Overview of Management and Restoration Activities in the Salton Sea

name redacted
Specialist in Natural Resources Policy

name redacted
Specialist in Natural Resources Policy

September 24, 2013

Congressional Research Service
7-....
www.crs.gov
R43211

CRS Report for Congress
Prepared for Members and Committees of Congress

Summary

The Salton Sea is located in southern California and is considered the largest inland water body in the state. The Salton Basin, where the Salton Sea is located, has supported many lakes and water bodies throughout its geological history. The Salton Sea was created when a canal gate broke in 1905 allowing fresh Colorado River water into the Basin. The Salton Sea is now sustained by agricultural runoff from farmlands in the Imperial and Coachella valleys. It provides permanent and temporary habitat for many species of plants and animals, including several endangered species. It also serves as an important recreational area for the region. The Salton Sea has been altered by increasing salinity and decreasing size caused by steadily decreasing water flows into the Sea. High salinity levels and shrinking area have been linked to habitat changes and stressed populations of plants and animals, economic losses in the region, and impaired air quality.

Efforts to restore the Salton Sea ecosystem have been discussed and initiated through state and federal actions. Several studies by state and federal agencies have provided baseline data about the Sea, and some restoration plans have been proposed. The State of California, the Salton Sea Authority, and the federal government through the Bureau of Reclamation have devised plans for restoring the Sea. However, none of these plans are being fully implemented. Federal authorities that address restoration of the Salton Sea are generally based on creating and evaluating proposals for restoration, rather than implementing restoration activities in a comprehensive manner similar to other initiatives in the Everglades and Great Lakes. California is pursuing restoration options, but funding for implementing them is lacking.

Whether or not to restore the Salton Sea remains controversial. Proponents of restoration contend that the Salton Sea ecosystem is valuable from an ecological standpoint because it is one of the few remaining large-scale wetland habitats in California for migratory birds and fish. Further, some argue that keeping the Salton Sea intact will stimulate economic development, recreation, and tourism in the region. They note that losing the Sea could cause economic and environmental decline, and could lead to air quality problems from exposed seabeds. Others contend that the Sea should not be restored. They argue that the Salton Sea is naturally declining, as it has throughout its geological history. Further, they note that countering this process will be costly and ultimately not worth the expense. They state that limited restoration funds should be used to restore other natural wetlands in California, such as the Sacramento-San Joaquin Bay Delta.

The decline of the Salton Sea ecosystem is accelerating due to water transfers from agricultural lands to municipal water districts in San Diego under the terms of the Quantification Settlement Agreement, an agreement on how to share California's apportionment of Colorado River water. The water transfers have resulted in less water flowing into the Salton Sea and accelerated increases in salinity and shoreline recession. According to some scientists, salinity levels may reach lethal levels for most fish and wildlife as soon as 2018. These predictions, along with the steadily declining ecosystem might provoke Congress to consider a larger role in restoration for the federal government. Congress may decide to address restoration by increasing the federal role in restoration efforts. This could be done by funding existing federal authorities that address, or could address, restoring the ecosystem; authorizing federal participation and appropriations for implementing existing restoration plans; or authorizing a new comprehensive plan to be created that might involve participation from federal and non-federal stakeholders, similar to other restoration initiatives around the country. Congress might also decide not to address restoration of the Salton Sea ecosystem, or simply maintain the status quo of federal participation.

Contents

Figures

Appendixes

Contacts

Introduction

The Salton Sea is located in southern California and is considered the largest inland water body in the state. The Salton Sea was formed in 1905 when the Colorado River broke through a canal gate, allowing water to flow into the Salton Basin uninterrupted for 18 months. Since its formation, the Sea has been maintained largely through agricultural runoff from surrounding areas. 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. The creation of the Salton Sea in 1905 eventually led to development of its shoreline and its waters were stocked with sportfish. Until the late 1960s, the Salton Sea was one of the most prolific sport fisheries in the country, with a high diversity of birds and wildlife. The Salton Sea also serves as an important wetland area along the Pacific Flyway, a migratory route for birds stretching from Alaska to Patagonia.

The ecology and economy surrounding the Salton Sea has deteriorated steadily over the past several decades due, in part, to a changing ecosystem marked by decreasing water flows and increasing salinity. The Salton Sea has shrunk due to evaporation and declining water inflows, resulting in increased salinity and deteriorating fish and wildlife habitat. High salinity levels combined with toxic concentrations of substances have led to disease and widespread mortality of fish and birds.[1] Current saline levels are nearing fatal levels for all fish, leading some scientists to predict that fatal saline levels will occur by 2018.[2] The subsequent population decline of fish could have severe effects on migratory birds that use the Salton Sea as a primary stopover point on the Pacific Flyway. Furthermore, exposed lake beds could allow toxins and dust to enter the air, which could lead to air pollution and human health problems.

Attention to the ecological condition of the Salton Sea and efforts to restore the Sea have existed for several decades. However, interest in the ecological health of the Salton Sea has amplified since 2003, when the Quantification Settlement Agreement (QSA) was signed by several water districts in California, the state of California, and the Department of the Interior (DOI), and signed into California law. QSA requires California to gradually reduce its consumption of Colorado River water to 4.4 million acre-feet a year (AFY) through voluntary agriculture-to-urban water transfers and other water efficiency measures.[3] The implementation of this agreement has resulted in less water flowing into the Salton Sea, thus accelerating its ecological decline. However, as part of the QSA, participating water districts agreed to contribute $163 million toward mitigation and restoration. In addition, the water districts agreed to provide 200,000 AFY of Colorado River water to the Sea though December 31, 2017. While some of these mitigation efforts have been implemented, longer-term restoration efforts and the distribution of these costs are still contested and uncertain.

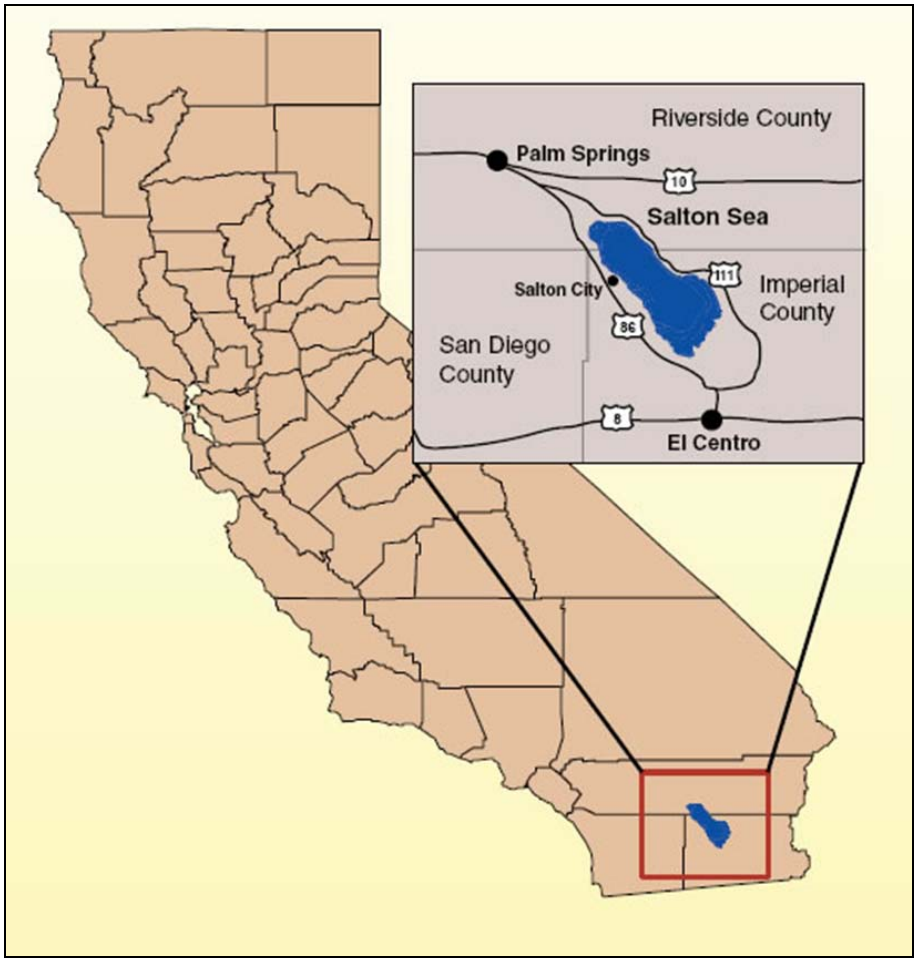
[1] U.S. House of Representatives, Committee on Resources, Subcommittee on Water and Power, *H.R. 5123, The Colorado River Quantification Settlement Facilitation Act*, Hearing, 107th Cong., 2nd Sess., July 25, 2002, (Washington, DC: GPO).

[2] Michael J. Cohen and Karen H. Hyun, *HAZARD: The Future of the Salton Sea With No Restoration Project*, Pacific Institute, May 2006, http://www.pacinst.org/wp-content/uploads/2013/02/report15.pdf.

[3] Imperial Irrigation District, Metropolitan Water District of Southern California, and Coachella Valley Water District. *The Quantification Settlement Agreement and Related Agreements and Documents*, October 10, 2003, http://www.sdcwa.org/sites/default/files/files/QSA_final.pdf.

Congressional concern for restoring the Salton Sea stems, in part, from the value of the Sea as habitat for federal and state listed endangered species, as well as other migrating and resident bird species; a reservoir for agricultural drainage waters; a center for recreation; and a large wetland ecosystem, among other things.[4] Concerns over air pollution from exposed sea beds have also been expressed by Members of Congress.[5] These concerns have been reflected, in part, by efforts to address the restoration of the Salton Sea and its ecosystem. Congress has passed laws addressing the restoration of the Salton Sea and authorized funds for restoring the Salton Sea in the Water Resources Development Act of 2007.[6] Current restoration efforts have been led mainly by the state and local governments.

Figure 1. Map of Salton Sea and Vicinity



Source: California Legislative Analyst's Office. Restoring the Salton Sea. January 24, 2008, http://www.lao.ca.gov/2008/rsrc/salton_sea/salton_sea_01-24-08.aspx.

[4] 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.

[5] Lisa Lien-Mager, *Lawmakers Call for Action on Salton Sea*, Association of California Water Agencies, September 19, 2012, http://www.acwa.com/news/water-news/lawmakers-call-action-salton-sea.

[6] P.L. 110-114, Section 3032.

