

ReEnvisioning the Delta

Alternative Futures for the Heart of California

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<http://landscape.ced.berkeley.edu/~delta>

About this report

ReEnvisioning the Delta is an initiative of the Department of Landscape Architecture and Environmental Planning of the University of California, Berkeley. Our aim is to conduct research on land-use change in the Delta, its environmental, infrastructural, social, and economic consequences, and to work with agencies and stakeholders to develop alternative futures for this critically important region. Towards this end, we have conducted research documenting for the first time the actual extent of urbanization potential in the Delta (drawing upon general plans from all jurisdictions in the region, development documents, and analysis of sequential aerial photographs), held a workshop with key Delta leaders in February 2006 to better define the issues, hosted a public symposium in March 2006 on the Berkeley campus, held a student design competition for a Delta park, facilitated a design charrette in the Delta in October 2006 for stakeholders to develop alternative future visions for the region, and are currently undertaking a cumulative effects analysis for urbanization in the Delta and a further charrette.

This report is based on original research conducted by faculty and graduate students, review of existing data and reports, interviews with key players in the Delta, and the information and ideas presented at the symposium and charrette. We thank all those who contributed to the symposium. We thank then-Chair Peter Bosselmann, current Chair Linda Jewell, and departmental manager Sue Retta and her staff, and Dean Harrison Fraker and his staff in the College of Environmental Design, for their support of the effort. We are grateful for financial and other support from the Beatrix Farrand Fund, the College of Environmental Design, the Natural Heritage Institute, the Lee Chairs Program in Business, Environmental Design and Law, the Boalt Law School, the Haas School of Business, the UCB College of Engineering, and the Water Resources Center Archives. We would also like to thank Tanya Higgins for the design of the website and her calm early management of the initiative.

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2006 Thomas Church competition entrants: Patricia Fonseca, Elke Grommes, Eva Huang, Stephen Miller, Mei Minohara, Zachary Rutz, Brooke Ray Smith, Chrissy Udvardy, Alex Westhoff, Liyan Yang. Jurors: Steve Chainey (MIG, Inc.), John King (San Francisco Chronicle), Bill Thompson (Landscape Architecture), Jane Wolff (Washington University).

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Aerial view of Sacramento-San Joaquin Delta and Suisun Bay

Introduction

The 1150 square miles of interspersed water and low-lying land between the Bay Area and the Central Valley are little known by most Californians. With few towns, huge tracts of open farmland, and a bewildering maze of water channels, the Sacramento-San Joaquin Delta has always seemed a "place apart" from the intense urbanism of the Bay Area, Sacramento, and Stockton. But this unassuming region of the state provides services that are indispensable to modern California. Indeed, without the Delta's services, California as we know it could not exist.

More than 23 million people and numerous key industries throughout the state rely on the Delta for their water supply. Millions of birds and fish, some of them endangered, rely on it for breeding sites and migration passage. An entire regional economy and distinct local culture depends on the rich peat soils and the deep-water ship channels carved out of them. Most of the infrastructure that powers the Bay Area's dynamic economy passes through here. And much of Northern California uses the Delta for boating, fishing, and hunting not available anywhere else nearby.

But change is coming to the Delta. With housing prices recently at record levels and population continuing to rise throughout northern California, the pressure to urbanize

Delta lands is mounting rapidly. If present trends persist, the five counties that contain the Delta -- Contra Costa, Sacramento, San Joaquin, Solano and Yolo, will more than double in population in the coming decades, from 3.7 million people today to more than 7.5 million in 2050. Even *before* this population growth, development proposals are already bumping up against the boundary of the Delta "primary zone" established by the 1992 Delta Protection Act, raising the question of whether the traditional aversion to building within the line will hold over the long term.

Because the Delta's services are so critical to California, this urbanization pressure is a matter of statewide importance. Previous efforts to manage the Delta have focused on its water – how much will be taken out for people, and how much will be left behind for birds, fish, and ecosystems? Now, the Delta's lands are in question as well. How would urbanization of these lands affect water quality in the Delta and the drinking water supply for 23 million people? How would it affect the species that live in or pass through the Delta? How would widespread urbanization affect efforts to restore wetlands, or to moderate the impacts of climate change over the long term? How would it constrain the state's flood control system?

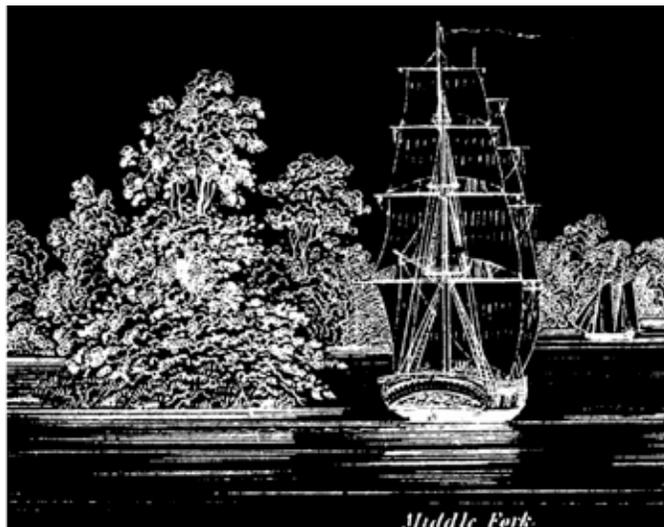
Moreover, much of this land is below sea level and protected only by an antiquated system of levees that is extraordinarily vulnerable to failure from earthquake, flood, or soil subsidence. These risks are rising. Not only are the levees aging, but there is, by one estimate, a 60 percent likelihood of an earthquake or large flood causing mass levee failure in the next 50 years. Soils within the levees continue to subside, and sea level rise and intense rainstorms associated with climate change will further increase pressure on the levees.

After the destruction of New Orleans by mass levee failure in Hurricane Katrina, the desire to build thousands of houses below sea level is alarming from a public safety point of view. The risk of catastrophe also extends to the water supply system. Any disaster that caused more than ten to twelve levee failures in the Delta could knock out the water supply for 23 million Californians for more than a year -- "an Armageddon scenario for California's economy," in the words of levee engineering expert Raymond Seed. How would urbanization of lands in the Delta affect the ability to fight or repair such a catastrophe?

The *ReEnvisioning the Delta* initiative seeks to address these pressing questions. Rather than defining the Delta only as a problem to be solved, however, we recognize the Delta as a place with its own unique character, history, and potential. Thinking about the issue in this way may help break the political gridlock that has characterized recent Delta planning efforts. With urbanization expanding on all sides, what role can the Delta play in the northern California of the future? Can we preserve its invaluable services, restore its ecosystems, and protect against disaster, even as the Bay Area and the Central Valley continue to grow together? The Delta will no longer be a "place apart," but whether or not it retains the key values that make it unique and indispensable depends on choices that are already before the state today.

This report describes the unprecedented extent of the urbanization threat facing the Delta, the reasons for that growth pressure, and the risks that urbanization creates for the people who would live there and for the Delta itself. Urbanization may well make it harder, not easier, to address the system's vulnerability to disaster. Urbanization also has negative effects on water quality, flood control, and ecosystem management, all of which are important components of the critical services that the Delta provides.

The regulatory structure in place to protect the Delta – the Delta Protection Commission established under the Delta Protection Act – is only a partial solution at best. The composition of the Commission and the political bargains



The Delta was a critical navigation route in 19th century California, linking the ocean to Sacramento, Stockton, and the Sierra gold fields.



Recreational boating and fishing are major uses of the Delta. Photo by Lucas Griffith.

that underpinned the Act's passage limit the Commission's inclination to protect the Delta's "secondary zone" lands, and perhaps even those in the "primary zone." (Figure 1) Even the secondary zone lands, however, have important ecological value and carry significant risks to those who would live on them.

