

Official Preface

A symposium and a lake in multiple contexts: A prefatory essay on Salton Sea science and politics

[*Note: text portions shown **in bold** are those which the NALMS Directorate demanded, without explanation, be deleted, causing us to withdraw this entire preface from the special issue.*]

A wondrous lake and jewel of the southwestern desert

The Salton Sea is the largest lake in California and occupies a below sea level depression in the desert just north of the border with Mexico. It formed accidentally in 1905 as a result of a breaching of diversion structures on the Colorado River by unexpected high river flows. Ever since then it has persisted, despite the hot, desertic climate, as about 1.6 billion cubic meters of agricultural wastewaters have been discharged into it annually for many decades.

For most of its life it has been a mecca for wildlife, rich in nutrients, microorganisms, invertebrates and fish, and a well-laden banquet table for birds and fishermen alike. Half a century ago it became a popular area for swimming and boating, and at one point 16 marinas were present along its shorelines. Small residential communities also were built on its shores. Agriculture continued to benefit from the lake's value as a receiving basin for agricultural wastewaters, as well as for treated municipal wastewaters from the cities and small towns in the region. Nutrients in these wastewaters made the lake very productive and the wildlife abundant. Fish in the 0.5 to 10 kg weight range abounded. Swimmers, at least those with any courage, learned that when they stood in ankle deep water and couldn't see their toes, it was only because some "friendlies", probably diatoms and dinoflagellates, were blooming – who were completely compatible with a good swim.

In short, as our symposium subtitle states, there really has existed a "symbiosis among agriculture, wildlife and people" at this artificially maintained lake.

Salt lakes that exist in the vicinity of people, especially rapidly growing populations, are always in danger. As other freshwater supplies are scarce in desertic and semi-arid regions, the inflows to such lakes are at risk of being diverted for cities or agriculture. And as such lakes always lack outflows, they also can become concentration basins for any pollutants in the inflow waters – such as salts, nutrients, trace metals, pesticides, and so on. When this happens fish, wildlife, and people can be endangered.

Increasing salt and nutrient levels in the Salton Sea had long been expected to cause problems for this ecosystem. In the 1980s, elevated levels of selenium in wastewaters and fish tissues and elevated levels of pathogens in the New River where it enters the U.S. from Mexico were found. Large scale fish- and bird die-offs were occurring and seemed to increase in the early 1990s. Many 'scare' articles and much speculation appeared in the popular press and on TV news programs. People living in the region were increasingly worried. Recreational use of the Salton Sea declined. People were looking to outdated scientific studies from the 1950s and 1960s for answers, because little recent scientific investigation had been carried out on these problems, the ecology of the lake, or the potential for remedies.

The science boom

In 1993 a four-member regional joint powers authority, representing Riverside and Imperial counties, and two water agencies - the Imperial Irrigation District and the Coachella Valley Water District – was created. Its mandate was, in a word, to maintain the "symbiosis" – to bring science and politics together in order to accelerate the process of finding and implementing solutions to the problems of the Salton Sea and to obtain funding, mainly from the U.S. Congress, for carrying out new scientific and engineering studies. To initiate and oversee new scientific work at the lake, the Secretary of the U.S. Department of the Interior, in 1996, created the Salton Sea Science Office. This was administered by scientists from the U.S. Geological Survey, and was initially guided by a Salton Sea Science Committee comprised of representatives from various local, state, and federal agencies, as well as local Indian tribes and non-governmental organizations. The Science Office and this committee assessed research needs at the Salton Sea, developed requests for research proposals, solicited proposals, oversaw research projects, synthesized and transmitted findings to the Salton Sea Authority, government agencies and other parties, and organized workshops and symposia. This was the structure under which much of the scientific work reported here and in a companion volume (Hurlbert 2008) was initiated in the late 1990s. Later activities included development and assessment of different possible components of a Salton Sea restoration project, transfer of much authority for restoration planning to the California Department of Water Resources in 2003, and the issuance in May 2007 of the *Salton Sea Ecosystem*

Restoration Program: Preferred Alternative Report and Funding Plan (CRA 2007).

Much of the new scientific information on the Salton Sea has been published in the proceedings of other salt lake conferences, in Springer's *Developments in Hydrobiology* series (Zheng et al. 1998, Melack et al. 2001, Barnum et al. 2002, Melack 2007) and in the proceedings of a conference on Salton Sea birds (Shuford and Molina 2004a). The 2002 volume also was dedicated exclusively to papers on the Salton Sea. Those earlier volumes alone contain 50 articles on the Salton Sea, and other recent scientific articles on the Salton Sea have been published elsewhere. The present volume and its companion (Hurlbert 2008) now offer 26 more. The preface to the 2002 volume recounts some of the history of Salton Sea science up to that point (Friend 2002). The *Preferred Alternative Report* (CRA 2007) summarizes the scientific information that has been most critical to the planning process as well as the restoration proposal itself.

