

**REPORT
on
CONSERVATION OF THE BENEFICIAL WATER USES OF
SALTON SEA IN CALIFORNIA**

Adopted December 12, 1963

by

COLORADO RIVER BASIN REGIONAL WATER POLLUTION CONTROL BOARD

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The Salton Sea Advisory Planning Committee comprises representatives from the following agencies:

CALIFORNIA STATE DEPARTMENT WATER RESOURCES

CALIFORNIA STATE DEPARTMENT FISH & GAME

CALIFORNIA STATE DIVISION BEACHES & PARKS

IMPERIAL IRRIGATION DISTRICT

COACHELLA VALLEY COUNTY WATER DISTRICT

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information and materials for this report:

AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA

HOLLY CORPORATION, representing SALTON CITY and DESERT SHORES

TRAVIS ROGERS, Representing NORTH SHORE BEACH ESTATES

FOREWORD

Situated in Southern California near one of the greatest centers of population in the United States (the metropolitan complex which is encompassed within the Los Angeles-San Diego - San Bernardino triangle), Salton Sea today is providing excellent residential-recreational features, including sports fishing and water-contact sports enjoyment for millions of people at reasonable cost and within close driving distance of their places of residence and occupation.

The elevation of this unique inland lake is located approximately 232 feet below the surface of Pacific Ocean. Although drainage waters from adjacent valleys flow into Salton Sea, water cannot drain out. Inflow of water is balanced approximately by surface evaporation but the salts remain. Based upon information presently available, the salinity of Salton Sea is slowly increasing, such that, unless water quality control measures are employed, after a few decades the water will become too salty to support a sports fishery, or to be useful for water-contact sports.

During its 1963 General Session, the California Legislature adopted "Assembly Concurrent Resolution No. 49 - Relative to Water Quality of the Salton Sea". Therein, the Legislature urged the State Water Quality Control Board and the Colorado River Basin Regional Water Pollution Control Board to take extraordinary precautions to prevent pollution in order to retain the vital Salton Sea area as an attractive recreational and residential community; giving due regard. However, to the primary beneficial use of Salton Sea for storage of waste and seepage water from irrigated lands, and for the corollary beneficial use of providing for regulated disposal of treated domestic and commercial wastes from watershed communities. In compliance with this directive of the California State Legislature, The Colorado River Basin Regional Water Pollution Control Board, through and in cooperation with the State Water Quality Control Board is coordinating the development of a water quality control plan whereby the salinity of Salton Sea may be permanently retained at a level which is conducive to propagation of saline water type aquatic and wildlife resources, and to the enjoyment of water-contact sports activities. Basically, the control plan involves ponding off a portion of Salton Sea to concentrate salts and effect physical removal.

The purpose of this report is to explain the value of recreational-residential development and usage of Salton Sea, the need to preserve water quality, and thereby retain the beneficial uses, and a plan and program by which this may be accomplished.

SOURCE WATERS OF SALTON SEA

Salton Sea is located in a geologic sink area. Although the sink is a natural phenomenon, the Sea itself is man-made, in that the replenishment waters are derived from drainage of farmlands in Mexicali, Imperial and Coachella Valleys. These desert valleys have been converted into lush farmlands through the importation of water from Colorado River via the All-American Canal system (California), and the Canal del Alamo (Mexico).

In California, irrigation water diverted from Colorado River at Imperial Dam, is conveyed approximately 50

miles westward, and there distributes to the Imperial Valley farmlands. The Coachella Branch of the All-American Canal, extends northwesterly 123 miles into Coachella Valley₁ and there distributes water to farmlands.

Development of the agricultural economy of Imperial and Coachella Valleys has progressively increased over the years, such that today these valleys constitute one of the richest agricultural areas in the world. During 1962 these valleys produced in excess of 240 million dollars worth of food and fiber.

