



# River REPORT

Winter 2010-2011

*A project of the Water Education Foundation*

## Balancing a Complex Set of Interests: Glen Canyon Dam and Adaptive Management

*By Gary Pitzer*

For years, the operations of Glen Canyon Dam have been closely watched as scientists seek to sharpen their knowledge about the effects of different flow patterns on the downstream ecosystem. One of the larger issues revolves around sediment transport, and the efforts to build sandbars in the Grand Canyon to benefit the environment and recreational enthusiasts.

Sand is so important to the Grand Canyon ecosystem that federal agencies have spent considerable resources on

experimental high flows from Glen Canyon Dam that aim to build sandbars. Officials say the high flow releases act to re-suspend and deposit a fraction of the sand that is delivered to the Colorado River from tributaries below the dam – such as the Paria and Little Colorado rivers.

Encouraged by what it has seen, the Department of the Interior (Interior) is completing an environmental assessment for a proposed protocol that specifies the

conditions under which future high flows will occur.

Advocates for environmentally friendly flows are glad to see the protocol, saying the evidence is clear that well-timed high flows lead to improvements in the Grand Canyon environment.

“The high flows are exciting and celebratory, but then after the experiment is done, we go back to the same old fluctuating flows” that eradicate the

*Continued on page 4*



*Lake Powell and Glen Canyon Dam*

## Dear Readers

Completed in 1963, Glen Canyon Dam and its reservoir, Lake Powell, serve many different functions. The dam helps regulate the Colorado River's water supply and equalize storage for Upper Basin and Lower Basin users, with Powell operated in conjunction with Lake Mead. The dam's turbines provide electricity to major metropolitan areas. And the dam is responsible for maintaining a healthy ecosystem and the recreational well-being of Grand Canyon National Park.

The dam's relationship with the Grand Canyon involves sediment, a.k.a. sand. Periodically, high, flood-like flows have been released from Glen Canyon to redistribute the sediment downstream. The experiments have succeeded in building sandbars/beaches in Grand Canyon – important stopping places for rafters – but as with every water issue, it's not that simple. As Gary Pitzer writes in this issue of River Report, the problem is the regular water releases from the dam – managed in a matter to produce the power so vital to the Southwest – can erode those beaches.

Balancing the important functions of hydropower, water supply and the ecosystem/recreation goals of Glen Canyon Dam is the focus of a pending environmental review, the Long Term Experimental and Management Plan. The plan is an ambitious undertaking and we will follow its progress in future issues of River Report.



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The mission of the Water Education Foundation, an impartial, nonprofit organization, is to create a better understanding of water resources and foster public understanding and resolution of water resource issues through facilitation, education and outreach.

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# Basin Briefs

## Navajo Leaders Approve Colorado River Water Settlement

Navajo Nation leaders approved a water rights settlement Nov. 4 that provides them 31,000 acre-feet of Colorado River water annually as well as unappropriated flows from the Little Colorado River and groundwater access.

When finalized, the agreement will result in three water pipelines to provide service to areas of the Navajo Nation with very little or no water supply. Estimates are that more than 61,000 homes are in need of water.

"The water supply projects in the agreement will provide resources for community development such as addressing the Navajo Nation's highest health priorities: the construction of health care facilities, providing safe drinking water

and the availability of sanitation," said Thomas Walker, chair of the Nation's Health and Social Services Committee. "The Navajo Nation government is responsible for these pragmatic issues and the approval of the water settlement will help in protecting and improving the quality of life for our Navajo people."

The settlement effectively terminates a lawsuit between the Navajos and the federal government regarding the Nation's Colorado River rights. The vote "is the first step" toward securing the Nation's water rights to the Lower Basin of the Colorado River and the Little Colorado River system, according to the Navajo Nation Council.

Some members of the Council, which voted 51-24, did not believe the Navajo should limit their rights and should have access to as much water as is needed. "I have numerous concerns about certain language and terms of the agreement," said Hope MacDonald Lone Tree, a Council delegate. "It is wrong to connect the need for waterlines with any irreversible waiver of our water rights."

The settlement needs approval by several different entities, including the Hopi Tribe, Central Arizona Water Conservation District and Salt River Project. Final congress approval will include authorization to fund the water delivery projects. •

## Hoover Dam Bypass Bridge Opens

Federal and state officials officially unveiled the new Hoover Dam bypass bridge Oct. 20. Five years in the making, the \$240-million project is an efficient conduit between Las Vegas and Phoenix, shortening the drive time by about an hour.

The 1,900-foot-long Mike O'Callaghan-Pat Tillman Memorial Bridge sits 890 feet above the Colorado River and allows traffic to avoid the two-lane congestion across Hoover Dam. Commercial trucks, which were banned from crossing the

Dam after Sept. 11, 2001, will no longer have to use the 75-mile detour.