In 2004 Douglas Barnum and Rey Stendell of the USGS Salton Sea Science Office raised the possibility of having a small workshop to begin developing formal models of the Salton Sea ecosystem. It soon was apparent, however, that there was no consensus on even a general conceptual understanding of the lake's dynamics, that there was much research in progress or unpublished that would aid that understanding, and that the best way to accelerate the completion and writing up of this research and its integration into the collective consciousness of scientists and decision-makers would be to hold a scientific symposium and publish its proceedings. Potential funding sources agreed, and planning of a symposium was soon underway.

The 2005 symposium

The Salton Sea Centennial Symposium was held in San Diego, California, from March 30 to April 1, 2005, about 100 years and 1 month after the Colorado River first broke through outtake structures and began flooding the below-sea level desert basin known as the Salton Sink. The formal theme of the symposium was *A Salton Sea for the 21st Century: Science, Rehabilitation, Management*.

Sponsors and funders were the USGS Salton Sea Science Office, San Diego State University's Center for Inland Waters, the Water Education Foundation, the SDSU President's Leadership Fund, and the California Department of Water Resources. Douglas Barnum and I planned the scientific program, and Rita Schmidt Sudman and her staff at the Water Education Foundation in Sacramento, California coordinated symposium logistics.

A total of 51 scientific oral and poster presentations were made at the symposium. A summary of the abstracts for these presentations was published by the Water Education Foundation in November 2005 (WEF 2005). Manuscripts based on 34 of the presentations were promised, 30 manuscripts were submitted, 24 of these were adequately revised in response to reviewers' suggestions, and two additional Salton Sea manuscripts not presented at the symposium were also accepted. Of these 26 papers, 12 are included in the present volume and 14 are published as *Salton Sea Centennial Symposium, Part 2*, in the journal *Hydrobiologia* (Hurlbert 2008).

Some special speakers and panel discussions

Several important speakers and events at the symposium are not represented in this collection of papers. Acknowledgment of them is appropriate, and brief summaries of them should be of value to historians, scientists, managers and decision-makers.

To put the problems of the Salton Sea in a broad perspective, we brought to San Diego as keynote speakers, experts on three other large, saline, aquatic ecosystems being strongly impacted by man. Enrique Bucher (Professor of Ecology, National University of Córdoba, Córdoba, Argentina) gave a talk titled *Mar Chiquita, Salton Sea's Sister: Status of a 5000 km² lake in Northern Argentina*. This giant salt lake in a semi-arid agricultural region of northern Argentina has been, like the Salton Sea, of great value as a mecca for wildlife, as a receiving basin for agricultural and municipal wastewaters, and as a site for recreation, and even a small-scale commercial fishery. Unlike the Salton Sea, it is fed mostly by natural rivers, and so its level and salinity have shown much larger fluctuations than has the Salton Sea. In the 1970s, while shoreline landowners at the Salton Sea were complaining about a 1m rise in the level of that lake, landowners near Mar Chiquita were having to deal, on stilts and in chestwaders (!), with a 10m increase in the level of their lake. Mar Chiquita is threatened mainly by pressure for increased diversion of inflow waters to supply an expanding population and expanding irrigated agriculture, though some residents of the one small town on its margin, Miramar, still worry more about a repeat of the 1970s inundation. A beautifully produced and illustrated book on the history and ecology of Mar Chiquita and the extensive wetlands on its northern border has just been published by Bucher and his colleagues (Bucher 2007).

Philip Micklin (Professor of Geography, Western Michigan University, Kalamazoo, Michigan) presented a talk on the *History, Status and Lessons of the Aral Sea*, giving us the benefit of his many

decades of analyzing problems of this giant salt lake in Central Asia. This lake had a productive commercial fishery until the Soviet Union decided to divert most of the inflowing rivers to expand irrigated agriculture for cotton production. Since the 1960s the level of the Aral Sea has fallen more than 24m, its area has shrunk by 80 percent, and it has functionally separated into three separate waterbodies. Salinity in the two southern lakes has increased from 10 to 100-200 g l⁻¹. Climate has changed over large areas. The fishery no longer exists in the two southern lakes. The formerly wildlife- and vegetation-rich delta areas of the influent rivers are in a severely degraded state. Major dust storms bearing salt and other particles from the dry, relict lake bottom have caused severe health problems for people in the region. An \$85 million project to raise the level and partially restore the northern lake has been implemented. Since the lake level started to rise in August 2005, the lake has experienced an amazing ecological recovery with a rapid salinity decline and the return of most native fishes, contributing to a revitalization of fisheries (Micklin 2007, Micklin and Aladin 2008). We learn much from this example and from that of Owens Lake in northern California. The latter was dried up several decades ago when its inflow streams were diverted into aqueducts to supply the population of Southern California. Politicians, public health experts, and Salton Sea planners have recognized for some time that allowing the Salton Sea or even large portions of it to dry up is not a good option. The number of people living within 80 km of the Salton Sea is a bit less than 2 million and increasing rapidly. The region even now is in violation of U.S. Environmental Protection Agency standards for particulate air pollution for large parts of the year. In Imperial County, which embraces the southern half of the Salton Sea, childhood asthma rates, as measured by hospital admission rates, “are the highest in California, and roughly three times the state average” (Cohen and Hyun 2006).

