Overview of Management and Restoration Activities in the Salton Sea

name redacted
Specialist in Natural Resources Policy

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Summary

The Salton Basin in southern California has supported many lakes and water bodies throughout its geological history. The most recent inland water body in the Basin is the Salton Sea, which was created from a levee break in 1905. The Salton Sea is the largest inland water body in California. In the past several decades the salinity of the Sea has been increasing, and is now considered a significant threat to the health of the current Salton Sea ecosystem. Ecosystem changes in the Sea were exemplified by several large die-offs of fish and birds that inhabit the Sea. Some of these events included endangered species such as the brown pelican.

The Sea receives most of its water from agricultural drainage originating in the Imperial and Coachella Valleys in California. When water transfers from agricultural lands in these valleys to municipal water districts in San Diego were proposed to reduce California's reliance on water from the Colorado River, concerns about the environmental impacts of these transfers on the Sea surfaced. The proposed water transfers would have resulted in less water flowing into the Salton Sea, which according to some scientists would increase the rate of evaporation in the Sea so that salinity levels would be lethal to most fish and wildlife in less than 10 years.

Interest in restoring the Salton Sea was evident before its role in water transfers was realized. Several studies were done by state and federal agencies to determine baseline data about the Sea and potential management regimes for restoring the Sea. Federal efforts to study the Sea were amplified with the Reclamation Projects Authorization and Adjustment Act of 1992 (Title XI of P.L. 102-575), which authorizes research to develop plans to control salinity, provide habitat to endangered species, enhance fisheries, and protect recreational values in the Salton Sea. Federal restoration efforts were formally initiated by The Salton Sea Recovery Act of 1998 (P.L. 105-372). This act authorizes feasibility studies and economic analyses of various options for restoring the Salton Sea. Prospects for funding restoration in the Sea improved when legislation containing provisions that would allocate an estimated $300 million for restoring the Salton Sea was enacted by the State of California.

Whether or not to restore the Salton Sea remains controversial. Some who favor restoration argue that the value of the Sea is high because it is one of the remaining wetland habitats in the region for migratory birds, fish, and wildlife. Further, some argue that the Sea has potential for economic development, recreation, and tourism. Some against restoring the Sea believe that the Sea is destined to evaporate similar to the water bodies in the Salton Basin that preceded it (i.e., that the Sea is a lake in natural decline). In addition, some critics suggest that the Sea is too expensive to restore, and scientifically sound plans for restoration are not available.

This report provides a summary of management and restoration events in the Salton Sea and will be updated as developments warrant.

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Introduction

Congressional concern for securing funding and developing plans to restore the Salton Sea stems from the value of the Sea as a habitat for federal and state listed endangered species as well as other migrating and resident bird species, a reservoir for agricultural drainage, a center for recreation, and a wetland ecosystem.[1] The Salton Sea is located in southern California and is considered the largest inland water body in the state (**Figure 1**). The Salton Sea was formed in 1905 when a levee break allowed water to flow into the Salton Basin from the Colorado River uninterrupted for 18 months.[2] The Salton Sea was not the first body of water in the basin; several other lakes have existed in the Basin throughout its geological history.[3]

Interest in the ecological health of the Salton Sea has amplified since 2002, when negotiations of proposed water transfers in southern California began. The proposed water transfers would have diverted agricultural water from farms in the Imperial Valley to San Diego and the Coachella Valley. This was expected to result in less water flowing into the Salton Sea, which some scientists predict would have increased the rate of evaporation in the Sea so that salinity levels would be lethal to most fish and wildlife in less than 10 years. Questions over how environmental impacts in the Salton Sea would be mitigated and who ultimately would be responsible for their costs played a large part in the negotiations. On September 12, 2003, the State of California enacted three bills that contain provisions that would allocate an estimated $300 million for restoring the Salton Sea. These funds were secured when the Quantification Settlement Agreement (QSA) was passed on October 10, 2003.[4] The agreement allows California to gradually reduce its over-dependence on the Colorado River to 4.4 million acre-feet in the absence of surplus water through voluntary agriculture-to-urban water transfers and other water supply programs. The agreement will attempt to protect inflows to the Salton Sea for 15 years and establish a restoration fund for the Sea. The fund will receive money from mitigation fees collected from the sale of water transfers in the region. These acts also authorize the creation of an advisory committee for restoration activities and set a deadline of 2006 for the California State Resources Agency to prepare a restoration study of the Salton Sea.

