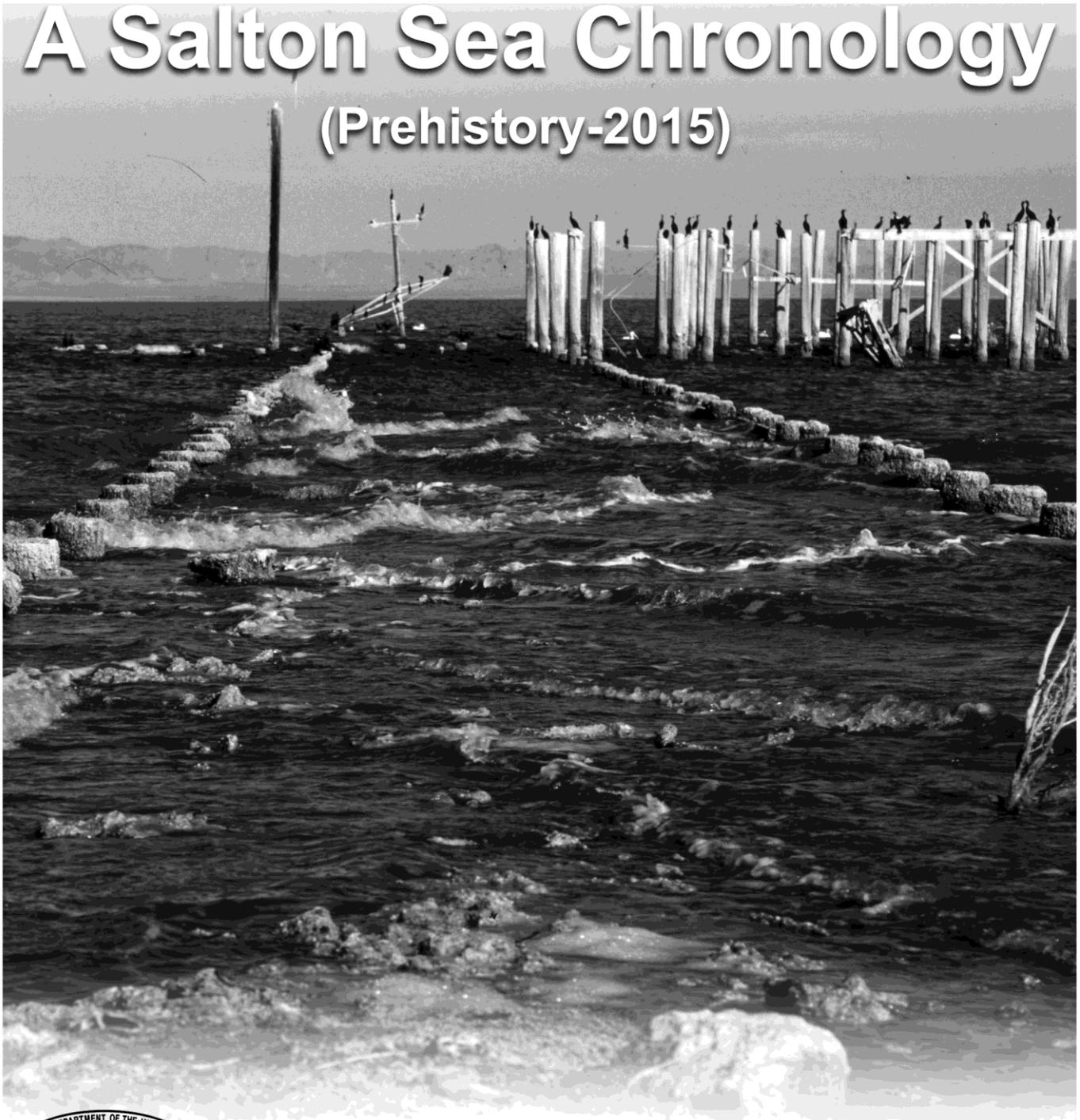


RECLAMATION

Managing Water in the West

A Salton Sea Chronology (Prehistory-2015)



U.S. Department of the Interior
Bureau of Reclamation

January 2016

Mission Statement

The Bureau of Reclamation manages, develops, and protects water and related resources in an environmentally and economically sound manner in the interest of the American public.