"This magnificent bridge is proof positive that America is not afraid to dream big," Transportation Secretary Ray LaHood said Oct. 14. "The jobs supported by this project are undeniable, and its economic benefits to the American Southwest and the nation as a whole will be felt for generations to come."

The bridge is the longest single-span concrete arch bridge and one of the tallest in the world, according to the Federal

Highway Administration. It consists of 16 million pounds of steel, 30,000 cubic yards of concrete and 2 million feet of cable. Planning for the bridge began in the late 1980s, though construction didn't begin until 2002.

"This bridge is a critical link in a major transportation network that services travelers from all over the world; it is equally as important in providing a quicker route for major freight shipments," said John Halikowski, director of the Arizona Department of Transportation. •

## Investors Eye CAP Pipelines to Mollify Demand

Concern about overdrafted groundwater basins coupled with increasing demand is pushing investors in Southern Arizona to pursue pipelines that would tap into the Central Arizona Project (CAP).

The projects in the Green Valley and Sahuarita regions have been in the works for years and are tied into expanded copper mining operations, which require about 6,000 acre-feet of water (an acre-foot of water is about 325,000 gallons).

The water table in the Santa Cruz

Valley is dropping by as much as 4 feet annually because of a heavy demand that has resulted in an overdraft of 35,000 acre-feet per year. By 2012, two pipelines could convey as much as 11,000 acre-feet of CAP water each year to replenish the aquifer. One of the pipelines is backed by the Community Water Company (CWC) of Green Valley and the other by Farmers Investment Company (FICO). Officials with CWC are still deciding the size of the pipe diameter while FICO is apparently targeting a 36-inch pipe.

FICO aims to start pumping water by the end of 2011. CWC wants to begin pumping by 2012. CAP officials say both projects can connect to the system. The issue is controversial, however, because of the involvement of the proposed Rosemont Copper Mine, which is funding the CWC project, and because of Arizona water laws that cover groundwater pumping and recharge facilities. Rosemont has committed to \$15 million for the project, although CWC hopes for more money to build a wider pipeline. •

## FEATURE

*Continued from front page*

sandbars, said Nikolai Lash, water and state trust land program director with the Grand Canyon Trust in Flagstaff, Ariz. Lash and others believe a steadier flow schedule is possible within the confines of Glen Canyon Dam operations.

But the possibility of further modifications to dam operations concerns those who believe Interior is going out of its way to address national park and environmental issues without considering the impacts to hydropower and other downstream resources, and the wishes of the Colorado River Basin states. Advocates of increased hydropower production believe it is time to restore the generation capacity that has not been in place at the dam since changes were implemented more than 20 years ago.

“The expected impact was the loss of about one-third of the generating capacity but the actual experience is closer to one-half,” said Leslie James,

*Scientists say the beaches created by the high-flow releases wash away when releases revert to the fluctuating pattern used to generate hydropower.*



executive director of the Colorado River Energy Distributors Association (CREDA), which represents nonprofit public utilities that purchase hydropower from the Colorado River Storage Project.

Sand is not the only issue being talked about. Removal of non-native fish, guidelines for future high flow releases and the well-being of the Grand Canyon also are topics of high interest related to the operation of Glen Canyon Dam.

Years of research and adaptive management are providing officials with much-needed information on the impacts of various flow regimes and how responses can be tailored with the interests of a large stakeholder group that surrounds Glen Canyon Dam operations.

Changes to the flow schedule at the dam only occur after a rigorous examination of the expected impacts on water supply, hydropower and the environment. There are many factors to consider, including the numerous federal laws governing the river as well as the shortage criteria that determines

if and how water is released from Lake Powell to Lake Mead. Lake Powell has typically released only 8.23 million acre-feet of water per year downstream since 2000 owing to persistent drought in the Upper Colorado River Basin. That amount could be bumped higher in 2011 if forecasted runoff from the Upper Basin is increased only slightly by the time the January river forecast update is completed, said Ted Melis, deputy chief of the U.S. Geological Survey's (USGS) Grand Canyon Monitoring and Research Center (GCMRC).

If that's the case, then there would be “more potential” for power generation and peaking power capacity when equalization flows are released from Lake Powell to Lake Mead, Melis said.

Glen Canyon's eight generators can produce nearly 1.3 million kilowatts of electricity, enough to provide power to 5.8 million residential, commercial and agricultural customers, according to the federal Bureau of Reclamation (Reclamation). As such, the dam is known as “the cash register” of the Colorado River, Melis said. The revenue generated by hydropower production is partly used to repay the federal government's investment in water development in the Upper Colorado River Basin.

