COLORADO RIVER PROJECT

River REPORT

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A project of the Water Education Foundation

CONTROLLING THE SALT:
Crafting a Restoration Plan for the Salton Sea

By Sue McClurg

The Salton Sea was formed by the forces of man and nature a century ago when the Colorado River broke through a series of dikes and flooded the low-lying desert between the Imperial and Coachella valleys. It was not the first such lake to form in the region, but unlike those of the past, irrigation runoff sustained the sea and helped it become the valuable wetlands habitat it is today.

But the saline sea is steadily growing saltier and scientists say unless this natural process is checked, it will follow the course of Mono Lake and the Great Salt Lake. How to best sustain the Salton Sea of tomorrow is the question now facing government officials, scientists, environmentalists, farmers, local residents and others.

Adding to the complexity of the question of how to restore the sea is the issue of inflow. Already declining, inflows will dramatically decrease under the historic Imperial Valley to San Diego water transfer – accelerating the rate of salinity increase and eventually resulting in a smaller sea.

There are no easy answers. A broad range of habitats and hundreds of different species with different needs will have to be accommodated. There also is the long implementation period – 75 years. It is difficult today to imagine what the sea will ultimately look like, yet somehow the plan must be adaptable to address unanticipated challenges.

The challenges of addressing these and other issues are detailed in the 3,000-page "Salton Sea Ecosystem Restoration Program" draft programmatic Environmental Impact Report (EIR) released by the Resources Agency in October. The draft EIR identifies eight alternatives to restore the sea, along with two "no action" alternatives. The eight alternatives range in cost from $2.3 billion to $5.9 billion in today's dollars. Each has some benefits, but each comes with tradeoffs.

"All of the alternatives meet the majority of the objectives in different ways," said Dale Hoffman-Floerke, chief of the Colorado River and Salton Sea office for the California Department of Water Resources (DWR). (DWR and the California Department of Fish and Game prepared the document for the Resources Agency.) A final EIR that identifies a preferred alternative will be presented to the state Legislature in April.

After years of trying to craft a restoration plan, efforts to restore the sea

Continued on page 4

In This Issue:

Dear Readers

The Salton Sea is growing saltier each year and if nothing is done to reverse this trend; it will eventually become as saline as the Great Salt Lake. Developing a restoration plan for this important wetlands habitat is a major undertaking, and one that could have implications for years to come as California implements the Imperial Valley-San Diego water transfer. In October, California officials identified eight proposed alternatives to address myriad problems facing the sea and they are hopeful that a consensus can be reached on a multi-billion dollar restoration plan. Time, as you will read in this issue of River Report, *is of the essence if the sea's ecosystem is to be saved.*

Bringing together stakeholders who have a common interest in the many issues in the Colorado River Basin is the goal of our biennial, invitation-only Colorado River Symposia. Our sixth symposium will be held Sept. 19-21, 2007, at The Bishop's Lodge in New Mexico. Please mark your calendars with this important date and be in touch with us if you have any suggestions for our panel topics.

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

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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.

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WATER EDUCATION FOUNDATION

Basin Briefs

UPPER BASIN:

The golden anniversary of the Colorado River Storage Project Act was celebrated in October at Glen Canyon Dam, one of four projects authorized by the 1956 legislation. Three other units were part of the initial legislation signed into law by then-President Dwight Eisenhower: the Flaming Gorge Unit on the Green River in Utah and Wyoming; the Navajo Unit on the San Juan River in New Mexico and Colorado; and the Curecanti Unit on the Gunnison River in Colorado.

Completed in 1963, Glen Canyon Dam created Lake Powell, the nation's second largest manmade lake. The reservoir, which can hold up to 26 million acre-feet of water, about two years of total average flows for the Colorado River, helps the Upper Basin states meet their annual delivery requirements to the Lower Basin states. It has been especially valuable during the severe drought.

All told, the reservoirs formed by the four units of the 1956 Act have a total capacity of nearly 30.6 million acre-feet of active storage. The generating units provide hydroelectric power for more than 5.8 million customers in six Western States. •

LOWER BASIN:

The state of Nevada has concluded hearings on a proposal by the Southern Nevada Water Authority (SNWA) to tap rural groundwater supplies and transport the water to the Las Vegas area. The two-week session, conducted by the Nevada State Engineer in September, considered whether SNWA can draw 91,224 acre-feet of water from White Pine County's Spring Valley. The ruling is expected to take several months.

The White Pine County water is just one part of SNWA's overall proposal to tap in-state groundwater resources for 180,000 acre-feet of water to help augment its Colorado River supplies.

Southern Nevada's growing population is on a collision course with its limited water resources. From 2003-2004, Las Vegas was the fourth fastest growing city in the U.S., and the Las Vegas area currently is home to 65 percent of Nevada's residents. But the SNWA is entitled to only 300,000 acre-feet per year of Colorado River water and has limited local groundwater. Water agency officials have adopted stringent water conservation measures, but unless new sources are found, Las Vegas could run out of water for new development by 2025.