A Salton Sea Chronology

(Prehistory-2015)

Year	Events
10,000 BC <i>(Approx)</i>	First recorded human habitation in the Salton Basin.
700 AD <i>(Flood!)</i>	Lake Cahuilla is formed in the Salton Basin when the Colorado River silts up its outlet to the Gulf of California and swings northward. Lake Cahuilla is subject to multiple wet and dry cycles over intervening years.
1500 <i>(Flood!)</i>	Large inflow of the Colorado River water fills Lake Cahuilla to create a waterbody 26 times the size of the current Salton Sea. (The calcareous water line remains visible on the northwest mountains in the present day).
1840-1891	Multiple flood events from the Colorado River are recorded in the Salton Basin forming ephemeral lakes up to 100,000 acres.
1876	Executive Order of May 15, 1876, establishes the Torres Martinez Desert Cahuilla Indian Reservation with a grant of 640 acres (Torres Martinez Compact, 2003).
1891	Executive Order of December 19, 1891, pursuant to the Mission Indian Relief Act of 1891, expands the Torres Martinez Desert Cahuilla Indian Reservation approximately 12,000 acres on the northern side of the Salton Basin.
1892	New Liverpool Salt Company mines salt from a salt marsh centered west of the railroad station named "Salton".
1901	California Development Company is contracted by a private entity to build a canal (the Alamo Canal) to deliver water by gravity flow from the Colorado River to irrigate the Imperial Valley.
1904	Silt blocks the Alamo Canal, preventing it from supplying water to the Imperial Valley.
1905 <i>(Flood!)</i>	Temporary diversion of the Colorado River to replace water from the blocked Alamo Canal is breached by a series of floods. Colorado River changes course into the Salton Basin.



During the 1905-1906 Colorado River Flood, a southern Pacific passenger train crosses the Salton Sea on a trestle at a point 5 miles east of Salton Station. Bureau of Reclamation photo 1905.

1906 The present day Salton Sea is created in the Salton Basin after a series of exceptional winter floods. Prior to the flooding, the Salton Sea surface elevation is estimated at 240 feet below sea level (Carpelan, 1958).



The New River is widened by the Colorado River flood that creates the Salton Sea. Bureau of Reclamation photo 1906.

1907 Southern Pacific Railroad repairs the breach and the Colorado River ceases to flow into the Salton Sea. The United States Geological Survey (USGS) records the Salton Sea surface elevation at 197 feet below sea level.

1909 An additional 12,000 acres of land, 9,000 of which were submerged under the Salton Sea, are added to the Torres Martinez Reservation under an Executive Order issued pursuant to a 1907 amendment to the Mission Indian Relief Act of 1891.

1911 Imperial Valley residents vote to establish the Imperial Irrigation District (IID) to acquire properties of the bankrupt California Development Company and its Mexican subsidiary.

1917 Seining of Striped mullet (*Mugil cephalus*) becomes profitable industry at Salton Sea during World War I.

1918 The Coachella Valley Water District (CVWD) is formed to deliver irrigation and domestic (drinking) water, collect and recycle wastewater, provide regional storm water protection, replenish the groundwater basin and promote water conservation.

1924 President Calvin Coolidge issues Public Water Reserve Orders 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. (All lands subject to the two Public Water Reserve Orders were revoked in their entirety by Public Land Order 6105 on March 5, 1982. Reclamation subsequently withdrew 79,576 acres from the public domain under the Salton Sea for project and agricultural discharge purposes.)

1928 Boulder Canyon Project Act of 1928 (P.L. 70-642), authorizes the construction of the Boulder Dam and All American Canal (expected to control the Colorado River and stop future flooding events).