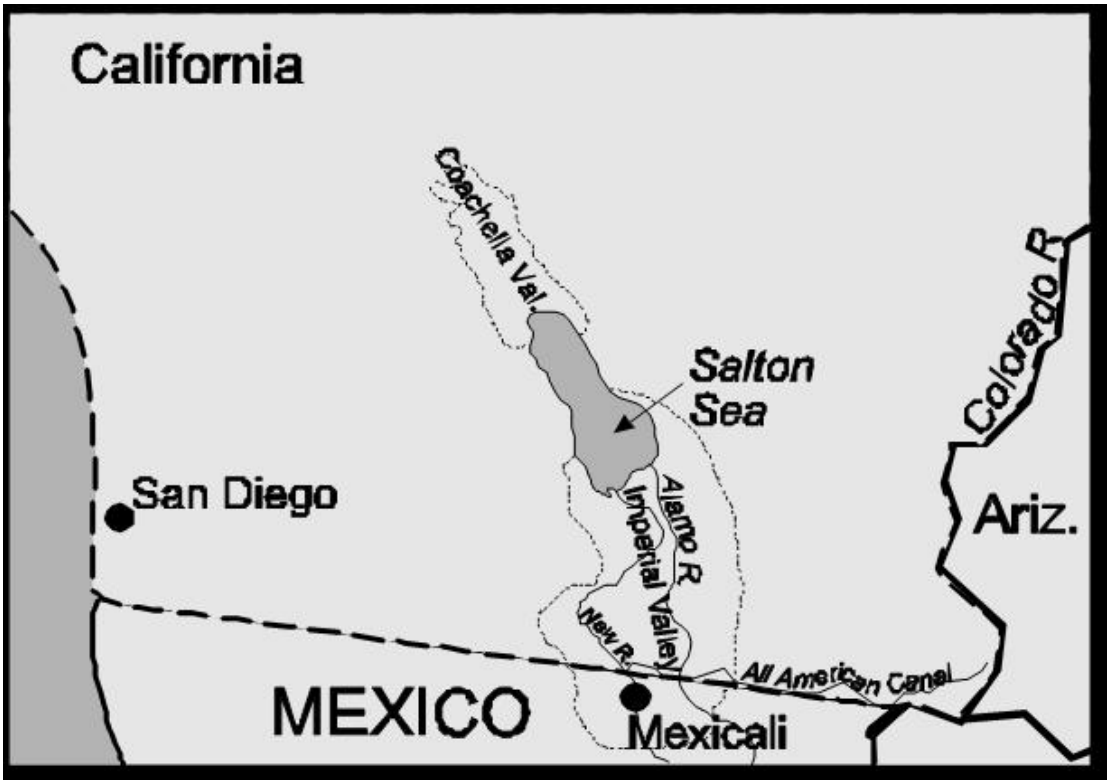
[1] Letters to Secretary of the Interior Gale Norton from Congressman Duncan Hunter on December 19, 2002 and Senator Dianne Feinstein and Congresswoman Mary Bono on January 31, 2003.

[2] U.S. House of Representatives, Committee on Resources, Subcommittee on Water and Power, *Salton Sea Stabilization and Water Quality Improvement*, Oversight Hearing, 105th Cong., 1st Sess., (Serial No. 105-60), October 3, 1997 (Washington, DC: U.S. GPO), 112 p.

[3] Michael Cohen, J.I. Morrison, and E.P. Glenn, *Haven or Hazard: The Ecology and Future of the Salton Sea*, (Oakland, CA: The Pacific Institute, February 1999), 63 p. (Hereafter referred to as Cohen et al., *Haven or Hazard*.)

[4] For more information on the QSA, see CRS Issue Brief, IB10019, *Western Water Resource Issues*, by (name redacted) and (name redacted).

Figure 1. Location of the Salton Sea, California



Source: Map Resources. Adapted by CRS.

Background

The Salton Basin, where the Salton Sea is located, has supported many lakes and water bodies throughout its geological history. The last of these prehistoric water bodies was Lake Cahuilla, which dried up nearly 400 years ago. In 1901, a portion of the Colorado River was diverted through the Imperial canal to irrigate agricultural fields in the Salton Basin. Water flowed through the New Alamo River and into the Imperial Valley from this channel.[5] In 1905, water from spring floods broke through a levee diverting a portion of the Colorado River, and began forming the Salton Sea. Water flowed uninterrupted for nearly 18 months into the Salton Sea before it could be turned back to the Gulf of California. The Sea formed as a closed basin with no outlets. (This is still valid today.) The Sea consisted largely of fresh water at its inception, and immediately began to evaporate and increase in salinity.