For more than a dozen years, experimental water releases from Glen Canyon Dam have periodically built sandbars that are subsequently eroded with the return of fluctuating flows that facilitate hydropower production. The question of permanently modifying the flow regime is opposed by the seven Colorado River Basin states and power providers.

In addition to sediment accumulation in the Grand Canyon, there is ongoing analysis regarding which flow patterns are most beneficial to the humpback chub, a large freshwater fish native to the Colorado River that is on the endangered species list. Although they once ranged throughout the Grand Canyon, the chub now exist primarily near the confluence of the Colorado and Little Colorado rivers. The chub is threatened by several factors, including dam operations, water

*“We have learned that ... it is possible to run a flood when the system is not charged with sediment and thereby do more harm than good.”*

*—Jack Schmidt, Utah State University*

quality, lack of suitable habitat and predation by non-native fish. While the chub was formally in an overall state of decline between 1989 and 2001, recent surveys indicate a “very gradual, positive increase” in their numbers, said Brian Clark, a wildlife specialist with the Arizona Game and Fish Department.

High flow experiments and the September to October steady flow schedule have eroded the dam’s ability to produce hydropower, something CREDA believes gets lost in all the discussion of sediment transport and native fish protection. “Hydropower is foremost in our mind,” James said. “Often what gets lost and left behind is the real benefit of the hydropower resource.”

James cited a March 24 memorandum of understanding (MOU) on hydropower signed by the Departments of Energy and Interior and the U.S. Army Corps of Engineers that pledges the agencies “will cooperate more closely and align priorities to support the development of environmentally sustainable hydropower.”

The MOU “represents a new approach to hydropower development” and is an agreement “to focus on increasing energy generation at federally owned facilities and explore opportunities for new development of low-impact hydropower,” according to the Department of Energy.

One of the benefits of hydropower is the 5 billion pounds of carbon emissions annually offset by its generation, James said. The aggregate energy purchased to compensate for the lost hydropower at Glen Canyon has cost more than \$500 million, she said.

Hydropower will certainly be part of a scheduled environmental impact statement (EIS) getting underway this winter. Known as the Long Term Experimental and Management Plan, the document is “definitely the next major ... action” to address dam operations since the completion of the last EIS in 1995, said Lisa Iams, public affairs specialist with Reclamation.

The 1995 EIS was a lengthy and costly (more than \$100 million, according

to Reclamation) undertaking that is one of three major actions related to Glen Canyon Dam, along with the Grand Canyon Protection Act of 1992 (GCPA) and a biological opinion issued by the U.S. Fish and Wildlife Service (USFWS) in 1994. According to the GCPA, the dam is to be operated “in such a manner as to protect, mitigate adverse impacts to, and improve the values” for which the Grand Canyon National Park and Glen Canyon National Recreation Area were established.

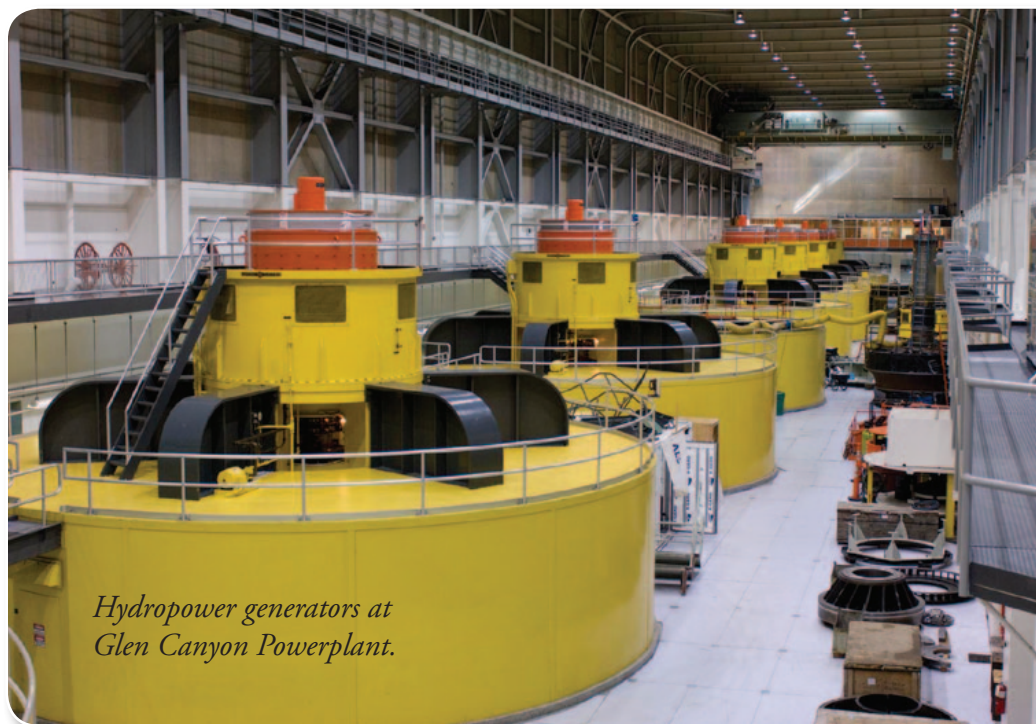
The new EIS will build on all that’s been learned since 1996 “to develop and implement a structured, long-term experimental plan that may include modifications to Glen Canyon Dam releases and non-flow action,” said Beverley Heffernan, chief of Reclamation’s Upper Colorado Environmental Resources Division. “The EIS would propose actions that would increase scientific understanding of the ecosystem

