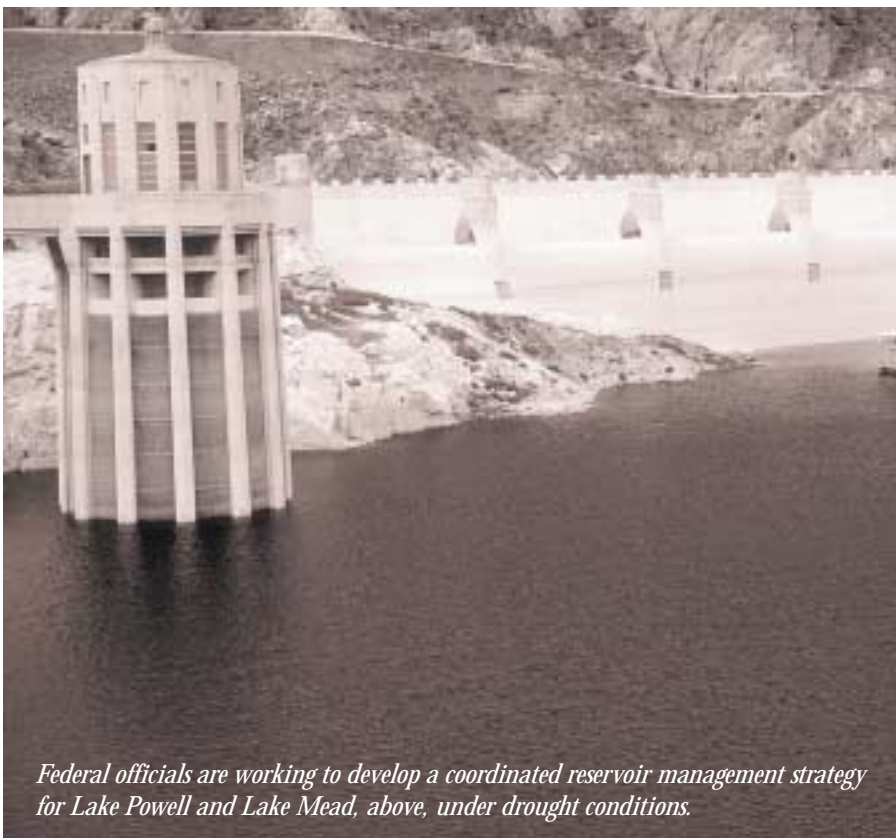
help balance the various benefits of the reservoirs.

In addition to the use of ICS credits to help stretch the Colorado River's water supplies, the seven states are studying the potential to implement a broad range of alternatives for augmenting river flows. The study is being financed and managed by the Southern Nevada Water Authority (SNWA). In May, the SNWA board of directors approved a \$750,000 contract to determine, compile and review all practicable means for long-term augmentation of the Colorado River, including weather modification. The states are discussing implementation of a near-term program to increase the natural flow of the river through weather modification (cloud seeding).

At a June workshop in Boulder, Colo., Colorado River Basin agencies and stakeholders heard from a number of top scientists and policymakers about the potential benefits and costs of cloud seeding programs to augment the flow in the Colorado River. They also heard about the need for more research to determine the effectiveness of cloud seeding.

"We are interested in anything that gets more water into the Colorado River system," said Kay Brothers, SNWA's assistant general manager. In addition to the above actions, SNWA is looking at various options to increase its 300,000 acre-feet Colorado River allocation by introducing non-system water.

This issue of *River Report* provides an update on the ongoing work to craft a program to modify the management of the Colorado River during future droughts. A final plan is to be adopted by Dec. 31, 2007. For more background on the seven states' preliminary proposal, please refer to the January/February 2006 *Western Water*.



*Federal officials are working to develop a coordinated reservoir management strategy for Lake Powell and Lake Mead, above, under drought conditions.*

## The Alternatives

In May 2005, then-Interior Secretary Gale Norton directed Reclamation to develop specific Lower Basin shortage guidelines and coordinated reservoir management strategies to address operations of Lake Powell and Lake Mead under low reservoir conditions. Federal officials initiated a public scoping process to solicit input on the scope of specific shortage guidelines and coordinated reservoir management strategies as well as the issues and alternatives to be considered and analyzed in the EIS.