Due to the construction of the Hoover Dam and the All American Canal in 1928, some water from the Colorado River was directly transferred to the Imperial Valley for irrigation. After flowing through agricultural lands, this water entered the Salton Sea and prevented it from completely evaporating. In 1924 and 1928, President Coolidge executed Public Water Reserve Orders 90 and 114 for the withdrawal of lands located in and around the Salton Sea. These lands were designated as a repository for agricultural, subsurface, and surface water drainage. During this

[5] Robert H. Boyle, "Life—or Death—for the Salton Sea?" *Smithsonian* (June 1996): 87-93. (Hereafter referred to as Boyle, "Life—or Death—for the Salton Sea?")

period, dissolved salts in the Colorado River water, combined with evaporation, led to an increasingly saline Sea and subsequent population reductions in freshwater fish species.

In 1950, when the salinity of the Sea was roughly equivalent to the ocean, the California Department of Resources began transferring saltwater fish species to the Sea. Some species thrived in the Sea, including the orangemouth corvina (*Cynoscion xanthulus*) and gulf croaker (*Bairdiella icistia*).[6] During this period, and in the next two decades, the Sea became a popular destination for sportfishing and tourism. However, changes to the Sea including the inundation of resort areas and wildlife habitats, bird and fish die-offs, and health threats of untreated water, among other things, led to a decline in recreation and development around the Sea in the 1960s.[7] Health advisories, for example, included posted warnings against human contact with the Sea and consuming fish from the Sea.[8] The stench of dead fish and concern over inorganic and organic pollution from the Sea were also factors that led to less interest in inhabiting the shorelines of the Sea. In the mid-1980s, recreation around the Sea had dropped nearly 50% since the 1960s.[9] In the past few decades the focus of activities concerning the Sea has been on the environmental problems it faces.

The current Salton Sea ecosystem has problems ranging from poor water quality to loss of habitat. The New River provides water to the Salton Sea after it flows through the urban area of Mexicali, Mexico and the Imperial Valley. As the urban area of Mexicali increased, water pollution from sewage treatment plants, agricultural runoff, and other sources of pollution has increased. Water inflows to the Sea from another country illustrate the complexity of efforts to regulate water pollution in the Sea.[10] Elevated levels of selenium and DDE have been detected in Sea fish and wildlife. Selenium can cause a variety of physical problems in humans and was one of the reasons for advisories against consuming too much fish from the Sea. DDE, which is derived from DDT, is also found in waters of the Sea. DDT was banned in the United States in 1972, but is still used in Mexico as an insecticide. Both DDE and selenium cause reproductive problems in fish and birds.[11]

Ecology of the Salton Sea

The Salton Sea provides a variety of habitat for fish and wildlife species, including open water, estuaries, salt marshes, and riparian corridors. Due to the loss of wetland habitat in southern California and throughout the state's vast Central Valley, the Salton Sea is regarded as a primary stopover point for birds on the Pacific Flyway.[12] The Salton Sea is periodically inhabited during the year by the second largest number of bird species in the United States, including some federal

[6] *Ibid.*

[7] Cohen et al., *Haven or Hazard.*

[8] Since 1986, advisories against consuming fish in quantities above eight ounces every two weeks have been posted for the Salton Sea. Currently, it is advised that no one under age 15 should eat fish from the Salton Sea, and that adults should not eat greater than four ounces of either corvina, tilapia, sargo, or croaker every two weeks.

[9] Cohen et al., *Haven or Hazard.*

[10] In 1983, the United States and Mexico signed a border environmental agreement, with the Environmental Protection Agency as the lead agency for the United States. One product from this agreement is a $1.2 million proposal to reduce pollution into the New River.

[11] Boyle, "Life—or Death—for the Salton Sea?"

[12] Ann Vilesis, *Discovering the Unknown Landscape: A History of America's Wetlands* (Covelo, CA: Island Press, 1997).

and state recognized threatened and endangered species.[13] In one season, for example, more than 380 bird species were observed. Surveys have estimated that the total population of birds in the Salton Sea can reach up to 500,000 birds per month.[14] The Sea also provides habitat for a large fish population, most of which were originally introduced manually or through drainage ditches leading to the Sea. The most ubiquitous species in the Salton Sea is the tilapia (*Oreochromis mossambicus*), which was introduced by farmers to control weeds in their ponds.[15]

The ecosystem properties of the Salton Sea are largely determined by its water level, chemical and salt concentration, and balance between the rate of evaporation and water inflow. Nearly 75% of the water flowing into the Sea comes from agricultural run-off originating in the Imperial and Coachella Valleys in California, the other 25% is from rain and other surface inflows.[16] The salinity of the Sea has been increasing over time. Recent studies have reported that about 4 million tons of salt enter the Sea annually. As water evaporates, the concentration of salt increases. Presently, the salinity level in the Sea is approximately 44 parts per thousand (ppt), which is approximately 25% greater than ocean water and one-sixth that of the Great Salt Lake, Utah (280 ppt). High salinity levels combined with high concentrations of other toxic substances (e.g., naturally occurring selenium) and disease is thought to be a factor in the mortality of fish and birds in the Sea.[17]

