HAZARD

The Future of the Salton Sea With No Restoration Project

Executive Summary

The Salton Sea lies on the brink of catastrophic change. The amount of water flowing into the Sea in the next twenty years will decrease by more than 40%, causing its surface elevation to drop by more than 20 feet, rapidly shrinking its volume by more than 60%, tripling its salinity, and exposing more than 100 square miles of dusty lakebed to the desert's blowing winds. These changes will cause four major impacts:

1. Human health in the Imperial and Coachella valleys – currently home to more than 400,000 people and growing quickly – will be harmed by the estimated 33% increase in the amount of fine windblown dust in the basin. Imperial County already suffers from the highest childhood asthma hospitalization rate in the state; the growing number of retirees living in both valleys are especially susceptible to poor air quality.
2. Air quality in these two valleys – which already fails to meet state and federal air quality standards – will get much worse, increasing the cost of bringing these areas into compliance.
3. Air quality-related litigation and state liability will increase. California has assumed ultimate responsibility for managing only those lands exposed due to a recent set of water transfers, constituting about half of the estimated 134 square miles exposed in 30 years. Responsibility for managing any dust blowing off the other 60 or so square miles will rest with the individual property owner. However, there is no clear way to determine which lands will be exposed due to the water transfers and which will be exposed due to other actions. Total air quality management costs at Owens Lake have exceeded $400 million. Costs at the Salton Sea could be higher.
4. Many – if not most – of the hundreds of thousands of birds that currently use the Sea will lose their roosting and breeding habitats and their sources of food. The Sea's fish will be almost entirely gone within a dozen years. Those birds that remain will suffer from disease and the reproductive deformities and failures that plagued the Kesterson National Wildlife Refuge twenty years ago. Some of the endangered and threatened species that use the Sea may be able to find other habitats, but others could suffer significant population losses.

Figure ES-1. The Salton Sea basin and southern California.[1]

Background

The Salton Sea is California's largest lake, a huge, shallow body of water more than 228 feet below sea level, in one of the hottest deserts in the state. As shown in Figure ES-1, the Sea lies in a broad depression between the agricultural fields of the Coachella and Imperial valleys, about 135 miles southeast of Los Angeles and about 90 miles northeast of San Diego.

The tremendous scale of the Sea adds to its complexity, and

1 Image ISS004-E-6119.JPG taken January 10, 2002, courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center, available at http://eol.jsc.nasa.gov.

the difficulty of finding a viable solution. The Sea currently runs almost 35 miles long, and 15 miles at its widest point, covering about 365 square miles. It has the largest surface area of any lake in California, yet is barely 50 feet at its deepest point. The Sea is 1/3 saltier than the ocean, and, fed by the fertilizers running off of neighboring fields, sustains incredible levels of biological productivity. Until recently, the amount of water entering the Sea was roughly balanced by the amount of water evaporating from its broad surface. Stabilizing the Sea at its current salinity would require the removal of more than four million tons of salt each year, assuming flows to the Sea do not change.

But they will change. Under a set of agreements signed in 2003, the Imperial Valley has begun to transfer water to San Diego County, ultimately reducing flows to the Salton Sea. Other actions, including actions in Mexico, will also reduce the amount of water flowing to the Sea by 45% or more in the next 30-40 years. These changes will dramatically decrease the size of the Salton Sea and the quality of its water.

In September, 2003, the California legislature passed a set of laws that implement the 2003 water agreements and provide a 15-year reprieve for the Sea. The legislation offers the prospect of more than $300 million of restoration funds, but it does not guarantee a long-term restoration project for the Salton Sea. California's Resources Agency will submit a Salton Sea Ecosystem Restoration Plan and related documents to the state legislature by December 31, 2006. The cost of any long-term restoration plan will almost certainly exceed a billion dollars. Although various private-public partnerships have been suggested, funding and implementation of any restoration plan is far from certain, especially given the lack of consensus on a preferred alternative.

Objective of Report

The objective of this report is to describe likely future conditions at the Salton Sea if no restoration project is implemented, over a period of 75 years. Because of the uncertainties inherent in any such projection, this study focuses on general trends, rather than specific year-by-year annual projections. The scope of this report is limited to discussion of future trends in hydrology, water quality, biological resources, and air quality, largely within the confines of the current shoreline of the Salton Sea itself.