In a summary scoping report released in March, Reclamation officials reported receiving 1,153 written comment letters (approximately 80 percent were form letters) for a total of 5,340 comments.

In the July alternatives report, Reclamation officials said their proposed federal action was crafted to reflect three main issues raised in these comments:

- That conservation be included in the river re-operation strategy;
- That a full range of operational levels for Lakes Mead and Powell be developed;
- That interim guidelines be considered. Although there was not unanimity on this point, many commentators did suggest interim rather than permanent guidelines.

The alternatives now being analyzed by Reclamation for adoption would be in place from 2008 through 2025.

An operations model will evaluate how each of the five alternatives would operate under 100 different potential scenarios of Colorado River runoff. Those scenarios are based on historic runoff and inflow data. "The goal is to identify a broad range of impacts to each of the resources and identify the pluses and minuses of each alternative," Fulp said. "The model assumes many possible inflows (based on the historic record) and identifies the probabilities of what might happen."

Under the no-action alternative, the secretary would continue to develop an Annual Operating Plan that would



*The prolonged drought has caused a major decline in storage in Lake Powell.*

determine the water supply available to users in the Lower Basin and the annual release volume from Lake Powell for that water year. No shortage criteria for the Lower Basin would be developed; the secretary would continue to retain the authority to declare a shortage on an ad hoc basis.

The other four alternatives each include a different method to determine when shortages would be declared, what shortages would be implemented and how water releases from Lake Powell and Lake Mead would be determined. Three of the alternatives also include a list of potential programs designed to stretch and/or augment the amount of water in the Colorado River Basin. (See chart.)

The full EIS will analyze the environmental impacts of each of the possible alternatives, including an assessment of long- and short-term effects on the physical environment such as water supply, water quality, aquatic resources, fish and wildlife, recreation and energy resources.

The **basin states preliminary proposal**, released in February, includes triggers for determining when a Lower Basin shortage would be declared and when/how Lake Powell releases to Lake Mead would be managed under certain hydrologic conditions. The first Lower Basin shortages would be declared when Lake Mead's elevation dropped to 1,075 feet. The proposal also set the stage for the consideration of stretching the Colorado River system's water supply through ICS methods related to water conservation, exchanges, transfers and other options.

The **conservation before shortage alternative** was developed by Defenders of Wildlife, Environmental Defense, the Pacific Institute, the Sierra Club, the Sonoran Institute and other NGOs. The alternative originally was submitted to Reclamation a year ago, but Reclamation's EIS will analyze the July 2006 revised proposal "conservation before shortage II."

The focus of this proposal is for the

*"The goal is to identify a broad range of impacts to each of the resources and identify the pluses and minuses of each alternative."*

– Terry Fulp

implementation of voluntary conservation programs to help offset the potential need to declare a drought-related

shortage. At higher elevations of Lake Mead, corresponding with the shortage triggers in the seven states' proposal, the secretary would seek to obtain voluntary forbearance agreements with contractors in the Lower Basin and in Mexico – to reduce the chance of an involuntary, uncompensated shortage and to provide a market-based mechanism for distributing risk. Part of the funding for this proposal would come from the federal government's obligation, under the Colorado River Basin Salinity Control Act, to replace the bypass flow. The proposal expands upon the idea of creating ICS water through various actions.

to keep Lake Mead above the SNWA's intake – 1,000 feet. The agency currently has two intakes, one at 1,050 feet elevation and one at 1,000 feet elevation. If the water level were to drop below 1,000 feet, SNWA would lose about 80 percent of its water supply. A third intake now under construction will be about 150 feet lower than the lowest existing intake. It is scheduled for completion in late 2011.