Large-scale mortality of fish and birds in and around the Salton Sea received national attention in the 1990s. In 1992, for example, nearly 150,000 eared grebes (*Podiceps nigricollis*) died in the Sea. Some scientists proposed that grebes may have died from consuming fish with high selenium levels; whereas other scientists attribute grebe mortality to disease. Definitive answers to these deaths were not found.[18] In 1994, another 20,000 eared grebes died, and in 1996, approximately 20,000 American white pelicans (*Pelecanus erythroryhnchos*) and brown pelicans (*Pelecanus occidentalis*) died in and around the Sea.[19] The death of brown pelicans was especially dramatic since it is a federally listed endangered species (listed in 1970). Indeed, avian mortality was reported to be highest in and around the Sea in the 1990s compared to other decades. The cause of mortality in these events was largely attributed to microbes that lead to disease in birds.[20] The origin of these microbes was unclear, although some scientists have attributed them to contaminated fish that were eaten by birds.

Large fish kills are also reported in the Sea, including the mass mortality of tilapia and gulf croakers (*Bairdiella icistia*). Dead fish were thought to have weakened immunity because of high levels of toxins (e.g., selenium and DDE) and parasites, and low levels of dissolved oxygen in the

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[13] J.G. Setmire, J.C. Wolfe, and R.K. Stroud, *Reconnaissance Investigation of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Salton Sea Area, California, 1986-1987*, U.S. Geological Survey Water Resources Investigations Report 89-4102 (Reston, VA: 1990), 68 p.

[14] W.D. Shuford, N. Warnock, K.C. Molina, and K.K. Sturm, "The Salton Sea as Critical Habitat to Migratory and Resident Waterbirds," *Hydrobiologia* 473 (2002): 255-274.

[15] W.A. Dill and A.J. Cordone, *History and Status of Introduced Fishes in California, 1871-1996*, California Dept. of Fish and Game Fisheries Bulletin 178 (Sacramento, CA: 1997), 414 p.

[16] Cohen et al., *Haven or Hazard*.

[17] U.S. House of Representatives, Committee on Resources, Subcommittee on Water and Power, *H.R. 5123, The Colorado River Quantification Settlement Facilitation Act*, Hearing, 107th Cong., 2nd Sess., July 25, 2002, (Washington, DC: U.S. GPO).

[18] Cohen et al., *Haven or Hazard*.

[19] Milton Friend, "Avian Disease at the Salton Sea," *Hydrobiologia*,473 (2002): 293-306.

[20] *Ibid.*

Sea.[21] Low immunity in fish will increase their chances of contracting disease and dying. High salinity levels are also thought to affect fish populations in the Sea. Scientists regard salinity levels of 33 - 37 ppt adequate for ocean living organisms. Beyond salinity levels of 40 ppt, fish may have limited reproductive success and physiological stress.[22]

The mortality of bird and fish species in and around the Salton Sea is of concern because of federal and state listed endangered species that inhabit the Sea. For example, the brown pelican and Yuma clapper rail (*Rallus longirostris yumanensis*) are federally listed endangered species, which reside in and around the Sea during the year. Other endangered species such as the peregrine falcon (*Falco peregrinus*) and threatened species such as the bald eagle (*Haliaeetus leucocephalus*) are occasionally seen at the Sea as they make their way along the Pacific Flyway. The desert pupfish (*Cyprinodon macularius*) is the only endemic fish species in the Salton Basin, and was listed as an endangered species in 1986.

In 1986, the U.S. Fish and Wildlife Service (FWS) issued a Biological Opinion for the desert pupfish.[23] In this Opinion, the FWS stated that both agricultural drain maintenance activities by the Imperial Irrigation District and the Coachella Valley Water Authority and the introduction of sterile grass carp would not jeopardize the continued existence of desert pupfish.[24] The opinion also allowed for unlimited incidental take of the species during drain maintenance.[25] A subsequent Biological Opinion for the desert pupfish in 1992, found again that drain maintenance would not harm the population, yet only a limited incidental take was allowed. It was found that there was a large number of desert pupfish inhabiting the drains. This opinion also covered the effects on the Yuma clapper rail and California brown pelican.

Conserving endangered species in the Salton Basin is one of the objectives of the Salton Sea Authority, which formed in 1993 to remedy problems facing the Salton Sea. Indeed, some policymakers assert that the presence of endangered species in the Sea obligates the federal government to restore the Sea and designate it as a useful water body.