We need bold new ideas for the Delta's future, drawing upon precedents from the history of land conservation in California and elsewhere in the U.S. The efforts to conserve San Francisco Bay, the Golden Gate National Recreation Area, Lake Tahoe, the Santa Monica Mountains, and the Everglades all have important similarities to the situation facing the Delta. So too did the creation of Central Park and the "Emerald Necklace" in Boston, situations in which visionary designers created open space assets in anticipation of future urbanization, not simply in reaction to it.



This report also presents new spatial analyses and visions for the Delta generated by UC-Berkeley



*Agriculture is the dominant land use in the region.
Photo by Lucas Griffith*

landscape architects and planners. These designs envision a multi-use preserve that provides water transport, habitat, and recreation, while concentrating urbanization in low-impact locations where levees can be greatly improved. Through design workshops being held simultaneously with the state's Delta Vision Process (DVP), we are working with stakeholders to develop specific regional-scale proposals for the future of the Delta that can inform the DVP (see <http://landscape.ced.berkeley.edu/~delta>).

These precedents and visions form an auspicious basis on which to move forward in the Delta. Political conditions are better than they have been in years, maybe decades. The tragedy of New Orleans drives home the seriousness of the threats facing the Delta and creates opportunity for bold visioning of what the Delta could be. That we need a plan for the Delta is not in doubt. Gathering better data with which to plan, and developing consensus on what vision to plan for, are now the primary challenges.



*Above: Legacy towns, such as Locke pictured above, are key tourist attractions. Photo by Jane Wardani
Below: Figure 1. The Legal Delta. Image courtesy of Delta Protection Commission*



The challenge: urbanization

The urbanization threat facing the Delta region is extraordinary even by California's high-growth standards. Demographer Hans Johnson of the Public Policy Institute of California projects that the population of the five Delta counties will more than double by 2050, from 3.7 million people today to more than 7.5 million at mid-century. Put another way, about 3.8 million *new* people – more than the entire current population of Connecticut – will be living in these five counties by 2050.

Moreover, if recent trends continue, this population growth will be much more concentrated in the Delta portions of these counties than in the non-Delta portions. Just since the 2000 census, the towns and cities within the Delta have collectively grown by 18 percent, whereas the other portions of these counties have grown by “only” 6 percent. Several Delta cities, including Brentwood, Elk Grove, Manteca, Tracy, Rio Vista, and West Sacramento, have grown more than 25 percent in just the last five years. As Johnson emphasizes, the Delta's recent and projected growth rate, “are among the highest of any developed region of the world.”

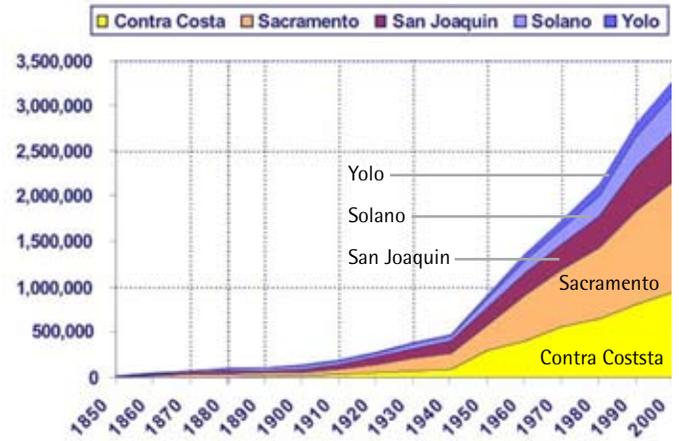


Figure 2. Population of Delta counties, 1850-2000. Courtesy Hans Johnson.

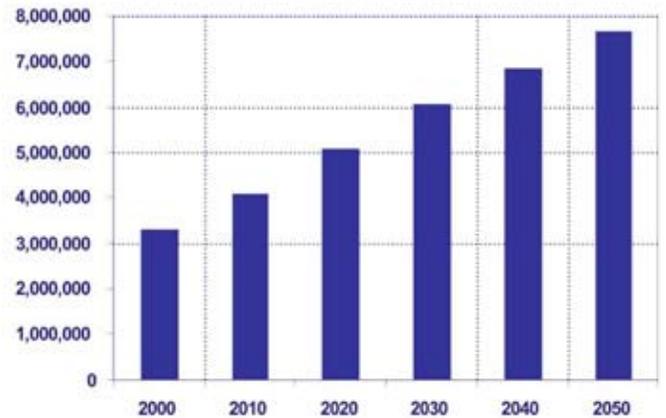


Figure 3. Projected total population of five Delta counties, 2000-2050. Courtesy Hans Johnson.

Table 1. Growth in Delta-adjacent cities, 2000-2005. Courtesy Hans Johnson.

CITY	2000	2005	% CHANGE
Antioch	90 532	101 049	12%
Brentwood	23 302	40 912	76%
Pittsburg	56 769	62 605	10%
Elk Grove	70 000	121 609	74%
Galt	19 472	22 955	18%
Isleton	828	820	-1%
Sacramento	407 018	452 959	11%
Lathrop	10 445	12 565	20%
Lodi	57 011	62 467	10%
Manteca	49 255	61 927	26%
Stockton	243 771	279 513	15%
Tracy	56 929	78 307	38%
Dixon	16 103	17 179	7%
Fairfield	96 178	105 026	9%
Rio Vista	4 571	6 837	50%
Suisun City	26 118	27 716	6%
Vacaville	88 642	96 735	9%
West Sacramento	31 615	40 206	27%

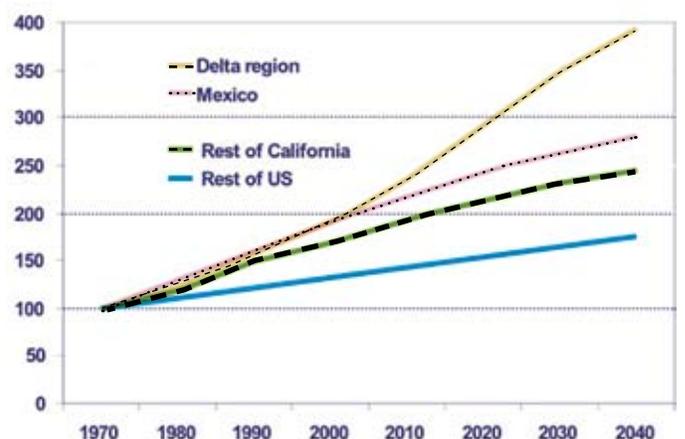


Figure 4. Projected indexed population growth in Delta and other regions (1970 = 100). Courtesy Hans Johnson.



Urbanization pressures are intense in Eastern Contra Costa County. Photo by Madeline Streicek

To get a better sense of what this growth means for the Delta landscape, we created the first comprehensive spatial analysis of the current urbanization pressures in the Delta. This analysis shows that currently planned growth in the Delta would form a nearly continuous ring of urban development around the south and east sides of the Delta, and would penetrate into the central Delta at Bethel Island (Figure 5, page 8). The areas in red on the map represent parcels that are either within incorporated cities or are slated for development by specific development proposals or by local general plans.

Crucially, this map represents only *currently* planned growth, and does not nearly reflect all the growth implied by the continuation of existing trends over the next half-century. And as UC-Berkeley Emeritus Professor Bob Twiss illustrates with virtual “overflights” of new development locations (see below), housing is already bumping up against the edges of the tidally influenced Delta (roughly 5-foot elevation) in places such as Oakley, Bethel Island, the Hotchkiss Tract, Stewart Tract, and west Stockton.