The **reservoir storage alternative**, developed in coordination with cooperating agencies and hydropower and recreational stakeholders during Reclamation's scoping stage, would establish a different set of triggers for

If a shortage declaration were needed, Lower Basin shortages would be implemented in any given year necessary

determining shortage conditions – triggers designed to keep more water in Lake Mead and Lake Powell by reducing water deliveries and increasing shortages. The first Lower Basin shortages would be declared when Lake Mead's elevation dropped to 1,100 feet. By maintaining higher reservoir levels, there would be more water for recreation and hydro-power production. This particular alternative takes both more frequent and larger shortages than the basin states' proposal, and it includes ICS measures to help stretch supplies.

The **water supply alternative** is designed to maximize water deliveries at the expense of retaining reservoir storage for future use. Lower Basin shortages would be implemented only when there is not enough water in Lake Mead to meet entitlements; elevation 895 feet, considered dead pool. This alternative does not include any water management

## Proposed Alternatives

Alternatives	Shortage Components	Coordinated Reservoir Operations
<b>Basin States</b>	Reduced deliveries of 400-, 500-, and 600,000 acre feet from Lake Mead at elevations 1,075', 1,050', and 1,025' respectively	High reservoir conditions minimum objective: 8.23 million acre-feet released from Lake Powell unless storage equalization releases required. Lower reservoir conditions: either reduce Powell releases or balance contents based on Powell and Mead elevations
<b>Conservation Before Shortage</b>	Shortages implemented in any year to keep Lake Mead above SNWA's lower intake at 1,000'	Same as basin states proposal
<b>Water Supply</b>	Release full annual entitlement amounts until Lake Mead is drawn down to dead pool (elevation 895')	Minimum objective: 8.23 million acre-feet released from Lake Powell unless storage equalization releases required. Balancing if Powell is below elevation 3,575' or Mead is below elevation 1,075'
<b>Reservoir Storage</b>	Reduced deliveries of 600-, 800-, 1,000-, and 1,200,000 acre-feet from Lake Mead at elevations 1,100', 1,075', 1,050', and 1,025' respectively	Minimum objective: 8.23 million acre-feet released from Lake Powell if above elevation 3,595' unless storage equalization releases required. 7.8 million acre-feet released from Powell between elevations 3,560' and 3,595'. Balancing below elevation 3,560'.

mechanism related to conserved water or non-system water.

The alternatives report as well as the complete seven-state proposal and the complete conservation before shortage II proposal are available on Reclamation's web site, <http://www.usbr.gov/lc/region/programs/strategies.html>

### Innovative Programs

The seven-state preliminary proposal released in February included a far-reaching program to generate ICS water supplies in the Lower Basin. ICS credits would be created through activities such as land fallowing, canal lining programs and even desalination programs. As proposed by the seven states, the conserved water would be stored in Lake Mead for future use; 5 percent would be required to be left in storage to benefit the overall system. Credits to use the water in storage would be reduced by annual evaporation losses and each Lower Basin state would have an annual limit on the amount of credits that could be created during any year. No credits would be used during a Colorado River shortage and flood control releases would reduce – and perhaps end – the credits.

In June, Reclamation and MWD officials announced an agreement for a demonstration program to help determine if creating “surplus” water in Lake Mead will work as a long-term water management tool. The demonstration program allows MWD to leave water that the district would otherwise use in Lake Mead in 2006 and 2007.

For 2006, MWD plans to leave 50,000 acre-feet of water from its existing conservation/fallowing/crop rotation program with Palo Verde Irrigation District (PVID) in Lake Mead to initiate the demonstration program. Normally, that water would go directly to MWD's service area for delivery. In 2007, MWD will be allowed to create up to 200,000 acre-feet of ICS water in Lake Mead. Five percent of the water will immediately become system water, which will benefit all the Lower Basin

## The Law of the River

Six components are the focus of the effort to address drought-related issues:

- The Colorado River Compact of 1922, which divided the Colorado River Basin into upper and lower basins and apportioned water between the two basins.
- The Boulder Canyon Project Act of 1928, which ratified the Colorado River Compact and authorized construction of Hoover Dam, its power plant and the All-American Canal. The act also authorized the Secretary of the Interior to establish by contract the basic apportionments from the mainstem river among the three Lower Basin states.
- The Mexican Water Treaty of 1944, in which the United States agreed to deliver 1.5 million acre-feet of Colorado River water to Mexico annually, except under surplus or extraordinary drought conditions, as defined by the Treaty.
- The Colorado River Storage Project Act of 1956, which authorized storage reservoirs and dams, including Glen Canyon, in the Upper Basin and on its tributary rivers.
- The *Arizona v. California* U.S. Supreme Court Decree in 1964, which affirmed the Lower Basin mainstem apportionment among Arizona, California and Nevada and recognized under the 1928 Boulder Canyon Project Act American Indian water rights for five tribes below Hoover Dam.
- The Colorado River Basin Project Act of 1968, which authorized construction of CAP and limited diversions to Central Arizona Project during shortages to assure California's use of its annual 4.4 million acre-feet apportionment.

states. Under the full terms of the proposed ICS program, the states' preliminary proposal would allow MWD to store up to 400,000 acre-feet of conserved water in Lake Mead.

“From a policy standpoint the demonstration will help determine if the concept of ICS is going to work within the overall operation,” said Roger Patterson, assistant general manager for MWD. He said the program also will help analyze some of the key technical issues such as how Reclamation can verify that ICS water truly is conserved on the ground.

“We're pretty excited about (the ICS program) because given the recent reduction in Colorado River supplies to MWD, this could be a great tool to help us with managing that supply,” he said.

California has agreed to gradually reduce its historic use of Colorado River

water, up to 5.2 million acre-feet a year, to its annual 4.4 million acre-feet allocation by 2016. As the junior water rights holder in California, MWD will bear the brunt of the 800,000 acre-feet cutback.

But while MWD will be allowed to store ICS water in Lake Mead the next two years, there currently is no procedure to allow for the withdrawal of this water.

“We've made it clear that they can't take the water back out until we define the procedures,” Johnson said. “Under the *Arizona v. California* decree, in a normal year, no state can take out more than its allocation; a mechanism for guidelines for ICS withdrawal will need to be developed.”

The mechanism for withdrawal will be evaluated in the current EIS. Reclamation is studying the range of how



*The basin states' proposal includes the potential development of a cloud seeding program to increase snowpack in the Upper Colorado River Basin.*

much water could be banked and how much could be withdrawn as modeled for the different alternatives. The EIS will be “programmatically” in nature; any specific project to store water in Lake Mead will need its own, specific environmental compliance.

Patterson acknowledged that MWD is “taking a little bit of a risk” whether the Interior secretary and other states will go forward with the ICS program. But he said that the demonstration project itself is designed to demonstrate “the follow through in good faith with the other parties.” He added that the ICS program “will need more detailed agreements in the future to ensure that no one else makes a claim on the water.” The earliest that MWD would be able to withdraw any credits would be 2008.

IID also has entered into an agreement with Reclamation for a pilot ICS program to create credits of 1,000 acre-feet in 2006 and up to 25,000 acre-feet in 2007 using water from its on-farm fallowing program.

“This is a management tool the district has long sought from the Bureau,” IID Water Department Manager Michael King said in a press release. “It gives us storage capacity we don’t currently have and the ability to manage our water use more effectively.”

The conservation before shortage proposal developed by the NGOs incorporates the elements of the ICS

program as developed by the states, but would expand it to include “additional potential domestic water users, provide for direct federal participation, and leave the door open to potential international implementation of ICS programs.”

Their proposal would allow entities that do not have Colorado River delivery contracts to also generate ICS credits. U.S. federal agencies, state agencies, private entities (including NGOs), Mexican federal agencies and Mexican water users would all be eligible to participate in the program.

Advocates of the conservation before shortage alternative say that expanding the ability to generate ICS credits beyond the U.S. border could help to “firm up urban water supplies in both countries, engage in long-studied environmental restoration projects in the Delta, and increase flexibility in Mexico’s agricultural sector – creating economic, environmental, and social benefits in both countries while offering the United States and Mexico a venue for cooperation in the otherwise contentious area of water management at the border.”