A historic proposed agreement released in February 2006 by the seven Colorado River states recommends enacting a far-reaching program for water conservation and other augmentation activities to generate "intentionally created surplus" supplies – allowing water SNWA creates such as through this proposal to be cycled through the system without affecting a state's Colorado River allocation. The states' proposal is one of five river re-operation scenarios now being analyzed by the U.S. Bureau of Reclamation officials in development of an Environmental Impact Statement.

But the proposal to develop and transport rural groundwater supplies to Las Vegas is highly controversial. Environmentalists and local ranchers opposed to the White Pine County proposal say SNWA has exaggerated how much water is available from these aquifers, and that tapping these sources will threaten the rural area's economic growth and environment. They also argue that the SNWA should seek to conserve more water in Las Vegas or curb growth before looking to rural Nevada for more water. •

Continued from front page

gained momentum in 2003 during negotiations over the Quantification Settlement Agreement (QSA). Through the QSA, the California water agencies quantified their share of the state's Colorado River supplies, making possible water transfers among them – including the Imperial Valley-San Diego transfer.

The long term water transfer is a key component of the QSA and California's plan to cut its use of Colorado River water to its 4.4 million acre-feet annual allocation by 2016. How to mitigate for any deterioration of the sea related to the transfer and who should be liable became major sticking points in the negotiations. The stalemate was broken when California enacted legislation in 2003 assuming that responsibility and exempting the transfer from liability under state endangered species laws. (Fears about liability for environmental consequences scuttled an earlier version of the QSA in late 2002.)

Some people say if no solution is implemented to restore the sea it could potentially jeopardize the transfer, and perhaps the QSA itself, because the State Water Resources Control Board reserved "continuing authority to consider whether it would be appropriate to add, delete or modify mitigation measures required" for the transfer, which is the cornerstone of the QSA.

"There are tremendous implications for the Colorado River basin states," said Michael Cohen, senior research associate with the Pacific Institute. "If the QSA unravels there are huge ramifications up and down the river."

Originally opposed to the transfer, environmentalists say they are now working to ensure that the best possible restoration plan is adopted for the Salton Sea. "Restoration of the sea was part of the deal to get the Water Board to approve the transfer and for the transfer to comply with state environmental laws," said Kim Delfino, California

program director for Defenders of Wildlife. "Restoration must move forward. The question is: What is it going to look like?"

Under terms of the legislation, the state is required to select a preferred alternative that 1) provides the best restoration of long term stable aquatic and shoreline habitat for the historic levels and diversity of wildlife, 2) eliminates air quality impacts from the restoration project and 3) protects water quality.

Local governmental officials also want to somehow maintain a deep marine sea for recreation and economic opportunities, which will increase political support and, potentially, local funding for the preferred alternative. How to mesh environmental values – and the state's legal obligations – with recreation is a central question.

Many residents and policymakers in the Imperial and Coachella valleys have come out in favor of the restoration alternative developed by the Salton Sea Authority (SSA), primarily because they believe it would best protect the region's air quality and because it would provide the largest and deepest bodies of water for recreation. The SSA's original alternative generated controversy, however, because it assumed that more water would flow into the sea than projected by state officials. Critics also said it would not provide enough water for habitat. The schematic also detailed plans for major urban development around the sea.

Although the original proposal is the one included in the draft EIR because of time constraints in the process, SSA officials have since amended their proposal so that it uses the same water/inflow baseline as the state and provides more wildlife habitat. The extensive development around the sea included in the early draft has been removed, partly in recognition that land-use decisions ultimately will be made by local planners.