Consensus around restoring the Salton Sea has not been fully attained. Some contend that the Salton Sea should not be restored.[7] They argue that the geological history of the Salton Sea demonstrates a pattern of water bodies naturally shrinking and disappearing, and then reforming over time. They note that the Salton Sea will follow a similar process and that countering this natural process will be costly and ultimately not worth the cost. These opponents argue that the restoration funds should instead be used to restore other natural wetlands in California, such as the Sacramento and San Joaquin rivers' delta confluence with San Francisco Bay (Bay-Delta). To counter this argument, some respond by noting that the natural inflows of water into the Salton Sea have been artificially diverted by humans when the Colorado River was diverted into a canal and that natural processes and cycles will not exist again with these structures in place. Further, they note that the value of restoring the Salton Sea lies in its ecological significance as a large wetland along the Pacific Flyway and a habitat for fish and wildlife, and its potential to stimulate economic development in the region through tourism, recreation, and energy development.

Background

Geological and Ecological Characteristics of the Salton Sea

The Salton Sea is located in southern California and is considered the largest inland water body in the state. 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.[8] In 1905, water from spring floods broke through a canal head-gate diverting a portion of the Colorado River into the Basin and forming the Salton Sea. Water flowed uninterrupted for nearly 18 months into the Salton Sea before it could be redirected to the Gulf of California. The new Sea formed as a closed basin with no outlets, which is still its condition today. The Sea consisted largely of fresh water at its inception; however, the water immediately began to evaporate and increase in salinity.

The construction of Hoover Dam and the All American Canal in 1928 allowed water from the Colorado River to be transferred directly to the Imperial Valley for irrigation. After flowing through agricultural lands, this water drained into the Salton Sea, thereby preventing the Sea from 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.[9] These lands were designated as a repository for agricultural, subsurface, and surface water drainage.

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%

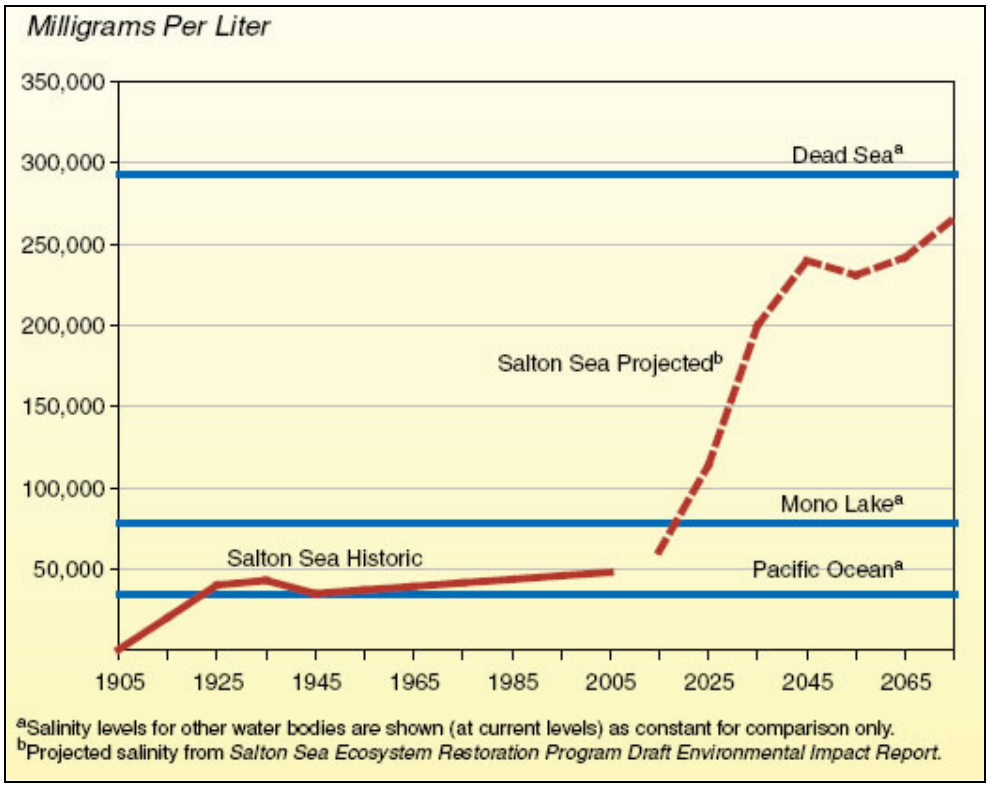
[7] Michelle Nijhunis, "Accidental refuge: Should we save the Salton Sea?," *High Country News*. http://www.hcn.org/issues/181/5865/print_view.

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

[9] Chelsea Congdon, Kathrine Currie, and Taylor Miller, et al., *Summary analysis of authorities and responsibilities associated with the Salton Sea*, San Diego State University, July 1988, http://www.sci.sdsu.edu/salton/MeyersResSSAppendixF.html.

of the water flowing into the Sea comes from agricultural runoff originating in the Imperial and Coachella valleys in California, the other 25% is from rain and other surface inflows.[10] As water in the Sea evaporates, the concentration of salt increases. Presently, the salinity level in the Sea is approximately 52 parts per thousand (ppt), which is approximately 50% greater than ocean water and one-fifth that of the Great Salt Lake in Utah (270 ppt) (See **Figure 2**).[11] At 52 ppt, the Salton Sea is considered to be hypersaline. High salinity combines with extreme eutrophication to cause fish kills in the Sea. Eutrophication can result in anoxic conditions leading to fish death.[12]

Figure 2. Trend in Salinity Levels



Source: California Legislative Analyst's Office. Restoring the Salton Sea. January 24, 2008, http://www.lao.ca.gov.

In 1950, the Sea reached salinity levels similar to the Pacific Ocean. At this time, the California Department of Fish and Game began transferring saltwater fish species to the Sea. During the 1950s, and in the next two decades, the Sea became a popular destination for sport fishing and tourism. However, changes to the Sea, including flooding of resort areas and wildlife habitat, bird and fish die-offs, and health threats of untreated water, led to a decline in recreation and

[10] Cohen et al., *Haven or Hazard*. p. 10.

[11] California Department of Water Resources and California Department of Fish and Gamer, *Salton Sea Species Conservation Habitat Project Draft Environmental Impact Statement*, August 2011, http://www.water.ca.gov/saltonsea/habitat/eir2011.cfm. (Hereinafter referred to as *SCH Project EIS/EIR*.)

[12] Anoxic waters refer to waters with a total depletion of oxygen, an extreme version of hypoxia. Fish need oxygenated waters to survive, thus anoxic conditions is often associated with large fish kills, sometimes observed in the Salton Sea. See B. Marti-Cardona et al., "Relating Fish Kills to Upwelling and Wind Patterns in the Salton Sea," in *Developments in Hydrobiology: The Salton Sea Centennial Symposium Developments in Hydrobiology*, ed. Stuart Hurlbert, vol. 201 (2008), pp. 85-95.

development around the Sea in the 1960s.[13] The current salinity levels in the Sea are too high to support the former diversity of fish. The most ubiquitous species in the Salton Sea now is the tilapia (*Oreochromis mossambicus*), which was introduced by farmers to control weeds in their ponds in 1964.[14] In addition, the Sea also houses the endangered desert pupfish (*Cyprinodon macularius*), the only native fish species in the Sea. Deteriorating water quality has also had a large detrimental impact on the invertebrate life in the Sea, such as on pileworms and barnacles, two important components of the Salton Sea food web.[15] Currently, few fish can survive in the hypersaline waters of the Sea. Future salinity predictions indicate that all species of fish may disappear from the Sea as early as 2023.[16]

The Salton Sea ecosystem 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 a primary stopover point for birds on the Pacific Flyway.[17] The Sea supports more than 400 species of resident and migratory birds, of which more than 50 are species of special status (including three listed under the Endangered Species Act[18] (ESA)).[19] Surveys have estimated that the total population of birds in the Salton Sea can reach up to 500,000 birds per month.[20] Many of these birds are piscivorous, relying on fish in the Salton Sea for sustenance. Other birds can feed on both the fish and invertebrates found in the basin.

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 Yuma clapper rail (*Rallus longirostris yumanensis*) is a federally listed endangered species, residing in and around the Sea during the year. Other state listed species of special interest, such as the peregrine falcon (*Falco peregrinus*) and 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 a federally endangered species in 1986.

Conserving endangered species in the Salton Basin is one of the objectives of the Salton Sea Authority, which was chartered by the State of California in 1993 to remedy problems facing the Salton Sea. The Salton Sea Authority is a "joint powers" agency chartered 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. This agency is comprised of representatives from Riverside and Imperial counties, the Coachella Valley Water District, the

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

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

[15] *SCH Project EIS/EIR*. Section 1, p. 3.

[16] Michael J. Cohen and Karen H. Hyun, *HAZARD: The Future of the Salton Sea With No Restoration Project*, Pacific Institute, May 2006, http://www.pacinst.org/wp-content/uploads/2013/02/report15.pdf.

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

[18] 16 U.S.C. Chapter 35, Section 1531-1544.

[19] Jeanie Jones, P.E., "Management of the Salton Sea Ecosystem," *Southwest Hydrology*, July/August 2004.

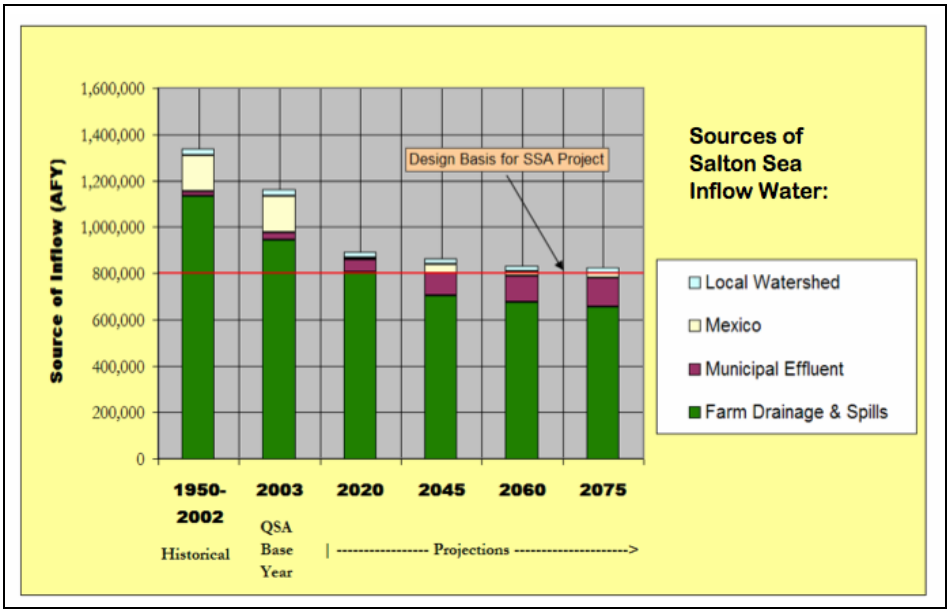
[20] W.D. Shuford, N. Warnock, K.C. Molina, and K.K. Sturm, "The Salton Sea as Critical Habitat to Migratory and Resident Waterbirds," *Hydrobiologia* 473 (2002): p. 255-274.