The NGOs say combining their original proposal to use voluntary, market-based conservation with an expanded ICS program will mitigate against shortages and help the federal government meet its bypass flow replacement obligations under the Colorado River Basin Salinity Control Act.

The reservoir storage alternative to be analyzed in the EIS includes an ICS program similar to the one proposed by the basin states.

### **Increasing River Flows**

In their preliminary proposal, the seven Colorado River states agreed to “...complete a weather modification action plan...” with any water generated to be allocated to the entire system, not to any individual state or contractor.

Weather modification through cloud seeding is the attempt to change the amount or type of precipitation from clouds by dispersing substances into the air that allow water droplets or ice crystals to form more easily. Three different cloud seeding agents are commonly used: silver iodide, dry ice and liquid propane. These chemicals are dispersed either by aircraft or by devices located on the ground.

An overview of how cloud seeding works and examples of past and current programs were provided to Colorado River stakeholders at a June weather modification workshop sponsored by the California Department of Water Resources and California’s Six Agency Committee, the districts in the state that receive water from the Colorado River. (The Water Education Foundation handled workshop logistics.)

For the Colorado River Basin, five years of drought and a looming future of more demands with an already over allocated water system have given impetus to consideration of widespread cloud seeding activities in the Colorado River Basin. Currently, the states of Colorado, Utah and Wyoming have several state and locally funded cloud seeding programs underway.

Tom Ryan, resource specialist for MWD, estimated in an October 2005 white paper, *Weather Modification for Precipitation Augmentation and its Potential Usefulness to the Colorado Basin States*, that cloud seeding in six major runoff-producing areas within the Colorado River Basin could produce between 1.1 and 1.8 million acre-feet



# Calendar

annually in the Upper Colorado River Basin (approximately 10 percent of the average annual stream flow) and an additional 830,000 acre-feet in the Lower Basins. "Of the total," he wrote, "it has been estimated that approximately 1.7 million acre-feet would be available to reduce deficits and meet new demands."

A March 2006 white paper prepared for the Upper Colorado River Commission, *The Potential Use of Winter Cloud Seeding Programs to Augment the Flow of the Colorado River*, concludes that "the anticipated effects from well designed and conducted operational seeding programs range from a 5 percent to 15 percent increases in precipitation." Report authors Don Griffith and Mark Solak, with North American Weather Consultants, say "the total estimated average potential" of a comprehensive cloud seeding program, including new programs in the Upper Basin and in Arizona, "would be 1,381,004 acre feet."

"We must make an argument for a bigger role for weather modification. People are changing our environment. There are potential effects to increase water," said June workshop presenter Alexander "Sandy" MacDonald, acting director of the Earth System Research Laboratory, Global Systems Division for the National Oceanic and Atmospheric Administration (NOAA).

Cloud seeding has been in use since the 1940s in an effort to increase precipitation/water supply and/or to try to prevent damage from severe weather systems such as hail storms. But it is hard to determine the effectiveness of a weather modification program because it is very difficult to know how much precipitation would have occurred if a cloud had not been "seeded."

A 2003 report, *Critical Issues in Weather Modification Research*, prepared by the Committee on the Status of and Future Directions in U.S. Weather Modification Research and Operations for the National Research Council of the National Academies, concluded that

*Continued on page 11*

## October

- 3-4 **51<sup>st</sup> Annual New Mexico Water Conference, Water Quality for the 21st Century**  
Sponsored by New Mexico Water Resources Research Institute, Albuquerque, NM  
Contact: 505-646-4337 web: <http://wrri.nmsu.edu/conf/confsymp.html>
- 4-6 **Sustaining Colorado Watersheds: Science & Restoration Through Collaboration**  
Sponsored by Colorado Watershed Assembly, Colorado Watershed Network, Colorado Riparian Association. Breckenridge, CO  
Contact: Jay Thompson, 303-239-3724, [jay\\_thompson@blm.gov](mailto:jay_thompson@blm.gov)
- 23-24 **Utah Water Law, Keeping up with Growing Demand**  
Sponsored by CLE International, Salt Lake City, UT  
Contact: 800-873-7130. Web: <http://www.cle.com/upcoming/PDFs/SLCWAT06.pdf>