1929 End of observed populations of carp (*Cyprinus carpio*), and bonytail chub (*Gila elegans*), in the Salton Sea; razorback sucker (*Xyrauchen texanus*) remain common. Mullet becoming scarce (although limited restocking continues until April 1951) (Walker, 1961).

1929 Striped bass (*Roccus saxatilis*) first deliberate stocking, but did not survive.

1930 Pile worms (*Neanthes succinea*) introduced as fish food. Longjaw mudsuckers (*Gillichthys mirabilis*) fish stocked, but did not survive.

1930 Salton Sea National Wildlife Refuge (35,000 acres) designated pursuant to Executive Order 5498. (Renamed the Sonny Bono Salton Sea National Wildlife Refuge by the Salton Sea Reclamation Act of 1998 [P.L. 105-372.]

1934 Construction of the 90 mile All-American Canal commences, as a reliable water delivery system to the Imperial Valley.



Construction of the All-American Canal with mule teams and Fresno scrapers. Reclamation photo 1935.

1938 Construction of the 122-mile Coachella Canal, off-shoot of the All-American Canal, commences.

1941-45 Commercial fishermen use Salton Sea to supply mullet to coastal fish markets after German submarines make ocean fishing hazardous during WWII.

1942 Construction of the All-American Canal completed; the Bureau of Reclamation (Reclamation) owns the canal, which IID operates and maintains to supply water to the Imperial Valley.

1944-45 B-29s from the U.S. Army's 393rd Heavy Bombardment Squadron, commanded by Lt. Col. Paul Tibbets, make highly secret practice flights from Wendover Air Base in Utah to drop dummies of a new bomb into the Salton Sea. On August 6, 1945, Tibbets and his crew, in the *Enola Gay*, drop the first Atomic Bomb over Hiroshima, Japan.

1949 Construction of the Coachella Canal is complete. CVWD operates and maintains the canal which provides irrigation water to the Coachella Valley and drinking to urban southern CA.

1950 The California Department of Fish and Game introduced Corvina (*Cynoscion xanthulus*) along with several other species of ocean game and baitfish, which continues through 1956, after which only tilapia, originally a freshwater fish, manages to adapt to increased salinity levels and survive into the 21st century.

1951 Single introduction of Sargo (*Anisotremus davidsoni*) resulted in a very productive fishery until 1958, presumably because of increasing salinity levels.

1955 Salton Sea State Park is dedicated; at the time, the largest state park in California. The park consists of 120,682 acres, of which 1,855 acres are leased from Reclamation. (Renamed the Salton Sea State Recreation Area in 1965.)

1960 North Shore Beach and Yacht Club Estates opened on north side of Sea, becoming a premier recreation site.

1967 Yuma Clapper Rail (*Rallus longirostris yumanensis*) is listed as an endangered species in the U.S. Its range includes the Salton Sea.



Yuma Clapper Rail. Bureau of Reclamation photo 1989.

1968 USGS records the Salton Sea surface elevation at 233 feet below sea level.

1968 The California legislature adopted a statute declaring the primary use of the Salton Sea for the collection of agricultural drainage water, seepage, and other flows (Assembly Bill 461, 1968; Statutes 1968, Chapter 392).

1969 Department of the Interior (DOI) and various Federal and state agencies complete a reconnaissance study of water quality concerns in the Salton Sea.

1970 Brown Pelican (*Pelecanus occidentalis*) is listed as an endangered species. Its range includes the Salton Sea.

1971 Salton Sea Project Act of 1971 (P.L. 92-76) authorizes DOI and other Federal and state agencies to conduct a feasibility investigation to provide alternatives for lowering the salinity and maintaining water levels in the Salton Sea.

1974 Salinity of the Salton Sea found to be approximately 38 parts per thousand (ppt) based on water quality sampling during the feasibility investigation.

1976/1977 Along with rising agricultural discharge levels and above average rainfall for the next 7 years, Tropical storms Kathleen and Doreen flood Bombay Beach and Salton City, destroying the recreation/leisure infrastructure.