Development plans for Hotchkiss Tract and Stewart Tract superimposed on Google Earth aerials. Images created by Bob Twiss.

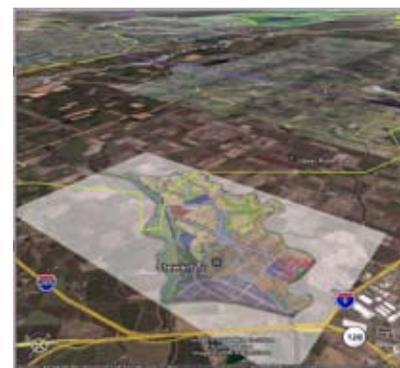
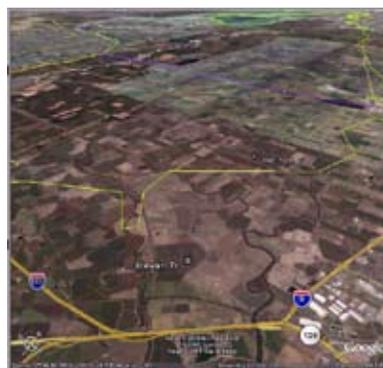
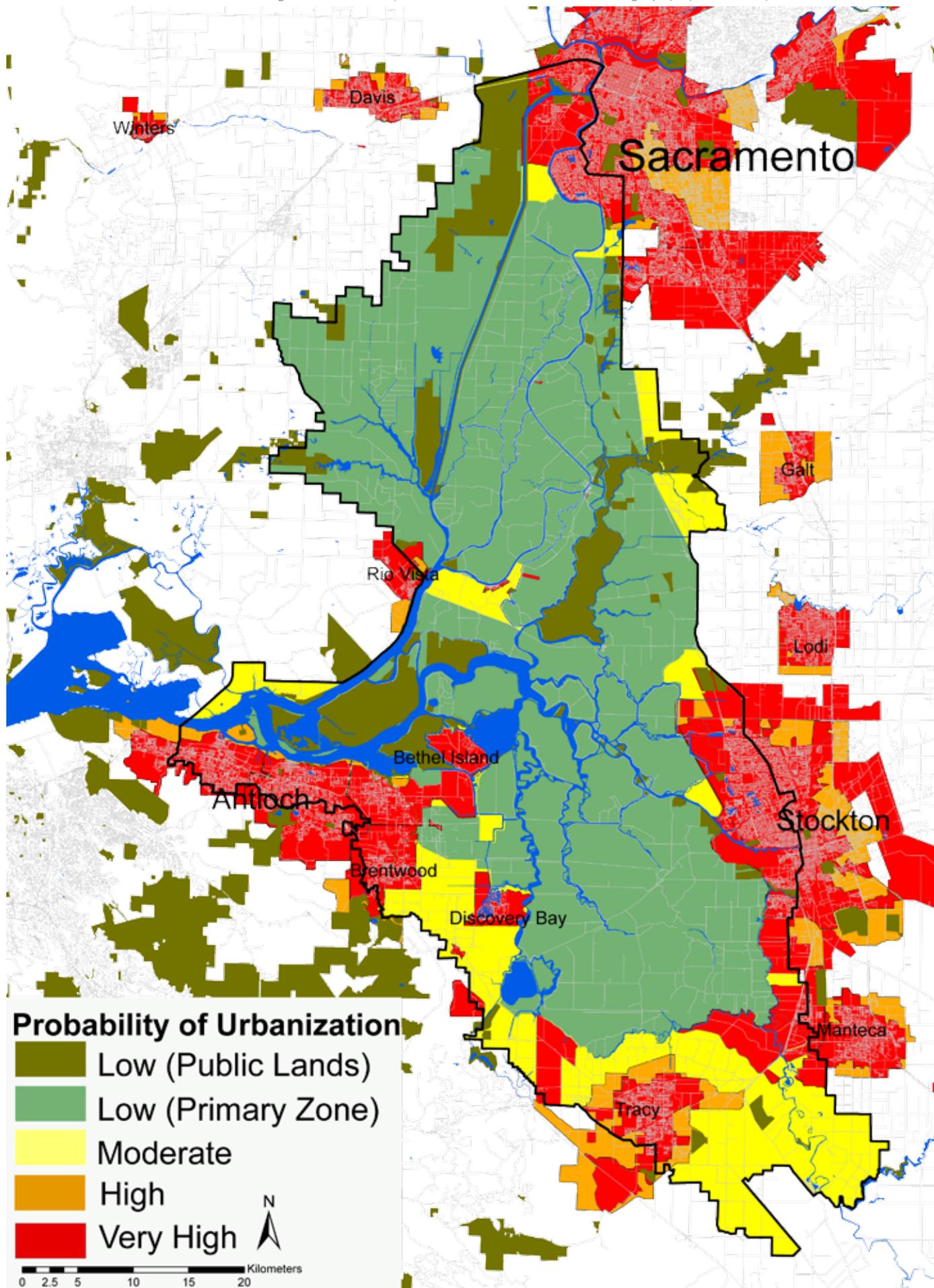


Figure 5. Probability of urbanization in the Delta. Cartography by Brooke Ray Smith and Alex Westhoff.





Eco-tourism could be a key part of the Delta's future. Images created by Elke Grommes, Mei Minohara, and Zachary Rutz

The Delta Protection Act

What is driving this growth? First and foremost, the gap in median home prices between the Bay Area and the Central Valley is now several hundred thousand dollars. As Carol Whiteside, executive director of the Great Valley Center and former mayor of Modesto, points out, developers seek sites that are within commuting distance of the job-rich Bay Area, but where costs are lower and political resistance to development is minimal.

Cities, for their part, want the tax and fee revenue that come with new housing in order to provide more public services. "In areas where you have relatively high unemployment, enormous economic need, and under-resourced local governments," says Whiteside, "housing more people looks like a way to bring not only revenue from sales tax, but increased property tax." Moreover, the state's "Fair share" housing law requires that cities zone enough land to accommodate their "fair share" of California's population growth for the next 20 years. Because this is a rolling requirement, it effectively means that cities must continually plan to consume more land.

More fundamentally, Whiteside argues that "over the long run, development wins" in locally administered land use planning processes. Local elected officials operate on a short time horizon and rely on measurable outcomes like tax revenues. Developers can afford to wait out unfavorable political conditions, and can eventually win zoning amendments and exemptions for most projects. As a result, a jointly held resource like the Delta cannot be well protected by such a planning structure.

The endangerment of the Delta is also a legacy of the partial failure of prior Delta protection efforts. As former state senator and author of the legislation Patrick Johnston recounts, the Delta Protection Act of 1992 was passed to conserve the Delta for agricultural and ecological purposes. In order to get the Act passed, however, Johnston and other sponsors agreed to define the Delta on the basis of political, rather than scientific or ecological, criteria. Thus, the "secondary zone" of the Delta consisted of lands where development proposals already existed, or local general plans called for growth. The "primary zone" was everything else left over. Large areas of subsided land, including Bethel Island, Hotchkiss Tract, Veale Tract, Discovery Bay and Isleton, were designated as "secondary zone" despite being at less than five feet elevation, or even below sea level.

Although the Act did grant the Delta Protection Commission authority to regulate land use in the secondary zone, Johnston argues, the Commission has never exercised that authority. One reason is that the Commission is composed of state agency representatives, local government officials, and farmers. State agency representatives bring substantial technical and institutional experience to the Commission, but are generally reluctant to advance controversial initiatives. The farmers are not afraid of controversy, but are reluctant to place restrictions on other farmers who may wish to sell their land to developers. The local government representatives, for their part, are not inclined to reject growth proposals for their own jurisdictions, or to presume to do so for other jurisdictions.