## November

- 5-9 **Water Quality Technology Conference and Exposition**  
Sponsored by American Water Works Association, Denver, CO  
Contact: 800-926-7337. Web: <http://www.awwa.org/conferences/wqtc/>
- 28-Dec. 1 **NWRA Annual Conference**  
Sponsored by National Water Resources Association, San Diego, CA  
Contact: 703-524-1544. Web: <http://www.nwra.org/meetings.cfm>

## December

- 8 **National Groundwater Association Expo**  
Sponsored by NGWA, Las Vegas, NV  
Contact: 800-551-7379. Web: <http://www.ngwa.org/expo2006/main.cfm>
- 13-16 **61<sup>st</sup> Annual Colorado River Water Users Association conference**  
Sponsored by the CRWUA, Las Vegas, NV Web: <http://www.crwua.org/>

## January

- 11-12 **5<sup>th</sup> Annual National Salinity Conference**  
Sponsored by the Multi State Salinity Coalition, San Diego, CA  
Contact: Donna Bloom, 775-626-6389. Web: <http://wrri.nmsu.edu/conf/confsymp.html>
- 25-26 **Colorado Water Congress Annual Convention**  
Sponsored by the Colorado Water Congress, Denver, CO  
Contact: 303-837-0812. Web: [http://www.cowatercongress.org/meeting\\_notices.htm](http://www.cowatercongress.org/meeting_notices.htm)
- 29-30 **Nevada Water Law**  
Sponsored by CLE International, Reno, NV  
Contact: 800-873-7130. Web: [http://www.cle.com/dev/product\\_info.php?products\\_id=765](http://www.cle.com/dev/product_info.php?products_id=765)

## February

- 22-23 **24<sup>th</sup> Annual Executive Briefing**  
Sponsored by Water Education Foundation, Sacramento, CA  
Contact: Diana Farmer, 916-444-6240. Web: [www.watereducation.org](http://www.watereducation.org)

Contact Sue McClurg with your calendar items from January 2007 through July 2007 for inclusion in the Winter 2006-2007 issue of River Report, [smcclurg@watereducation.org](mailto:smcclurg@watereducation.org) or 717 K Street, Suite 317, Sacramento, CA 95814

## Yuma Desalting Plant Demonstration Set for Next Spring

By Sue McClurg

For the first time since 1993, water will flow through the Yuma Desalting Plant beginning some time in early 2007. The scheduled 90-day test run on the shuttered plant is part of a demonstration program designed to explore ways to meet the 1974 Salinity Control Act Title 1 objectives and reduce bypass flows to the Republic of Mexico.

"The demonstration will help us get a better handle on what the cost of operation will be," said Jim Cherry, area manager of the U.S. Bureau of Reclamation's (Reclamation) Yuma Area Office. Desalting estimates for full operation of the plant range from a low of \$350 an acre foot to a high of \$560 an acre foot; variables such as the cost of energy to run the plant play a major role in the cost.

Located about 5 miles west of Yuma, Ariz., the plant was designed to desalt about 80,000 acre-feet of irrigation drainage water from about 60,000 acres of Wellton-Mohawk farmland. Drainage water is pumped from groundwater wells in Welton and conveyed more than 20 miles to the plant. The plant's eight-month inaugural run was cut short in 1993 when flooding on the Gila River washed out the canal delivering irrigation drainage water to it. The plant has since been maintained by Reclamation in "ready reserve" status at a cost of just over \$4 million per year. The test run, Cherry said, will help Reclamation determine if the fixes to the design deficiencies identified in 1992-1993 have been addressed.

As originally planned, once the Yuma plant had removed the salt from the

drainage water, the "clean" water would have been returned to the Colorado River above Mexico's Morelos Dam and counted as part of the U.S. water delivery obligations to Mexico, consistent with Minute 242 of the International Boundary and Water Commission, while the brine water would be discharged into a canal to Mexico's Cienega de Santa Clara. Since the plant ceased operation, all the salty drainage water has been bypassed around it and directly into the Cienega. This water has given new life to this wetlands area south of the border, and it is now vital habitat for migratory waterfowl as well as several endangered species.