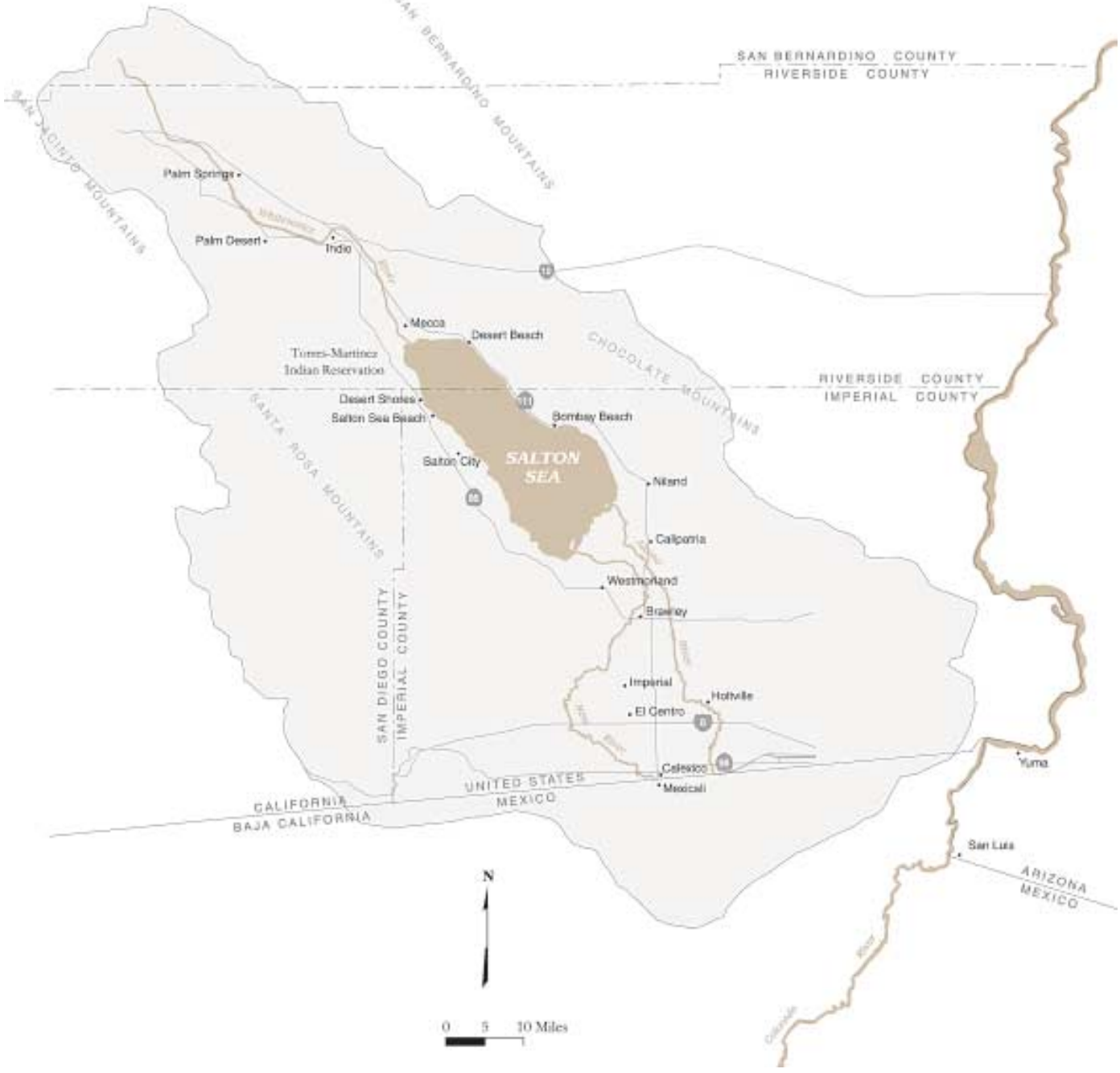
"We need a plan based on sound science, but we also need one that will have the political support of local and state elected officials," said Rick Daniels, the SSA's executive director.

A group of Imperial Valley farmers, known as the Imperial Group, has advanced its own plan for the sea of the future, proposing a series of concentric lakes of varying salinity. Leaders of the group say their plan – which is included in the draft EIR – is superior because it will work with even less inflow than currently projected, increasing the ability to adapt to changing conditions. "We don't see the [certainty] in the models," said Mike Morgan "so we chose to build it to the lowest flows you can anticipate and deal with the additional flows if and when you have them."

None of the eight alternatives received an "A" grade from environmental groups, but representatives believe a hybrid plan based on several of these proposals could receive very broad support.

State officials hope such a consensus is reached over the next five months as they work to identify a preferred alternative. (The public review period for the draft EIR closes on Jan. 16, 2007.) "My goal is to try to get as many people on board as possible," Hoffman-Floerke said.

Time is of the essence. As a terminal lake with no natural outlet, the sea's salinity already has increased to a point where it is 30 percent saltier than the Pacific Ocean and it can no longer support the marine sport fishery planted in the 1950s. Only the salt-tolerant tilapia fishery remains, a weak link in the food chain upon which thousands of fish-eating birds rely. By the time the full transfer takes effect, current inflow, estimated at 1.3 million acre-feet, is projected to be reduced by about 25 percent, further concentrating the salt as the sea shrinks in size. Experts believe other developments over the next 75 years will further reduce inflows. The exposed seabed, or playa, will be vulnerable to wind – potentially creating dust storms that could affect the health of nearby residents.



Irrigation runoff from Imperial, Coachella and Mexicali valley farmlands sustains the Salton Sea

For now, fallowing within the Imperial Irrigation District (IID) generates water to flow into the sea. But when that supply is cut off, experts predict that the shoreline would recede to expose as much as 140 square miles of seabed (the sea currently covers 360 square miles). The remaining salts and chemicals would be concentrated into a much smaller pool of water in which fish and most invertebrates would be unable to survive – threatening the food source for many of the 400 species of birds found at the sea. The alternatives in the draft EIR are designed to manage these effects in the best way possible. But all of the alternatives would take decades to fully construct. Meanwhile, the sea will only grow saltier.