Imperial Irrigation District, and the Torres Martinez Desert Cahuilla Tribe. Federal and state agencies have representatives on the Authority as *ex-officio* members.[21]

Salton Sea and the Quantification Settlement Agreement

Farmlands in the Imperial and Coachella valleys have historically been irrigated with approximately 3.3 million AFY of Colorado River water.[22] From this amount, the Salton Sea received approximately 1.4 million AFY of this water in the form of agricultural runoff. However, under the Quantification Settlement Agreement (QSA), which was passed in October 2003, around 300,000 AFY of Colorado River water that flows from these valleys are being supplied to other urban water districts and not all reaching the Salton Sea.[23] (See below for a summary of the QSA.) These agriculture-to-urban transfers will reduce agricultural inflows to the Sea by an estimated 30% by 2018, according to stakeholders. The Bureau of Reclamation modeled flow changes after 2018 with the implementation of the QSA and determined that 95% of all future inflows would less than or equal to 835,000 AFY between 2018 and 2077, with a mean of all inflows equaling 727,000 AFY.[24] The Salton Sea Authority estimated a relatively similar scenario, where water flowing to the Salton Sea would stabilize at 800,000 AFY after 2018 with the implementation of the QSA (see **Figure 3**).[25]

Figure 3. Predicted Water Flows into the Salton Sea



Source: Salton Sea Authority, *Salton Sea Authority Plan for Multi-Purpose Project*, La Quinta, CA, June 29, 2006, p. 11.

[21] For more information on the Salton Sea Authority, see http://saltonsea.ca.gov/.

[22] Salton Sea Authority, *Salton Sea Authority Plan for Multi-Purpose Project*, La Quinta, CA, June 29, 2006, http://saltonsea.ca.gov/pdfs/ssa-plan-board-review-copy-7-20-06.pdf. (Hereinafter, 2006 *SSA Plan*).

[23] 2006 *SSA Plan*.

[24] U.S. Bureau of Reclamation, *Restoration of the Salton Sea: Volume 1: Evaluation of Alternatives*, U.S. Bureau of Reclamation, December 2007, pp. 4-7.

[25] 2006 *SSA Plan*.

Quantification Settlement Agreement (QSA)

Seven western U.S. states (Colorado, Utah, Wyoming, New Mexico, Arizona, California, and Nevada) signed the Colorado River Compact in 1922, agreeing to specified allotments of Colorado River water. California was apportioned 4.4 million acre-feet a year (AFY) of Colorado River water. However, California had historically used an additional 800,000 AFY over this allocation.[26] This occurred because other states in the Compact were withdrawing less than their allocation. As other states increased their water consumption, the water available for California has been reduced. In 1996, the Secretary of the Interior required California to develop and enact a strategy to reduce its water consumption to 4.4 million AFY before the secretary would approve any further cooperative water transfers between California agencies. This strategy became known as the Colorado River Water Use Plan (California Plan).

The QSA was designed to help implement components of the California Plan by serving as a contractual agreement between the Imperial Irrigation District (IID), the Coachella Valley Water District (CVWD), the San Diego County Water Authority (SDCWA), the Municipal Water District of Southern California (MWD), the state, and the U.S. Department of the Interior (DOI).[27] The agreement established long-term (45-75 years) transfers of agricultural water from IID to SDCWA and MWD for urban use.[28] Around 300,000 AFY would be transferred; the water to be transferred would come from fallowing of or other water efficiency measures on agricultural lands. Starting in 2021, 200,000 AFY will be transferred to SDCWA; up to an additional 110,000 AFY will be transferred to MWD.[29] Over this long-term agreement, over 18.3 million acre-feet of water will be diverted from agriculture to urban use in San Diego.[30] State legislation implementing the QSA also has multiple mitigation measures that are to be implemented to restore the Salton Sea. They range from medium-term water transfers to funding restoration actions. Further, legislation requires that the state identify a Salton Sea restoration plan and a funding plan to implement it. In 2007, the state identified and submitted a restoration plan to the state legislature with an estimated cost of $8.9 billion. The plan has not been implemented and a funding plan has not been approved.

The QSA was passed and authorized under California law in October of 2003. Since 2003, there have been multiple, ongoing challenges to the validity of the agreement. On July 31, 2013, the Sacramento Superior Court issued the final ruling on all 12 separate agreements within the QSA. The court concluded that IID's actions in entering and executing the 12 QSA agreements were valid and upheld the legality of the water transfers.

The QSA contains multiple provisions to mitigate environmental effects of its implementation on the Salton Sea, including the following:

- IID is to directly transport 200,000 AFY of Colorado River water to the Salton Sea for 15 years from 2003 to January 1, 2018.[31]
- IID, CVWD, and SDCWA are to provide $133 million for environmental mitigation related to the water transfers, and for IID to deposit an additional $30 million into a restoration fund.[32]

[26] Jeanie Jones, P.E., "Management of the Salton Sea Ecosystem," *Southwest Hydrology*, July/August 2004.

[27] San Diego County Water Authority, *Quantification Settlement Agreement Fact Sheet*, San Diego, CA, http://www.sdcwa.org.

[28] The agreement will last for 45 years with an option to extend the transfer an additional 30 years.

[29] Currently, 100,000 AFY is transferred to SDCWA. San Diego County Water Authority, *Quantification Settlement Agreement Fact Sheet*.

[30] San Diego County Water Authority, *Quantification Settlement Agreement Fact Sheet*.

[31] Originally, IID offered to provide water until 2030. In Order WRO 2002-0013, the California State Water Resources Control Board (SWRCB) decreased this to 15 years, stating that this reduced timeframe would still prevent unreasonable environmental damage while insuring that the mitigation costs of the transfer would not be prohibitory for the stakeholders involved. SWRCB stated that those 15 years would allow the State to determine whether restoration of the Salton Sea was feasible and begin implementation of any restoration efforts. The full SWRCB Order WRO 2002-13 can be found at http://www.iid.com/Modules/ShowDocument.aspx?documentid=924.

[32] Jeanie Jones, P.E., "Management of the Salton Sea Ecosystem," *Southwest Hydrology*, July/August 2004.

- The State of California is to assume all additional costs of mitigation and restoration. The legality of this cost provision was recently upheld.
- Concurrent legislation also set up a Salton Sea Restoration Fund (SSRF), overseen by the Department of Fish and Game to be used for environmental and engineering projects (Fish and Game Code Section 2931).[33]
- The California Secretary for Resources, in consultation with the Salton Sea Authority, was to present the state legislature with a preferred alternative restoration plan for the Salton Sea by December 31, 2006.[34]

In addition, this legislation stated that restoration of the Salton Sea was of state and national interest; it authorized the state to develop a long-term, adaptive conservation and restoration plan for species in the Salton Sea. However, the development and implementation of any restoration plan is conditional on the state legislature appropriating funds and not required by the QSA.[35] The California Secretary for Resources was required to present the state legislature with a preferred alternative restoration plan, but there is no requirement to implement or fund this preferred alternative.[36] Some have used this premise to assert that there is no unconditional obligation for the State of California to develop and implement a long-term restoration plan that would aim to restore the Sea to a previous state that could support the fish and migratory birds that currently reside and visit there (for a visual representation of mitigation versus restoration impacts in salinity, see **Figure 4**).

There is still disagreement on the extent to which the state is responsible for restoration. Some contend that the recent state court ruling established that the QSA requires the state to restore the Salton Sea.[37] However, in recent QSA litigation, IID and CVWD have argued that actual Salton Sea restoration was never a commitment by the state. The state legislation implementing the QSA requires IID, CVWD, SDCWA, and the State of California to fund the costs of environmental mitigation deemed necessary to avoid environmental harm due to the water transfers.[38] The Environmental Impact Assessment determined that appropriate mitigation could be met by 200,000 AFY of Colorado River water transferred annually to the Salton Sea for the first 15 years after water transfers commenced; the construction of a pupfish refugium pond and the development of a plan to provide pupfish connectivity between drains; up to 652 acres, and at least 190 acres, of managed marsh for rail birds; two roost sites for brown pelicans; monitoring programs for all state and federally listed species; and a study program to determine the impacts

[33] SSRF is a state program funded by Prop 84, or the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006. This state law authorized $5.4 billion in general funds for projects pertaining to safe drinking water, water pollution control, water supply and quality, flood control, waterway and natural resources protection, state and local park improvements, and water conservation efforts. So far, the SSRF has appropriated $32 million in projects in the past 10 years.

[34] Jeanie Jones, P.E., "Management of the Salton Sea Ecosystem," *Southwest Hydrology*, July/August 2004. P. 2.

[35] Fish and Game Code Section 2081.7, subdivision (d), paragraph 3.

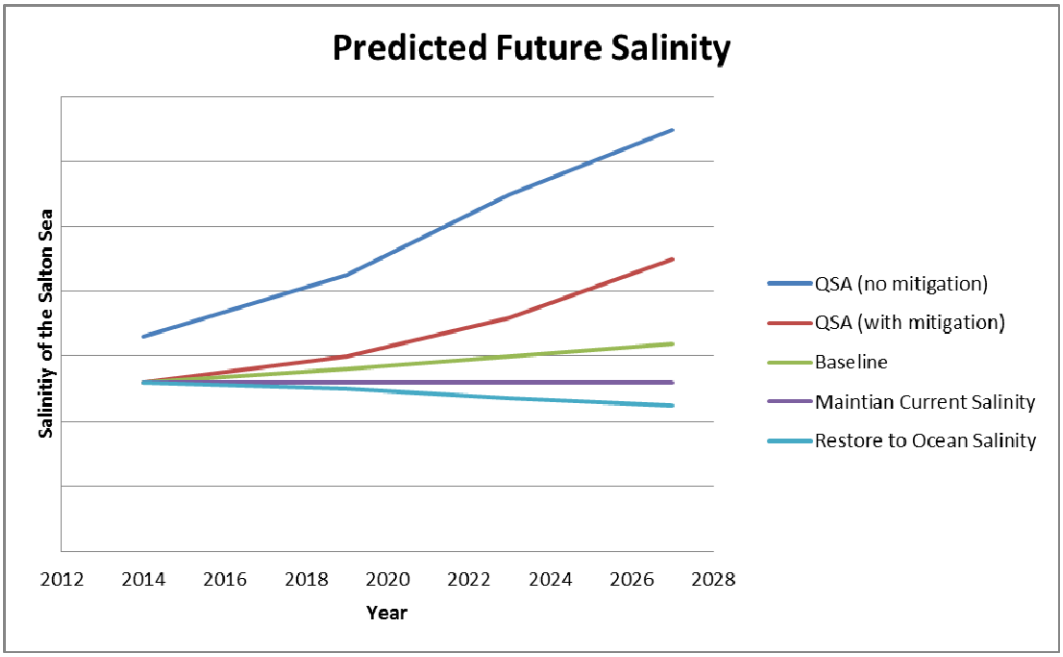
[36] See SB 317 (Chapter 612, Statutes of 2003).