1985 Reclamation records the salinity of the Salton Sea at approximately 40 ppt.

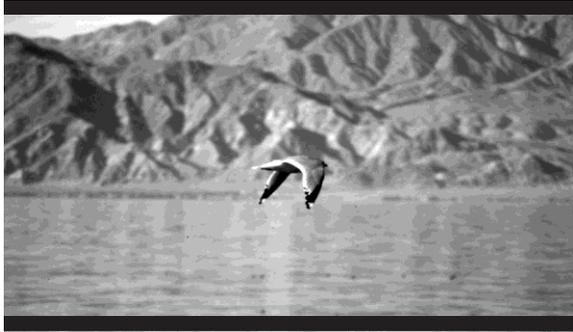
1986 Desert pupfish (*Cyprinodon macularius*) is listed as a federally endangered species in its entire range, which includes the Salton Sea.

1992 Title XI of the Reclamation Projects Authorization and Adjustment Act of 1992 (P.L. 102-575) authorizes, and Congress appropriates, \$10 million for Reclamation salinity control studies.

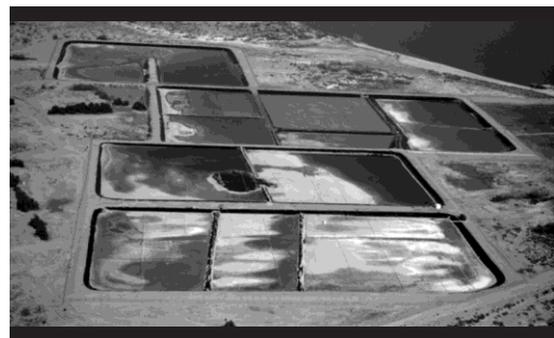
1992 Estimated 150,000 eared grebes die at the Salton Sea; mortality cause was not determined.

1993 The Salton Sea Authority is formed under the provision of Articles I and II, Chapter 5, Division 7, Title 1 of the government code of the State of California, “for the purpose of directing and coordinating activities relating to improvement of water quality and stabilization of water elevations and to enhance recreational and economic development potential of the Salton Sea and other beneficial uses, recognizing the importance of the Salton Sea for the continuation of the dynamic agriculture economy of Imperial

and Riverside Counties.” This Joint Powers Authority membership consists of Imperial and Riverside Counties, IID, CVWD, and the Torres Martinez Indian Tribe.

- 1995** USGS records the salinity of the Salton Sea at approximately 45 ppt.
- 1996** Type C avian botulism outbreak causes large-scale mortalities of white and brown pelicans. This die-off focuses national attention on the Salton Sea. An estimated 15 to 20 percent of western population of white pelicans and more than 1,000 endangered brown pelicans die at the Sea.
- 1997** Reclamation and the Salton Sea Authority provide a report to Congress which provides an evaluation of alternatives to address salinity and elevation concerns at the Salton Sea.
- 1997** A workshop is held in October 1997 in Palm Springs, CA which becomes the genesis for future scientific endeavors at the Sea. Workshop participants include U.S. Fish & Wildlife Service, California Department of Fish & Game, Reclamation, and USGS.
- 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 stabilize salinity and surface elevation, as well as maintain fish and wildlife populations and enhance the potential for recreation and economic development.
- 
- Shown is a portion of the Salton Sea. Reclamation photo 1998.*
- 1998** The Salton Sea Reclamation Act of 1998 (P.L. 105-372) authorizes and establishes the Salton Sea Research Management Committee and Salton Sea Science Subcommittee to conduct research into environmental issues impacting Salton Sea. Dr. Milt Friend was appointed as executive director.
- 1998** In August, 7.6 million tilapia and croakers die from oxygen being depleted due to algae bloom in Salton Sea. Scientific studies determined that the Sea may still have the most productive fishery in the world despite the massive fish die-off.
- 1998** Salton Sea Authority awarded \$4.875 million EPA grant to conduct scientific investigations described in P.L. 105-372. Restoring and Sustaining the Salton Sea: Supporting Science and Environmental Data Collection and Analysis 1998-2003. Project scientific oversight conducted by Science Subcommittee and USGS Salton Sea Science Office (formed in 2000, see below).
- 1999** Reclamation begins quarterly water quality monitoring at the Salton Sea (ongoing)
<http://www.usbr.gov/lc/region/programs/saltonsea.html>
- 1999** The Water Resources Development Act of 1999 (P.L. 106-53) authorizes the Secretary of the Army to provide technical assistance to Federal, state, and local agencies to implement restoration measures in the Sea.