To help offset this problem, the state and SSA are proposing construction of 2,000 acres of early-start habitat in and around the sea. But even this habitat would take several years to develop. The urgency of the situation is not lost on Daniels. "We are not short on technical solutions," he said. "We are short on political leadership to get this thing done." The sea has been "studied to death," he added. "I believe action will be taken. This represents our last, best chance to restore the sea."

In addition to garnering political support and action, implementing the ultimate alternative also will require funding. Proposition 84, passed by California voters in November, will provide $47 million toward a Salton Sea restoration plan. The water agencies involved in the transfer (the Coachella Valley Water District, IID and the San Diego County Water Authority) pledged a total of $133 million to mitigate for the water transfers including impacts on the sea, plus an additional $30 million ($10 million each) exclusively for Salton Sea restoration. The state agreed to assume liability for any additional necessary funding.

Julia Levin, state policy director with Audubon California, is confident that funding will be found. "The key to funding is to build broad public support. I think funding will follow," she said. "There's too much at stake not to implement a good restoration plan."

This issue of *River Report* discusses the important role the sea plays in the ecosystem, the challenges of restoration and provides an overview of the eight alternatives to restore the sea. Please refer to DWR's web site for maps and detailed descriptions for each alternative, http://www.saltonsea.water.ca.gov

Background

The 35-mile long, 15-mile wide depression in Riverside and Imperial counties known as the Salton Sink has been filled by the meandering Colorado River at least three times over the last 1,000 years. Such lakes eventually evaporated. Today's Salton Sea was formed in 1905-07 when the Colorado River broke through a series of dikes and poured into the Salton Sink for 18 months before the Southern Pacific Railroad Co. finally managed to close the gap. The flood left behind a freshwater lake with about twice the surface area of today's sea. The sea has no natural outlet and is sustained by salty drainage water from nearby farm fields.

In the 1920s, the Salton Sea developed into a tourist attraction because of its water recreation and the waterfowl attracted to the area. By the mid-1950s, the sea was an ideal location for recreational boaters, weekend campers and tourists. Many believed then that it would become the next Lake Tahoe, and investors purchased land around the sea on the premise of one day developing resorts. In the 1970s, a combination of higher inflows and a higher shoreline washed out the shoreline developments – including many of the resorts. Ordered to reduce its discharges, IID agreed in the 1980s to transfer some conserved water to the Metropolitan Water District of Southern California.

The Salton Sea is California's largest remaining wetlands habitat and it has become one of the most important wetlands for birds in North America, particularly for migrating water birds on the Pacific Flyway. More than 400 resident, migratory and special status bird species have been recorded at the sea, with about 250 of those species using the Salton Sea on a regular basis. It also is home to three endangered species, the Yuma clapper rail, the brown pelican and the desert pupfish.

Throughout the years, the sea's overall salinity has steadily increased. About 4.5 million tons of salt are dissolved in the 1.3 million acre-feet of inflow that enters the sea each year. About the same amount of water evaporates annually, leaving salts behind, and the remaining water gets saltier each year. This increasing salinity has changed the dynamics of the ecosystem.

Algae blooms have caused odor problems in the region and are believed to contribute to the periodic fish die-offs at the sea. Bird die-offs are more alarming. In 1992, 150,000 eared grebes died from unknown causes, and more recently 1,400 endangered brown pelicans perished from a form of botulism.

Despite these problems, the wealth and diversity of wildlife at the sea continue to attract visitors, primarily fishermen and bird watchers.

Since the 1960s, studies have been conducted on how to reduce the sea's salinity and address these other water quality issues. With the formation of the

SSA (a local joint powers authority) in the early 1990s, federal officials provided money for new studies – primarily focusing on creating some sort of outlet for the sea. Those ideas never came to fruition, in part because of their enormous price tags, but they did form the groundwork for today's restoration efforts, which rely on in-sea management of the salt.

If no restoration plan is implemented, the sea's current salinity of about 48,000 milligrams per liter (mg/L) will continue to increase. Water elevations are expected to decline over the next decade due to events unrelated to the transfer; increasing salinity to 60,000 mg/L – too salty for the pile worm that now forms the base of the food chain. Once transfer mitigation flows end in 2018, it would accelerate the drop in water elevation and by 2078, salinity would exceed 300,000 mg/L. By comparison, Mono Lake today has a salinity level of 80,000 mg/L; the Great Salt Lake 230,000 mg/L; and the Pacific Ocean, on average, 35,000mg/L.

Challenges

The Salton Sea of tomorrow will not look like the Salton Sea of today or yesterday. Developing a vision of the sea of the future and working to bring that vision to life is an immense challenge. "The sea is constantly changing – it's not like Mono Lake, where the lake can be restored to a historical set of conditions," said the Pacific Institute's Cohen. He said the environmentalists' goal is to maximize the ecological benefits of the water and minimize any threat to public health because of dust storms.