Jose Campoy Favela (Director, Northern Gulf of California and Colorado River Delta Biosphere Reserve, San Luis Rio Colorado, Sonora, Mexico) gave a talk titled *Wetlands and Parallel Crises in the Colorado Delta Region of Mexico*. He spoke of his concerns for the area under his management in Mexico – the upper Gulf and the still undeveloped lower portions of the old Colorado River delta. There is one salt lake, Laguna Salada or Laguna Macuata, that sometimes fills in this area, when flows in the Colorado River are very high. It becomes a popular recreation spot for residents of the nearby city of Mexicali, who use it for swimming and fishing during those years. But most of the environmental concern for this region is with the wetlands, grasslands, cottonwood and willow riparian corridors, estuarine areas, and associated fish and wildlife that

were lost or severely degraded, starting when Hoover Dam was built on the Colorado River in 1935. Since then, the U.S. has diverted about 90 percent of the river’s annual flow for its cities and agriculture; this, indeed, is the ultimate source of most inflows to the Salton Sea. Mexico diverts, in most years, all of the remaining portion of the Colorado’s flow for its own cities and agriculture. It has been estimated that improvement or restoration of some of these critical delta habitats could be achieved by dedicating only a small amount of Colorado River water specifically to such purposes. Some binational groups have suggested this should come out of the U.S.’s treaty-allocated portion of Colorado River water. High rates of population growth in both southwestern U.S. and northern Mexico will continue to be an ever higher obstacle to carrying out such plans on more than a modest scale.

A visit by a delegation of 16 scientists and officials from Uzbekistan, Turkmenistan, Kazakhstan, and Tajikistan, countries bordering the Aral Sea, was another highlight of the symposium. We learned only a few days before the symposium that this delegation, sponsored by the Special American Business Internship Training (SABIT) Program of the U.S. Department of Commerce was in San Diego to attend a conference on *Water Resource Management for Central Asia* that was being held only a few kilometers from the Salton Sea symposium. At our invitation they attended Philip Micklin’s talk on the Aral Sea which they heard with great interest and enthusiasm. They then returned in the evening for an informal discussion with symposium attendees, with the help of their very able translators. Some of the Central Asians commented that by the standards of the Aral Sea problems they face, the problems of the Salton Sea seemed quite manageable, and why haven’t they been fixed yet?!

A panel discussion at the end of the second day gave a glimpse of the hot politics relating to Salton Sea restoration and to present and future water supplies for the lake. It was titled *The Link between Water Supply, Science, Restoration and the Law*. Panelists were: Ron Enzweiler (Executive Director, Salton Sea Authority), Steve Robbins (General Manager, Coachella Valley Water District), Elston Grubaugh (Board Member, Imperial Irrigation District), and Kim Delfino (Director of the California Program, Defenders of Wildlife). The discussion was moderated by Rita Schmidt Sudman (Executive Director, Water Education Foundation). Panelists responded to these questions which had been given them prior to the meeting: *What are the prospects for establishing legal guarantees for minimum needed inflows to the Salton Sea? If they are poor, can the expense of a large project that will depend on such inflows be justified? Who should be responsible for*

long-term mitigation of environmental impacts of a no-action alternative or of a rehabilitation project? They also commented on numerous other issues, and a lively discussion followed. The political power of Southern California urban areas combined with high, immigration-driven rates of population growth pose a real threat to Salton Sea inflows. Various water agencies have already filed for legal rights to those inflows, which could easily be reclaimed and used for municipal water supplies in the future. A Salton Sea restoration project will be very expensive. Quite reasonably, rational taxpayers and responsible decision makers would like to have some assurance that a couple of decades from now water will still be available to maintain the new ecosystem before massive costs are incurred. The response of three panelists to the “legal guarantees” question showed a sharp split of opinion. Enzweiler thought legislation providing such guaranteed flows was definitely necessary; but Robbins and Grubaugh, representing the agencies that currently have the rights to most of the water supplies in the region, opined their agencies would prefer only to have a “memorandum of understanding” among the interested parties.

Finally, California State Senator Denise Ducheny-Moreno and Representative Bob Filner of the U.S. House of Representatives both gave short speeches, welcoming symposium attendees, thanking them for their scientific work, and promising their own strong support for funding of restoration efforts at the Salton Sea.