Under no circumstance should this report be construed as an endorsement by its authors, funders, or any of its reviewers, of a future with no restoration project for the Salton Sea.

Future Conditions

From now through the end of 2017, changes at the Salton Sea will be gradual. Its elevation will drop about five feet in the next 11 years and its salinity will increase by about a third. The combination of poor water quality, infestation by parasites, and slowly rising salinity could eliminate most of the Sea's fish, and many of its larger invertebrates, by 2017. A five-foot drop in elevation translates into the exposure of more than 26 square miles of land that currently is under water. Although dust and salt have been seen blowing off of recently exposed land, the percentage of exposed land that will generate dust during the region's frequent wind storms has not been quantified. If an estimated 40% of these lands generate dust, an average of 17 tons of fine dust could be added each day to the basin's already poor-quality air within 11 years.

Starting in 2018, the rate of change at the Sea will increase dramatically, as shown in Figure ES-2. (The width of the lines in the graph connote the uncertainty and variability in the projections.) These rapid changes, caused by an abrupt decrease in the amount of water flowing into the Sea, will cause the surface of the Sea to drop 20 feet in the 10 to 12 years after 2017, shrinking the Sea's volume by more than

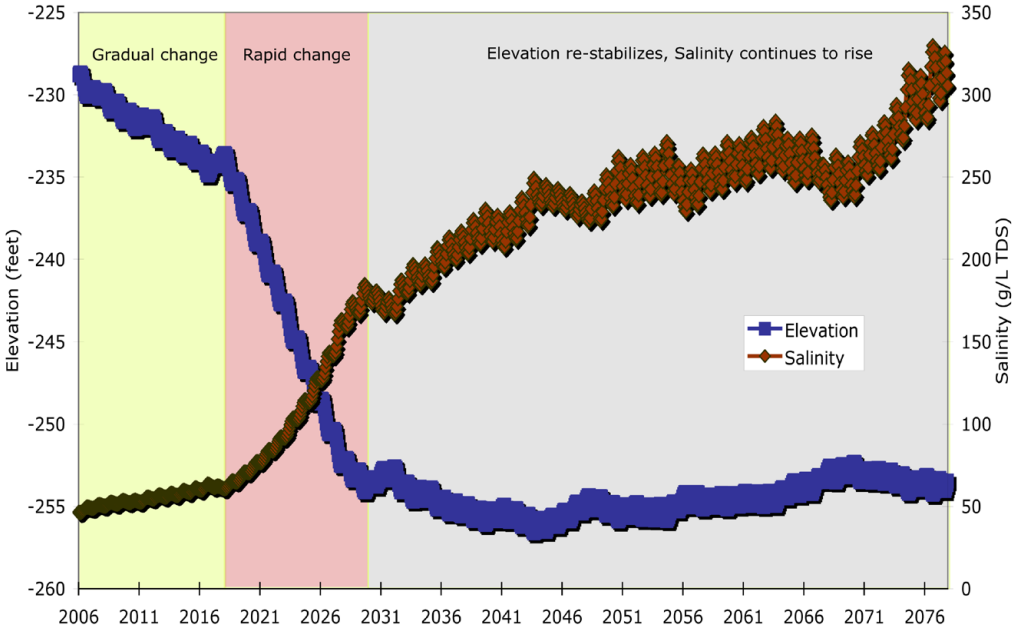

Figure ES-2. Elevation and salinity of the Salton Sea, Jan. 2006 – Dec. 2077.

60% and tripling its salinity. The impacts of these rapid changes will be catastrophic for wildlife, including the loss of all fish in the Sea within a couple of years, the loss of breeding and roosting habitat for birds, widespread disease, and possibly the hideous deformities that plagued birds at Kesterson 20 years ago.