One of the biggest challenges is how to accommodate the broad range of species at the sea. Typically, a habitat conservation plan addresses the needs of 10 to 20 species. Some 250 species of resident and migratory birds are regularly found at the sea. Habitat requirements for all species are unique, with some species favoring shallow water and others deeper water. Management trade-offs are inevitable.

"This represents our last, best chance to restore the sea."

– Rick Daniels, Salton Sea Authority

For the fishery, somehow what will become a salt sink has to be separated from a lake or other body of water with lower salinity concentrations that can support marine fish. Many of the birds at the sea, including the endangered brown pelican, depend upon the sea's fishery. The state estimates that should the fishery be eliminated, pelicans and other fish-eating birds would disappear from the sea by 2020. Balancing the needs of three endangered species against hundreds of others will require compromise.

Then there is the question of inflow. In its simplest form, the objective of the Salton Sea plan is to do as much as possible to restore the ecosystem with less water, all while reducing the amount of exposed seabed and/or managing the playa to reduce the occurrence of dust storms.

"The amount of water that flows into the sea is very important in determining what you can do there. The size of any project will reflect the reliability of inflows, and the risk that California is willing to assume that in any given year there won't be enough water to satisfy all of the project's various components. How dependable are the flows?" said Cohen. "We want to maximize the dependability of the system by relying on flows that seem to be pretty certain."

Construction of the preferred alternative is likely to take 20 to 30 years, and it is impossible to foresee what other events will impact the sea. Under the existing Imperial Valley-San Diego transfer, 300,000 acre-feet less water will flow into the sea each year. State officials identified other out-of-sea activities that could reduce inflow such as potential decreases in flows from the New and Alamo rivers if Mexico decides to develop this water for its own use.

Another wild card is the development of TMDLs (total maximum daily loads) for various pollutants. A TMDL requires that loads from all pollution sources within an impaired watershed be allocated. For example, the Regional Water Quality Control Board's Colorado Region (Colorado Regional Board) is in the process of developing a TMDL to reduce phosphorus loads to the Salton Sea. Phosphorus is a nutrient that is a major contributor for the growth of algae. As the algae die, bacteria decompose them, using up the available dissolved oxygen (a process called eutrophication), causing fish die-offs. As the TMDL is developed, a numeric value for how much phosphorus can flow into the sea will be established, with the "load" then divided among various water sources – including agricultural drains. As this and other TMDLs are adopted, local and state officials say farmers will reduce the amount of water that runs off their land, thereby reducing the amount of inflow into the Salton Sea.

Considering all of these factors, the state based its analysis of the alternatives on an average annual inflow of 717,000 acre-feet.

The Imperial Group believes that there will be even less water to depend upon and crafted its plan on a projected inflow of 500,000 acre-feet. Some have suggested that the group's ultimate plan is to sell some of the projected inflow. Morgan denied this, pointing out that the farmers do not have the ability to set up a water transfer because the IID holds the water rights in trust for the farmers. He said the Imperial Group believes that other factors will result in less water for the sea over the next 75 years, including the demands for more water by other Colorado River states.

The SSA had developed its proposal based on an assumed average annual inflow of 800,000 acre-feet, but has altered its plan to ensure it is feasible based on the state's projections. The SSA has also changed its plan to add more wildlife habitat and better address air quality concerns.

Daniels said local constituents remain committed to the SSA's proposal because it includes elements that allow for the maximum amount of recreation and recognizes the need for economic development. Such economic development, he said, could help generate local funds to help pay for implementation of the restoration plan.

Selenium also is a concern. Selenium is a naturally occurring element and an essential nutrient for fish and birds. However, when it is present at elevated concentrations in the food web, selenium can cause severe adverse effects, especially on reproduction of fish and birds. According to the Colorado Regional Board the concentration of selenium in the sea's water is about 1 to 2 parts per billion (ppb), well below the 5 ppb federal criteria for protection of aquatic life. But some sediment concentrations are elevated and there is concern that under most of the alternatives, construction of various habitats and barriers would disturb these sediments, releasing selenium into the food chain.

According to the draft EIR, between now and 2020, state officials would conduct pilot studies and monitoring programs to further characterize the distribution of selenium in the sediments, and collect additional samples to refine predictions of selenium risk, and modify the project design to minimize selenium uptake in the food web.

The Alternatives

The release of the draft EIR follows two years of scientific study and input taken during 30 public meetings. Although the alternatives are identified as one to eight, state officials say this is not a ranking of priority, rather a ranking of least to most complex of the alternatives evaluated.

The report analyzes three main types of habitat:

The **saline habitat complex** consists of a series of 1,000-acre cells with water ranging in depth from 1 inch to 6 feet, with most acreage 6 inches deep. The habitat would mimic the current shoreline, which is the most productive part of the Salton Sea. The salinity of each cell would vary from brackish 10,000 to 15,000 mg/L up to 60,000 mg/L.