*Improved levees could form a regional trail system in the Delta of the future.
Image created by Patricia Fonseca, Alex Westhoff, and Chryssa Udvardy.*

This political structure, which differs greatly from other state commissions such as the Coastal Commission or the San Francisco Bay Conservation and Development Commission, ensures that the Delta Protection Commission will have “a certain timidity” in its regulation of growth in the secondary zone, in Johnston’s words. Because of the Commission’s structure, and the political compromise that birthed it, many have taken the position that the secondary zone was fair game for development, whether or not this made sense from an environmental, infrastructure, and public safety point of view.

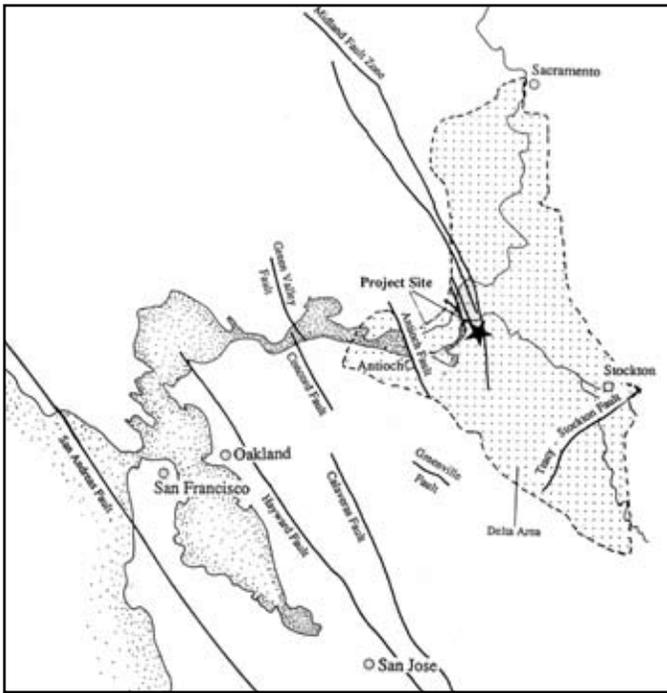
But Johnston feels that “a day of reckoning” is coming for the Commission. Not only is the wisdom of urbanizing behind levees coming under new scrutiny after Hurricane Katrina, but proposals to urbanize within the primary zone are also emerging. Stockton’s draft General Plan Update, for example, identified four islands in the primary zone for urbanization, although the idea was retracted in later drafts. A proposal to redevelop a sugar mill in Yolo County into housing and tourism facilities may be the first true test of the Commission’s will to prevent housing development within the primary zone. If that “line in the peat” is crossed, it will set a crucial precedent for the future of the Commission and the Delta itself.

The ecosystem services of the Delta

Before the Gold Rush brought a huge influx of American settlers, the Delta was primarily a vast tidal marsh shaped by the intermingling of saltwater carried inland by tides and fresh water carried oceanward by four rivers: the Sacramento, San Joaquin, Cosumnes, and Mokelumne. These rivers joined in this inland location because the Coast Range only permits one avenue for water to flow out to the ocean – through Suisun, San Pablo, and San Francisco Bays.

These basic geographical facts lie at the heart of all the ecosystem services the Delta provides to California today. The slowing of the rivers as they met the tides deposited the silt and peat soils that are the basis of the region’s agricultural productivity. The shallow spread of the waters over the flat topography formed wetlands that provided crucial habitat for migrating birds, a role that the region’s agricultural wetlands still play to a lesser extent. And because there is only one path for water to flow out, there is also only one path for salmon to swim back upstream to spawning rivers in the Sacramento and San Joaquin River systems. Other fish, like the Delta smelt, became adapted to the particular conditions of the Delta itself.

As cities and industries developed in California, the break in the Coast Range took on a new significance as a pathway for roads, railroads, and infrastructure lines. The Delta itself became a primary shipping route from the Pacific to Sacramento and Stockton, a role that it retains today. Finally, and perhaps most importantly, the gathering of so much freshwater in one place created the possibility of exporting that water to other portions of California. The fact that so many services of value to the state are concentrated in one place is not an accident, but a product of the geological forces that have shaped California.



Several faults threaten the Delta's levee system.
 Courtesy Matt Kondolf.



Levee breaches can take weeks or months to repair.
 Photo courtesy of Ray Seel.

Urbanization's risks

The urbanization of the Delta carries risks and consequences that are particular to this region of the state. Much of the land under urbanization pressure is either below sea level or well within the Delta's 100-year floodplain (see figures 5 and 6). Any housing built on these lands will deal with a perpetual flood threat, either from high flows on any of the four rivers that flow into the Delta, or from an earthquake- or subsidence-induced levee failure.

Though the Delta is historically a flood-adapted wetland system, human transformation of the landscape has sought to eliminate flooding completely by building levees that strictly separate land and water. Rather than spreading out over the landscape, floodwaters now surge through more constrained channels, often at an elevation several feet higher than the land on the other side of the levee.

Tom Zuckerman, former counsel to the Central Delta Water District and a lifelong resident and farmer, has seen first hand what the consequences can be:

"I was out on the levees in the mid-fifties with my father. My father's family were the original landowners of McDonald Island, one of the major islands in the central Delta. In 1955, we were battling the floods. I remember him saying as we drove by our gauge, 'Son, we've got a half an hour to go and we're not going to make it,' because the water was already coming over the top of the levee. We came back about 15 minutes later and the water was down a foot. He said: 'Somebody flooded.'"

As serious as the threats appear in Figures 6 and 7, there is good reason to believe that the real threats are even worse. The topographic map in Figure 6 relies on data from the 1970s that doesn't reflect the further soil subsidence of the last 35 years. Many areas shown as below sea level are now at even lower elevation. Additional areas of land have dropped below sea level since the 1970s.

The map in Figure 7 is based on Federal Emergency Management Agency (FEMA) hydrology data from 1986. This does not reflect new information about the Delta's hydrology gained in the 1997 floods. In a larger sense, the hydrology of the Delta does not conform well to FEMA's standard models because of the tidal influence on the system, making their estimations of the 100-year floodplain unreliable. Nonetheless, most regulatory and insurance decisions are based on this estimation.

Even if the FEMA information were perfect, the 100-year flood standard (also known as the "one-percent approach" to flood protection) is inadequate and misleading. The 100-year (or one percent) flood is the flood that has a one percent chance of occurring in any given year, so protecting against the 100-year flood means protecting against a flood of this size, but no larger. Unfortunately, there is still a significant "residual risk" of a larger flood. Over the life of a 30-year house mortgage, for example, there is a 26 percent chance that the house will be inundated by one of these larger floods (see page 15).

Figure 6. Elevation of land in Sacramento-San Joaquin Delta, based on 1970s topography.