Restoration Activities in the Salton Sea

Some of the ecological problems in the Salton Sea were foreseen by scientists in the 1960s who noted that salinity in the Sea was increasing at a rate that would eventually render the Sea inhabitable for fish and wildlife. Early studies that attempted to create a base of information for restoration activities focused on understanding the hydrological and saline properties of the Sea. Since then, several federal, state, and private entities have developed proposals to restore the Sea,

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[21] B. Kuperman and V. Matey, *Fish Parasites of the Salton Sea*, presented at the Science for Salton Sea Ecosystem Management Conference (Riverside, CA: University of California January 5, 1999).

[22] R. Riedel, L. Caskey, and B.A. Costa-Pierce, "Fish Biology and Fisheries Ecology of the Salton Sea, California," *Hydrobiologia*, 473 (2002): 229-244.

[23] U. S. Department of the Interior, Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Determination of Endangered Status and Critical Habitat for the Desert Pupfish," *Federal Register*, vol. 51, no. 61(March 31, 1986):10842.

[24] Agricultural drains in the Imperial Valley are canals that drain irrigated water into the Alamo and New Rivers, which eventually drain into the Salton Sea.

[25] Incidental take occurs when ESA-listed species are harassed, harmed, pursued, hunted, shot, wounded, killed, trapped, captured, or collected incidentally during activities done deliberately but for a lawful purpose other than the objective of taking these listed species. For more information on incidental take, see CRS Report RL31654, *The Endangered Species Act: A Primer*.

primarily by controlling its salinity and maintaining its water level. (See the **Appendix** for examples.)

Federal efforts to restore the Salton Sea were amplified with the passage of the Reclamation Projects Authorization and Adjustment Act of 1992 (Title XI, §1101 of P.L. 102-575). This act came on the heels of a massive die-off of eared grebes (approximately 150,000) from January to March 1992 as well as the issuance of a second Biological Opinion on the desert pupfish that limited incidental take of species when agricultural drainage areas were maintained. (See appendix for more information.) The act directs the Secretary of the Interior to conduct research to develop plans to control salinity levels, provide habitat to endangered species, enhance fisheries, and protect recreational values in the Salton Sea. Ten million dollars were authorized in this act for this effort. Seven years later, the authorization and funding for restoration activities in the Salton Sea expanded with the passage of the Salton Sea Recovery Act of 1998 (P.L. 105-372). This act authorized the Secretary of the Interior to conduct feasibility studies and economic analyses of various options for restoring the Salton Sea. Further, the Secretary was authorized to conduct studies of wildlife resources and their responses to the hydrology and toxicology of the Sea. The U.S. Fish and Wildlife Service was directed to receive $5 million for conducting these studies. This act also authorized river reclamation activities for the New and Alamo Rivers (tributaries that flow into the Salton Sea).

To counter environmental changes in the Salton Sea and support restoration and management activities, the federal government has provided approximately $36.7 million in funding to date.[26] The State of California has provided approximately $10.8 million to date for similar activities and has approved $20 million to fund the development of a restoration plan. Further, an estimated $300 million from water transfer fees is expected to be generated for restoration activities in the future. A summary of the primary federal management and restoration activities in and around the Salton Sea is presented in the appendix.[27] In addition to the listed activities, there have been several specific studies on various biological and hydrological properties of the Salton Sea conducted by private interests, university personnel, and state and federal agencies.

Several restoration projects have been administered through the Salton Sea Authority. The Salton Sea Authority is a "joint powers" agency chartered by the State of California to ensure the beneficial uses of the Salton Sea, such as maintaining the Sea as an agricultural drainage reservoir, restoring the wildlife resources and habitats around and in the Sea, stimulating recreational use, and providing an environment for economic development around the Sea.[28] This agency is comprised of Riverside and Imperial counties, the Coachella Valley Water District, Imperial Irrigation District, and the Torres Martinez Desert Cahuilla Tribe. Federal and state agencies have representatives on the Authority as *ex-officio* members.[29] The Salton Sea Authority collaborated with the U.S. Bureau of Reclamation (BOR) to provide a Draft Environmental Impact Report and Environmental Impact Statement in 2000 that provided five alternatives for

[26] For FY2004 $4.0 million was appropriated for desalinization studies, restoration activities in the New and Alamo Rivers, groundwater assessment in Imperial Valley, and programs conducted by the Salton Sea Authority.

[27] These are primary management and restoration activities; there are several other research activities done by federal, state, and private interests that may not be listed.

[28] A "joint powers" entity is a government entity created under state law that allows two or more government or public agencies to combine forces by "jointly" exercising their powers with respect to a specific purpose or set of objectives. These joint powers agencies function as legally separate government entities with their own governing boards.

[29] Salton Sea Authority homepage at http://www.saltonsea.ca.gov/ssa.htm, accessed February 24, 2003.

restoring the Sea. A final Environmental Impact Report and Environmental Impact Statement for restoring the Salton Sea has not been issued by the BOR.