[37] The final court ruling was released on July 31st, 2013, and found that it was within IID's authority to sign the QSA and agree to its terms, upholding the legality of the agreement. The full court case can be found at http://www.saccourt.ca.gov/coordinated-cases/qsa/qsa.aspx.

[38] The QSA was enacted into law through a package of legislation, including SB 277 (Chapter 611, statutes of 2003); SB 317 (Chapter 612, Statutes of 2003); SB 654 (Chapter 613, Statutes of 2003); SB 1214 (Chapter 614, Statutes of 2004). In addition, the Fish and Game Code was amended to include Section 2081.7 concerning the QSA and Salton Sea mitigation requirements.

of selenium on wildlife.[39] IID, CVWD, and SDCWA, were required to pay up to $133 million of these environmental mitigation costs, with the state required to pay any and all additional costs, regardless of legislative appropriations.[40] IID, CVWD, and SDCWA also agreed to place $30 million into the Salton Sea Restoration Fund (SSRF).[41]

Figure 4. Salton Sea Salinity Under Different Restoration Paths



Source: Pervaze Sheikh. CRS Natural Resource Analyst. August 2013.

Note: QSA with mitigation and the baseline separate around 2018 due to salinity reaching 60 ppt (when water transfers end). After the Sea passes 60 ppt, mitigation does not include salinity control measures to keep the Sea's salinity consistent with the baseline; it only includes species habitat construction and management in the area.

Environmental Concerns in the Salton Sea

Some contend that the most pressing issue for the Salton Sea is increasingly high salinity. Some experts state that, without intervention, the Salton Sea will reach fatal salinity levels for most aquatic wildlife in the Sea between 2018 and 2028. Scientists have predicted that the Salton Sea could exceed 60 ppt by 2018 after the water transfers under the Quantitative Settlement Agreement (QSA) ramp up and mitigation water transfers to the Sea end.[42] According to some, salinity levels beyond 40 ppt might result in fish with limited reproductive success, suppressed

[39] The EIR only addressed the increased rate of salinization due to water transfers, accounting for increasing salinity naturally in the baseline. Therefore, mitigation activities were only designed to prevent any additional rise in salinity above the Sea's naturally increasing future salinity, not to restore the sea indefinitely or to previous, lower salinity levels. The EIR can be found at http://www.iid.com/index.aspx?page=229.

[40] See SB 654 (Machado, Chapter 613, Statutes of 2003), section 3.

[41] See SB 654 (Machado, Chapter 613, Statutes of 2003), section 3.

[42] California Department of Water Resources and Fish and Game, *Salton Sea Ecosystem Restoration Program: Preferred Alternative Report and Funding Plan*, California Resources Agency, May 2007, p. 3.

immune systems, and physiological stress.[43] At 60 ppt and above, the water would be too saline to support tilapia, the main food source for birds in the area. Some contend that the Salton Sea would have naturally increased in salinity over time, thereby reducing its ability to sustain aquatic wildlife.[44] Others describe increasing salinity in the Sea as predominately a result of human activities (e.g. water transfers and agriculture), which have decreased the potential for restoration.[45]

Other water quality issues, such as toxic chemicals and low oxygen levels, are also directly related, in part, to diminishing water flows. Toxic levels of selenium and elevated levels of Dichlorodiphenyldichloroethylene (DDE) have been found in the Sea. These substances have been detected at toxic levels in fish and wildlife in and around the Sea. Both DDE and selenium can cause reproductive problems in fish and birds.[46] In addition, DDE and selenium can have adverse health effects on humans.[47] Some contend that toxic levels of these substances were attained due to agricultural areas being the main source of water inflows to the Sea. [48] There were widely publicized mortalities of fish and birds in and around the Salton Sea in the 1990s thought to be associated with toxins.[49] In 1996, an estimated 15% to 20% of the western population of white pelicans and more than 1,000 endangered brown pelicans died.[50] In August 1999, more than 7.6 million tilapia and croakers died due to low levels of dissolved oxygen in the Sea.[51]

Water quality issues have raised concerns about the future of endangered species that depend on the Salton Sea ecosystem. The loss of fish populations in the Sea could significantly reduce and possibly eliminate use of the Salton Sea by piscivorous birds by the early 2020s, according to some scientists.[52] Some state and federally listed piscivorous birds such as the Yuma clapper rail (federal and state endangered) could be affected initially. Some invertebrates and possibly desert pupfish could survive at higher salinity levels, according to some scientists. For example, desert pupfish have survived in waters with salinity as high as 90 ppt in various locations.[53] Some birds that rely on both fish and invertebrates may still be able to forage under high salinity conditions; however, the species composition of birds would be expected to change as the makeup of invertebrates shifts due to changes in salinity. Some nonnative fish species might still be found in

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

[44] Modeling predicts that the Salton Sea would have reached 60 ppt between 2023-2030 with no water transfers.

[45] Michael J. Cohen and Karen H. Hyun, *HAZARD: The Future of the Salton Sea With No Restoration Project*, Pacific Institute, May 2006, http://www.pacinst.org/wp-content/uploads/2013/02/report15.pdf.

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

[47] Human exposure to DDE and Selenium comes from eating the meat of animals that lived in areas with high levels of the compounds. Public health warnings about consuming fish from the Salton Sea have been posted by the State Office of Health and Hazardous Assessment since the 1990s.

[48] DDT was banned in the United States in 1972, but is still used in Mexico as an insecticide.

[49] Dr. Tonie E. Rocke, *California's Salton Sea- A Troubled Ecosystem*, U.S. Geological Survey, June 2001, http://www.nwhc.usgs.gov/publications/fact_sheets/pdfs/fact_salton2.pdf.

[50] This was the largest die off of an endangered species at the time. For a chronology of events at Salton Sea, see http://saltonsea.ca.gov/history_chronology.html.

[51] 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).

[52] *SCH Project EIS/EIR*.

[53] This endangered fish is only located in a few sites in the Salton Sea and the Colorado River Delta in Baja California. Imperial Irrigation District. *Habitat Conservation Plan.*Ch.3. Included in the *Water Conservation and Transfer Project EIR*. October 2002.

the Salton Basin in areas of lower salinity around the Salton Sea, such as the rivers, creeks, and agricultural drains that feed into the Sea.[54]

Air pollution may emerge as an environmental issue as the Salton Sea shrinks in size. As the shoreline recedes, areas of lake bed would be exposed to heat and wind. As the lake bed dries and erodes, dust could enter the air and be circulated across large areas. Air-borne dust from dry beds in the Sea could contain harmful levels of pesticides, herbicides, and naturally occurring selenium.[55] People in the surrounding Coachella and Imperial counties could be affected by this contaminated dust and contract respiratory problems. Presently, some counties near the Salton Sea have significantly higher rates of respiratory problems compared to other nearby counties.[56] While there are many possible causes for these increased numbers of respiratory issues around the Salton Sea area, some attribute the problems, in part, to contaminated air derived from dry areas around the Salton Sea.[57] Some also note that salt in the dust upwelling from dry areas around the Sea can damage crops. The Pacific Institute has estimated that the loss of water due to water transfers will expose an additional 130 square miles of seabed and increase the amount of dust in the air by a third over what is currently found.[58] The Salton Sea Authority estimates that if the Sea dries up, the cost to mitigate the effects of dust alone will be upwards of $1 billion, with annual maintenance cost of around $48 million.[59]

In the fall of 2012, a strong southern wind stirred the Salton Sea waters, bringing decayed material to the surface. This released hydrogen sulfide and produced a very strong rancid odor that was reported more than 200 miles away in both Simi Valley and Los Angeles County.[60] This incident was dubbed the "Big Stink" and captured the attention of national media outlets. After this incident, funds were allocated to install monitoring equipment to measure gases rising from the sea.[61] While there are no known human health concerns linked to the odorous gases, the incident stimulated attention about the poor condition of the Salton Sea, according to some.[62] Further, the hydrogen sulfide released from the Sea (the source of the smell) consumes oxygen in Sea waters. This could result in fish kills, and if severe enough, could deplete all the oxygen in the Sea and cause the ecosystem to collapse.

---

[54] *SCH Project EIS/EIR*.

[55] County of Imperial, *QSA Litigation Bulletin: Environmental Impact*, April 2009, http://www.co.imperial.ca.us/PdfDocuments/QSALitigationBulletin.pdf.

[56] One in five children in Imperial County is asthmatic and the county has almost three times the state average of ER visits. Coachella Valley has more than three times the state average rate of asthma, with most cases concentrated in the elderly population.

[57] Rebecca Walsh, "Deadly dustbowl seen as future of Salton Sea."

[58] Rebecca Walsh, "Deadly dustbowl seen as future of Salton Sea."

[59] Dust mitigation cost estimates have been based on the actual cost of similar mitigation in Owens Lake. Owens Lake is a water body in the Sierra Nevadas. When the Owens River was diverted away from the lake in 1913, the lake began to dry up. Today it is almost completely dry. Owens Lake is currently the largest single source of dust pollution in the nation. Ian James, "Engineer sees big challenges saving the Salton Sea," *The Desert Sun*, April 13, 2013.

[60] Keith Matheny, "Officials, activists push for fix to Salton Sea's growing crisis," *The Desert Sun*, December 19, 2012.

[61] $200,000 was appropriated. Janet Zimmerman, "Salton Sea: $200,000 Ok'd to monitor for odors," *The Press Enterprise*, January 4, 2013. http://www.pe.com/local-news/local-news-headlines/20130104-region-salton-sea-to-get-air-monitoring-for-odors.ece.