Restoration proposals

The future of the Salton Sea ecosystem is uncertain, but it certainly is headed toward uncharted waters. The ecosystem analyzed in these studies already has changed. Water inflows are declining. The fish are essentially gone except for the hardy tilapia. Salinity is presently 47-48 g l⁻¹, matching the previous historic high of the mid-1930s, and continues to rise. We may intervene or not, but the Salton Sea ecosystem of the last half century is no more. And just as we understood it better than ever before!

But much of what we have learned about it has proved useful in at least developing plans for a brighter future. After years of study and discussion involving large numbers of stakeholders, the California Resources Agency has put forward its preferred alternative for a *Salton Sea Ecosystem Restoration Program* (CRA 2007, LAO 2008). This ambitious and complex plan defies concise description (Fig. 1). It envisions use of dikes, berms, canals and other elements to create: a narrow, 182 km², horseshoe-shaped salt lake, stabilized at 30-40 g l⁻¹, around the perimeter of the northern two-thirds of the present lake; a 251 km² complex of tiered,

shallow, saline (20-200 g l⁻¹) wetlands mostly around the southern end of the present lake; and a large central area that eventually would consist of exposed lakebed or playa (<429 km²) and two highly saline lakes that might gradually decrease to about 69 km² in area. Aquatic habitat diversity would be greatly increased in the region, though total area of aquatic habitat would be eventually about half that of the present lake (930 km²). Project capital costs are estimated at \$8.9 billion, with post-construction operating and maintenance costs estimated at \$142 million per year.

Before responsibility for restoration planning was assumed by the State of California, the region-based Salton Sea Authority (SSA) had initiated restoration planning efforts. The SSA's proposals have undergone gradual modification, were considered by the CRA's evaluation and selection process, and are presented in full as the *Salton Sea Authority Plan for Multi-Purpose Project* (SSA 2007). In CRA (2007) and LAO (2008) the SSA plan is referred to as Alternative 7 and has estimated construction costs of \$5.2 billion. The SSA proposal differs from the CRA's preferred alternative in many ways but most notably in being less expensive, in having a larger (365 km²), deeper lake in the northern part of the basin, and in proposing to greatly increase human population density in the region. Partly as a way to generate revenues to cover project costs, the SSA *Multi-Purpose Project* proposes the sale of large amounts of federal government land to private developers who would construct 250,000 new housing units, develop six seaside villages, and increase from <2 percent to 26 percent the proportion of land around the Sea given over to residential, commercial, industrial and mixed uses. All done, of course, “incorporating smart growth and sustainable development concepts.” To “save” the Salton Sea by increasing population density, water and power consumption, waste production, and traffic congestion around its margins will seem a Faustian bargain to many who would prefer to keep the area less like, not more like, the rest of overpopulated Southern California. Wildlife, birdwatchers, campers, fishermen and boaters who like their feeding, nesting and recreation areas surrounded by a million people already have plenty of such bays and marinas here on the California coast.

Such a difference between the two proposals is not surprising given that environmental scientists and environmentalists had a large role in defining and selecting CRA's preferred alternative while the SSA proposal was selected mainly by representatives of agricultural and commercial interests. Fostering further population growth in the Salton Sea area and California generally will only increase threats to the environmental values of the Salton Sea. It is precisely