Remnants of the historic habitat of the Salton Sea would be provided by the **deep marine sea** component where water salinity would range between 20,000 to 40,000 mg/L in order to support marine sport fish such as sargo or corvina. The deepest water could extend to 50 feet, depending on the location of the sea, which would be formed by a rock fill barrier.

Shallow marine water at depths of about 10 feet would have about the same saline concentration. These bodies of water would be established by rock fill barriers or geotubes that would generally run parallel to the existing shoreline.

In its current form, the sea covers 233,000 acres and is 50 feet deep at its deepest point. If no action is taken, experts say the sea would shrink to about half its size, exposing the playa and creating an ever saltier body of water – creating, in effect, one large brine sink surrounding by an exposed shoreline. The alternatives would help to manage that situation so the water would be in the best possible location and configuration to support different habitats. A dedicated brine sink would be set aside for the saltiest waters while dust storms from the exposed playa would be managed either through irrigated water efficient vegetation or development of a salt crust.

The no-action alternative in the report (California environmental laws require the inclusion of a no-action alternative) is intended to be a benchmark against which the other proposals are evaluated. At the least, the exposed playa would have to be managed for air quality concerns at an estimated cost of $48 million a year.

Alternative 1, Saline Habitat Complex I would provide 38,000 acres of saline, shallow habitat primarily in the southern portion of the Salton Sea. Pupfish channels would be constructed along the shoreline, but they would not connect – creating five different populations. The brine sink would cover 123,000 acres with 77,000 acres of exposed playa. According to the draft EIR, it would be fully implemented by 2025 with a construction cost of $2.3 billion; annual operation and maintenance costs would be $91 million.

Alternative 2, Saline Habitat Complex II would provide more saline habitat – 75,000 acres – complex areas, located in the southern, northern and western portions of the sea. Pupfish habitat would be constructed, but again, would create five distinct populations. The brine sink would cover 85,000 acres with 91,000 acres of exposed playa. According to the draft EIR, it would be

fully implemented by 2030 at a cost of $3.3 billion; annual operation and maintenance costs would be $107 million.

Alternative 3, Concentric Rings would preserve the Salton Sea's existing shoreline habitat by constructing two concentric water bodies. The outer waterbody, or first ring, would be a brackish waterbody ranging from 0 to 10 feet deep. The inner ring would be a marine waterbody with a maximum depth of 10 feet that would provide additional shoreline habitat. All pupfish would be connected in the first ring. Both rings would be created by constructing rock filled dikes or levees. No saline habitat complex would be included. The brine sink would cover 68,000 acres with 127,000 acres of exposed playa. According to the draft EIR, it would be fully implemented by 2021 at a cost of $4.9 billion. Annual operation and maintenance costs would be $138 million.

Alternative 4, Concentric Lakes was proposed by the Imperial Group. This alternative is similar to Alternative 3, but would include multiple lakes. Water from one lake would flow into the next with the water increasing in salinity before reaching the brine pool in the center of the sea. Each lake would be 6 feet deep. The pupfish would be located in the outer lake, connecting all pupfish populations. There would be 88,000 acres of shallow habitat similar to the saline habitat complex. The brine sink would cover 22,000 acres with 111,000 acres of exposed playa. According to the draft EIR, it would be fully implemented by 2040 at a cost of $2.3 billion. Annual operation and maintenance costs would be $20 million.

Alternatives 5 to 8 include some form of a deep marine sea 40 to 50 feet deep. The location of the barrier varies.

Alternative 5, North Sea would provide an 82,000-acre deep, marine, open-water habitat in the northern portion of the Salton Sea and saline habitat complex in the southern portion.

Continued on page 11

Calendar

January

11-12 **5th Annual National Salinity Summit**, sponsored by Multi State Salinity Coalition, San Diego, CA • Contact: email: nmwrri@wrri.nmsu.edu, web: http://wrri.nmsu.edu/conf/confsymp.html

25-26 **49th Colorado Water Congress Annual Convention**, Denver, CO
Contact: (303) 837-0812, email: cwc@cowatercongress.org, web: http://www.cowatercongress.org

February

17-19 **10th Annual Salton Sea International Bird Festival**, Imperial, CA
Contact: 760-344-5359, email: newriver@usa.net, web: http://www.newriverwetlands.com/saltonsea.html

22-23 **Water Education Foundation's 24th Annual Executive Briefing**, Sacramento, CA
Contact: Diana Farmer, 916-444-6240, email: dfarmer@watereducation.org, web: http://www.watereducation.org/briefings.asp

March

7-9 **Water Education Foundation's Mexican Delta Tour**, Yuma, AZ
Contact: Diana Farmer, 916-444-6240, email: dfarmer@watereducation.org, web: http://watereducation.org/tours.asp#mexican

8-9 **Xeriscape Conference and Expo**, sponsored by Xeriscape Council of New Mexico, Albuquerque, NM.
Contact: Scott Varner, 505-468-1021, email: scott@xeriscapenm.com, web: www.xeriscapenm.com