Restoration Alternatives for the Salton Sea

Restoration of the Salton Sea is considered a complex process and restoration plans proposed so far have been the subject of debate among relevant state and federal agencies. Options for restoring the Salton Sea were studied by the DOI and results were presented to Congress in a Draft Environmental Impact Statement/Environmental Impact Report, a Strategic Science Plan, and a Draft Alternatives Appraisal Report in 2000.[30] In January 2003, the DOI submitted a Salton Sea Status Report, which presented the latest information on some alternatives for restoring the Sea, including engineering feasibility and cost estimates.[31] Other plans have been proposed by public and private interests such as the Pacific Institute (a non-profit organization in California) and the U.S. Filter Corporation (the largest water company in the United States).

All of the proposed restoration plans include a mechanism for reducing or stabilizing the salinity level of the Salton Sea. Some plans expect to accomplish this by creating evaporation ponds and implementing processes that accelerate water evaporation; other plans propose dividing the Sea into a hypersaline section and a managed section with low salinity. In most plans, the resulting brine from evaporation and removal techniques is disposed to locations away from the Sea. Some plans also propose the construction of a desalinization plant that would treat water entering the Salton Sea and send it to regional users. The cost of restoring the Salton Sea according to most of these proposed plans ranges from $1.0 billion to $9.0 billion.[32]

On April 22, 2004, the Salton Sea Authority endorsed a restoration plan for the Salton Sea that calls for the construction of a causeway across the center of the Sea. This would separate the Sea into two basins, an 85,000 acre North Basin that would reach salinity levels similar to the ocean, and a southern section that would consist of wetlands areas as well as numerous recreational lakes ranging from fresh water to hyper saline. The estimated cost of this project is $738 million. This plan is now under review by the California Department of Water Resources.

Conclusion

Taking water out of the Imperial and Coachella Valleys is expected to reduce water inflows to the Salton Sea and increase the level of salinity in the Sea over a relatively short period. Unless the salinity level in the Sea is stabilized or reduced, its ecosystem will soon be unable to support the current diversity of fish and wildlife. Some proponents for restoring the Sea base their arguments on the value of the Salton Sea as one of the few remaining habitats in the region for migratory birds and other fish and wildlife. With nearly 90% of California's original wetlands gone, the Sea, according to scientists, is of regional or national importance to pelicans and cormorants, wading birds, waterfowl, shorebirds, gulls, and terns.[33] Indeed, some scientists believe that because of the

[30] A final version of these reports has not been submitted yet.

[31] U.S. Dept. of the Interior, Bureau of Reclamation, *Salton Sea Study: Status Report* (Washington, DC: January, 2003), 44 p. (Hereafter referred to as the Salton Sea Study.)

[32] For greater detail of some proposals to restore the Salton Sea, see Salton Sea Study.

[33] W.D. Shuford, N. Warnock, K.C. Molina, and K.K. Sturm, "The Salton Sea as Critical Habitat to Migratory and Resident Waterbirds," *Hydrobiologia* 473 (2002), p. 255-274.

connectivity of the Sea to the migratory patterns of hundreds of species of birds, the environmental health of the Sea is directly related to the population health of these birds.[34] The value of the Sea can also be measured in terms of its potential for recreation and economic development (e.g., tourism) as well as its function for agricultural drainage.

Some opposed to restoring the Salton Sea base their arguments on the premise that the Salton Sea is destined to evaporate and eventually convert back to a desert ecosystem. Throughout geological history, water bodies in the Salton Basin have eventually dried up, leading some scientists to hypothesize that evaporation and conversion to desert would be the progression of the Salton Sea if no restoration activities are undertaken. Some critics also argue that salinity levels will increase in the Sea despite restoration attempts, especially if water inflows to the Sea are reduced by water transfers or other diversions.[35] Further, some argue that the high cost of restoration and the scientific uncertainty of the restoration proposals do not warrant the expenditure of federal funds. Some critics of restoration also suggest that if restoring wetlands for environmental reasons is paramount, then efforts should be made to use funds to restore naturally occurring wetlands in California instead of in the Salton Sea. They cite the San Francisco Bay Sacramento/San Joaquin Rivers Delta Restoration (CALFED) effort as an example of where funds can be allocated to restore naturally occurring wetlands.

The question of whether or not to restore the Salton Sea is expected to be addressed in the near future as negotiations continue over water allocation in southern California. If restoring the Sea becomes a federal or state priority, then determining how restoration will be funded and what restoration plan will be used will be issues for Congress.

[34] *Ibid.*

[35] According to the BOR, water use in Mexican urban areas on the border may increase if water quality is improved. This may lower water inflows in the New River and hence reduce water flowing into the Salton Sea.

