The Salton Sea fits well into the American public's image of southern California as a fabulous place that has been conjured into existence. After all, what is now regarded as an invaluable asset did come into being through an engineering mistake! For about eight months (during 1905-06, with a renewed break in 1907) the full flow of the Colorado River flooded about 518 square miles of a formerly dry, salt-encrusted basin 274 feet below sea level to create California's largest lake (Figure 1). Originating as an unintentional end-product of one of the greatest disasters in California's history, this desert lake strikingly illustrates man's ability to transform the face of the earth.

But the story of the Salton Sea's origin is well-known. More important for an understanding of present-day man in California are its most recent developments, for this desert lake also affords a prime example of changing human interpretations of what constitutes a valuable resource. The problem is that the use of the Salton Sea is being interpreted by different people in different, and even
mutually contradictory, ways. One vivid example is the bathhouse at the resort of Desert Beach on the north shore, which was built in 1948 only to be flooded out and abandoned by 1953. Competition may be "the spice of life," but it is also creating some man-made difficulties of increasing complexity. Compromise solutions are seldom easy, and the long-term use of the Salton Sea will involve all the engineering, biological, political, and economic skills Californians can master.

The history of the use of the Salton Sea is a story of ever-increasing intensity for ever more varied purposes. Present uses, listed in approximate order of chronologic development, are multiple:

- Agricultural Sump or Drainage Basin
- Urban Waste Disposal
- Conservational - Migratory Bird Refuge
- Armed Forces Test Base-U.S. Navy; Atomic Energy Commission
- Recreational-Hunting, Fishing, Boating and Water Sports,
  Camping
- Residential

**USE AS AN AGRICULTURAL SUMP OR DRAINAGE CATCHMENT BASIN**

In 1907, at the time of closure of the break of the river, the sea covered 331,000 acres and had reached a maximum elevation of 198 feet below sea level (Figure 2). This was its maximum size and highest surface elevation. The present pattern of railroad and roads, upslope at a considerable distance from the nearest seashore, derives from their placement during and shortly after this high sea

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**Table of Changes in Shorelines with Changing Surface Levels**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>LEVEL (FT)</th>
<th>AREA (SQ. MI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>-198</td>
<td>518</td>
</tr>
<tr>
<td>1925</td>
<td>-249</td>
<td>266</td>
</tr>
<tr>
<td>1956</td>
<td>-235</td>
<td>347</td>
</tr>
</tbody>
</table>

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stand of 1907.

Over the next dozen years an excess of evaporation over inflow caused the elevation of the sea to drop rapidly. By 1920, its depth had decreased from 79 to 25 feet in this arid region which receives an annual average rainfall of only three inches. Meanwhile, the Colorado Desert was being conquered, to become the Imperial Valley. The disaster of 1905-07 was but a tragic interlude in the epic story of the diversion of Colorado River water that began in 1901 and went on to become the greatest single irrigation development in the United States — a canal system now 1,800 miles in length. By 1925, irrigation development had reached a point where water flow to the sea had caught up with evaporation and the minimal low point of 249.6 feet below sea level was reached. The decade 1925-1935 witnessed fluctuations with an amplitude of 7 feet: rising to -243 feet by 1931, due in part to a plentiful water supply for irrigation and in part to several severe local winter storms, then dropping to -248 feet in 1935, due particularly to a water shortage in 1931 and 1934.

Since the beginning of storage of the Colorado River behind Hoover Dam in February, 1935, there has been an ample water supply available to the lower river, and the sea has been rising, although at varying rates. It is now at approximately -234 feet, and varies about one foot annually, being highest in April and lowest in October. Some 1,376 miles of drainage canals and 128 miles of the Alamo River and New River channels serve as main outlets to the sea from the more than 3,700 miles of tile draining the 5,500 farms occupying over half a million acres in Imperial Valley. To the north, in Coachella Valley, some 75,000 acres are irrigated by Colorado River water, and these lands, too, are drained into the sea.