The 108,000 acre-feet of bypass water are not included in the 1.5 million acre-feet of water delivered to Mexico each year, which, in effect, increases the amount of water withdrawn from Colorado River reservoirs. The continuing drought has heightened interest in reducing these flows as state representatives confront ever declining reservoir levels – and the potential for drought-related cutbacks.

Under the demonstration, the desalter will be run at one-tenth of its capacity so water still will reach the Cienega. The predicted 3,000 acre-feet of product water from the plant will be delivered to Mexico as part of its 1.5 million acre-feet treaty supply.

The desalter test run is part of a larger planning effort that Reclamation is conducting as it considers ways to reduce and/or offset the bypass flows to Mexico while still meeting the United

States' treaty obligations, and avoiding depletions of water to the Cienega. Reclamation recently launched a demonstration system conservation program under which it will make voluntary arrangements with water entitlement holders in the Lower Basin and pay them to conserve water through land fallowing. The conserved water will be stored in Lake Mead and will help to mitigate the impacts of the 108,000 acre-feet that now flow across the border from storage.

Reclamation has signed the first agreement under the system conservation program with the Metropolitan Water District of Southern California (MWD). Under this agreement, 3,000 acre-feet of water will be stored in Lake Mead in 2006 and another 7,000 acre-feet in 2007. The water will be generated by the fallowing of land within the Palo Verde Irrigation District (PVID). MWD and PVID already have an agreement under which MWD pays PVID farmers to fallow land in exchange for the water. For this demo, Reclamation will provide MWD with money for payments for additional fallowing – producing 10,000 acre-feet in additional storage.

"Reclamation is trying to build a consensus around what we do to replace the bypass flows," Cherry said.

The consensus focus has its roots in groundbreaking work conducted by a special Yuma Desalting Plant/Cienega de Santa Clara Workgroup led by Sid Wilson, general manager of the Central Arizona Project (CAP). CAP officials have made operation of the Yuma desalter a top priority because CAP is last in line under the water priority system established for the Lower Colorado River, thus it would be the first to lose water in a drought-related cutback.

Environmentalists have opposed operation of the Yuma desalter because the plant's operation, especially at full capacity, has the potential to destroy the 10,000-acre Cienega wetlands. If the desalting plant were to operate at full

## FEATURE ARTICLE

*Continued from page 9*

capacity, the amount of water reaching the Cienega on a regular basis would be cut by about 70 percent, while the salt content in the remaining water would increase. They support seasonal land fallowing and similar programs.

Through Wilson's leadership, the work group, comprised of water interests and environmentalists, released the report "Balancing Water Needs on the Lower Colorado River" in April 2005. The report's recommendations included development of a forbearance demonstration program such as Reclamation is conducting and operation of the Yuma desalter.

As part of the Yuma desalter test run, the CAP board approved an \$80,000 contract with the University of Arizona to monitor water quality in the Cienega to help determine the environmental effects of the demonstration. The 13-month monitoring study, which features scientists north and south of the border, began in August. Scientists are collecting monthly water samples to test the water's salinity, dissolved oxygen, nutrients and selenium concentration to evaluate whether the trial run of the desalter has affected water quality.

"I am really pleased the plant will go into operation on a demonstration basis," Wilson said. "I just think it's good for the environment and good for water managers, and really represents a constructive, joint effort by management and environmental interests."

Environmentalists were pleased that the water users agreed to the monitoring program, and that CAP agreed to finance it. "Without the monitoring program," said Michael Cohen, senior associate at the Pacific Institute, "the environmental organizations would have opposed the desalter operation." Environmentalists also are pleased, he said, that Reclamation is moving forward with its forbearance program in addition to the scheduled desalter demonstration.