[62] The measurements of hydrogen sulfide were one-tenth to one-millionth the level at which the odor would be considered a risk to public health.

Restoration Efforts in the Salton Sea

Some of the ecological problems in the Salton Sea were foreseen by scientists who noted that salinity in the Sea was increasing at a rate that would eventually render the Sea uninhabitable for fish and wildlife. Early studies 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, primarily by controlling its salinity and maintaining its water level.

Federal efforts to restore the Salton Sea can be traced to the passage of the Reclamation Projects Authorization and Adjustment Act of 1992 (Title XI, §1101 of P.L. 102-575).[63] The act directed the Secretary of the Interior to conduct research on projects to control salinity levels, provide habitat for endangered species, enhance fisheries, and protect recreational values in the Salton Sea. Seven years later, authorized 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 and species' responses to the hydrology and toxicology of the Sea.[64] This act also authorized river reclamation activities for the New and Alamo Rivers (tributaries that flow into the Salton Sea). In addition, several restoration projects have been administered through the state-funded Salton Sea Authority, including efforts in collaboration with the U.S. Bureau of Reclamation (BOR).

Early restoration work conducted by both state and federal entities consisted of feasibility studies focused on solar pools and salt evaporation technology.[65] Both of these approaches aim to reduce the salinity of the Salton Sea by evaporating a portion of the seawater and disposing resulting salt deposits. To maintain a steady sea level, water from the Colorado River would need to flow into and mix with the Salton Sea. In 2004, the Salton Sea Authority released a restoration plan for the Salton Sea that called for the construction of a causeway across the center of the Sea.[66] This was eventually incorporated into the 2006 *Salton Sea Authority Plan for Multi-Purpose Project*.[67] The plan proposed to split the Salton Sea into two pools. However, when the QSA was first upheld by court in 2007, some suggested that the acquisition of water from the Colorado River necessary for salinity control technologies would be physically and politically infeasible.[68] In its study analyzing options for restoring the Salton Sea, the Secretary of the Interior was not authorized to consider any option that relies on importing new or additional water from the Colorado River.[69]

[63] This act was enacted after a die-off of eared grebes (approximately 150,000 birds were found dead).

[64] This includes studies on the effects of selenium and high salinity on species in the area.

[65] See Salton Sea Salinity Control Research Project.

[66] This would have separated 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. Plan available at http://saltonsea.ca.gov/media/ppr_summary.pdf.

[67] Plan available at http://saltonsea.ca.gov/pdfs/ssa-plan-board-review-copy-7-20-06.pdf.

[68] QSA Coordinated Special Proceedings are filed under case number JCCP 4353 (there have been nine separate cases filed; cases were first heard by Imperial County until 2008 and then appealed to Sacramento County).. For discussion of QSA's effect on restoration possibilities, see Bureau of Reclamation's 2007 *Restoration of the Salton Sea Summary Report* (p. xx) and Salton Sea Ecosystem Monitoring Project (p. 4) as examples.

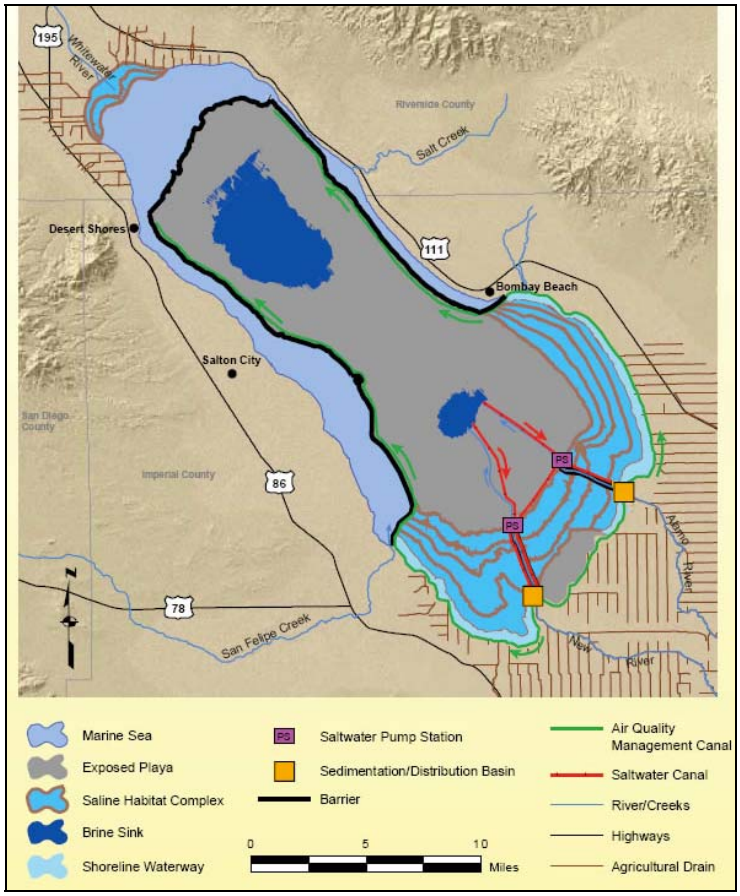
[69] Section 101(b)(2)(C)(i) of P.L. 105-372.

Current Restoration in the Salton Sea

State Actions in the Salton Basin

Restoration activities and studies regarding the Salton Sea have been mainly funded and managed by the State of California. The state has increasingly endorsed the use of Saline Habitat Complexes (SHCs) to maintain viable ecosystems for current wildlife. These complexes would be constructed with berms or other barriers to create shallow saline pools. The salinity in these pools could vary and would be maintained by 'blended water', or possibly geothermal-powered desalinated Salton seawater. State efforts to restore the Salton Sea are, in part, due to provisions in the QSA which require the California Secretary for Resources, in consultation with the SSA, to present the state legislature with a preferred alternative for restoration. This state-identified preferred alternative was published as the Salton Sea Ecosystem Restoration Final Programmatic Environmental Impact Report (PEIR) and presented to the legislature in May of 2007.[70]

Figure 5. State Preferred Plan



Source: California Department of Fish and Game and the California Department of Water Resources, *Salton Sea Ecosystem Restoration Program: Preferred Alternative and Funding Plan*, May 2007. p. 8.

[70] The full plan can be found at http://www.water.ca.gov/saltonsea/docs/Funding_Plan.pdf.

The state-identified preferred alternative included SHCs in the northern and southern end of the Sea, a marine sea formed by barriers, air quality management facilities, a brine sink for discharge of salts, conveyance facilities, and sedimentation distribution facilities. In addition, the preferred alternative included Early Start Habitat, areas for geothermal development, and connectivity waterways for desert pupfish (See **Figure 5** for the plan).[71] The final cost for the state preferred alternative is estimated at $8.9 billion (in 2006 dollars).[72]After construction is completed, the expected annual operations and maintenance costs are $142 million (in 2006 dollars). No state action has been taken to authorize funding for this plan. However, the state is proceeding to implement pilot studies that measure the effectiveness of SHCs, with federal assistance. For example, the state has a Salton Sea Species Conservation Habitat Project plan that is nearing completion.[73] The aim of this project is to create up to 3,770 acres of SHCs for conserving and protecting fish and wildlife species that depend upon the Salton Sea. Pools would be created at the southern end of the Salton Sea on land owned by Imperial Irrigation District or the federal government. The project is not intended to be a comprehensive restoration project for the Salton Sea, but rather a "proof of concept" project to see if SHCs along the edge of the Sea can sustain fish and wildlife. The project would affect jurisdictional waters, and thus, requires the U.S. Army Corps of Engineers (Corps) to assess the project and provide necessary permits for construction. The Corps, in conjunction with the state, released a Final Environmental Impact Statement/Environmental Impact Recommendation in July 2013.[74] The Corps is expected to use the EIS/EIR in determining whether to issue a Department of the Army permit for this project under section 404 of the Clean Water Act.

In addition to the state-identified plan, the SSA continues to seek funding and support at both the state and federal level for its 2006 plan involving the separation of the Sea into two lakes (see "Restoration Efforts in the Salton Sea" for more details on the SSA Plan). In recent negotiations between IID and County of Imperial, both parties have endorsed the SSA 2006 Plan.[75]

The state legislature is addressing Salton Sea issues through legislation. For example, state bill AB71 would require the California Natural Resources Agency, in consultation and coordination with the Salton Sea Authority, to lead Salton Sea restoration efforts.[76] Efforts would include several investigations into restoration projects. Further, the bill would authorize the Salton Sea Authority to lead a restoration and funding study to address restoring the Salton Sea and provide

[71] These components would be created by beams and rock barriers. Construction is estimated to take 70 years; in total, 62,000 acres of Saline Habitat Complex, 45,000 acres of marine sea, 106,000 acres of exposed playas including geothermal areas, and 75,000 acres designated as an air quality management area would exist in the Salton Basin after construction. There would also be two sedimentation/distribution basins.

[72] The cost figure does not include the cost of the Demonstration Project ($6.6 million), investigations in addition to pre-design efforts and administrative costs pre-construction ($19.3 million), permits/land or easement acquisitions (~$10 million), or interest on borrowed funds.

[73] The Final ESI/EIR for the plan is available at http://www.water.ca.gov/saltonsea/habitat/eir2013.cfm.

[74] The Final ESI/EIR for the plan is available at http://www.water.ca.gov/saltonsea/habitat/eir2013.cfm.

[75] These negotiations were held in May 2013, ending with an agreement between IID, County of Imperial, and the Imperial County Air Pollution Control District to pursue funding for restoration, including the use of geothermal and other renewable energy in the Salton Basin to provide long-term funding. The terms of agreement included the endorsement of the 2006 *SSA Plan*, as well as increased geothermal capacity of 1,400 megawatts (MW) (up from 600 MW) and a surcharge at Hoover Dam to pay for restoration of the Salton Sea, among other things. Full terms can be found at http://www.iid.com/modules/showdocument.aspx?documentid=7818.

[76] For the text of AB71 and its status, see http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB71

input to the Secretary of the California Natural Resources Agency on various aspects of restoration and air quality in the region.