- 2000** At the request of the DOI Deputy Secretary, the USGS Salton Sea Science Office is established to provide “continuity of the science effort, effectiveness of the science undertaken in support of the restoration project and efficiency of operations in serving management needs...”(Salton Sea Science Subcommittee, 2000).
- 2000** Reclamation and the Salton Sea Authority conduct a study at the old Salton Sea Navy Test Base to test the use of solar ponds and enhanced evaporation system technology to reduce salinity, as well as understand issues related to disposing of salt deposits produced from salt concentrating technologies.
- 2000** The Secretary of the Interior submits to Congress a Reclamation-produced Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and Strategic Science Plan for restoring the Salton Sea.
- 2000** Title VI of the Torres Martinez Settlement Act (P.L. 106-568) provides compensation to the Torres Martinez Desert Cahuilla Indians for reservation land submerged by increased irrigation and other drainage.
- 2001** The Imperial County Farm Bureau Voluntary Total Maximum Daily Load Compliance Program commence to reduce the amount of silt and mineral runoff (salts) entering the New and Alamo Rivers which discharge into the Salton Sea. The program proves to be very successful.
- 2003** California State legislature passes the Salton Sea Restoration Act that states, “the intent of the Legislature that the State of California undertake the restoration of the Salton Sea ecosystem and the permanent protection of the wildlife dependent on that ecosystem.”
- 2003** Reclamation submits a Salton Sea Study Status Report, which evaluates alternatives from the 2000 Draft EIS/EIR for the full or partial restoration of the Salton Sea.
- 2003** The Quantification Settlement Agreement (QSA) is executed to quantify IID, CVWD, and Metropolitan Water District’s share of California’s 4.4 million acre-feet of Colorado River water.
- 2004** The Water Supply Reliability and Environmental Improvement Act of 2004 (P.L. 108-361) requires the Secretary of the Interior, in coordination with the State of California and the Salton Sea Authority, to complete a feasibility study on a preferred alternative for Salton Sea restoration.
- 2006** USGS and Reclamation construct Shallow Saline Habitat Ponds (SHPs) on the southern end of the Salton Sea to evaluate the ecological risk to birds from selenium of a blended water strategy in created saline habitat ponds.



Aerial view of the Salton Sea Test Base, located at the Salton Sea in southern California. Bureau of Reclamation photo 2005.

2006 Pacific Institute publishes Hazard: *The Future of the Salton Sea with No Restoration Project* released May 1, 2006 (Pacific Institute, 2006).

2007 The Water Resources Development Act of 2007 (P.L. 110-114) authorizes \$30 million for Salton Sea Restoration (money was not appropriated).



Aerial view of the Shallow Habitat Project, located at the Salton Sea in southern California. Bureau of Reclamation photo 2005.

2007 In fulfillment of Water Supply and Reliability and Environmental Improvement Act of 2004, Reclamation releases a summary report titled Restoration of Salton Sea.

2007 State of California finalizes Programmatic Environmental Impact Report on Salton Sea Restoration.

2009 Brown Pelican (*Pelecanus occidentalis*) is removed from the list of threatened and endangered species. Its range includes the Salton Sea.

IID completes Phase 1 (365 acres) of managed marsh complexes in Niland, CA (QSA mitigation).

2010 USGS and Reclamation SHPs at the southern end of the Salton Sea are decommissioned. USGS publishes “*An Ecological Risk Assessment*” documenting that SHPs are a viable alternative for restoration of wetlands at the Salton Sea (Case III, H.L. et al. 2013).