The farm drainage, or return irrigation waters, from these valleys enter Salton Sea principally via the New and Alamo Rivers (Imperial and Mexicali Valleys) and via the Whitewater River (Coachella Valley). Individual drains which are not hydraulically located to enter these rivers, discharge directly into Salton Sea. These irrigation drains, along with certain natural watercourses, also intermittently discharge storm runoff and seepage waters to Salton Sea.

The use of Salton Sink, as an integral part of this vast irrigation system, to receive waste and seepage waters from irrigated land, was established by the Federal Government during the 1920's. Such use, along with natural drainage from the combined watershed, constitutes the primary beneficial uses of Salton Sea.

Development of recreational-residential features in and around Salton Sea has created additional beneficial uses of the Sea waters. Such beneficial uses include sports fishing, water-contact sports activities, and boating. This report is concerned with control of water quality in Salton Sea, for the purpose of retaining these beneficial uses on a permanent basis.

RESIDENTIAL - RECREATIONAL DEVELOPMENT

Today Salton Sea is the major inland water recreational facility of Southern California, Recreational features include fishing and hunting, boating, swimming, water skiing, and esthetic enjoyment. Recreation along the shoreline includes golfing, picnicking and camping.-3

The Sea presently receives over three million visitor-days of recreational use per year, and can easily accommodate many times this quantity of usage, as development is warranted. Salton Sea State Park alone receives over one million visitor-days of use per year. Several million dollars of recreational-residential developments surround the Sea, and are dependent upon it. Salton City, Salton Sea Beach, Desert Shores, North Shore Beach Estates, Desert Beach, Mecca Beach, and Bombay Beach are the major "on-shore" communities, and consist of over 30,000 subdivided lots, with thousands of homesites and attendant commercial establishments. Salton City alone has 15,000 subdivided lots. In addition, the economy of several "off-shore" communities are affected by tourism and general services to the Salton Sea area.

As previously mentioned, the proximity of Salton Sea to the metropolitan complex which is encompassed with the Los Angeles-San Diego-San Bernardino triangle (10 million people) is an added feature of its attractiveness as a recreational outlet. That portion of the industry and commerce of this metropolitan complex which is associated with sporting goods (including boats and trailers) has a definite dependency upon retention of the recreational features of Salton Sea.

Salton Sea may be considered as "the average man 35 playground". This is so, mainly because of the following factors.

1. By far, the greater portion of the shoreline is owned by public agencies. A considerable portion of the privately-owned shoreline is being developed for community purposes.
2. Due to the general quiescent surface of Salton Sea, smaller boats may be used thereon.

3. The main population centers of Southern California are located between 90 to 140 miles from Salton Sea, such that round trip driving from centers of population does not exceed five hours.

4. Salton Sea is flanked by main arterial highways. U.S. 99 runs along the southwest shoreline between Los Angeles and El Centro. State Highway 111 runs along the northeast shoreline between Palm Springs and El Centro. U.S. 80 connects San Diego to El Centro, at U.S. 99.

Any discussion of the recreational assets of Salton Sea must include a statement on the excellent sports fishery which was developed by the California State Department of Fish and Game, through the transplanting of salt-water aquatic species (principally from the Gulf of California). The success of the sports fishery is documented by the many thousands of fishermen and their bountiful catch. The principal sports fish is corvina, which is excellent to eat. The Sargo Perch, a pan-size fish, is also abundant and makes delicious eating.

The recreational-residential and dollar-value features of Salton Sea are not confined to the Sea itself, nor to the shore areas surrounding the Sea. Nor are these features and values confined to the cities and communities of Imperial and Coachella Valleys. The use and value of Salton Sea extends throughout the metropolitan complex which is encompassed within the Los Angeles-San Diego-San Bernardino triangle; and may be measured in terms of the pleasure and commerce which it provides to millions of people in Southern California.