8-9 **Colorado Water Law**, sponsored by CLE International, Denver, CO.
Contact: CLE International, 800-873-7130, web: www.cle.com

28-30 **Water Education Foundation's Lower Colorado River Tour**, Las Vegas, NV
Contact Diana Farmer, 916-444-6240, email: dfarmer@watereducation.org, web: http://watereducation.org/tours.asp#watertours

May

2-3 **80th Annual Conference & Exhibition**, sponsored by Arizona Water & Pollution Control Association, Mesa, AZ
Contact: 1-888-559-8844, web: http://www.awpca.org/default.aspx

11 **Colorado River Super Conference**, sponsored by CLE International, Las Vegas, NV
Contact: CLE International, 800-873-7130, web: www.cle.com

June

5 **Annual Water Conference**, sponsored by University of Arizona Water Resources Research Center, Phoenix, AZ
Contact: Cas Sprout, 520-792-9591 ext. 55, email: csprout@ag.arizona.edu, web http://ag.arizona.edu/AZWATER/conf2007/index.html

Contact Sue McClurg with your calendar items from July 2007 through December 2007 for inclusion in the Summer issue of River Report, *smcclurg@watereducation.org or 717 K Street, Suite 317, Sacramento, CA 95814*

Adapting the Glen Canyon Dam Adaptive Management Program

By Sue McClurg

Dam releases, a water temperature control device and non-native fish control are just some of the ideas on the table as federal officials begin to explore ways to adapt the Glen Canyon Dam Adaptive Management Program (AMP) to better protect the endangered humpback chub and restore beach habitat in the Grand Canyon.

The U.S. Bureau of Reclamation (Reclamation) announced in November that it would begin development of an Environmental Impact Statement (EIS) on the implementation of a long-term experimental plan for Glen Canyon Dam operations as part of a legal settlement. According to the Nov. 6 Federal Register, the plan "is proposed to implement a structured, long-term, program of experimentation (including dam operations, potential modifications to Glen Canyon Dam intake structures, and other potential management actions, such as removal of non-native fish species) in the Colorado River below Glen Canyon Dam."

"This action reflects the Department's continued commitment to the Glen Canyon Dam Adaptive Management Program and appropriate environmental review and compliance of such experimentation," said Mark Limbaugh, assistant secretary for Water and Science for the Department of the Interior (Interior), in a press release.

Five environmental groups filed suit against Interior in February 2006 (*Center for Biodiversity v. Kempthorne*) charging that Reclamation had violated the Grand Canyon Protection Act, the Endangered Species Act and the National Environmental Policy Act, and that the decade-long effort to operate the dam to reduce impacts on the endangered humpback chub and the Grand Canyon's natural resources has failed to produce results.

"We feel they have had 10 years to make improvements and they have not," said John Weisheit of Living Rivers, one of the environmental groups involved in the suit. "The question is, are they going to save the Grand Canyon or not?"

Established in 1996, the AMP's objective is to determine how Glen Canyon Dam can be re-operated to protect and improve natural and cultural resources downstream, including the Grand Canyon, through adaptive management and scientific experimentation. The Adaptive Management Work Group (AMWG) recommends development and review of science-related work and changes to management practices.

Construction of Glen Canyon Dam has caused the once-muddy, warm Colorado River to become a cold, clear stream – better suited for the introduced trout than native fish such as the chub. According to the U.S. Geological Survey (USGS) the humpback chub's population had declined from about 10,000 to about 3,000 to 5,000 despite efforts to restore the fish while nonnative rainbow trout and brown trout had increased dramatically. Both trout species prey on native fishes. (Recent USGS news releases say the population has stabilized at approximately 5,000.)

Sediment now trapped behind Glen Canyon Dam has contributed to the disappearance of downstream sandbars and beaches used for habitat and recreational purposes. The erosion also is exposing archeological sites in the river corridor and locations of traditional importance to Native Americans.

Many of the actions undertaken under the AMP have focused on managing this sediment. Perhaps the biggest effort to restore this downstream habitat occurred in November 2004 when Reclamation conducted a high-flow test release of water from Glen Canyon Dam in an effort to conserve sediment from tributaries below the dam and re-build riparian and fish habitat in the Grand Canyon.

According to a 2005 report prepared by the USGS Grand Canyon Monitoring and Research Center this experiment resulted in "the robust increase in sandbar area and volume in upper Marble Canyon … [b]ut more recent scientific findings suggest the use of short, strategically timed high-flow releases following sporadic sand inputs from tributaries is a possible strategy for rebuilding beaches and sandbars."

Prepared at the request of the AMWG, the 220-page report, *The State of the Colorado River Ecosystem in Grand Canyon*, found that many of the AMP objectives had not been met.