A very important use of the Salton Sea is to maintain a “salt balance” in the irrigated areas tributary to the sea. In order to assure continued production of an irrigation project, it is necessary to remove from the project each year, on the average, at least as much salt as is brought into it yearly with the irrigation water. Until 1949, the amount of salt being removed from the Imperial Valley each year was less than that being brought in. Commencing in 1949, there has been a favorable salt balance, with over 4 million tons of dissolved salts annually draining into the sea. It follows that any increase of salt brought into the valley (for example, diversion of fresh water in the headwater, or Upper Basin, region will increase the salinity of waters of the Colorado River) will require an increase of drainage-water flushing salt into the sea, thus raising the level.

The importance of the Salton Sea as a drainage basin has been realized for a great many years, and studies have been made, from
time to time, of what might be expected in the future. In 1924, the federal government, by executive order, withdrew from all forms of entry all public lands of the United States in the Salton Sea area lying below -244 feet, and created a Public Water Reserve. At the time the elevation of the sea was its minimum point of -250 and a vertical difference of 6 feet was thought to be sufficient. In a 1927 report, the United States Geological Survey concluded that the future stabilized elevation of the sea might be between -223 and -226 feet, but for safety the maximum elevation should be considered as 220 feet below sea level. This is about 14 feet higher than the present sea level. Based on these conclusions, the federal government, by another executive order, withdrew more lands from public entry, adding the area lying below -220 feet to the Public Water Reserve created in 1924.

The Imperial Irrigation District, the administrative operating agency for all Colorado River water and power channeled into the valley, has expended over a half million dollars acquiring fee title to, or flooding rights on, practically all of the private lands under and around the Salton Sea lying below the -230 foot elevation. The district, a private cooperative enterprise, realizes that the sea may reach a higher elevation in the future, but feels that this much drainage reserve is as much acquisition as the district can undertake.

The importance of the Salton Sea as an agricultural sump or drainage basin for the flushing of salt is far greater than its immediate benefits to the 71,000 inhabitants of the Imperial County. The valley enabled the county to rank seventh nationally in the value of its agricultural products. More cattle are fed here than in any county in the eleven Western States; over 60 vegetable fruit and nut and field crops are grown in the valley, 14 of which bring in $1,000,000 or more, for a gross-income in 1958-59 of about $138,000,000. The valley is literally the food basket for metropolitan Southern California, as well as for winter fruits and vegetables for much of the rest of the United States and Canada. It is a unique and valuable place with an unbeatable combination of ample sunshine and water. Where else can farmers grow winter vegetables and raise cattle in the same hothouse!

USE FOR URBAN WASTE DISPOSAL

This sea is a sump for more than agricultural drainage. Imperial Valley towns that grew to cities during the past half-century continue to dump their untreated domestic sewage into New and Alamo Rivers which lead into the Salton Sea (Figure 3). However, they have come under pressure from the state and the local Chambers of Commerce to cease such practice.
Since 1956 the State Department of Health and the Colorado River Basin Regional Water Pollution Control Board have contended that four cities—Calipatria, Brawley, Calexico, and Mexicali, plus the U. S. Naval Air Station west of El Centro—are endangering recreational use of the sea. Prolonged "campaigns of persuasion" have been waged with the local city officials. Brawley has objected to "spending $350,000 to $400,000 for a sewage disposal plant to protect a few acres of the Salton Sea." Calexico has defended itself on the grounds that its larger twin city of Mexicali, Mexico, dumps more sewage into the New River than "all Imperial Valley combined." Mexicali, of course, lies outside California's jurisdiction, but it, too, is seeking funds for treatment-plant construction during
1961. In April, 1960, the Pollution Control Board "got to" and ordered Brawley and Calipatria to build sewer plants and quit dumping raw sewage into the Salton Sea by October 30, 1961.

Bacteriological studies of collected samples of Salton Sea show that there is pollution in a 30-square-mile area in the south end of the sea, from the point where New and Alamo Rivers enter, extending northward to immediately south of Bombay Beach on the eastern shore. This area has been posted as closed to water sports. The problem of water pollution has become acute not from any marked rise in the amount of pollution, but because of intensified use of the desert lake for other purposes - recreation and residential development.