Federal Actions in the Salton Basin

Federal actions directed towards restoring the Salton Sea are not following any comprehensive plan. Restoration efforts by federal agencies are largely in the form of pilot projects, monitoring, and individual agency plans or proposals. For example, BOR created and disseminated a study assessing restoration possibilities in 2007.[77] The development of the study was authorized and required under P.L. 108-361. Section 201 states that the Secretary of the Interior, in coordination with the State of California and the Salton Sea Authority (SSA), shall complete a feasibility study on a preferred alternative for restoration. The BOR study provided five alternative restoration plans and a no action alternative, with costs for implementing the alternatives ranging from $3.5 billion to $14 billion.[78] BOR did not state a preferred alternative, claiming that the uncertainty and risks, combined with the high costs of all five restoration alternatives prevented it from recommending an alternative. However, given that the no-action alternative had $1.4 billion estimated mitigation costs, BOR emphasized that consideration should be given to the SHCs component described in alternative 5.

BOR and USGS created a pilot study consisting of a small series of SHCs from 2006 to 2010 to determine whether these complexes could be a feasible restoration approach.[79] The pilot study concluded that SHCs, and similar saline complexes, could minimize the risks and costs of restoration, while restoring wildlife habitat and partially mitigating air quality impacts. However, selenium concentrations in these pools were reported at potentially toxic levels, which would warrant observation and study to see how it might adversely affect fish and wildlife. Overall, the study was reported to demonstrate that the SHP model is a viable alternative for restoring wetlands at the Salton Sea, but that the potential risks of selenium need to be considered.[80]

As noted above, the Corps is also involved in pilot studies concerning SHCs. The Water Resources Development Act of 2007 (P.L. 110-114) authorized the Secretary of the Army to review the state-approved plan, the "Salton Sea Ecosystem Restoration Program Preferred Alternative Report and Funding Plan", and implement feasible pilot projects described in the plan.[81] Under WRDA 2007, if the secretary determines the projects are feasible, then he is authorized to enter into an agreement with the state to help implement the pilot projects.[82] One of these pilot projects is the previously mentioned Salton Sea Species Conservation Habitat Project

[77] Full study available at http://www.usbr.gov/lc/region/saltnsea/finalreport/index.html.

[78] Cost in 2006 dollars. The no action alternative was estimated to cost $1 billion for dust mitigation. From Bureau of Reclamation, *Budget Justification for FY 2009*, http://www.doi.gov/budget/appropriations/2009/upload/BOR-Budget-Justification.pdf.

[79] Report and findings found in: A. Keith Miles, Mark A. Ricca, and Anne Meckstroth, et al., *Salton Sea Ecosystem Monitoring Project*, USGS and US DOI, Open File Report 2009-1276, Reston, VA, 2009, http://www.usbr.gov/lc/region/saltnsea/SaltonSeaEcosystemMonitoring.pdf.

[80] Ibid, p. 29.

[81] Section 3032. The pilot project the secretary is currently studying is termed the Salton Sea Species Conservation Habitat Project. (This is discussed in greater detail under the State Actions section below.)

[82] Section 3032.

plan. The Administration has requested $200,000 of federal funding for a reconnaissance study of the plan. The request is in the Corps FY2014 budget request.[83]

Additional Restoration Measures

In addition to proposed comprehensive plans to restore the Salton Sea, several have endorsed site-specific plans or activities for restoration. For example, local and state efforts have been made to fund and explore the development of renewable and biofuel energy sources in the Salton Sea.[84] The Sea has multiple potential renewable energy sources that include geothermal energy, solar power, and bio-algae. It has been estimated that the Salton Sea Basin could support up to 2,000 megawatts (MW) of economically feasible renewable energy capacity.[85] A large portion of this capacity- around 1,400 MW- would be geothermal. The rest would be solar, which some proposed could be constructed along acres of the exposed lake beds around the Sea.

Currently, IID generates approximately 600 MW of geothermal energy in the Basin.[86] IID has been developing a pilot study to use geothermal energy to desalinate water to create saline habitat pools. The Torres-Martinez Tribe has also requested funding from the State of California to construct a solar photovoltaic field to power reliable and sustainable water delivery to the saline habitat ponds on its land.[87] If these pilot studies indicate that the use of renewable energy for desalination is feasible, it could allow for previously discussed salinity control methods to be used. The desalinated water could be a substitute for the fresh Colorado River water that would otherwise be necessary for salt evaporation and salinity control in the Basin.

In addition, SSA has been discussing a partnership with the Salton Sea Action Committee (SSAC), which represents some of the private business in the area interested in energy development. The SSAC is interested in promoting the development of renewable energy (e.g., solar fields and geothermal) in the Basin to generate funds for restoration. Further, there is discussion about creating an Infrastructure Finance District in the area, which would use a portion of proceeds from development to fund restoration. The SSAC contends that this arrangement would allow local governments to take on infrastructure and other projects (e.g., geothermal and other energy plants) and generate funds necessary for maintaining the Sea for fish and migratory birds.[88]

Some others have proposed the production bio-algae as a mechanism to both provide funds for restoration and improve the environmental health of the Salton Sea. Researchers at Clemson University have developed a Controlled Eutrophication Process (CEP) to grow algae in the Sea.[89]

---

[83] Army Corps of Engineers, *Civil Works Budget FY 2014*, 2013, http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll6/id/42.

[84] See AB 148 from the 2013-2014 California legislative session.

[85] Summit Blue Consulting LLC, *Renewable Energy Feasibility Study Final Report*, Imperial Irrigation District, April 1, 2008.

[86] See the Imperial Irrigation District Resolution No. 14-2013 (Geothermal Energy Development and Use). http://www.iid.com/Modules/ShowDocument.aspx?documentid=7742.

[87] Details of the projects can be found through the Salton Sea Financial Assistance Program at http://www.water.ca.gov/saltonsea/habitat/final_list.cfm.

[88] Keith Matheny, "Officials, activists push for fix to the Salton Sea's growing crisis," *The Desert Sun*, December 19, 2012.

[89] D.E. Brune, H.W. Yen, and G. Schwartz, et al., "The Controlled Eutrophication Process; Microalgae for Biofuels (continued...)

Preliminary studies have shown that CEP would improve water quality, increase fish production, and have a potential sizable revenue stream.[90]

Potential Issues for Congress

Progress towards restoring the Salton Sea has been slow in recent years, largely due to the lack of a comprehensive plan to guide efforts and lack of funding. Indeed, some contend that there is not full consensus behind restoring the Sea. Those against restoration contend that it will naturally shrink and disappear, making attempts at restoration futile and expensive in the long term.[91] Others counter these claims by stating the Sea is in an artificial state of decline because of its reliance on agricultural runoff artificially conveyed from the Colorado River. Further, they add that the increasing salinity of the Sea along with its shrinkage will cause irreparable damage to the ecosystem and negatively affect fish and wildlife populations, as well as create health risks for humans due to contaminated dusts.

Some contend that the federal government has not taken an active role in physically restoring the Sea.[92] Most federal actions have centered on creating proposals for restoration and conducting pilot studies. Restoration efforts have largely centered on state actions. Congress might consider shifting the federal position to a more active role by authorizing federal restoration actions and providing appropriations to implement them. In contrast, Congress might consider leaving restoration responsibilities to the State of California and allowing the federal government to continue its supporting role.

The importance of the decision of how to proceed might amplify as the QSA goes into effect and temporary local mitigation efforts end. The presence of endangered species in the Salton Sea and documented health hazards from the evaporation of the Sea are issues some cite to justify federal action. The following section provides an overview of the issues concerning the federal role in restoring the Salton Sea, and then discusses specific aspects of the federal role and how Congress might address them.

Is There a Federal Role in Restoring the Salton Sea?

Some contend that the federal government should have a greater role in restoring the Salton Sea. They note that the federal government owns 47% of the land underneath the Sea, and federal agencies, such as the Bureau of Land Management, have leased a portion of the land to private entities for oil and natural gas development. They also note that the Salton Sea ecosystem is important for several listed species under the federal ESA and that the Department of the Interior is currently conducting studies to evaluate proposals for restoring the Salton Sea. Others counter this sentiment by noting that there are no laws that authorize direct federal involvement in physically restoring the Sea. (Note that some federal laws authorizing broad restoration actions

(...continued)

Production and Fertilizer" (Clemson University).

[90] *Ibid.*

[91] Michelle Nijhunis, "Accidental refuge: Should we save the Salton Sea?," *High Country News*. http://www.hcn.org/issues/181/5865/print_view.

[92] Keith Matheny, "Officials, activists push for fix to Salton Sea's growing crisis," *The Desert Sun*, December 19, 2012.

could be applied to restoring parts of the Salton Sea ecosystem.) Further, they note that the State of California is directly authorized to restore the Sea under state law and that restoration should be a state responsibility.[93] State efforts to restore the Salton Sea ecosystem have largely gone unfunded due to state fiscal concerns, according to some. Some note that if federal funds were available, the construction and development of larger restoration projects could proceed.

Due to the expense and estimated costs of currently proposed restoration plans, advocates argue that a combined state and federal effort to restore the Salton Sea would be an appropriately balanced approach to restoration. However, some may contend that an open-ended federal commitment to restore an area with questionable prospects for restoration success may not be the best use of federal resources in a time of fiscal constraint. They contend that other wetland restoration efforts, such as in the San Francisco Bay and Sacramento and San Joaquin Rivers Delta (Bay-Delta) and Lake Tahoe in California would be more cost-effective and efficient ways to address species concerns and restore existing ecosystems.[94]

If Congress considers expanding the federal role in restoring the Salton Sea, there are a few factors to consider, including (1) creating authorizing legislation to create a comprehensive plan (or implement an existing plan) and governance structure for restoration; (2) funding existing authorized activities or a new effort at restoration; (3) addressing restoration under ESA; and (4) maintaining the status quo of providing assistance to the State of California. Lastly, Congress might decide not to address restoration in the Salton Sea ecosystem. If Congress chooses not to authorize or fund Salton Sea restoration activities, efforts by the State of California would be the primary avenue for restoration. California is directed under the QSA and the state law to mitigate the effects of the QSA in the Salton Sea. However, even with mitigating the effects of the QSA, habitat loss and salinity is expected to continue.[95] The next sections discuss options for Congress listed above.

Comprehensive Plan and Governance for Restoration

The Salton Sea does not have a comprehensive plan that is being implemented for restoration. Several entities have released different restoration plans. Many state, tribal, and federal agencies have a stake in the Basin and each has proposed different plans. The current proposed state plan is estimated to cost $8.9 billion. The federal restoration alternatives identified by BOR in 2007 had estimated costs ranging from $3.5 billion to $14 billion.[96] So far, state and federal appropriations have not been provided to support the implementation of any large-scale project. Some private stakeholders have presented smaller-scale versions of the state and federal plans that cut costs by eliminating certain aspects of the plans. These partial restoration plans are estimated to reduce costs by up to 75%.[97]

[93] See SB 654 (Machado, Chapter 613, Statutes of 2003), section 2.