"I think it's very encouraging and Reclamation has been very active to make this happen," Cohen said. •

"there still is no convincing scientific proof of the efficacy of intentional weather modification efforts. In some instances there are strong indications of induced changes, but this evidence has not been subjected to tests of significance and reproducibility. This does not challenge the scientific basis of weather modification concepts. Rather it is the absence of adequate understanding of critical atmospheric processes that, in turn, lead to a failure in producing predictable, detectable, and verifiable results."

Part of the problem, the report noted, is funding. The federal government once provided as much as \$20 million a year to research efforts related to weather modification; 20 years later, that dollar amount has declined to \$500,000. "Clearly there is a paradox in these divergent trends," they wrote, "the federal government is not willing to fund research to understand the efficacy of weather modification, but others are willing to spend funds to apply these unproven techniques."

But the National Academies' study also found "strong suggestions of positive seeding effects" in wintertime seeding efforts that prolonged the precipitation of winter cloud systems over mountains, and recommended that a "coordinated, national program be developed to conduct a sustained research effort in the areas of ... cloud seeding" and that it should "be implemented using a balanced approach of modeling, laboratory studies and federal measurement."

Presenters and participants at the June workshop in Boulder agreed that more research is needed to determine the effectiveness of weather modification and the potential success for an expanded program in the Colorado River Basin.

MacDonald echoed this theme. "Research could pay huge dividends now. We at the NOAA would like to be

part of a solution that serves the nation further. And we see weather modification as a way to do it." He added, "Unless the West stands up, we will not get the support for these programs."

How much federal funding might be available is a big question. Legislation introduced last year by Sen. Kay Hutchison, R-Texas (S. 517) and Rep. Mark Udall, D-Colorado (H.R. 2995) proposed creation of a weather modification operations and research board that would "develop and implement a comprehensive and coordinated national weather modification research policy and a national cooperative federal and state program of weather modification research and development."

In December, Bush administration officials wrote to Hutchinson and asked her to defer "further consideration of the bill – pending the outcome of an inter-agency discussion" of issues related to "liability, foreign policy and national security." In his letter, John Marburger, III, director of the president's Office of Science and Technology Policy, discussed concerns related to the potential of U.S. programs affecting global weather patterns; the implication of a 1978 international treaty in which the United States agreed to a ban on weather modification for hostile purposes; and the fact that NOAA had abandoned weather modification in favor of research more directly related to its core mission.

At the Boulder workshop, Assistant Interior Secretary Mark Limbaugh referred to the letter, saying that the Bush administration is "looking at weather modification in a very cautious way." As for the Colorado River system itself, he noted that the Upper Colorado River Commission study pointed to a "lack of understanding of predictable results," and that "results are what we need to have when we ask for money."

"We have to face reality," Limbaugh said. "We have limited funding. We have to have performance measures built into the budgetary process. Based on the data I've seen, only research and measuring could be funded." •



# CONTRIBUTOR'S FORM

Please accept my contribution of:

\$25  \$50  \$100  \$250  Other \$ \_\_\_\_\_

I would like to pledge \$ \_\_\_\_\_ Please invoice me:  quarterly  annually

Your Name: \_\_\_\_\_

Company/Organization: \_\_\_\_\_

Mailing Address \_\_\_\_\_

Phone(\_\_\_\_\_) \_\_\_\_\_

Email \_\_\_\_\_

**Method of Payment:**  Check  Credit Card  Please send invoice

Purchase Order Number

**Credit Card Information:**  Visa  MasterCard  American Express

Card # \_\_\_\_\_ Exp. Date \_\_\_\_\_

Signature \_\_\_\_\_

*Fully 83% of contributions to the Water Education Foundation go toward education programs.  
Contributions to the Water Education Foundation and the Colorado River Project are tax-deductible to the fullest allowable by law.*



**WATER EDUCATION  
FOUNDATION**

717 K Street, Suite 317  
Sacramento, CA 95814  
Phone: (916) 444-6240  
Fax: (916) 448-7699  
Internet: [www.watereducation.org](http://www.watereducation.org)



**COLORADO  
RIVER  
PROJECT**

Non-Profit Organization  
U.S. Postage  
**PAID**  
Sacramento, CA  
Permit No. 430

**CHANGE SERVICE REQUESTED**