YEARLY VISTOR - DAYS ATTENDANCE AT SALTON SEA STATE PARK 1953-1963

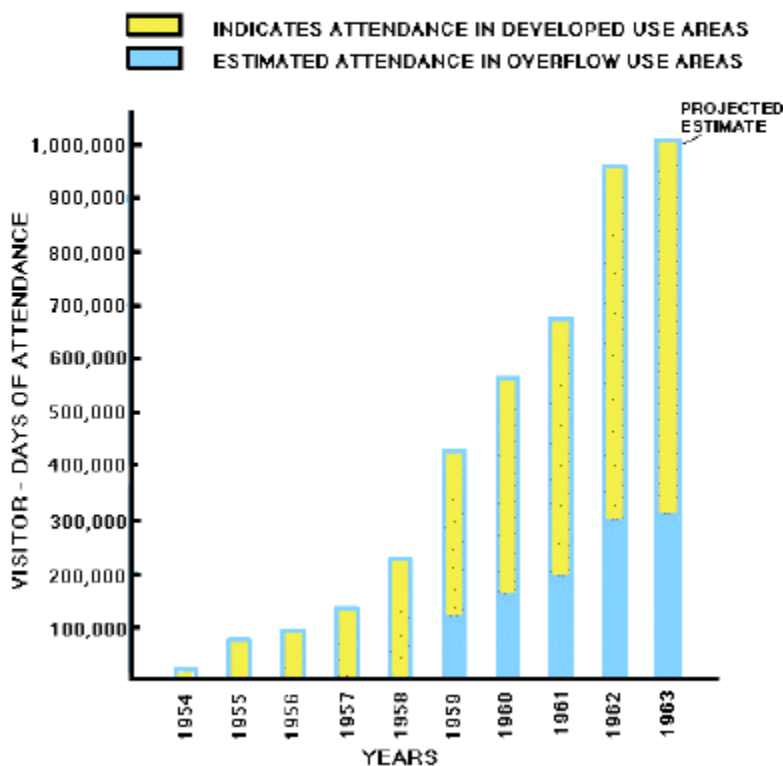


Figure 1. Yearly visitor - says attendance at Salton Sea State Park 1954-1963

SALINITY CONSIDERATIONS

The basic source waters of Salton Sea are obtained from return irrigation and treated waste water discharges from Mexicali, Imperial and Coachella Valleys. In California, Colorado River water is imported through the All-American Canal, and is used beneficially for irrigation and municipal purposes. Irrigation return waters required for soil salinity control, and municipal waste waters are discharged to channels tributary to Salton Sea. Approximately 1 1/2 million acre-feet of water with a salt content of approximately 2600 parts per million reaches Salton Sea annually.

Being in a sink area, Salton Sea does not have a drainage outlet. Due to the desert's warm and arid climate, a six-foot depth of water is evaporated from the Sea surface annually. Although the water losses by evaporation approximate the total water input, the elevation of the Sea has increased 1 1/2 feet in the five year period 1957 to 1962. Since the largest source of inflow to the sea is return irrigation water from three large areas and quantities of such flows are not predictable nor controllable, no accurate estimate of future sea elevation can be made at this time.

Since salts are not removed through evaporation, an overall, gradual increase of salinity is occurring in Salton Sea. Today the salt content is approximately 34,200 parts per million which is about equal to that of the oceans. However, the ionic composition of Salton Sea waters differ from ocean water, in that Salton Sea water contains relatively less magnesium, potassium, and chloride ion; about the same proportion of sodium; and more sulfate, calcium, bicarbonate and carbonate ions than are present in ocean water.

In the period 1951 to 1961, the total computed tonnage of salts in the sea increased from 226 million tons to 261 million tons. However, during this period, the concentration of salts decreased from 37,630 ppm in 1951 to 34,620 ppm in 1962 due to the dilutional effect of the 1,126,500 acre-feet of relatively fresh water inflow which went into storage in the sea during the period. During the period 1955 to 1959, when the net change in water volume in the sea was negligible, the salt concentration increased from 31,600 ppm to 34,320 ppm. These records indicate that when the elevation of the Salton Sea is stabilized, the concentration of dissolved salts will steadily increase. A further factor which must be considered is that there will be some increase in the annual amounts of salt entering the Sea as additional drainage is installed within the agricultural areas.