RECREATION: FISHING

Though of fresh water origin, the Salton Sea now has a total salt content comparable to that of the ocean. The fauna of the sea consists of hardy marine animals able to tolerate a great annual temperature range of over 400 F., extreme high summer temperatures in the upper 90's (about 80 days over 1000 F.), and periods in summer of high concentrations of sulfide and ammonia and of oxygen depletion at the bottom.

The predominant plants of the sea are dinoflagellates, diatoms, and other single-celled algae. These serve as food for zooplankton, and together they comprise the rich bottom mud on which the pileworm, Neanthes, feeds. These worms, introduced from San Diego Bay in 1930 are present by the billions, and are the principal food for small fish and salt vital link in the Salton Sea food chain. The Gulf croaker, Bairdiella, a bait-sized fish introduced in 195051 from the Gulf of California, has built up in great numbers. Its establishment provided the kind and quantity of food for predatory fish. Orangemouth corvina, a close relative of white sea bass, were introduced almost yearly from 1950 to 1955, and this game fish has established itself, adding another link to the food chain.

Corvina grow to about 3 pounds in their third year and 12 pounds in their fourth year. Specimens ranging up to 16.5 pounds have been caught on ocean-type wobbling spoons suitable for yellowtail. The principal fishing is from boats, since corvina is a school-fish chasing the schooling croaker, but early-morning surfing, by wading out from shore in swim trunks, has proved successful, especially during spring when corvina spawn around the inshore areas. A corvina population estimated at well over 1,000,000 ("boosters" say several million) assures successful fishing, which, together with a year-round day-and-night fishing season and daily limit of six fish, is attracting more and more people and their boats to the sea.
RECREATION: BOATING, WATER-SPORTS, SWIMMING, AND CAMPING

A desert lake convenient of access by paved highway from the Los Angeles metropolitan area has been a mecca for speedboaters, and water-skiers. There were more boats than autos sold during 1959 in Southern California; these small pleasure craft must now be registered with the State Department of Motor Vehicles under a law approved by the 1959 State Legislature. Pleasure boating and outboard racing have been stimulated for the Salton Sea by the shore-based facilities, focused at access points or launching areas provided by both private developers and public agencies.

Salton Sea State Park was established in 1954 on the northeast shore. About one-third of its 24-mile shore is still in private hands, but the State Division of Beaches and Parks is buying these private properties that now split up the park in about a dozen places, with the goal of a continuous of park-site between Highway 111 and the shoreline. Improved facilities include 50 elaborate camping places for tents and small trailers with ramadas, tables, stoves, food lockers, toilets, and showers, a bathing beach and picnic area, a launching ramp for trailered boats, a turning basin protected from the wind, and a boat beach for water-skiers. Over 175 more campsites are planned, to make the park the second largest in California. In 1959 there were 308,500 visitors. At present, week-ends are congested. On Memorial Day week-end, 1960, there was a daily average 11,040 visitors in 2,760 cars, with 1,073 boats on the water along both improved and unimproved beaches.

The Coachella Valley Advisory Planning Committee has led a fight against state acquisition of the private parcels, arguing that more tourist are needed along the northeast shore and that to rule out private enterprise would be to lose a sizable chunk of tax base. To counter this argument, the state park plans to offer lease arrangements under which private developers can build such facilities as motels, restaurants, and possibly trailer parks, and operate them under state supervision.

But private enterprise elsewhere is capitalizing on the attraction of is sea as a recreational base, whether for the seasonal parking of trailers for permanent homes. North Shore Beach Estates, for example, is a "membershp association" with a private yacht club which offers docking and landing services, with boat slips, storage lockers, fresh water, and electricity Recently added was a 48-unit two-story motel. Boating involves a combination of recreational activities. Fishing, picnicking, camping, sightseeing, resting, speedboat racing, water-skiing, A swimming are associated activities. Except for fishing, offshore portions of the sea are used
much less intensively than are the near-shore portions near the launching areas. Boating also competes with other recreational uses of the sea. Powerboats and skiers conflict with fishermen, sailboaters and swimmers. The noise of powerboats is objectionable to people seeking a quiet, restful experience.