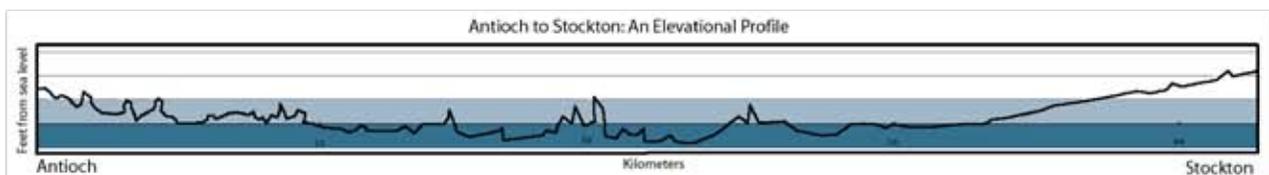
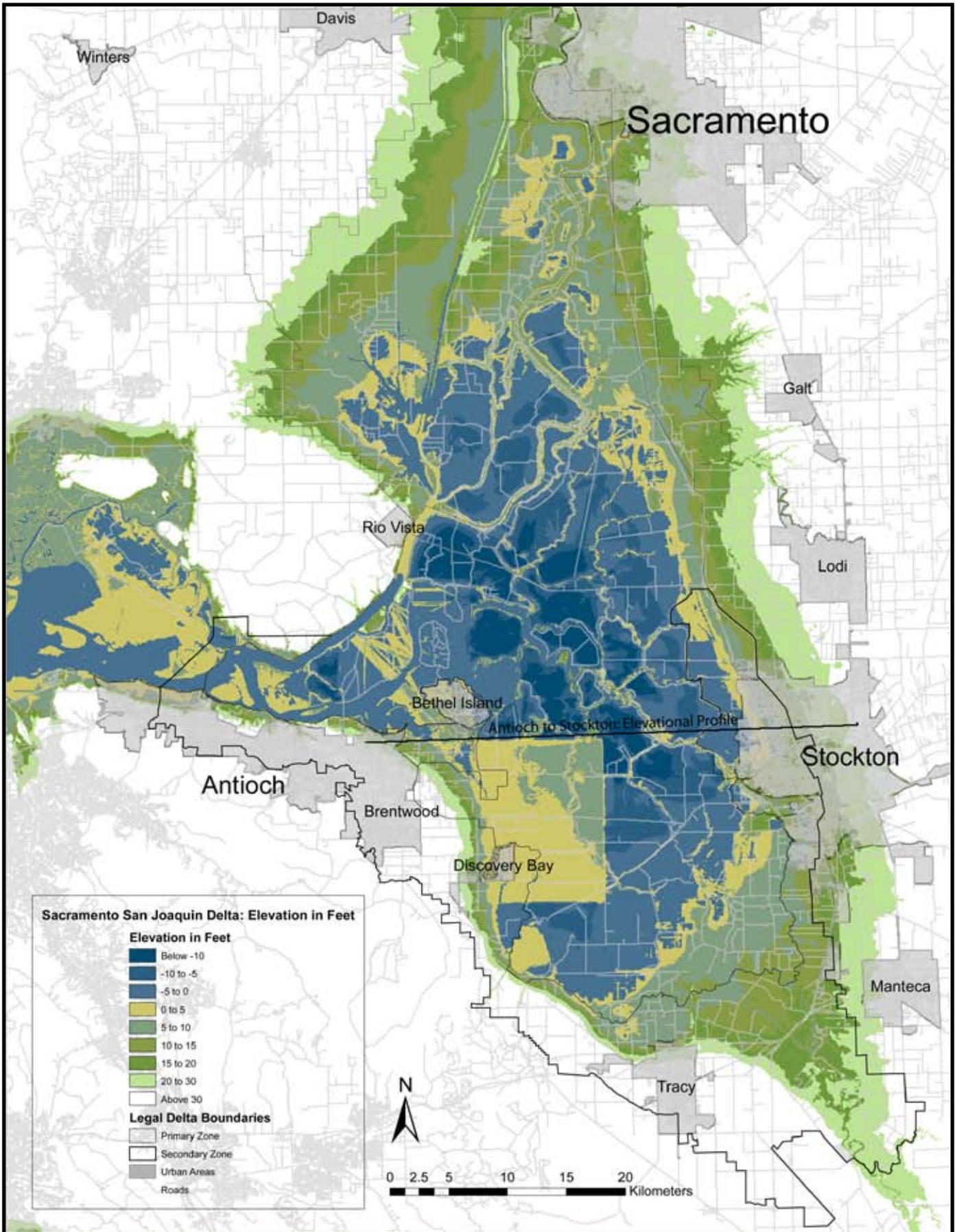


Figure 7. Sacramento - San Joaquin Delta 100-year floodplain.

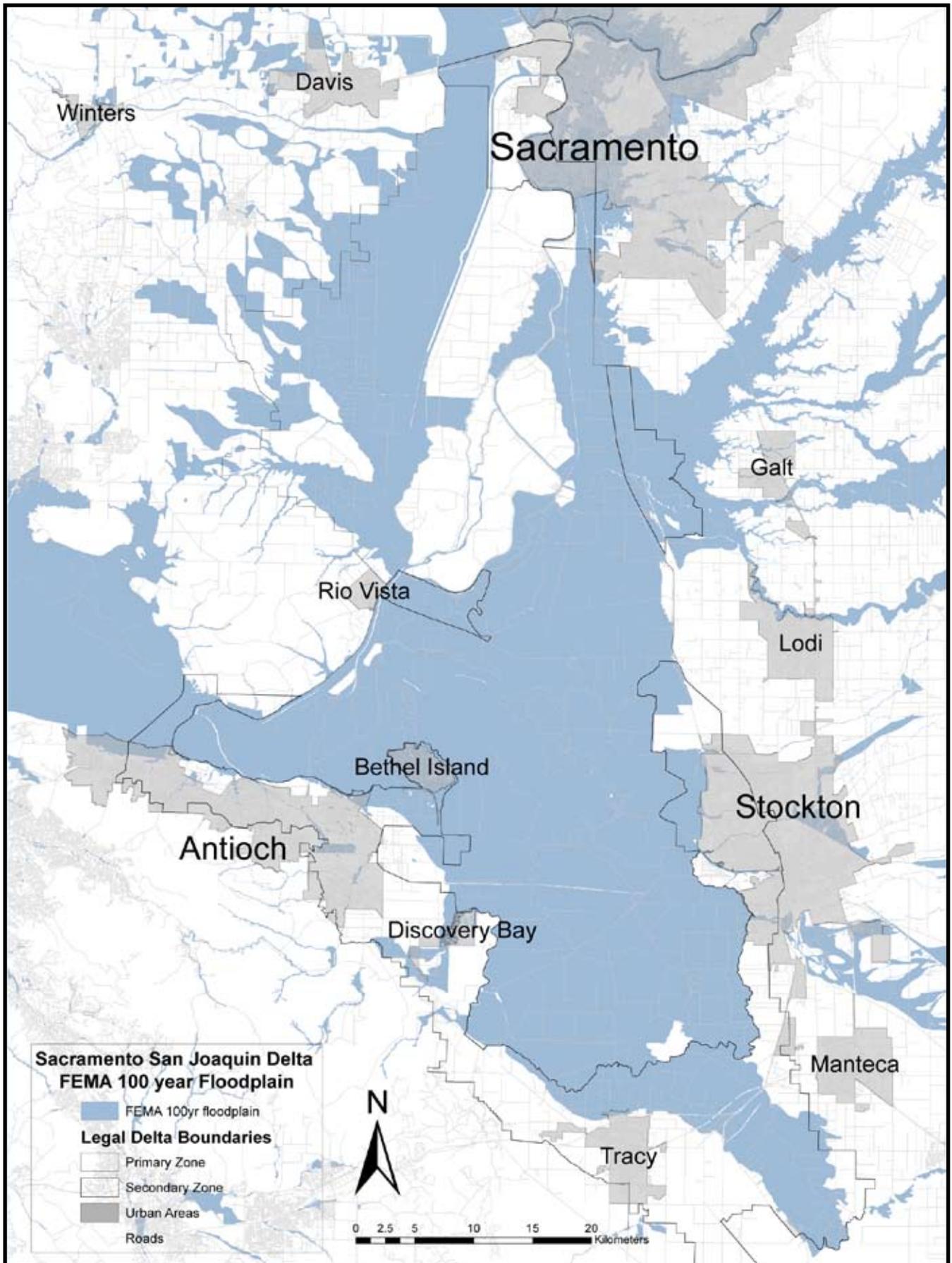




Photo by Matt Kondolf

In the Delta as elsewhere, this is not generally understood. The 100-year flood protection standard is often interpreted to mean that a given area is protected for 100 years, so buildings and infrastructure are constructed in the floodplain without regard to the residual risk (see box page 15). In addition, by causing more rain to run off from paved surfaces, urbanization in the watershed tends to increase the likelihood of high flows. Moreover, by preventing waters from being stored in floodplains, levees tend to exacerbate flood risk downstream of the protected reach.