Other major findings included:

- Under current dam operations, the Colorado River transports more sand out of the system than is supplied by tributaries on a seasonal to annual basis, preventing multi-year accumulation in the channel. As a result, erosion of channel and sandbar deposits from Marble and Grand Canyons continues
- Erosion between 1998 and 2003 in the area available for high-elevation camping decreased by 55 percent with an average rate of decrease of 15 percent per year. As noted above, these areas appear to have benefited from the November 2004 high-flow test.

Federal officials will now hold a series of scoping sessions to determine what to address as they develop an EIS, and anticipate publishing a draft in spring 2008. •

FEATURE ARTICLE

Continued from page 9

A shoreline waterway would also be created in the southern portion, adjacent to the saline habitat area, to provide habitat and connectivity for the desert pupfish and a mixing/distribution channel for water supplies to different areas of the restored Salton Sea. Three separate pupfish habitats would be created. It would include 45,500 acres of saline habitat complex. The brine sink would cover 13,000 acres with 117,000 acres of exposed playa. According to the draft EIR, it would be fully implemented by 2027 at a cost of $4.5 billion. Annual operation and maintenance costs would be $134 million.

Alternative 6, North Sea Combined would provide a deep, marine waterbody in the northern portion of the Salton Sea combined with a moderately deep marine sea in the southern portion for a total of 74,000 acres. The marine sea would extend along the entire western shore of the existing Salton Sea. Pupfish would be located in the drains along the southern shoreline and be connected to populations in the San Felipe Creek. A pupfish channel also would connect drains north of the Alamo River. This alternative includes 29,000 acres of saline habitat complex. The brine sink would be 11,000 acres with 131,000 acres of exposed playa. According to the draft EIR, it would be fully implemented by 2032 at a cost of $5.9 billion. Annual operation and maintenance costs would be $149 million.

Alternative 7, Combined North and South Lakes is an early draft of the SSA's preferred alternative and would include a deep (40 to 50 feet) marine sea in the north end and a moderately deep marine sea (15 to 20 feet deep) in the south. Saline habitat complex would be created along the southeastern shore. Because of time constraints, the state had to analyze the proposal as it existed in March; the SSA has since made several revisions to increase the amount of saline habitat complex acreage and decrease the size of the seas. The marine waterbody would extend along the entire western shore of the Salton Sea to the confluence of the Alamo River on the south side. Desert pupfish in drains along the northern and southern shorelines and San Felipe and Salt creeks would be connected; those in drains along the southeastern shoreline would not. This alternative also includes water treatment components and a storage reservoir for IID. The state did not include the proposed IID reservoir in its analysis, considering it to be an issue to be addressed in a site-specific EIR if this alternative were selected. This alternative relies on creation of a salt crust for air quality management.

The SSA plans to submit changes it has made to this alternative to the state through the public comment period. As adopted by the SSA board in September, the revised plan foresees 220 square miles of surface water, with the two lakes connected by a channel along the west shoreline. There would be a 75,000-acre brine sink with 18,000 acres of saline habitat complex. According to the draft EIR, construction costs would be $5.2 billion. Annual operation and maintenance costs would be $82 million.

The revised SSA plan can be viewed at http://www.saltonsea.ca.gov

Alternative 8, South Sea Combined would provide a large deep, marine waterbody in the southern portion of the sea with a smaller moderately deep sea in the north for a total of 83,000 acres. Pupfish would be connected along the northern and southern shorelines and include all the drains and San Felipe Creek. A separate population would be established in Salt Creek. It also includes 18,000 acres of saline habitat complex areas along the eastern and western portions. The brine sink would cover 9,000 acres with 128,000 acres of exposed playa. According to the draft EIR, it t would be fully implemented by 2027 at a cost of $5.8 billion. Annual operation and maintenance costs would be $145 million.

What Happens Next?

With the release of the draft EIR, the state kicked-off a 90 day public comment period, which ends Jan. 17, 2007. State officials will then review all of the comments in preparation of a final EIR identifying a preferred plan, which could be a combined or hybrid plan based on several of the draft alternatives.

Subsequent legislation will be required to implement and fund the chosen alternative.

More than anything, Daniels is pushing for action and political leadership. "We cannot allow this opportunity to restore the sea to pass," he said. "We need to make significant improvements to the sea before 2017. In project terms, that's just around the corner."

Delfino agrees that the time to act is now. "A small group of people could stand in the way of something and we probably have the power to do that. But that would be a very bad decision to make. … I actually do think while we may have all started out in different areas we are moving forward to achieve an agreement," she said.

"If we can't do that, then I think we failed the sea and the surrounding communities are going to bear the impact of this."

Implementation, however, will take decades. Saline habitat complex, air quality management and pupfish connectivity components, for example, could not be constructed until the current sea level recedes. State officials say that construction for most of the alternatives would not be able to begin before 2014; and some not before 2018. Construction would continue until at least 2040.

"The sea is only sustainable if managed by man," said Chuck Keene, chief of the water management branch for DWR's Southern District Office. "We won't be able to fix it and then let it go. It will need to be actively maintained and managed no matter what alternative is selected." •

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