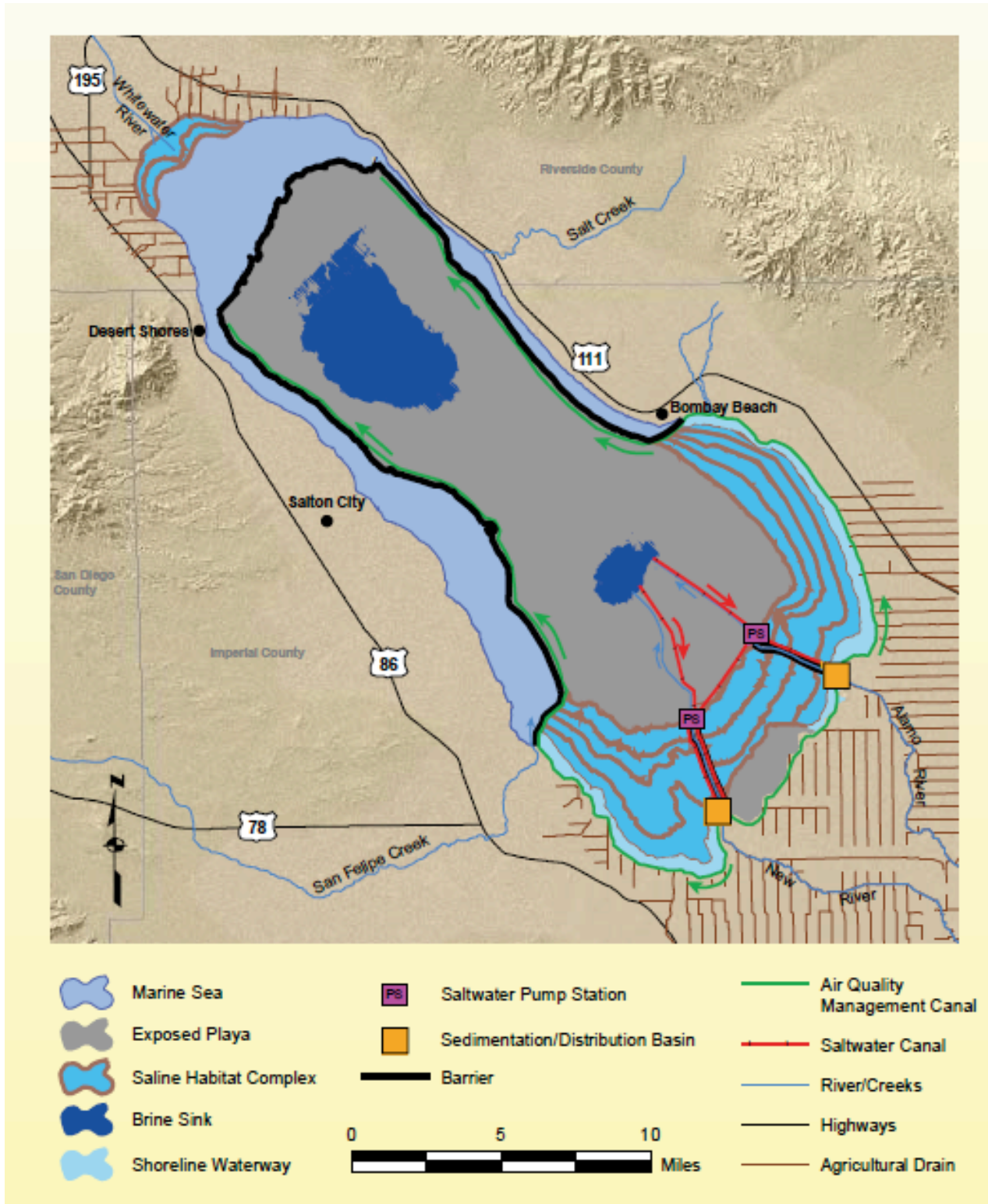


Figure 1. The preferred alternative plan for Salton Sea restoration selected by the Resources Agency of the State of California. Figure adapted from CRA (2007) and LAO (2008).

our existing overpopulation in relation to water supplies that places a major restriction on options for restoration of the Sea. That is why U.S. Secretary of the Interior Bruce Babbitt ordered in 1996 that no restoration proposal requiring additional Colorado River water, even temporarily, would be considered by the federal government.

Many large technical and financial issues concerning the respective restoration plans are not resolved or, in some cases, not yet even under discussion. The state of California is in a fiscal crisis, its population continues to grow, water demand is up, and climate models predict increasing aridity over large portions of the American Southwest. Whatever the consequences of these colliding plans and forces for the Salton Sea, they will – at a minimum – be ‘interesting’ over the next decades.

Population growth, immigration and the indispensability of political incorrectness

Will the science in this volume and the other new findings on the ecology of the Salton Sea really have a chance to contribute to a brighter long-term future for the Salton Sea? It is not at all certain. These scientific investigations could easily end up a waste of taxpayer funds, **aside from their value for training the new scientists who have made most of the scientific discoveries reported in this volume and for creating business for environmental and engineering consulting companies.** Powerful political forces are pushing for greatly increased rates of population growth in California and the U.S. as a whole, not just in the Salton Sea watershed. And as the legislative analyst’s report makes crystal clear, the Salton Sea has no explicit water rights under state or federal law, the state legislation authorizing a Salton Sea restoration project calls only for “maximum feasible attainment” of certain environmental objectives, and “it is possible that continuing urban growth in Southern California will increase the economic and political pressure to transfer additional water from Imperial Valley [origin of the major inflows to the Salton Sea] to urban Southern California” (LAO 2008). In other words, what will prove to be “feasible” in the long run may be “not very much.”

Specifically, water supplies that will be politically available for the Salton Sea will depend in part on whether by 2050, California’s present population of ~38,050,000 (California Department of Finance estimate for 1 January 2008) grows to ~47,860,000 – or whether it grows to ~82,180,000. Which scenario develops depends largely on what the U.S. does with respect to immigration legislation and enforcement (Martin and Fogel 2006). The first of these estimates assumes that, starting now, illegal immigration is

mostly halted and rates of legal foreign immigration are balanced with emigration. Under this scenario, the U.S. would be at or very close to population stabilization by 2050, with a population only ~26 percent larger than our present one. The Salton Sea might have a chance.