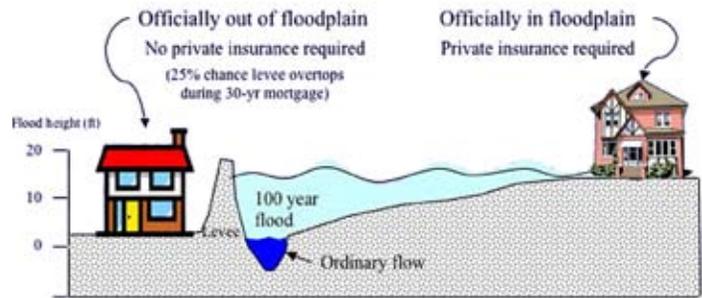
The levees in the Delta are not adequate to protect against these threats. UC-Berkeley engineering professor Ray Seed points out that the vulnerabilities of the Delta's existing levee system are much greater than those of New Orleans. Built over many decades by many different people and agencies, the Delta's levee system lacks any overarching central authority that would ensure its safety and maintenance. Soils in the Delta are variable over short distances and subject to subsidence, which can destabilize levees. Most importantly, an earthquake on any of the faults that run through or near the Delta could cause multiple levee failures simultaneously, much

as Hurricane Katrina did in New Orleans – except without the forewarning that an approaching hurricane provides.

In Seed's estimation, more than ten or twelve such failures could not all be rebuilt in a single year, given the state's current repair capacities. This means that water delivery to more than 23 million Californians could be lost for at least a year, with untold economic consequences. Seed argues, however, that such a catastrophe could be partially avoided through the systematic stabilization of liquefaction-prone soils underneath the levees, and through the improvement of the state's repair capacity.

These disaster risks affect more than just houses and water supply. A catastrophic flood could also compromise many of the ecological services that the Delta provides. Virtually all of the native freshwater marsh at the edges of the Delta has been lost to land reclamation, meaning that the migratory birds that pass through the region on the Pacific Flyway now rely heavily on agricultural wetlands. These could be inundated right along with the farmland in a catastrophic flood. Aquatic organisms that have adapted to the freshwater-saltwater balance of the post-reclamation Delta and neighboring Suisun Bay would also be affected by a sudden change in the water conditions.

Bob Twiss of UC-Berkeley and Jeff Mount of UC-Davis identify three main sources of disaster risk in the Delta: subsidence, seismicity, and sea level rise. Continuing subsidence of soils is mostly a problem in the Central Delta where deep peat soils remain. The seismic danger is most pronounced in the west Delta due to its increased exposure to earthshaking from faults in the western Delta and Bay Area, but the effects of a large quake could cascade through the entire system depending on the location of its epicenter. Sea level rise will affect the entire Delta, but perhaps most profoundly the periphery where new urban developments could be inundated. Overall, Mount and Twiss estimate that there is a 60 percent chance of multiple levee failures due to earthquakes or flood over the next 50 years.



In the U.S. system, the house on the left doesn't have to buy flood insurance, even though a levee overtop would be disastrous.

The "One-Percent" Approach to Flood Management

The National Flood Insurance Act of 1968 called for establishment of a National Flood Insurance Program in response to concerns about ever-increasing damages from floods. The basic idea was to establish a flood hazard zone within which local communities would agree to regulate land use to keep development out of flood-prone areas. In exchange, the federal government would provide low-cost flood insurance.

In 1971, the 100-year flood (the flood with a one percent chance of occurring in each year) was formally set as the mandatory minimum standard and has become the de-facto standard for design of flood control infrastructure. Mapping the 100-year floodplain involves estimating (from flow records and/or runoff models) the size of the flood with a 100-year return period. This flow is routed (with a hydraulic model) through the existing channel geometry to determine if the channel can convey this flow, and if not, how far out onto the landscape the floodwaters will extend. The area expected to be inundated is mapped as the 100-year floodplain. If a flood control dam is constructed, the 100-year flood is reduced and a new, much-diminished 100-year floodplain is mapped. If a levee is constructed to contain the 100-year flood, the area protected by the levee is then also removed from the 100-year floodplain, even if the land lies below sea level.

There are several serious problems with the 100-year standard. First, the 100-year flood is a statistical construct, and it usually becomes larger as our historical flood data set expands. Second, as areas urbanize, less rain infiltrates, so the flood runoff increases for the same rainfall, meaning the 100-year flood is actually greater than before. Third, the mapping of the 100-year flood assumes a static channel, but in fact river channels are subject to change, especially during big floods. Fourth, many people misunderstand the probability concept and think that the "100-year flood" won't happen for a hundred years.

Even more importantly, the 100-year flood is by no means the largest flood we can expect. There is the 200-year flood, with a one-half percent probability of occurring each year, and the 400-year flood, with a 0.25-percent annual probability, and so on. The residual risk of flooding from these larger, less frequent floods is significant. Over the life of a 30-year mortgage, the residual risk of flooding to a house protected by a 100-year levee is about 25 percent -- strikingly poor odds.

There is no better illustration of the flaws in this system than the Delta. Developers and local authorities are constructing levees to meet the standards of 100-year protection, thereby officially removing the "protected" area from the 100-year floodplain and releasing the below-sea-level land from restrictions on development. This is done in full knowledge that even if the levee performs as designed, they will not protect against any larger-than-100-year flood, which are about 25 percent likely over a 30-year period. And when the houses are below sea level, the floodwaters will rush in quickly, leaving little time for evacuation. This will inevitably result in loss of human life and massive property damage, for which California taxpayers likely will be held liable.



Hurricane Katrina illustrated the dangers of living below sea level. Photo courtesy of Ray Sead.

Urbanization's consequences

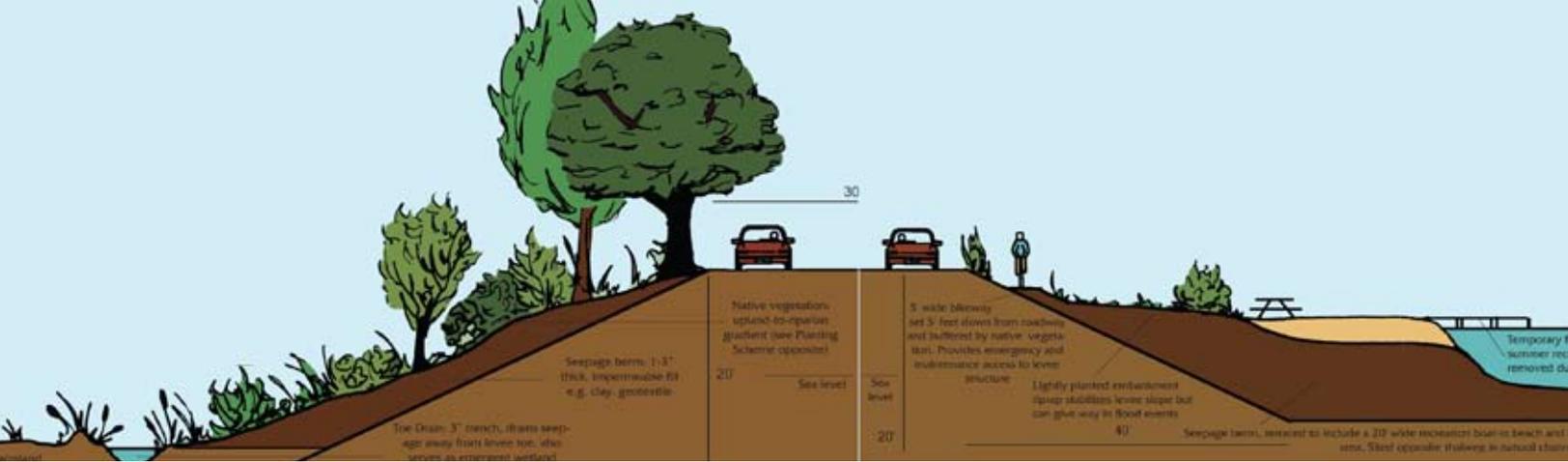
New urbanization undermines the flood-fighting system in place to protect existing inhabitants, degrades water quality, threatens wildlife habitats, and reduces the flexibility to manage all of these problems over the long term. Given that there are already significant numbers of people living in the Delta and its 100-year floodplain, the impact of new urbanization on the existing flood protection system must be a significant consideration. Ron Baldwin, the director of San Joaquin County's Emergency Services, points out that new urbanization in his jurisdiction is often built right up to the base of the existing levees, complicating efforts to fight a flood in two ways. First, the houses sometimes block access to levees that may need to be repaired or reinforced. In some urgent situations, houses may now actually have to be destroyed to allow flood fighters access to critical spots in levees.