2011 The U.S. Army Corps of Engineers (USACOE) and the State of California release the Draft EIR/EIS for the Salton Sea Species Conservation Habitat Project (SCH).

2012 State of California’s Financial Assistance Program awards \$1,194,154.00 to FWS to fund a portion of the Red Hill Bay Project (south end of the Salton Sea within the Sonny Bono Salton Sea National Wildlife Refuge), which will create 420 acres of shallow saline habitat for migratory birds; \$692,819.00 to IID/Sephton to fund a portion of the Salton Sea Water Habitat Pilot Project on the south end of the Salton Sea; and \$1,113,027.00 to Torres Martinez Tribe/SSA to fund a portion of the Tribe’s wetlands rehabilitation project, on the north end of the Salton Sea.

2013 The USACOE and the State of California release the Final EIR/EIS for the SCH. The preferred alternative permits 3,770 acres of shallow saline ponds at the mouth of the New River. (A Record of Decision has not been issued as of June 2015.)

2013 The University of California, Irvine (UCI), commences The Salton Sea Initiative (Initiative). The purpose of the Initiative is to harness the research, teaching, and service resources of the UCI campus to help address the multiple sustainability challenges faced by the Salton Sea region.

- 2014** IID completes Phase 2 (approximately 396 acres) of managed marsh complexes in Niland, CA.
- 2014** DOI and SSA enter into a Memorandum of Understanding on February 27, 2014, to facilitate collaboration and exchange of technical and scientific information regarding the resources of the Salton Sea.
- 2014** Genetics analyses prove that the endangered bird formerly known as Yuma Clapper Rail (*Rallus longirostris yumanensis*) is a subspecies of the newly designated Ridgway's Rail (*Rallus obsoletus yumanensis*), also classified as endangered.
- 2014** USGS convenes meetings for stakeholders, scientists, and managers to review all the Salton Sea science conducted to date to assess knowledge gaps, and make recommendations for immediate and near future science and monitoring needs, including anticipated funding requirements for Salton Sea management decisions.
- 2014** Pacific Institute publishes *Hazard's Toll: The Costs of Inaction at the Salton Sea* released on September 3, 2014 (Pacific Institute, 2014).
- 2014** The SSA and the Water Research Institute at Palm Desert Campus of Cal State San Bernardino establishes a Salton Sea Repository (includes materials of interest to the history and development of the region including the Coachella Valley and the Lower Colorado Watershed).
<http://wripdc.csusb.edu>
- 2015** The California State Water Resources Control Board convenes a workshop on March 18, 2015, in Sacramento California regarding the status of the Salton Sea and revised Water Rights Order 2002-0013, in response to a petition from IID in November 2014.
- 2015** The Little Hoover Commission (LHC) holds a public hearing on April 28, 2015, at the University of California Riverside Palm Desert Campus, to review the State of California's Salton Sea environmental mitigation and restoration governance strategy. (LHC conducted a subsequent hearing on June 25, 2015, in Sacramento). Their report was published on September 24, 2015.
- 2015** The IID Salton Sea Restoration and Renewable Energy Initiative (SSRREI) kick-off meeting is held on January 16, 2015 in Imperial, CA. The initiative is a collaborative incremental restoration approach designed to minimize environmental and air quality impacts, while using revenue generated by renewable energy projects to fund larger scale environmental mitigation and restoration efforts at the Sea. The SSRREI was released in July 2015.



View of the Salton Sea. Bureau of Reclamation photo 2005.

- 2015** Reclamation records the salinity of the Salton Sea during the quarterly May sampling at approximately 57 ppt.
- 2015** The State of California announces Bruce Wilcox as the new Assistant Secretary for Salton Sea Policy for the Natural Resources Agency on September 2, 2015.
- 2015** Pacific Institute publishes the Salton Sea Export-Import Infographic/video at <http://pacinst.org/publication/salton-sea-importexport-plans/> on September 29, 2015.
- 2015** November 5 groundbreaking event for FWS-IID Red Hill Bay wading bird habitat/dust suppression project.
- 2015** November-December: State of California convenes series of Salton Sea Management Plan agency stakeholder workshops.