downstream from Glen Canyon Dam to improve and protect important downstream resources in accordance with the Grand Canyon Protection Act.”

Even as the operations of the dam are analyzed, so will the process of adaptive management that was first incorporated after the 1995 EIS. The Glen Canyon Dam Adaptive Management Program (AMP) helps coordinate and integrate dam operations, downstream resource protection and management and monitoring and research information. In a complex ecosystem with many variables and many different interests to satisfy, striking the proper balance is an elusive target. The goal of adaptive management is to use scientific research, testing and monitoring to determine the effectiveness of an environmental restoration/protection program, and then allow for adjusting such a program if necessary.

“The concept is sensible in theory but difficult in practice,” Steven Carothers, a scientist, told a congressional subcommittee in April.

Adaptive management, the brainchild of those who put together the last environmental document on Glen Canyon Dam, is under scrutiny lately. A March



*Hydropower generators at  
Glen Canyon Powerplant.*



*Scientists conducted high-flow, flood-like releases from Glen Canyon Dam in 1996, 2004 and 2008.*

2010 paper published in the *Columbia Journal of Environmental Law* questioned the success of the AMP, saying it has “failed to stabilize or otherwise improve the quality of the fragile downstream ecosystem,” and “has been unable to make substantial progress toward resolving the significant resource conflicts at the heart of the Dam’s operations.”

The authors blame the “deficient initial design” of the AMP, which they say failed to prioritize the “competing resource goals.” Consequently, the AMP “missed multiple opportunities both to foster agency and stakeholder learning and to cultivate constructive engagement of the stakeholders who care the most about the Colorado River and the socio-ecological system it supports.”

Criticism launched at the AMP from such a distance should be kept in perspective, say some members of the

Glen Canyon Dam Adaptive Management Work Group (AMWG) that advises Interior on key decisions. James said authors of the paper may have been casting judgment from afar and questioned their direct familiarity with the workings of the advisory group.

“Everyone can spin things their own way,” she said of the paper’s criticism.

Dave Wegner, Democratic staff director with the House Subcommittee on Water and Power, disagrees that the AMP’s basic design is flawed, saying Congress “set a very clear direction” when it launched the program. “The issue as we always envisioned it would be that science would be used as the determining factor in meeting the requirements of the Record of Decision and the intent of the Grand Canyon Protection Act,” he said.

The procedures of the AMWG are being evaluated as federal officials and

stakeholders seek to update the group’s charter. An ad hoc committee is meeting to examine ways the AMWG might work better and emerge from its trend of voting blocs that frustrate certain participants.

Carothers, a scientist who helped put together the AMP, told the House subcommittees on National Parks, Forests and Public Lands and Water and Power that the AMWG is too often “management by democracy without a shared vision,” and that the majority of its members “have no management responsibility” for Glen Canyon Dam, Grand Canyon National Park or endangered species.

“Each stakeholder organization represents and works to further its own interests rather than an agreed upon common goal and those interests are often in direct conflict,” he said. “Trying to include every conceivable stakeholder in the process inhibits consensus and final decision making.”

But others say the playing field has to be leveled so that all aspects of Glen Canyon’s operations can be addressed and improved.

“My message to you today is that we can have both hydropower and endangered fish recovery,” Robert Lynch, an attorney representing power suppliers, told the congressional panel. “We can have both hydropower and river rafting recreation. But we can’t have these things, this win-win situation, unless the people collecting the information and doing the science are willing to focus on that proposal, to-wit: examine ways and conduct studies with the goal in mind of having all of these resources maximized. That goal, that focus, does not exist today and it has not existed in the 28 years that Glen Canyon environmental studies and the Adaptive Management Program have been operating.”