Ultimately, the Salton Sea's surface will drop to about 255 feet below sea level, about 27 feet below its present elevation. At that elevation, the Sea will be approximately 29 miles long, but its average depth will be only 14 feet. At those proportions, if the Sea were 100 yards long, it would be only 1/3 of an inch deep. The future Sea will continue to be very productive biologically, but aside from brine shrimp and flies, very high salinity (>200 g/L TDS) will cause this productivity to come from algae and bacteria. In about 30 years, the Sea will often be a dense green, orange, or red algal/bacterial soup; far from dead, but a very different lake.

As the Sea's salinity continues to climb, brine shrimp and fly populations will shrink, reducing food resources for the tens to hundreds of thousands of birds that will feed on these organisms. Currently, the Sea's abundant food resources and its variety of roosting and breeding habitats attracts hundreds of species of birds, often numbering in the hundreds of thousands of individuals. The future loss of these food resources and the loss of habitat as the Sea recedes will eliminate the ecological value of the Salton Sea for most of the birds that currently use it. The loss of this critically important breeding habitat and refueling stopover for migrating birds will be felt throughout western North America. Those birds that remain will be decimated by various diseases, and will also suffer from reduced breeding success, due to elevated concentrations of contaminants in their food.

Air Quality and Human Health

As the Salton Sea's elevation drops, it will recede 4-5 miles from its current southern shoreline, exposing more than 134 square miles of lakebed – an area five times the size of Washington, D.C., and nearly three times the size of the City of San Francisco. Winds blow throughout the Salton Sea basin, generating large dust storms that harm human health. Air quality in both the Coachella and Imperial valleys already fails to meet state and federal standards. Childhood asthma hospitalization rates in Imperial County are the highest in California, and three times the state's average. Exposing 134 square miles of salty lakebed could increase the amount of blowing dust in the basin by a third, harming tens of thousands of children, the elderly, and others with breathing problems. The local $1.5 billion agricultural economy will suffer from the blowing dust and sand, as will those seeking to enjoy the extensive recreational opportunities throughout the region.