The second of these estimates, representing a population ~116 percent larger than our present one and still rapidly growing, is the predicted outcome of legislation such as U.S. Senate Bill 2611 (Comprehensive Immigration Reform Act of 2006) (Martin and Fogel 2006). That bill, passed by a large majority of the Senate in May 2006 but rejected by the U.S. House of Representatives, would have given legal resident status to most illegal aliens in the U.S. and also roughly tripled annual *de facto* legal immigration quotas. For the U.S. as a whole SB2611 would have given us an estimated population in 2050 of 500,180,000. Between now and then the U.S. population would thus have grown at an average of ~1.9 percent per year, roughly double our current rate of ~1.0 percent per year. If that environmentally disastrous scenario were ever to transpire, then our efforts on behalf of the Salton Sea may indeed have been wasted. **California and much of the rest of the U.S. would be well on the road to achieving a degree of environmental degradation like that already typifying most of the settled parts of the Old World.**

Immigration legislation of this sort is not some past danger or distant theoretical prospect. **All three of the current U.S. presidential candidates – U.S. Senators Hillary Clinton, John McCain, and Barack Obama – voted for SB2611. During their current campaigns each has promised to champion such legislation once again if elected. Both of California’s Senators – Barbara Boxer and Dianne Feinstein – also voted for SB2611. Even the two politicians who spoke at our symposium in support of Salton Sea restoration – State Senator Denise Ducheny-Moreno and U.S. Representative Bob Filner – have aggressively championed giving legal resident status to millions of illegal aliens and massively increasing legal immigration quotas.**

Like the mainline environmental organizations who have abandoned advocacy of U.S. population stabilization, for reasons well analyzed by Beck and Kolankiewicz (2000), **these politicians all consider themselves to be “pro-environment”. In reality, they mainly exemplify the right hand tearing down what is occasionally raised by the left.**

The conflict between U.S. and California population growth and environmental objectives for the Salton Sea has repeatedly, to the consternation of many,

been placed on the table for discussion though with uncertain effect. At a Salton Sea symposium held in Rancho Mirage, California, in January 1997, I gave a talk titled *Eutrophication at the Salton Sea: Causes, Consequences and Correctives*. Before getting into the science of that topic, I stated:

Let's briefly look at the big picture of what we're dealing with here – because if we don't keep the big picture in mind, we can easily end up wasting our time and resources and picking suboptimal solutions. First, population growth can easily undo any narrow scientific or engineering solutions we come up with for the Sea. In this regard, the Sea's problems are no different than those of most other large environmental problems in the U.S. ...

At the top of my second slide, “immigration control” was listed a key need and a matter for public discussion.

At a Salton Sea symposium held in Desert Hot Springs, California, in January 2000, we (S.H. Hurlbert, J.S. Dainer, M.A. Tiffany, C. Trees, G.F. Gebler, E.B. Small) presented a poster titled *Population Growth and the Salton Sea: The Major Long-Term Issue Out from Under The Rug*, and also provided every attendee with a folder of articles on population and immigration issues. With charts, tables and text, this poster confronted the issues of high immigration and population growth rates and the role of both politicians and environmentalists in fostering them. A brief quote from the poster:

High, environmentally unsustainable rates of population growth in the Salton Sea watershed and in those parts of California hoping to siphon water out of it are the greatest medium- and long-term threats to a healthy Salton Sea.... High immigration rates are the greatest controllable cause of this population growth and the environmental degradation that comes with it.... Most of the likely major institutions – Congress, universities, scientific societies, environmental organizations, the press – seem unable to deal with these issues openly and rationally.

Praised in private by many, it also elicited some hateful public responses of the usual sort from those who would suppress discussion of these issues. One academic from a major regional university said the poster was “racist.” In a meeting a week or two later, a high level county official raised the question, “Is Hurlbert a neo-Nazi?” In a later reference to this slander, Shuford and Molina (2004b) also encouraged scientists to speak out on the overpopulation issue

but aptly noted that one “must be willing to take the heat” if they do so.

A few years later we began planning the 2005 *Salton Sea Centennial Symposium* reported here. In bits and pieces and quietly, advice came down from federal and state agencies that in the promotional materials and in the program it would be best if we did not discuss population growth, immigration, or water law and policy. **Translation: “We are not interested in opinions on policy or the ‘big picture’ from you scientists and technocrats. Just stick to your biology, chemistry, physics, and geology. We chiefs – or our bosses – will handle the big issues, thank you.”** The only logical response was to present another poster on the population aspect of the Salton Sea issue, titled *The Salton Sea Water Supplies, Population Growth and the U.S. Congress* (Hurlbert and Dainer 2005). **In its first panel, we threw down the gauntlet to our fellow Salton Sea technocrats and the general public:**

WHO WILL SPEAK TRUTH TO POWER?

Who will confront the arrogance of the radical right and political correctness of the radical left?

-- Scientists and engineers comfortably funded for their studies of environmental degradation and ways to achieve short-term fixes??