This issue of *River Report* examines some recent developments surrounding Glen Canyon Dam – control of non-native fish, possible flow changes to accommodate sediment transport and a new long-term operations plan.

## A Complex Set of Interests

Glen Canyon Dam serves many different functions. It helps regulate water supply and equalize storage in Lake Powell and Lake Mead. Its turbines provide electricity to major metropolitan areas. It is responsible for maintaining a healthy ecosystem and the recreational well-being of Grand Canyon National Park for many people, including Indian tribes.

Each aspect of the dam's operations is represented by organizations that collectively make recommendations to Interior regarding dam operations. With dozens of people involved in the process, the path to solving problems is not always easy as stakeholders pursue adaptive management – the credo that has guided oversight of the dam's operations for 15 years.

Authors of the *Columbia Journal* paper note that “factions are entrenched,” with environmentalists, river guides, USFWS and the NPS regularly on one side and the states and hydropower interests on the other.

Interior struggles to balance the objectives of the agencies under its umbrella, according to Wegner. “The conundrum is you have an entity [Reclamation] that has a lot of institutional clout within Interior balanced with agencies that have directives that conflict with maximizing the movement of water and the generation of hydroelectric power,” he said.

In an August report, *Grand Canyon National Park: Resource Challenges and Future Direction*, the National Parks Conservation Association found that the decisions of the AMWG “minimize the influence” of the National Park Service and that the effects on the Grand Canyon “are not always the primary factor considered by the group as a whole.” The report says the AMP should focus on implementing “key management choices that the science identifies as having a clear and significant impact on river and resource restoration.”

Lash, a member of the AMWG, said the group is an important entity for giving information and recommendations to Interior, but that the conflicting

interests of its membership interferes with environmentalists' vision of improving the river ecosystem as outlined in the GCPA. “We have done the monitoring and the experiments but we are not adaptively managing,” he said.

Carothers, who was at the ground floor of the design of the AMP, said its actions have yielded increased knowledge and an apparent rebound in native fish. Even so, “progress toward protecting downstream resources has been frustratingly slow,” he said.

## Rebuilding Sandbars

Advocates for the Grand Canyon push for a regime that more closely mimics conditions pre-dam – steady flows punctuated by periodic bursts of high flows that leave rich deposits of sediment that sustains a thriving riparian habitat. More than 90 percent of the sand that formerly moved through the Colorado River is trapped behind Glen Canyon Dam.

In 1996, 2004 and 2008, scientists conducted one weeklong and 2-1/2 days of steady flows of 45,000 to 42,000 cubic



*Glen Canyon Dam is an important source of electricity in the Southwest. Above, Salt Lake City.*

At the heart of the matter is the timing and volume of flows, which have considerable impacts to downstream resources, including the chub. In a June 29 written order, U.S. District Court Judge David Campbell acknowledged the “complex set of interests” involved with operating the dam – endangered species, Indian tribes, the seven Basin states, large municipalities that depend on water and power, agricultural interests, Grand Canyon National Park and national energy needs “at a time when clean energy production is becoming increasingly important.”

feet per second in March and April, November and early March, respectively, to study the effects on sandbars. In each case sandbars were rebuilt in upper reaches of the Grand Canyon with the distributed sediment, but ultimately washed away with the return of normal fluctuating flow operations.

A June report by USGS analyzing the three experimental high flows found that “the question still remains” as to whether sandbars can be both rebuilt and maintained in Grand Canyon through the use of controlled floods. In 2009, Interior announced plans for developing

a protocol for future high flow experiments. The new protocol will allow for high flows to occur when Colorado River tributaries below the dam produce sufficient sediment that, coupled with suitable hydrology, would build sandbars and beaches downstream. Timing of high flows would depend not only on sediment inputs from tributaries, but also other environmental considerations such as impacts to the Lees Ferry rainbow trout fishery and riparian vegetation.

“The protocol will provide a multi-year, multi-experiment approach to be based on the best scientific information obtained through the adaptive management program,” Iams said.

USGS will soon release a circular that takes all the data gathered from the last three experiments and “synthesizes it for a general audience,” Melis said.

With GCMRC leading the way, scientists with federal and state agencies have embarked on a wide array of evaluations and assessments to discover the impacts of Glen Canyon Dam operations on the Grand Canyon ecosystem, and the extent to which

modifications to the flow schedule help or hinder habitat restoration. Completion of the dam in 1963 has prevented huge amounts of sediment from flowing into the Grand Canyon, leaving only the trace inputs from the few rivers and creek below the dam that empty into the canyon, such as the Paria and Little Colorado.