Appendix. Chronology of Federal Management and Restoration Activities in and Around the Salton Sea

Year	Amount Appropriated (U.S.$, in thousands)	Source	Purpose
10,000 BC			Native Americans first occupy the Salton Basin.
700 AD			Lake Cahuilla is formed in the Salton Sink and proceeds to dry out and fill up four times.
1500 (about)			Large inflow of water fills the Salton Basin from the Gulf of California. It is 26 times the size of the Salton Sea.
1840 - 1870			Flooding from the Colorado River is recorded in the Salton Sink.
1876		U.S. Government	U.S. Government establishes the Torres-Martinez Desert Cahuilla Indian Reservation with a grant of 640 acres.
1891		U.S. Government	20,000 acres of land on the northern side of the Salton Sink are provided to the Torres-Martinez Band of Desert Cahuilla Indians.
1901			Imperial Canal brings water from the Colorado River to the Imperial Valley.
1905			The Salton Sea is created in the Salton Basin by a levee break in the Colorado River.
1909		U.S. Government	The U.S. government reserves in trust nearly 10,000 acres of land under the sea for the benefit of the Torres-Martinez Indians.
1924		U.S. Government	President Calvin Coolidge issues Public Water Reserve Order 90 and 114 (issued in 1928) setting aside lands under the Salton Sea as a permanent drainage reservoir for agricultural and surface water run-off from the Imperial and Coachella Valleys.
1928		Boulder Canyon Project Act (P.L. 70-642)	Authorizes the construction of the Boulder Dam and All American Canal (expected to control the Colorado River and stop flooding).
1930		Presidential Proclamation	Salton Sea Wildlife Refuge is established. It covers an area of 35,000 acres.[36]
1967		U.S. Fish and Wildlife Service	The yuma clapper rail is listed as an endangered species in the U.S. Its range includes the Salton Sea.
1969		U.S. Department of the Interior (DOI) and the Resource Agency of California (RAC)	A Federal-State Reconnaissance Investigation studies water quality problems in the Salton Sea. Based on this study, a feasibility study of management plans is authorized in 1972.

[36] Due to flooding, only 2,000 acres remain. See U.S. Fish and Wildlife Service, Pacific Region at http://pacific.fws.gov/salton/saltbgrd.htm, accessed February 13, 2003.

Year	Amount Appropriated (U.S.$, in thousands)	Source	Purpose
1970		U.S. Fish and Wildlife Service	The brown pelican was listed as an endangered species. Its range includes the Salton Sea. (In 1985, the species was delisted in the East, but it is still being monitored.)
1974		DOI and the RAC	Federal-State Feasibility Study, which provided alternatives for lowering the salinity and maintaining water levels in the Salton Sea, is completed.
1985	2,600	National Irrigation Water Quality Program (NIWQP)[37]	The Salton Sea is studied under this program to identify the nature and extent of irrigation-induced water quality problems from 1985 to 2003. Studies were conducted by the BOR, USFWS, and USGS.
1986		U.S. Fish and Wildlife Service	The desert pupfish is listed as a federally endangered species in its entire range, which includes the Salton Sea.
			A FWS Biological Opinion states that both agricultural drain maintenance activities and the introduction of sterile grass carp would not jeopardize the continued existence of desert pupfish. The Opinion allowed for unlimited incidental take of the species during drain maintenance.
1992		U.S. Fish and Wildlife Service	A second Biological Opinion for the desert pupfish, gave the same conclusion as the first with respect to agricultural drainage, but allows for only a limited take of species during drain maintenance. This Opinion also covered the yuma clapper rail and the brown pelican.
			150,000 eared grebes die garnering national attention for the Salton Sea. Cause of their deaths is unknown.
		Title XI of the Reclamation Projects Authorization and Adjustment Act of 1992 (P.L. 102-575)	Authorizes research on methods to control salinity levels, provide habitat to endangered species, enhance fisheries, and protect recreational values. Ten million dollars is authorized for this effort.
1993		Salton Sea Authority	The Salton Sea Authority is formed among Riverside and Imperial counties, and the Coachella Valley Water District and Imperial Irrigation District. The goal is to coordinate activities that relate to improving water quality, stabilizing water levels, and enhancing economic and recreational activities in and around the Salton Sea.
1994 - 1996	100 (each year)	P.L. 102-575	Appropriations for research on the restoration of the Salton Sea are provided.
1997	200	P.L. 102-575	Same as above.
1998	400	P.L. 102-575	Same as above.

[37] This is a cooperative program among the U.S. Geological Survey, U.S. Fish and Wildlife Service, and the Bureau of Reclamation. The effects of chemicals such as selenium, boron, and DDE were investigated in wildlife in and around the Salton Sea.