[94] Michelle Nijhunis, "Accidental refuge: Should we save the Salton Sea?," *High Country News*. http://www.hcn.org/issues/181/5865/print_view.

[95] State Water Resources Control Board, *Order WRO 2003-0013*, 2003. http://www.iid.com/Modules/ShowDocument.aspx?documentid=924.

[96] Bureau of Reclamation, *Restoration of the Salton Sea Summary Report*, September 2007, http://www.usbr.gov/lc/region/saltnsea/FinalSummaryRpt.pdf.

[97] See Michael Cohen's Restoration Plan as an example. Information available at http://www.pacinst.org/about-us/staff-and-board/michael-j-cohen/.

Most of the funding for restoring the Salton Sea, according to some, has been spent on creating plans and monitoring, rather than directly implementing projects.[98] These studies have provided data and highlighted issues and strategies for future restoration projects. However, the short lifespan (most projects are decommissioned within five years) of these efforts may result in limited long-term environmental impacts.

Congress might consider increasing the federal role in restoring the Salton Sea by authorizing the creation of a comprehensive restoration plan that would involve federal and state resources and incorporate shared governance, or authorizing an existing proposed restoration plan. For example, restoration in the Greater Florida Everglades is guided by the Comprehensive Everglades Restoration Plan (CERP), which includes 68 projects and has a 1:1 cost share between the federal government and the State of Florida.[99] DOI and the Corps are the primary federal entities involved and the South Florida Water Management District is the non-federal sponsor. Other ecosystem restoration initiatives in areas such as the Chesapeake Bay and Platte River also involve the federal government and one or more states. An alternative to creating and authorizing a comprehensive plan for restoration could be to expand and fund existing federal authorities that contribute toward restoring the Salton Sea.

Funding

Congress may choose to expand the federal role in the restoration of the Salton Sea by funding existing restoration projects and authorizations aimed at restoration. For example, the Water Resources Development Act of 2007 authorized the Secretary of the Army to review the state plan and determine whether pilot projects in the plan are feasible. If the Secretary decides that the projects are feasible, then he is authorized to enter into an agreement with the state, in consultation with the Salton Sea Authority and the Salton Sea Science Office, to carry out the pilot projects. The non-federal sponsor (e.g., State of California) would pay 35% of the total cost of the project, and the federal government would pay 65%. The law authorizes $30 million for these projects, with no more than $5 million per project. To date, no funding has been authorized for the Corps to carry out these projects; however, the Administration has requested $200,000 for a reconnaissance study on these pilot projects for FY2014.[100]

Other federal authorities for addressing restoration in the Salton Sea are primarily for conducting studies to determine if certain restoration methods are feasible. For example, funds authorized by the Salton Sea Reclamation Act of 1998 (P.L. 105-372) are for implementing pilot projects to measure saline habitat pools. BOR received appropriations (and then contracted with USGS) to carry out these pilot studies and have reported generally positive results. Funding has also been used to implement scientific research on the Salton Sea as well as monitoring and collecting data about the state of the Sea.

Some programs under ESA could be applied to restoration of habitat and species recovery and used to help fund efforts in the Salton Basin. The Salton Sea is a key stop along the Pacific Flyway, which serves as the migratory route for many endangered and threatened species. The

[98] Michael Cohen, *State Not Meeting Salton Sea Responsibilities*, Pacific Institute, October 10, 2009, http://www.pacinst.org/publication/state-not-meeting-salton-sea-responsibilities/.

[99] CRS Report R42007, *Everglades Restoration: Federal Funding and Implementation Progress*, by (name redacted)

[100] Army Corps of Engineers, *Civil Works Budget FY 2014*, 2013, http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll6/id/42.

Salton Sea is not currently designated as critical habitat for these species, which has been questioned by some scientists who believe it should be listed as critical habitat along the Flyway. Nearby areas, however, do contain critical habitat and can play a role in restoration. For example, parts of the Imperial Valley, including the Salton Sea, were designated a critical habitat for the desert pupfish.[101] The recovery plan for the desert pupfish states that the few natural habitats and populations remaining should be protected.[102] The incidental take permits granted by the Fish and Wildlife Service for the water transfer authorized under the QSA require that the participating parties maintain desert pupfish habitat connectivity. Further, QSA mitigation requires that desert pupfish habitats be maintained as long as the transfers are occurring and that a detailed management plan be developed when salinity reaches 90 ppt (the point at which desert pupfish can no longer reproduce in the Sea).[103] These requirements might stimulate restoration and maintenance of the Salton Sea or the maintenance of small habitat pools to maintain these endangered species.

Possible funding sources through the ESA include appropriations for recovery actions of listed species and the Cooperative Endangered Species Conservation Fund (CESCF). CESCF could benefit species that are listed or proposed for listing under ESA, through grants to states and territories. Funds from CESCF could also be used to help states prepare Habitat Conservation Plans (HCPs). If there are several actors participating in the creation of an HCP, states can use their funds to coordinate the effort and develop a single plan that might cover the region.

Some alternative funding mechanisms have been proposed by state, local, and private entities that could involve the federal government. For example, some have proposed the use of renewable energy development in the Basin to help fund restoration. One way to utilize renewable energy would be through public-private partnerships (PPPs). PPPs involve contract arrangements in which a nonfederal or private entity partners with the government to contribute funds, knowledge, or labor toward a project. In return, the private or nonfederal entity is guaranteed a portion of the project's revenue as repayment. The other portion of the revenue could be used to fund public goods such as restoration. Multiple federal agencies have instituted public-private programs to fund and manage restoration. These include the National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corps of Engineers (Corps), the Bureau of Land Management (BLM), the U.S. Forest Service (USFS), and the Fish and Wildlife Service (FWS), among others. Many of these agencies have programs that provide funding for a project while a private company develops and constructs the project. In several cases, this model also involves cost-sharing between the federal agency and nonfederal entity.

[101] The FWS last reviewed the pupfish in 2010, and determined that the pupfish should still be listed due to little population growth and increasing threats to the pupfish habitat. Although their numbers are low, recovery could potentially be large. For example, the desert pupfish were barred from experimental pools in the Salton Sea created by USGS and BOR. A small number infiltrated the study pools when they were completed in 2006. By 2010, over 1 million pupfish were found in the pools, indicating the potential for recovery using the pools. For more, see US Fish and Wildlife Service, *Biological Opinion for the Salton Sea Species Conservation Habitat Project*, March 5, 2013, http://criticalhabitat.fws.gov/docs/tails/11430/v699163.pdf.

[102] The recovery plan is available at http://www.fws.gov/carlsbad/speciesstatuslist/rp/19931208_rp_depu.pdf.

[103] Bureau of Reclamation, Conservation Agreement among Bureau of Reclamation, Imperial Irrigation District, Coachella Valley Water District, and San Diego County Water Authority, October 10, 2003, http://www.iid.com/Modules/ShowDocument.aspx?documentid=4594.

According to independent studies commissioned by stakeholders in the area, the Salton Sea Basin has large renewable energy potential.[104] This includes geothermal, solar, and bio-algae energy production. Integrating energy production and PPPs to generate funds for restoration has been suggested by some as a potential alternative to raise revenue and improve the local economy in the Basin. Potential federal entities that could be involved with PPPs in the area include BLM and FWS. However, for PPPs to be viable, they would need to generate revenues with minimal risk to the private entity. Some contend that the barriers to renewable energy development in Salton Sea Basin, such as lack of access to transmission lines, lack of access to water necessary to run generators, and environmental concerns including endangered species and seismic inductions due to the activities, might be prohibitive for energy development in the area.[105]

What If No Restoration Occurs?

Congress might consider the potential effects of not restoring the Salton Sea in weighing options for action. Most studies and statements by scientists and other stakeholders note that the Sea will shrink in size and increase in salinity without restoration. This is expected to amplify after 2018, which is the expected date for mitigation deliveries to the Salton Sea to stop under the QSA.[106] Some have modeled the future physical characteristics of the Salton Sea without restoration.[107] Without restoration, the present ecosystem would be unable to continue with high salinity concentrations. The migratory birds that visit the Salton Sea would largely disappear from the area.[108] The Salton Basin, however, could still be ecologically productive. For example, the high salinity concentrations would be conducive for brine shrimp, flies, algae, and bacteria. Over time, however, the salinity and oxygen depletion could reach levels that would affect the survival of remaining organisms in the area. While modeling has predicted that the sea size would stabilize around 2040, the salinity would continue to increase. Models estimate that salinity would be 330 ppt by 2075. To put this in perspective, the saltiest portions of the Great Salt Lake in Utah are 270 ppt and the Dead Sea is around 337 ppt.

By 2040, an additional 134 square miles of the seabed would be exposed compared to the present size of the Sea. Contaminated dust from these exposed areas could impact the livelihood of the farmers in the surrounding counties and have adverse health effects on those in neighboring communities. Studies have not been able to quantify the economic impacts of increasing dust on the agricultural economy in the area. However, possible impacts include damaged crops and additional water needed to leech salts and toxins from the soil. Many of the business owners in the area have stated that lack of restoration would lead businesses in the area to close. Locals

[104] Summit Blue Consulting LLC, *Renewable Energy Feasibility Study Final Report*, Imperial Irrigation District, April 1, 2008.

[105] See Summit Blue Consulting LLC, *Renewable Energy Feasibility Study Final Report*, Imperial Irrigation District, April 1, 2008, for complete list of potential barriers and additional details.

[106] Michael J. Cohen and Karen H. Hyun, *HAZARD: The Future of the Salton Sea With No Restoration Project*, Pacific Institute, May 2006, http://www.pacinst.org/wp-content/uploads/2013/02/report15.pdf.

[107] While this section draws mainly off of one study conducted by the Pacific Institute due to its recent publication, the findings are similar to many of the predictions about the future state of the Salton Sea scientific papers from the 1980s and 1990s.

[108] Fish and Wildlife Service's Biological Opinion for the QSA estimated that once salinity in the Sea reached 60 ppt, only 25 pelicans would remain in the Basin. It was estimated that the first 45 years of the water transfers would cause 12,383 lost pelican-use years. To account for this, two roosts for brown pelicans are to be established in San Diego and Santa Barbara that can hold 1,200 pelicans by 2018. The Biological Opinion can be found at http://www.iid.com/Modules/ShowDocument.aspx?documentid=2263.

have expressed fears that unemployment would increase if businesses closed. Also, the state and federal governments may bear additional health care costs due to increased health problems.[109]

While acknowledging that the Salton Sea ecosystem is undergoing a transition to a smaller and saltier water body, some contend that the natural transition of the Sea should not be interfered with. These opponents of restoration contend that the future Salton Sea will have a new, but equally productive, ecosystem that better fits with the physical and chemical properties of the Sea. They believe that restoring the Sea should not be a priority. Others counter this sentiment by noting the severity of the projected effects of a shrinking sea on the environment and economy of the region.