Jack Schmidt, a geomorphologist at Utah State University who has been working on Colorado River issues for more than 20 years, said the fundamental thing scientists have learned is that the river in Grand Canyon is in “a severe state of sediment deficit,” something that contradicts the original working hypothesis that the Colorado River was accumulating sediment that could be banked for many years to decades and redistributed.

Nonetheless, there are short “windows of opportunity” when fine sediments can be redistributed to the river bank through high flows, Schmidt said. Conversely, high flows at times of minimal sediment in the river’s tributaries can have a deleterious effect.

“We have learned that ... it is possible to run a flood when the system is not charged with sediment and thereby do more harm than good,” Schmidt said. “One must base high flows on a reasonably accurate calculation of the amount of sand in the channel bed. It is possible to screw it up.”

Scientists say it is possible to rebuild sandbars with flood releases of short duration. However, the gains are usually gone after about six months of fluctuating flows. Scott Wright, physical science and modeling coordinator with USGS, said the aim is to advise on the frequency of high flows that achieve the best results. “The question now basically is, “is there enough sand coming into the river?”” he said. “There is much less coming in from the tributaries and the question is how big the sandbars can be with relatively frequent flooding.”

One of the lessons gleaned by research is that it is not only the quantity but also the quality of the sediment being redistributed. Finer grain sandbars that are built using Paria River sand inputs erode very quickly under the onslaught of strong, clear water flows. “One way to mitigate for a changed sediment dynamic

*Sandbars provide camping beaches for hikers and whitewater rafters and create habitat used by native fish and other wildlife.*





# Calendar

is to have those dam releases occur when there is adequate sediment load in the river," Wegner said. "Another alternative is to get more sediment in the river channel by moving it around the dam. That's the engineering piece that's challenging."

Dam releases were modified in the early 1990s to restrict the washing machine effect of fluctuating flows, which had a "big effect" on the rate of sediment transport, Wright said. The rate of sandbar erosion is reduced with steadier flows which he acknowledged "further constrain" the ability to follow daily peaking hydropower demand.

"A lot of these issues are environmental vs. economic," he said.

But it's not as simple as releasing more water to achieve environmental benefits. The rules and regulations governing Colorado River use are numerous and long-standing, beginning with the 1922 Colorado River Compact and continuing with laws such as the Colorado River Storage Project Act (CRSPA) and the GCPA.

The dam regulates releases of water from the Upper Colorado River Basin to the Lower Basin to satisfy provisions of the Compact and subsequent water delivery commitments, and thereby allow states within the Upper Basin to deplete water from the watershed upstream of Glen Canyon Dam and utilize their apportionments of Colorado River water.

In addition to the primary purpose of water delivery, the dam generates substantial hydroelectric power used throughout the Southwest. The eight hydroelectric turbines produce power marketed by the Western Area Power Administration. Between the dam's completion in 1963 and 1990, the dam's daily operations were primarily undertaken to maximize generation of hydroelectric power capacity to meet changing daily demand in accordance with the CRSPA, which requires production of the greatest practicable amount of power.

"For any given volume of water that may need to be released in a year, the amount of energy that can be produced

## January

- 26-28 53rd Colorado Water Congress Annual Convention**, Denver, CO  
Contact: 303-837-0812  
web: <http://www.cowatercongress.org/AnnualConvention>

## February

- 1-3 Annual Conference**, sponsored by Nevada Water Resources Association, Reno, NV • Contact: 775-473-5473 • web: <http://www.nvwra.org/events.asp>
- 16-18 Water Education Foundation's Arizona Water Resources Tour**, Phoenix, AZ  
Contact Diana Farmer, 916-444-6240 • email: [dfarmer@watereducation.org](mailto:dfarmer@watereducation.org)  
web: <http://www.watereducation.org/tours>
- 16-17 2011 Tamarisk Research Conference**, Tucson, AZ  
web: <http://www.tamariskcoalition.org/Conferences.html>
- 17-18 National Salinity Summit**, sponsored by Multi-State Salinity Coalition, San Antonio, TX • Contact: 775-626-6389  
web: <http://multi-statesalinitycoalition.com/summit2011.php>
- 24-25 16th International Water Conservation and Xeriscape Conference**  
Sponsored by Xeriscape Council of New Mexico, Albuquerque, NM  
Contact: 505-468-1021  
web: [http://www.xeriscapenm.com/xeriscape\\_conferences/2011](http://www.xeriscapenm.com/xeriscape_conferences/2011)