Second, the presence of urbanization limits the options that flood fighters may have in a given emergency situation. It is often necessary, for example, to intentionally breach a levee in one spot to relieve pressure somewhere else. But since protection of human life and property must take precedence in any disaster scenario, the more houses there are, the fewer places this will be a viable option. Thus, new urbanization can compromise the flood protection for existing residents and farmers.

On the Hotchkiss Tract, the City of Oakley has approved development of over 3,000 homes on lands below sea level. The developers propose to build new levees inside the old, inadequate levees to remove the area from the "100 year flood plain" and remove restrictions on the development. So far, federal, state and local governments have not intervened even though the eventual consequence of flooding on land below sea level will be severe. Development of land below sea level also requires continual drainage, pumping, and discharge of water to the Delta to insure that groundwater levels do not rise above the ground surface elevation.

Highways run on top of huge levees separating South Florida urbanization from the Everglades. Image courtesy Pete Rhoads and the South Florida Water Management District.





Strengthening levees creates opportunities to provide for multiple uses. Image by Brooke Ray Smith and Stephen Miller.

On Stewart Tract, west of Manteca, the 11,000 unit River Islands development is proceeding despite the fact that the site was under at least 10 feet of water in the floods of 1997. That flooding of Stewart Tract very likely reduced water stage and flood pressures on downstream levees. The developer proposes to build "super levees" to protect River Islands from flooding, but this may simply direct flood waters downstream to areas where thousands of new homes were recently constructed. If undeveloped, Stewart Tract could be managed to reduce floods, but if developed this opportunity would be lost forever.

These developments and others like them would also have a significant effect on the water quality of the Delta. As with any urbanized area, the stormwater running off the Delta developments includes a mixture of metals, pesticides, hydrocarbons, oils, grease, trash, nutrients, chlorine and pathogens. Accumulations and interactions of these pollutants are harmful to aquatic organisms. Keith Lichten of the San Francisco Bay Regional Water Quality Control Board points out that this situation can be even worse for developments below sea level, since stormwater removal systems cannot rely on gravity for drainage. In periods of no rain, stormwater therefore settles in the systems and pollutant loads concentrate, potentially leading to a toxic plume of low-dissolved-oxygen water being flushed out of the system after the first rainfall.

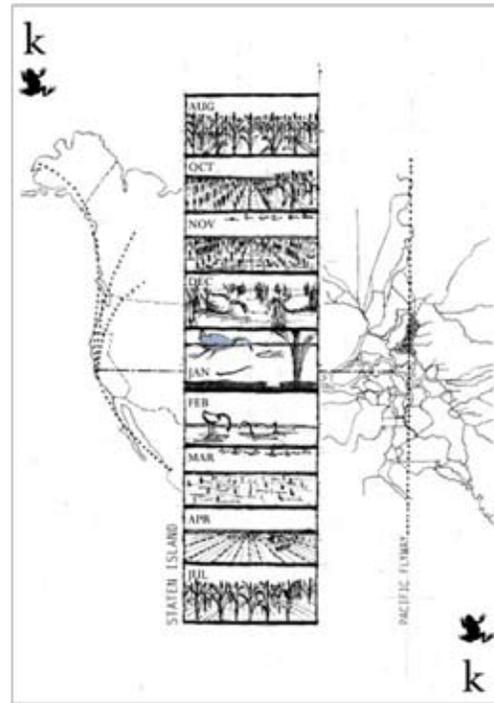
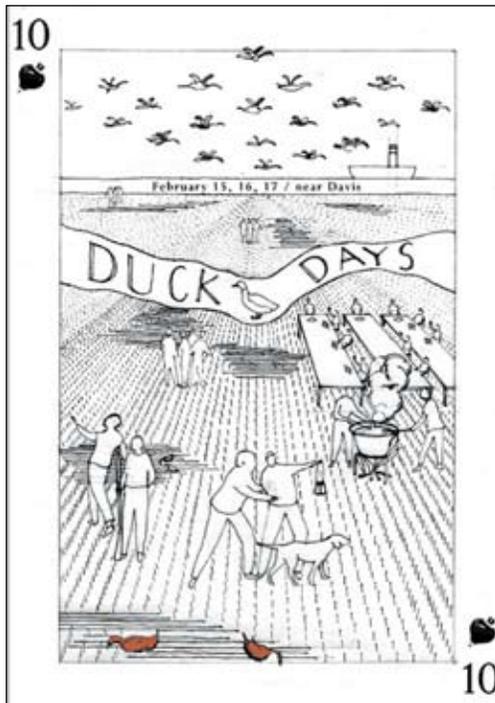
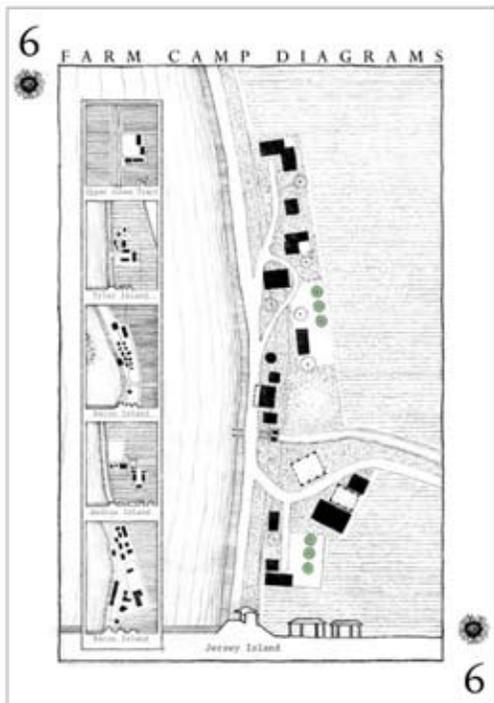
Any change to the biochemistry of the Delta's water will have major consequences for the species that rely on it. According to Gary Bobker of the San Francisco Estuary Institute, the Delta contains about half the remaining habitat for the species that are endemic to it. The saltwater - fresh water balance is a critical habitat parameter for many of these species. Climate change will alter the salinity gradient in the Delta gradually, and mass levee failure could do so suddenly, with significant consequences for habitat either way. Along with directly degrading water quality, extensive urbanization would physically limit our ability to manage these changes in ways beneficial to these vulnerable species.