EFFECT UPON SPORTS FISHERY

Predictions as to the effect of salinity increase upon the fishery of Salton Sea are based upon scattered, diverse, and not very direct information. However, it seems possible that under the present rate of salt inflow, the Sea's game fish and the food chain which supports it could be seriously affected, and possibly destroyed in the next 20 to 40 years. This time estimate is obviously subject to considerable variation.

The present fish life in the Salton Sea consists largely of species which are tolerant to salinity changes, and so it is probable that it can exist about as long as any combination which might be considered. Therefore it does not seem likely that introducing different varieties would prolong the life of sports fishery appreciably.

EFFECT UPON WATERFOWL

Any large increase in salinity in the Sea would adversely affect the shoal grass which has been established as a food for waterfowl. The Sea has long been a concentration point for migratory waterfowl.

EFFECT UPON WATER-CONTACT SPORTS

Since there is no basis for comparison, it can only be presumed that the Sea's attractiveness as a water-contact sports area may decrease with a major increase in salinity.

OTHER ITEMS AFFECTING WATER QUALITY

Besides the gradual increase of salinity, there are other items which should be given consideration from the standpoint of effect upon water quality. Principal among these is algae, which probably results from an excessive nutrient content in the Sea. Besides causing an increase in turbidity, algae are suspected to be the principal cause of a "red tide" which sometimes covers a portion of the Sea surface.

Some silt is conveyed to Salton Sea via the natural channels and irrigation drains. It is presumed that such conveyance of silt affects Sea dimensions and turbidity.

WATER QUALITY CONTROL

Preservation of the sports fishery and water-contact sports features of Salton Sea require that water quality control measures be instituted at the earliest possible date, consistent with the fact that any such program must be based upon carefully planned studies. By far, the most basic problem is salinity control. Algae and silt control are also important.

It must be emphasized, however, that the primary use of Salton Sea is to receive natural and agricultural drainage and seepage waters. **This primary use of the Salton Sea cannot be ignored.** On the contrary, any water quality control and must provide fully for the retention of this important economic use, and further, any such plan must be so oriented as to not cause interference with agriculture and the discharge of return irrigation waters.

There is reason to believe, however, that a well engineered plan can be developed which would in effect reduce the area required for final waste water disposal and at the same time conserve a large portion of the Salton Sea for recreation, fishing, wild life preservation, and related esthetic values. In fact it is possible that flexibility can be built into a water quality control project such that water quality in the recreational sea area can be improved and a measure of stability of the sea elevation achieved. In addition, it may also be possible to mine salts or minerals from the final disposal area.

The proposal of water quality control in Salton Sea is presently in its infancy. This proposal involves ponding off a portion of the Salton Sea and some plan for the removal of salts. The thinking so far on this shows that water quality control of the Salton Sea will be a major project. Successful accomplishment of any such project must be based upon carefully planned scientific, engineering and economic studies, preceded by a "Reconnaissance Investigation and Report", prepared by competent authorities. Such investigation and report should include but not necessarily be limited to, consideration of

- (1) Project feasibility as a whole Preliminary engineering designs.**
- (2) Preliminary engineering designs.**
- (3) Cost estimates.**
- (4) Benefit appraisal.**
- (5) Review of legal and right-of-way problems.**
- (6) Political entity or entities to own and/or operate the project.**
- (7) Equitable apportionment of costs.**
- (8) Preliminary considerations of location(s) of the project and disposals.**
- (9) Industrial potentials.**