-- Environmentalists who will be quickly slandered as “racist” by corrupt leaders of their own organizations (and many others)??

-- NGOs who have sold their souls to political power and wealthy donors??

-- Workers in government agencies who understand much, but are subject to increasing levels of censorship and political pressure??

All those who care about the long-term health of the Salton Sea ecosystem must speak out forcefully about the need to curb U.S. population growth.

[In retrospect, it would have been more precise to refer to “naïve and venal cornucopianism” rather than “arrogance”, and to “naïve and sanctimonious utopianism” rather “political correctness.”]

The poster then went on to present information and commentary on demography, the drying up of our water supplies, and the behavior of environmentalists and politicians.

Lessons from the salmon technocracy

These issues and social and political dynamics are not unique to the Salton Sea, and we should learn

from other situations and minimize reinventing of the wheel. In that regard, every Salton Sea technocrat and decisionmaker should purchase and read *Salmon 2100: The Future of Wild Pacific Salmon* (Lackey, Lach and Duncan 2006). **In key ways, that book is more relevant to the future of the Salton Sea than any of the scientific findings presented at our 2005 symposium. This 629 page book is beautifully produced and a real bargain at \$39.**

Many of the wild salmon stocks in California, the Pacific Northwest and southern British Columbia are in very bad shape as a result of building and operation of dams, overfishing, habitat destruction, water pollution, and other actions of man during the past century. Despite expenditure of billions of dollars over recent years, little improvement in their status has been achieved. If the human population of that region increases 4- to 8-fold between now and the year 2100, as currently predicted, consensus opinion is that these wild salmon stocks will be further damaged, with many more going extinct. *Salmon 2100* was initiated by the editors when they asked 33 other salmon biologists, salmon policy analysts and salmon advocates to think ‘outside the box’ and “to identify and describe practical policy options that could successfully sustain [at least until 2100] significant runs of wild salmon if adopted.”

Free from ideological or governmental censorship of topics, facts or opinion, this diverse group of thinkers and experts put forward in vigorous prose a wide array of often conflicting suggestions. Having these ideas all openly ‘on the table’ will surely prove valuable to society and to salmon. While some contributors say ‘it’s too late’ and others envisage only more attempts at technological fixes, several comment on the desirability and feasibility of reducing population growth, the major driver of the future of salmon. On page 2 the editors themselves ask, “Should society control western North America’s rate of human population growth, which is driven almost entirely by immigration from outside the United States and Canada...?” **And in their excellent chapter, Hartman et al. (2006) put “Limit immigration” at the top of their list of eight policy recommendations for saving salmon.** Lackey et al. (page 64) also note that population growth is “a taboo subject in most circles. Environmental advocacy groups avoid it like the plague, even though it dwarfs most of the human behaviors they are trying to modify.” **Lackey et al. also quote an anonymous colleague who warns that to raise the topic is to risk “being attacked as a racist, nativist, xenophobe, cultural imperialist, or, at the least, an economic elitist”, just as continues to happen so often in discussions on the future of the Salton Sea.**

Perhaps those of us in Southern California, Arizona and Mexico concerned with the Salton Sea, the Colorado River, its delta, and other threatened aquatic ecosystems in our region should aspire to compilation of a similar volume titled *Waters Southwest 2100...* Our brothers and sisters in the Pacific Northwest are ahead of us at the moment, though not by too much: 7 of the 8 U.S. Senators from Washington, Oregon, Idaho and Montana also voted for SB2611. No one should be under the delusion that truly ‘green’ politics rule in the Northwest any more than they do in the Southwest.

Scientists must avoid becoming compliant, politically correct technocrats and passive contributors to population-driven environmental decline. Or, as Shakespeare might have queried us,

*Salmon technocracy,
Salton Sea technocracy,
Trembling servants of
The aristocracy?*

Acknowledgments

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Each manuscript submitted for this volume was reviewed by at least 2-4 referees and myself, and almost all manuscripts underwent extensive revision before being accepted. Many thanks to all those referees whose constructive suggestions helped authors to “put their best foot forward.” C. Amrhein, D.W. Anderson, M.A. Anderson, T.W. Anderson, D.A. Barnum, I. Ciglencečki-Jušić, J. Cloern, M.J. Cohen, G.W. Cox, D.M. Dexter, S.I. Dodson, H.I. Ellis, T. Fenchel, J. Fitts, S. Fogel, J.C. Franson, D.B. Herbst, G.C. Holdren, A.H. Hurlbert, J.R. Jehl, Jr., J.O. Keith, S. Kelly, J.J. Kerekes, L. Kolankiewicz, R.T. Lackey, J. Laybourne-Parry, L.A. Levin, J.