## March

- 16-18 Water Education Foundation's Lower Colorado River Tour**, Las Vegas, NV  
Contact Diana Farmer, 916-444-6240 • email: [dfarmer@watereducation.org](mailto:dfarmer@watereducation.org)  
web: <http://www.watereducation.org/tours>
- 17-18 Law of the Colorado River**, sponsored by CLE International, Las Vegas, NV  
Contact: 800-873-7130 • web: [http://www.cle.com/product.php?proid=1258&page=Law\\_of\\_the\\_Colorado\\_River](http://www.cle.com/product.php?proid=1258&page=Law_of_the_Colorado_River)
- 24-25 Water Education Foundation's Annual Executive Briefing**, Sacramento, CA  
Contact: Diana Farmer, 916-444-6240 • email: [dfarmer@watereducation.org](mailto:dfarmer@watereducation.org)  
web: <http://www.watereducation.org/conferences>

## April

- 11-14 Annual Conference**, sponsored by New Mexico Rural Water Association, Albuquerque, NM • Contact: 505-884-1031  
web: <http://www.nmrwa.org/conference.php>

## June

- 29-July1 Western Governors Association Annual Meeting**, Coeur d'Alene, ID  
web: <http://www.westgov.org>

Contact Sue McClurg with your calendar items from July 2011 through December 2011 for inclusion in the Summer issue of River Report, [smcclurg@watereducation.org](mailto:smcclurg@watereducation.org) or 717 K Street, Suite 317, Sacramento, CA 95814

is the same regardless of how the power plant is operated,” Melis said. “It’s the ability to follow peaking demand [for electricity] that gets limited by operating constraints under [modified low fluctuating flows] and that means the amount of revenue generated is then limited.”

The *Columbia Journal* paper notes that the 2008 high flow experiment cost the power industry \$4 million in lost revenue, and that “it is still not clear whether [they] will be compensated for this loss.”

Lynch said the dam’s generators are producing about one-third the energy they are capable of providing. “In my view, the Adaptive Management Program should be focusing on how we can recapture this enormous power resource that is going unused and being replaced by fossil fuel capacity,” he said.

Lash said the dam “would be cranking just as much” to produce hydropower under a steadier flow regime, with the economic trade-off of less on-peak power sales countered by the boost from increased recreational use of the Grand Canyon. “Hydropower is green as far as it goes, but if it’s causing the decimation of Glen Canyon, sediment in Grand Canyon and a 4 million-year-old, ancient fish [the chub], how clean is it?” he said. “It’s an exaggeration or kind of abstraction to say that hydropower is a green

form of power. The damage that Glen Canyon Dam causes is huge.”

The NCPA report notes that more natural flows, which would shift some power productions from on-peak to off-peak hours, would impact electricity bills of end users by, on average, zero to 10 cents per month.

James said “absolutely not” to the idea of flattening the flows from the dam, noting there is no reason for such an “extreme change” when humpback chub numbers are increasing under the fluctuating flows schedule. Furthermore, generating capacity “is an important component” when considering alternative flow regimes, given that federal hydropower customers have statutory obligations to serve and must meet extensive oversight requirements in planning to serve electric customers.

“These planning processes center on peak season capacity requirements, which require the utilities to focus on long-term resource acquisition cost as a matter of standard utility practice,” James said. “In other words, utilities can’t assume that the market will always provide capacity.”

### **Humpback Chub on the Rebound?**

In 1996, state and federal officials pledged to ensure that a new population of humpback chub would be established in the

mainstem Colorado River or one or more of the tributaries within Grand Canyon. Clark and others have been targeting aggregations of humpback chub in nine different areas where the fish tend to congregate due to warmer water. “The data suggests that many adult chub remain near the Little Colorado River confluence in the mainstem Colorado River during the year when they are not spawning in the Little Colorado River,” Clark said.

The partial rebound in population has been aided by releases of warmer water from the dam (in 2005, due to drought) and the removal of non-native fish (mostly trout), that prey on young chub. The trout tend to favor the colder water near Lees Ferry and wildlife officials are attempting to get a better idea of the extent to which trout are present river-wide. In an illustration of the complexity that is part of dam management, the periodic high flows designed to build backwater habitat for the chub also benefit the trout by rejuvenating the food web and helping the young fish survive.

Identified as a control measure by USFWS, removal of non-native fish has occurred on a limited basis and may have helped boost the chub population. However, the confluence of the Colorado and Little Colorado rivers is of historic, religious and cultural importance to the Zuni Tribe, which opposes the culling of trout from the area.

Assistant Interior Secretary for Water and Science Anne Castle asked that Reclamation incorporate “structured decision making” as one process for working with the tribes to develop an environmental assessment for non-native fish control. Structured decision making is a formalized, facilitated process that provides the opportunity for all parties to propose and evaluate alternatives that can be considered in a National Environmental Policy Act analysis.

“Just as the adaptive management process and the foundation of its principles is a tool used in various resource management strategies, the same is true in structured decision making,” Iams said. “It’s clearly collaborative in essence.”