Year	Amount Appropriated (U.S.$, in thousands)	Source	Purpose
	900	U.S. Environmental Protection Agency Office of Research and Development	Funds to implement a Salton Sea Database Program at the University of Redlands, CA.
		The Salton Sea Reclamation Act of 1998 (P.L. 105-372)	Authorizes the Secretary of the Interior to complete studies of management options to allow the use of the Salton Sea to continue, and stabilize salinity and surface elevation, as well as maintain fish and wildlife populations and enhance the potential for recreation and economic development.
	1,000	U.S. Fish and Wildlife Service	Management options to mitigate bird die-offs in and around the Salton Sea National Wildlife Refuge.
1999	4,000	P.L. 105-372	U.S. Environmental Protection Agency (USEPA) grants funds to the Salton Sea Authority to research water quality and wildlife in and around the Salton Sea.[38]
	3,000	Title II of P.L. 105-372, appropriated through the USEPA	Demonstration wetland projects on the New and Alamo Rivers.
	2,800	USEPA Office of Research and Development	Salton Sea database program.
		Water Resources Development Act of 1999 (WRDA; §529 of P.L. 106-53)	Authorizes Secretary of the Army to provide technical assistance to federal, state and local agencies to implement restoration measures in the Salton Sea, and to determine a plan in which the U.S. Army Corps of Engineers could assist others in restoring the Salton Sea.
	1,000	U.S. Fish and Wildlife Service	Management options to mitigate bird die-offs in and around the Salton Sea National Wildlife Refuge.
2000	1,000	P.L. 105-372	Salton Sea Research Project through the Bureau of Reclamation (BOR)
		P.L. 105-372	The Department of the Interior submitted a Draft Environmental Impact Statement/ Environmental Impact Report, and Strategic Science Plan for restoring the Salton Sea.
		Title VI, §601 of P.L. 106-568, The Torres-Martinez Settlement Act	Compensation to the Torres-Martinez Desert Cahuila Indians for their submerged land. A total of $14 million was authorized, $10 million from the federal government and $4 million from water districts.
	1,000	U.S. Fish and Wildlife Service	Management options to mitigate bird die-offs in and around the Salton Sea National Wildlife Refuge.
2001	5,000	P.L. 105-372	Salton Sea Research Project, BOR.
	1,000	U.S. Fish and Wildlife Service	Salton Sea Recovery Program activities in the Salton Sea National Wildlife Refuge.

[38] This funding was provided in research grants to various public and private institutions. The USGS conducted studies on microbial pathogens and causes of the mortality of eared grebes in the Salton Sea.

Year	Amount Appropriated (U.S.$, in thousands)	Source	Purpose
2002	4,500	P.L. 105-372 and P.L. 102-575	Salton Sea restoration activities and reclamation of the New and Alamo Rivers, BOR.
	1,000	U.S. Fish and Wildlife Service	Salton Sea Recovery Program activities in the Salton Sea National Wildlife Refuge.
2003		Bureau of Reclamation	The BOR submits the Salton Sea Study Status Report, which contains various proposals for the full or partial restoration of the Salton Sea.
	2,000	Consolidated Appropriations Resolution FY2003 (P.L. 108-7)	Salton Sea Research Project.
	1,000	U.S. Fish and Wildlife Service	Salton Sea Recovery Program activities in the Salton Sea National Wildlife Refuge.
		Consolidated Appropriations Resolution FY2003 (P.L. 108-7)	Amendment to P.L. 105-372 changes the authorized appropriations for water reclamation and irrigation drainage in the New and Alamo Rivers from $3 million to $10 million.
	4,000	Energy and Water Development Appropriations for FY2004 (P.L. 108-137)	Appropriations for desalinization studies, restoration activities in the New and Alamo Rivers, groundwater assessment, and programs conducted by the Salton Sea Authority.
Total	**$36,700**		

Sources: Cohen et al., *Haven or Hazard*., 63 p; U.S. Dept. of the Interior, *Saving the Salton Sea: A Research Needs Assessment*, Proceedings from the Workshop held August 4 - 8, 1997, Palm Springs, CA; Phone conversation with Clark Newby, Bureau of Reclamation Budget Office, on February 12, 2003; U.S. House of Representatives, Committee on Resources, Subcommittee on Water and Power, *Salton Sea Stabilization and Water Quality Improvement*, Oversight Hearing, 105th Cong., 1st Sess., (Serial No. 105-60), October 3, 1997 (Washington, DC: U.S. GPO), 112 p.; and various other sources.

Author Contact Information

(name redacted)
Specialist in Natural Resources Policy
/redacted/@crs.loc.gov, 7-....

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