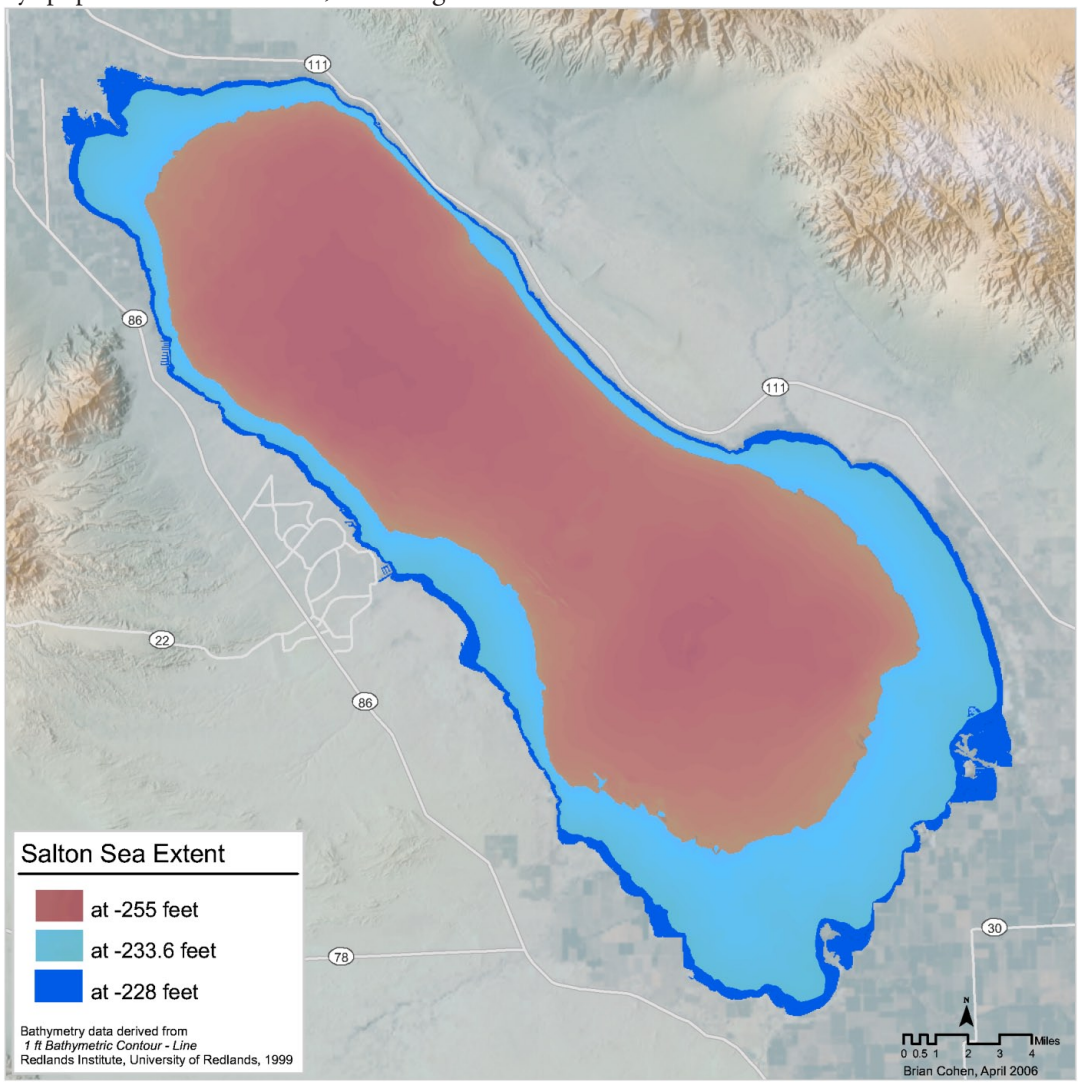

Figure ES-3. Exposed lakebed at -233.6′ and at -255′.

California has accepted ultimate responsibility for managing the dust blowing off lakebed exposed due to California water transfers, but not from lakebed exposed due to other actions. Determining which actions exposed which lands will probably be very contentious, especially given the expected costs, in both dollars and in water, necessary to manage this land. For purposes of comparison, dust management costs at Owens Lake already exceed $400 million. It is not clear how much land under the Salton Sea will generate dust once it is exposed, nor is it clear how much it will cost to manage dust blowing off of this land.

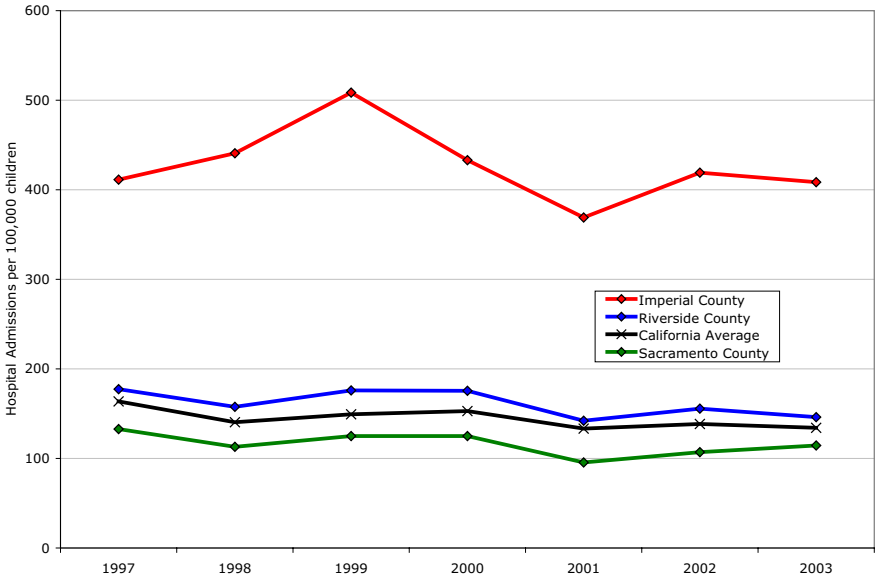

Figure ES-4. Children's hospitalization rates for asthma, by county.

Conclusion

Without a restoration project, the future Salton Sea will change dramatically. Many of these changes will carry exorbitant costs, in terms of human health, ecological health, and possibly agricultural production. As California and Congress decide whether and how to move forward with restoration of the Salton Sea, the high cost of funding a Salton Sea restoration project must be weighed against the catastrophic long-term costs of doing nothing.

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