Sources:

- Black, G.F. 1988. California Dept. of Fish and Game, California. Inland Fisheries Division, Description of the Salton Sea sport fishery, 1982-1983. Inland Fisheries Administrative Report No. 88-9. Retrieved June 15, 2015 from <http://www.sci.sdsu.edu/salton/SSSportFishery1988.html>
- Buwalda, J.P., and W.L. Stanton. 1930. Geologic events in the history of the Indio Hills and the Salton Basin. *Science*, 71:104-106.
- Carpelan, L. H. 1958. The Salton Sea. Physical and Chemical Characteristics. *Limnology and Oceanography*, Volume 3, Issue 4, 373-386.
- Case, H. L., III; Boles, J., Delgado, A., Nguyen, T., Osugi, D., Barnum, D. A., Decker, D., Steinberg, S., Steinberg, S., Keene, C., White, K., Lupo, T., Gen, S., and Baerenklau, K. A. 2013. Salton Sea ecosystem monitoring and assessment plan, USGS Open-File Report: 2013-1133. Retrieved on June 30, 2015 from <http://pubs.er.usgs.gov/publication/ofr20131133>
- Cockerell, T. D. A. 1946. The age of Lake Cahuilla. *Science*, 103:235.
- de Stanley, M. 1966. The Salton Sea yesterday and today. Los Angeles: Triumph Press.
- Dowd, M.J. 1956. IID: The First 40 Years. Retrieved on June 16, 2015 from <http://www.iid.com/home/showdocument?id=6000>
- Golden Gate Audubon Society. Retrieved on June 9, 2015 from <http://goldengateaudubon.org/blog-posts/farewell-clapper-rail-hello-ridgways-rail/>
- Holbrook, G.F. 1927. Probable future stages of Salton Sea. U.S. Geol. Surv., 27 pp. (Typed).
- MacDougal, D.T., (Ed.). 1914. The Salton Sea. Carnegie Inst. Wash., Publ. No. 193. 182 pp.
- Pacific Institute. 2006. Hazard: The Future of the Salton Sea with No Restoration Project. Retrieved June 22, 2015 from <http://pacinst.org/wp-content/uploads/sites/21/2014/04/hazard.pdf>
- Pacific Institute. 2014. Hazard's Toll: The Cost of Inaction at the Salton Sea. Retrieved June 22, 2015 from http://pacinst.org/wp-content/uploads/sites/21/2014/09/PacInst_HazardsToll.pdf
- Salton Sea Science Subcommittee January 2000. Strategic Science Plan Salton Sea Restoration Project.
- Sheikh, P.A., Stern, C.V., and Levin, A.M. 2013. Overview of Management and Restoration Activities in the Salton Sea. Congressional Research Service
- Torres Martinez Compact. 2003. Retrieved June 9, 2015 from http://www.cgcc.ca.gov/documents/compacts/original_compacts/Torres-Martinez_Compact.pdf
- U.S. Department of the Interior and California Department of Fish & Game. October 1997. Saving the Salton Sea: A Research Needs Assessment. 96 pp.
- U.S. Department of the Interior and The Resources Agency of California. October 1969. Salton Sea Project Federal-State Reconnaissance Report.
- U.S. Department of the Interior and The Resources Agency of California. April 1974. Salton Sea Project Federal-State Feasibility Report. 5 vols.
- U.S. Fish and Wildlife Service. 1993. Desert Pupfish Recovery Plan. Phoenix, Arizona. 67 pp.
- Walker, B.W. 1961. Fish Bulletin No. 113. The Ecology of the Salton Sea, California, in Relation to the Sportfishery. Retrieved June 15, 2015 from <https://escholarship.org/uc/item/1r11f7hq>
- Water Resources Institute. California State University, San Bernardino, Palm Desert Campus. Retrieved June 19, 2015 from <http://wripdc.csusb.edu/>.