Martin, K. McCluney, R. McCluney, J.P. Meador, P. Micklin, A.K. Miles, P.B. Moyle, G. Novarino, H.M. Ohlendorf, D. Pimentel, D. Schneider, J.P. Skorupa, K.A. Steidinger, B.K. Swan, T.J. Swift, J. Tarnow, M.A. Tiffany, R.W. Wilson, P. Zawislanski, and B. Zuckerman. Fourteen scientists and environmentalists provided comments on this preface; since most were highly favorable, their names are withheld lest their reputations be damaged! And a final thanks to the authors themselves for their contributions, their patience, and their stoic courtesy in putting up with unending editorial “suggestions.”

The facts and ideas presented in this essay have been offered to encourage deeper discussion and wiser decisions for the Salton Sea and the larger environmental and political contexts that will determine its future.

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References

Barnum, D.A., J.F. Elder, D. Stephens, and M. Friend, eds. 2002. The Salton Sea: Proceedings of the Salton Sea Symposium, 2000. *Hydrobiologia* 473:xii+306 pp. (Developments in Hydrobiologia 161:xii+306 pp.)

Beck, R. and L. Kolankiewicz. 2000. The environmental movement's retreat from advocating U.S. population stabilization (1970-1998): A first draft of history. *Journal of Policy History* 12:123-156. Available at <http://www.numbersusa.com/PDFs/Retreat2.pdf>

Bucher, E.H., ed. 2007. Bañados del Río Dulce y Laguna Mar Chiquita. Academia Nacional de Ciencias, Córdoba, Argentina. 342 pp.

CRA. 2007. Salton Sea Ecosystem Restoration Program: Preferred Alternative and Funding Plan. The Resources Agency, State of California, Sacramento CA. 46 pp. Available at <http://www.salttonsea.water.ca.gov/>

Cohen, M.J. and K.H. Hyun. 2006. Hazard: The Future of the Salton Sea with No Restoration Project. Pacific Institute, Oakland CA. vi+48 pp.

Friend, M. 2002. Preface. *Hydrobiologia* 473:vii-xii.

Hartman, G.F., T.G. Northcote and C.J. Cederholm. 2006. Human numbers – the alpha factor affecting the future of wild salmon. Pages 261-292 in R.T. Lackey, D.H. Lach and S.L. Duncan (eds), *Salmon 2100: The Future of Wild Pacific Salmon*. American Fisheries Society, Bethesda MD. 629 pp.

Hurlbert, S.H. and J.S. Dainer. 2005. The Salton Sea, water supplies, population growth and the U.S. Congress. Poster presentation, Salton Sea Centennial Symposium, San Diego CA, March 2005. Available at: <http://www.sci.sdsu.edu/salton/H2OSSPopGrowthCongr.html>

Hurlbert, S.H., ed. 2008. Salton Sea Centennial Symposium, Part 2. *Hydrobiologia* 604:195 pp. (Developments in Hydrobiology 201:vi+195 pp.)

Lackey, R.T., D.H. Lach and S.L. Duncan (eds.). 2006. *Salmon 2100: The Future of Wild Pacific Salmon*. American Fisheries Society, Bethesda MD. 629 pp.

LAO. 2008. Restoring the Salton Sea. Legislative Analyst's Office, State of California, Sacramento CA. 36 pp. Available at <http://www.salttonsea.water.ca.gov/>

Martin, J. and S. Fogel. 2006. Projecting the U.S. population to 2050: Four immigration scenarios. Federation of American Immigration Reform, Washington DC. 18 pp. +appendices. Available at http://www.fairus.org/site/DocServer/pop_projects.pdf?docID=901

Melack, J.M., R. Jellison and D.B. Herbst, eds. 2001. Saline Lakes: Publications from the 7th International Conference on Salt Lakes. *Hydrobiologia* 466:ix+347 pp. (Developments in Hydrobiology 162:ix+347 pp.)

Melack, J., ed. 2007. Saline Waters and Their Biota. *Hydrobiologia* 576:iii + 203 pp.

Micklin, P. 2007. The Aral Sea disaster. *Annual Reviews of Earth and Planetary Sciences* 35: 47-72.

Micklin, P. and N. V. Aladin. 2008. Reclaiming the Aral Sea. *Scientific American* 298: 44-51.

Shuford, W.D. and K.C. Molina, eds. 2004a.. Ecology and conservation of birds of the Salton Sink: An endangered ecosystem. *Studies in Avian Biology* No. 27:ii+169 pp.

Shuford, W.D. and K.C. Molina. 2004b. The Salton Sea: A conservation conundrum or paradigm for success? *Studies in Avian Biology* No. 27:152-155.

WEF. 2005. The Salton Sea Centennial Symposium: Summary of Abstracts. Water Education Foundation, Sacramento, California. 15 pp.

Zheng, M., S.H. Hurlbert and W.D. Williams, eds. 1998. Saline Lakes VI: Proceedings of the Vith International Symposium on Inland Salt Lakes. *Hydrobiologia* 381: x + 200 pp.

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