Closing of the southeast end of the Salton Sea to water sports because pollution has been a failure, because people pay no attention to signs and there is wholesale violation, especially on the weekends. It is possible, but impracticable, to enforce the closure by patrolling the area by boat. Officials of the two counties (Imperial and Riverside) in which the sea lies have discussed the possibility of a cooperative venture to enforce county and state boating-safety regulations, with responsibility for enforcement over the whole sea delegated to the Imperial County sheriff's office.

Clearly, the invasion of powerboats will increase the problems of the federal and state agencies charged with operating the south shore of the sea as a migratory bird refuge. The Fish and Wildlife Service of the U.S. Department of Interior manages the Salton Sea National Wildlife Refuge which covers more than 50 square miles.

RESIDENTIAL DEVELOPMENT

There are a number of striking real estate developments on the north and west shores of the Salton Sea—Desert Beach Resort, North Shore Beach Estates, Desert Shores, Salton Sea Beach—but the most fabulous is Salton City.

Salton City did not exist three years ago. A tract of 19,600 acres along Highway 99 on the western shore in Imperial County was purchased in 1957 by a Los Angeles syndicate, and subdivisions were first offered for sale by nine sub-developers on May 17, 1958. On the opening week-end over four million dollars worth of property was sold. In the first year $30,000,000 worth of bare desert lots was purchased by the general public; 110 miles of roads were graded, and 30 miles were paved. On the occasion of its second anniversary the city contained a 4,500-foot airport landing strip, 2 gas stations, 2 restaurants, 2 motels, 2 marinas or boat harbors, a hardware and boat shop. Thirteen thousand lots had been recorded, but only 60 homes had been built upon them. The zoning plan even includes a section for light industry. Electricity is supplied by the Imperial Irrigation District.

Although commercial buildings completed by spring, 1960, were valued at more than two million dollars, Salton City still mostly resembles a "mirage." One rubs one's eyes in disbelief at the "fancy" buildings along the highway, the miles of bulldozed and paved roads complete with name-signs at intersections that criss-cross many vacant square miles of perfectly barren desert. There
has been a tremendous expenditure for publicity by means of colored half-page advertisements in national magazines, in newspapers throughout California, by billboards, brochures, radio and television announcements, and a host of air and water "events." Speculation is rampant; the many purchasers of "city" lots are hopeful they are in on the ground floor of the new "Palm Springs-by-the-Sea." Not much is advertised about water supply and sewage disposal. Wells several miles to the west care for a population of 300 and the heavily mineralized water must be treated before drinking or cooking. Clay soils are not favorable for septic tanks and cesspools, except temporarily, and oxidation ponds and a sewage-treatment plant are to be located south of the city. Neither is anything said about the effects of the gradually-increasing salinity of the sea; present estimates are that about two decades the sea will become too heavily mineralized to support game fish.

Ever since World War II the Navy has used the east lobe of the sea for an aerial minelaying test area and a seaplane landing area. The south-west corner of the sea has been set aside as the Salton Sea Test Base operated by the Sandia Corporation of Albuquerque, New Mexico, under contract with the U.S. Atomic Energy Commission. When these defense installations began operations, the Salton Sea was a rather forlorn, isolated area. Only occasionally would someone go boating, hunting, or swimming in the sea. The present population explosion with its in-creased use of Salton Sea has become too much even for the A.E.C. In March, 1960, it announced plans to relinquish the Salton Sea Test Base by July, 1961, with a gradual reduction of activity while transferring operations and its 150 employees elsewhere. The base has its own beach area and boat launching facilities, and its buildings include a lodge which could become the focal point of a winter resort.

The A.E.C. also cited Southern California's smog as another reason moving away from the Salton Sea. High altitude layers of smog which occasionally drift eastward from Los Angeles have interrupted tracking of simulated missiles and caused cancellation of test flights.

For the most part, the present competition for use of the Salton Sea stems directly from the demands of the remarkably affluent, spectacularly mobile population of metropolitan coastal California for desert-resort living and recreation (boating and fishing). But such activities result in debris and pollution. The peoples of Imperial Valley have abundantly proven that cattle and vegetables can be grown in the same hothouse. But can fish and boats and people and sewage and salt all continue to thrive in the same sink? The "handwriting" of future problems is in the air and in the sea.