(10) Financing.**(11) Other pertinent data.**

SUMMARY

1. Today Salton Sea is the major inland water-recreational area of Southern California₁ with an annual attendance of over three million visitor days. Being located adjacent to the metropolitan complex which is encompassed within the Los Angeles-san Diego-San Bernardino triangle (10 million: people)₁ Salton Sea provides water recreational facilities for millions of people at reasonable cost, and within close driving distance of their places of residence and occupation.
 2. Salton Sea receives approximately 1 1/2 million acre feet of replenishment water annually from Mexicali, Imperial and Coachella Valleys. Since the Sea is located in a geological sink area, it does not have a drainage outlet. Loss of water occurs through evaporation only. The salts are retained in the Sea, and the salinity gradually increases. The salinity of Salton Sea is presently 34,200 parts per million, which is approximately equal to that of the oceans.
 3. It seems possible that under the present rate of salt inflow, the food chain which supports the fishery will be seriously affected, and possibly destroyed in the next 20 to 40 years.
 4. It is presumed that the Sea's attractiveness as a water-contact sports area may decrease with a major increase in salinity.
 5. If destruction of Salton Sea's sports fishery and water-contact sports features were to happen it would seriously and very adversely affect the total recreational-residential values of the Salton Sea area.
 6. The sports fishery and water-contact sports features of Salton Sea can be retained permanently, provided water quality control measures are instituted. From a strictly engineering stand-point, salinity control (which is the basic problem) can be achieved by ponding off a portion of Salton Sea for concentration and removal of minerals.
 7. The agricultural income of the Imperial and Coachella Valleys has steadily increased through the years. The 1962-63 income was 240 million dollars. Therefore, any such water quality control plan must be based upon the fact that the primary beneficial use of Salton Sea is to receive natural and agricultural drainage and seepage waters₁ and must be so oriented as to not cause interference with agriculture and the discharge of return irrigation waters.
 8. A first step of programming for water quality control requires the obtainance of a Reconnaissance Investigation and Report, prepared by competent authority. The cost of obtaining such report will require a substantial sum of money.
 9. Considering the possible "by-products" of any such project the employment of a consulting civil engineering firm with industrial experience is logical.
 10. Retention of the recreational-residential features of Salton Sea is of greater than local interest.
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NORTH SHORE BEACH ESTATES

Containing a private yacht club, marina, hotel, airport, and residential-recreational community

Recent Statistics:

Yacht Club has 2500 members.

87 boat slips and 50 moorings.

150 spaces for dry boat storage.

2500 subdivided lots - 1500 lots presently Bold.

Yacht Club averages 100 visitors per day, or 36,500 per year.

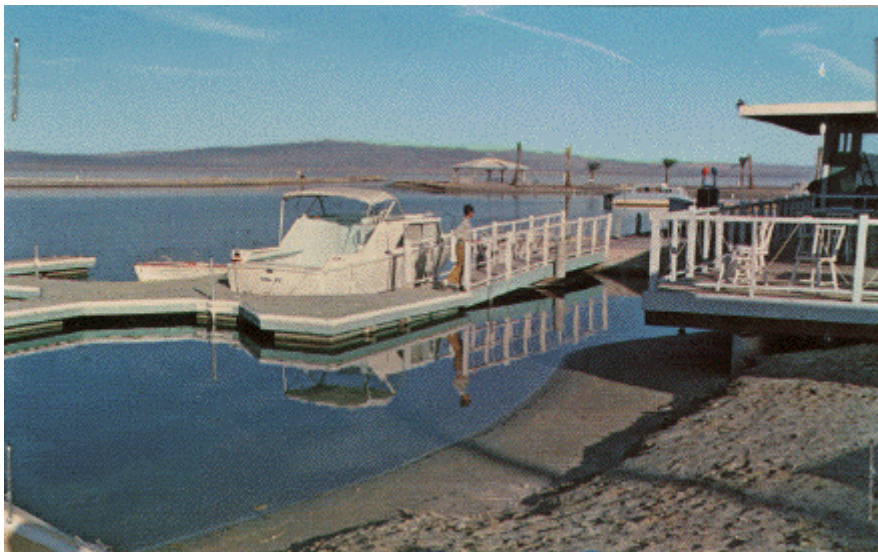
Main features are fishing, water skiing, and boating.



WATERFRONT AT SALTON CITY



SALTON BAY YACHT CLUB



YACHT HARBOR AND BOAT LAUNCHING FACILITIES

In addition to its marina's and yacht club, Salton City contains a golf course, private airport, commercial area, and over 15,000 sub-divided lots.

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