*Humpback chub*

## Effective Adaptive Management?

It is clear there is a significant role for the AMWG in management of Glen Canyon Dam. Schmidt with Utah State University said the program “must be guided by a clear articulation of what is the river we want,” and that the group has struggled when it has “tried to be all things to all people.”

“My take is that we are all in this together,” he said. “Society made the decision to build Glen Canyon Dam and to produce electricity. We should never forget that the people who run the Metropolitan Water District and the Southern Nevada Water Authority and the Western Power Administration and the Bureau of Reclamation – those people are public servants ... pursuing a societal good.”

Schmidt said “rigorous science” and a careful cost-benefit analysis “can guide the tough choices about how much water supply and energy production we have.”

Those choices are expected to be aided by a “desired future conditions” process underway for the AMWG that is intended to ease some of the gridlock and put members on a clear course toward anticipated results. CREDA’s James said it is important to remember the AMWG “is nothing more than an advisory committee [and] not a decision-making body.”

Lynch said the AMP “needs a new focus” that studies the impacts of the 1996 ROD and comes up with “common sense” ways to mitigate downstream impacts and stabilize the environment for native fish and recreation. “The taxpayers and ratepayers funding this exercise deserve it and the Grand Canyon deserves it,” he said.

Lash with Grand Canyon Trust believes federal officials can do more, including revisiting the Protection Act. “It’s an easy law to play with because it provides a huge amount of discretion for the secretary to act,” he said. “He could do very little and say he’s doing enough. Adaptive management never gets defined.”

The complications of Glen Canyon Dam management are partly demonstrated by the fact that the Arizona Game and Fish Department is mandated to manage the trout population below Lees Ferry for sports fishermen while also complying with ESA requirements to protect the humpback chub. “So many different individuals have a stake, it’s walking the tight rope for the balance,” said Clark, the wildlife specialist.

Schmidt urges an integration of Lake Powell and Lake Mead as a means of answering some of the environmental questions related to Glen Canyon operations. “We don’t ask if in a world of climate change, why not store all the water in Mead, put a bypass in Glen Canyon to minimize the storage, and allow Powell to be a secondary storage and still release floods,” he said, noting that pursuing such an objective “would be a hell of a political battle.”

Politics aside, major modifications would run against a multitude of river doctrines, including the 2007 Shortage Sharing Agreement that lays out the process for equalizing reservoir levels in Lake Powell and Lake Mead in response to a water shortage declaration.

Without more aggressive resource management, litigation and the courts will take more of a role in directing water management, Wegner said. He pointed to the successful rebound of salmon populations in the Pacific Northwest as an example of collaboration in the face of legal direction.

“What’s going on there is an example of people sitting down and working out issues and the courts only getting involved when the groups cannot develop appropriate actions that meet the requirements of the law,” he said. “While the courts continue to address the legal requirements of the Endangered Species Act, the agencies, tribes and states are all trying to find the most appropriate management regimes that will allow for protecting the fishery resources while meeting the goals of water supply, hydroelectricity and flood control. Collaboration works if it is grounded

in solid information and is transparent to all.”

Lynch said that spirit is needed to facilitate problem solving at Glen Canyon Dam and the Grand Canyon.

“We can have hydropower and environmental success. But we have to want it,” he said. “If everyone treats everyone else as the enemy, it is no wonder that certain people are lobbying to change the Adaptive Management Group because they feel it isn’t making decisions the way they want them made. It is no wonder that there is an ongoing tension over creating a long-term high flow experimental plan when there, at least for now, is no clear idea of what works and what doesn’t. It is no wonder that we have tension over using electroshocking to remove trout from the areas where the humpback chub is located within the mainstem of the Colorado River.”

Beyond collaboration, officials and stakeholders need to examine the long-term implications of climate change and how water supply and environmental restoration fits within the new paradigm.

Colorado River storage is based on some “key assumptions,” including the Rocky Mountain snowpack as the largest reservoir of water and the relative lack of variability in annual runoff (always between 9 million acre-feet and 14 million acre-feet), Wegner said.

With what appears to be a new normal of less runoff, managers will have to determine how to operate the system under a new set of conditions, including possible changes to the Lake Powell-Lake Mead relationship. For Schmidt, future decisions rely on understanding the pure physics of water management.

“We understand the geophysical process of sediment transport and mass balance pretty darn well,” he said. “What we don’t understand are the broader scale implications and our ability to maintain a program of rebuilding sandbars when 94 percent of it is stuck up in Powell. The Grand Canyon is trapped between the two largest reservoirs in the U.S. We won’t solve the problem until we begin to think bigger.” •



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