Understanding the science behind the ecosystem dynamics in the Salton Sea Basin is viewed as a priority by some who contend that long-term monitoring of the Salton Sea ecosystem is essential for deciding whether to restore the Sea or let it transition into a new ecosystem. The USGS and BOR collaborated with the California Department of Water Resources and Fish and Wildlife to create a Monitoring and Assessment Plan (MAP).[110] This plan would implement a monitoring program that would establish a baseline understanding of the key factors in the Salton Sea ecosystem (e.g, salinity and area of exposed seabed, among others); fill in data gaps; and provide capacity for storing, managing, and analyzing data. The program is not intended to be a prescriptive plan for restoration, but rather aims to implement monitoring activities directed at species and habitats that could be affected by future restoration activities.

Conclusion

The Salton Sea ecosystem has been steadily changing primarily due to less water entering the Sea. The notable changes are the decreasing area of the Salton Sea and increasing salinity of its waters. These changes have already caused stress on fish and wildlife species that reside in the ecosystem, and some avian species that use the ecosystem while migrating along the Pacific Flyway. The condition of the Salton Sea ecosystem is expected to change dramatically when water transfers authorized under QSA are implemented, thus reducing water inflows into the Sea. This is expected to increase the level of salinity in the Sea over a short period, thus making the Sea inhabitable for most existing fish and wildlife species. Severe effects on the ecosystem are expected as soon as 2018, according to some models.

Several groups support restoring the Salton Sea ecosystem so that it can support fish and wildlife and stimulate economic development in the region. Specifically, proponents of 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. They note that with nearly 90% of California's original wetlands gone, the Sea is of regional or national importance to pelicans and cormorants, wading birds, waterfowl, shorebirds, gulls, and terns.[111] Further, some note that a

[109] High cases of liver, kidney, and respiratory diseases have been reported in areas that have experienced similar shrinking lakes (e.g. Aral Lake and Owens Lake). The United Nations has reported an increase in immune-system disorders, birth abnormalities, tuberculosis, and cancer rates in the Aral Sea area since the Sea began shrinking; it has been, at least, partially attributed to the increased dust from the exposed seabed.

[110] H.L. Case III, Jerry Boles, and Arturo Delgado, *Salton Sea Ecosystem Monitoring and Assessment Plan*, U.S. Geological Survey, Open-File Report 2013-1133, Reston, VA, August 20, 2013, http://pubs.usgs.gov/of/2013/1133/pdf/ofr20131133.pdf.

[111] W.D. Shuford, N. Warnock, K.C. Molina, and K.K. Sturm, "The Salton Sea as Critical Habitat to Migratory and (continued...)

restored Sea could supports aquatic wildlife that include some threatened and endangered species and other species that might be able to support recreational or sport fishing practices. The value of a restored Sea, according to some, 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 geologic history, water bodies in the Salton Basin have eventually dried up, leading some scientists to hypothesize that evaporation and conversion to a salt brine 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 water diversions away from the sea.[112] Further, without the ability to use fresh water from the Colorado River, many of the restoration plans and projects developed in the early 2000s may be infeasible. As noted earlier, some argue that the high cost of restoration and the scientific uncertainty of existing proposals might not warrant limited state and federal funds. They note that limited funds should be funneled to other restoration efforts in naturally occurring wetlands in the California San Francisco Bay Sacramento/San Joaquin Rivers Delta.

Congress has addressed the restoration of the Salton Sea ecosystem through various laws that authorize, in part, the creation of restoration plans for the ecosystem and the testing of restoration methodologies through pilot projects. However, due to the pace of change in the Salton Sea and the anticipation of severe effects on the ecosystem due to water transfers, Congress may decide to address restoration by increasing the federal role in restoration efforts. This could be done by funding existing federal authorities that address, or could address, restoring the ecosystem; authorizing federal participation and appropriations for implementing existing restoration plans; and authorizing a new comprehensive plan to be created that might involve participation from federal and non-federal stakeholders, similar to other restoration initiatives around the country. Congress might also decide not to address restoration of the Salton Sea ecosystem, or, rather, maintain the status quo of federal participation.

(...continued)

Resident Waterbirds," *Hydrobiologia* 473 (2002), p. 255-274.

[112] 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	Purpose
10,000 BC	Native Americans first occupy the Salton Basin.
700 AD	Lake Cahuilla is formed in the Salton Basin 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 Basin.
1876	U.S. Government establishes the Torres-Martinez Desert Cahuilla Indian Reservation with a grant of 640 acres.
1891	20,000 acres of land on the northern side of the Salton Basin 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	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	President Calvin Coolidge issues Public Water Reserve Order 90 (issued in 1924) and 114 (issued in 1928) setting aside lands under the Salton Sea as a permanent drainage reservoir for agricultural and surface water runoff 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	Salton Sea Wildlife Refuge is established. It covers an area of 35,000 acres.[113]
1967	The yuma clapper rail is listed as an endangered species in the U.S. Its range includes the Salton Sea.
1969	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.
1970	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	Federal-state Feasibility Study, which provided alternatives for lowering the salinity and maintaining water levels in the Salton Sea, is completed.
1986	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.

[113] Due to flooding and a rise in sea level since 1930, only 2,000 acres remain uncovered by salty water. The refuge was renamed to Sonny Bono Salton Sea National Wildlife Refuge in 1998. See U.S. Fish and Wildlife Service, Pacific Region at http://www.fws.gov/refuge/sonny_bono_salton_sea/.

Year	Purpose
1992	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. $10 million is authorized for this effort.
1993	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.
1998	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.
1999	Water Resources Development Act of 1999 (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.
2000	The Department of the Interior submitted a Draft Environmental Impact Statement/ Environmental Impact Report, and Strategic Science Plan for restoring the Salton Sea.
	The USGS Salton Sea Science Office was established by DOI to provide continuity of the science effort, effectiveness of science undertaken in support of the restoration project, and efficiency of operations in serving management needs.
	Title VI of the Torres-Martinez Settlement Act (P.L. 106-568) provides 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.
2003	Bureau of Reclamation (BOR) submits the Salton Sea Study Status Report, which contains various proposals for the full or partial restoration of the Salton Sea.
	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.
2004	Water Supply, Reliability, and environmental Improvement Act (P.L. 108-361) requires the Secretary of the Interior to complete a feasibility study on a preferred alternative for Salton Sea restoration.
2006	Shallow Habitat Pools (SHPs) are constructed on the southern end of the Sea by BOR and US Geological Survey.
2007	Water Resources Development Act of 2007 (P.L. 110-114) authorizes $30 million for Salton Sea Restoration.
	Restoration of Salton Sea released by BOR and Department of Interior (DOI).
2009	Saline Habitat Complexes in the southern end are decommissioned. An Ecological Risk Assessment is published recommending SHCs.
2013	The Final EIR/EIS for the Salton Sea Species Conservation Project is released by the Corps, in conjunction with state agencies.

Federal Appropriations

Year	Funds Appropriated (Dollars, in thousands)	Purpose
1985	2,600	The Salton Sea is studied under the National Irrigation Water Quality Program (NIWQP)[114] 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.
1994 - 1996	100 (each year)	P.L. 102-575 appropriates for research on the restoration of the Salton Sea are provided.
1997	200	Same as above.
1998	400	Same as above.
	900	U.S. Environmental Protection Agency Office of Research and Development implements a Salton Sea Database Program at the University of Redlands, CA.
1999	1,000	U.S. Fish and Wildlife Service develops management options to mitigate bird die-offs in and around the Salton Sea National Wildlife Refuge.
	4,000	U.S. Environmental Protection Agency (USEPA) under P.L. 105-372 grants funds to the Salton Sea Authority to research water quality and wildlife in and around the Salton Sea.[115]
	3,000	Title II of P.L. 105-372 appropriated through the USEPA funds demonstration wetland projects on the New and Alamo Rivers.
	2,800	USEPA Office of Research and Development funds Salton Sea database program.
	1,000	U.S. Fish and Wildlife Service develops management options to mitigate bird die-offs in and around the Salton Sea National Wildlife Refuge.
2000	1,000	P.L. 105-372 funds for Salton Sea Research Project through the Bureau of Reclamation (BOR)
	1,000	U.S. Fish and Wildlife Service develops management options to mitigate bird die-offs in and around the Salton Sea National Wildlife Refuge.
2001	5,000	P.L. 105-372 funds for Salton Sea Research Project, BOR.
	1,000	Salton Sea Recovery Program activities in the Salton Sea National Wildlife Refuge by the U.S. Fish and Wildlife Service

[114] 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.

[115] 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.

2002	4,500	Salton Sea restoration activities and reclamation of the New and Alamo Rivers through BOR. Funds from P.L. 105-372 and P.L. 102-575.
	1,000	Salton Sea Recovery Program activities in the Salton Sea National Wildlife Refuge by the U.S. Fish and Wildlife Service.
2003	2,000	Salton Sea Research Project funded by from Consolidated Appropriations Resolution FY2003 (P.L. 108-7).
	1,000	Salton Sea Recovery Program activities in the Salton Sea National Wildlife Refuge by U.S. Fish and Wildlife Service.
	4,000	Energy and Water Development Appropriations for FY2004 (P.L. 108-137) provides appropriations for desalinization studies, restoration activities in the New and Alamo Rivers, groundwater assessment, and programs conducted by the Salton Sea Authority.
2004	3,595	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2005	1,994	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2006	4,780	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2007	743	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2008	1,132	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2009	1,074	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2010	379	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2011	400	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2012	290	P.L. 105-372 funds for Salton Sea Research Project, BOR.
2013	300	BOR Salton Sea Research Project funded by Continued Appropriations (P.L. 112-175).
Total	**51,387**	

Sources: Cohen et al., *Haven or Hazard*, 63 p; U.S. Dept. of Interior, *Budget Justifications for FY 2000-2013*; 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 Congress, 1st session (Serial No. 105-60), October 3, 1997 (Washington, DC: GPO), 112 p.; and various other sources.

Author Contact Information

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

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

Acknowledgments

Former CRS Research Associate Amanda Marie Levin coordinated the creation of this report and made important contributions to its content.