Bob Twiss also emphasizes that the fate of the periphery of the Delta is critical to the future of the whole system. In addition to being good farmland, the periphery contains numerous important ecological values. The intermittently flooded lands at the Delta's edge are very rich habitat, notably where tributaries enter the Delta. The periphery is also where new management interventions to improve water quality, flood retention, and wetland restoration over the long term could most easily be made. Last but not least, it is also where water-oriented economic uses such as recreational boat docks and ports could be located.

The urbanization of the periphery would sacrifice many of these values irreversibly. Most importantly, it would foreclose many ecosystem management options for the foreseeable future. The Delta is already a dynamic system and is becoming more so. Its future is inherently unpredictable. Allowing its edge to be "locked in" to one land use irreversibly sacrifices management flexibility that could prove critical to the Delta's survival in the future.

New developments propose new levees. Photo courtesy of John Cain.





The Delta has a varied cultural and ecological landscape. Drawings by Jane Wolff from Delta Primer.

No longer “a place apart”

Creating a vision for the future of the Delta means more than creating proper planning and policy measures to address these issues. It also means appreciating the Delta as a place in its own right, with a unique history, character, and potential. John King, the urban design critic for the San Francisco Chronicle, says that “a big part of what makes the Delta so distinct and idiosyncratic is that it truly has been a place apart.” He recalls:

“As someone who grew up in Walnut Creek, my dad liked to go bass fishing there – catfish fishing, things like that – it really was a sense that you were just stepping off the urbanized, suburbanized map and moving into a different sort of culture. Not some Louisiana Delta or Everglades sort of culture, but just this little bit of California that had been left behind by other things. I mean that very much in a complementary sense. You had a sense that you were stepping into a bit of unchanging time.”

Marci Coglianese shares similar memories.

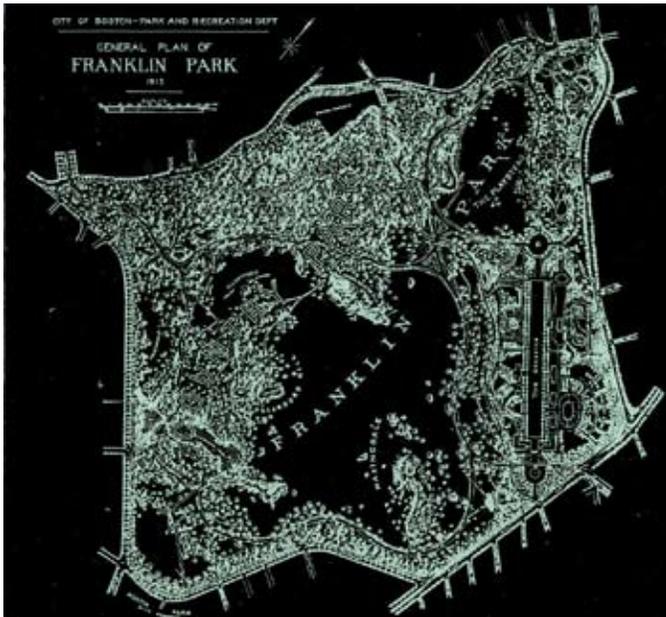
“When I think back, I remember when I first got there that the winter skies grew dark with wildlife, that in the foggy evenings you could hear them [flying] over. I guess we still had enough water, wetlands, and a balanced enough environment to be so rich in nature. And the same with the fisheries. Nobody had to be smart about how to fish, you just walked up to the bank and they were there.”

Jane Wolff has studied the Delta landscape closely to understand its history and culture. Standard maps “make

the whole region look the same,” she argues, but “it is characterized by differences, by particularities, and by idiosyncrasies.” It is a region where new farming tools like the beet harvester and new watercraft like the Boxie boat were invented to meet local needs, where immigrant laborers met in America’s only rural Chinatown to share a subscription to the *Chinese Times* of San Francisco, where people gather at Duck Days to celebrate the fowl that migrate to and from the abundant local wetlands.

Overall, “it’s absolutely impossible to think about the landscape of the Delta without considering land and water together,” in Wolff’s words. The physical and administrative separation of land and water was the pivotal moment in the Delta’s history and the origin of its ongoing challenges. As Margit Aramburu, former executive director of the Delta Protection Commission, puts it, the levees are “what define this human-created landscape.” Despite localized variations, the unique relationship of land and water that prevails throughout the region is what makes the Delta a unified place, with a distinct history and culture.

As all of these key observers recognize, however, it will no longer be a place apart. “There are too many pressures from too many directions,” says King, including encroaching urbanization. Coglianese concurs that “the imperceptible changes have really overtaken the people of the Delta.” The Delta cannot attempt to turn back the clock or shut the world out. It must somehow redefine its relationship to the rest of the state while retaining the character that makes it unique.



*Franklin Park, a central element of Olmsted's Emerald Necklace park system in Boston, stores floodwaters.
Image courtesy of UCB Architecture Visual Resources Library.*

Lessons in land conservation

Although the Delta is indeed a distinct place, it is a place that can be categorized in many different ways – a recreational open space close to major urban areas, a farming region, an economic resource of statewide importance, an estuary of national significance, or a wetland habitat of international importance. In fact, it is all of these things, and compelling visions of its future must recognize that. This also means that there are numerous land conservation precedents that can inform us as we imagine alternative futures for the Delta.

The Delta as a “Central Park”

Urbanization continues to expand throughout northern California, raising the prospect that a mega-region joining the Bay Area, Sacramento, and Stockton will come into being over the next century. The Delta's value as open space in such a huge urban conglomeration would be even greater than it is today.

Central Park in New York and the “Emerald Necklace” system of parks and wetlands in Boston each were planned at a similar moment in their regions' histories. Both were created in anticipation of future urbanization, not in response to it. “Central Park today seems utterly inevitable,” says UC-Berkeley landscape architecture professor Louise Mazingo. “It was not. The land set aside for Central Park was one-fourth the size of the existing urbanized area of New York, and it was a mile from the edge of the city.” The Emerald Necklace, also an Olmstead design, was truly regional in scope, involving lands all along the perimeter of the region and well outside the existing limits of Boston. It also integrated recreation and ecological function (the purification of wastewater) with unsurpassed success.

In each case, this proactive thinking was strongly resisted by powerful local interests and had no political reinforcement in environmental or land use regulation. It prevailed due to the persistence of its advocates and the compelling aesthetics of the designs. Though considered outlandish when first proposed, each ultimately became an essential model of what urban open space could be. The Delta, with its rich mixture of ecological services, economic resources, and recreational opportunities, could be an equally compelling model for the future.

Image by Elke Grommes, Mei Minohara and Zachary Rutz



Photo by Lucas Griffith





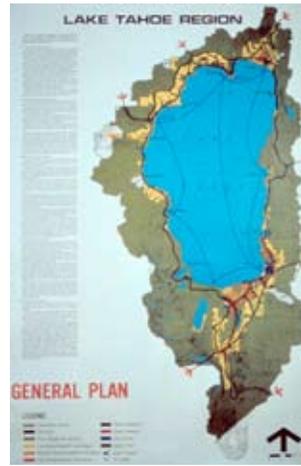
Preservation of Delta farmland should be modeled on previous farmland conservation efforts. Photo by Jane Wolff.

The Delta as an agricultural region

Northern California itself already possesses a fabled history of land conservation, much of which mixes aesthetic or recreational values with economic and ecological considerations. The Pt. Reyes National Seashore, and later the Golden Gate National Recreation Area, incorporated the working ranches and dairy farms of the Marin coastline into large public open spaces. The GGNRA also grew out of local opposition to a large housing development proposed at the Marin end of the Golden Gate Bridge, a powerful example of how an urbanization threat can crystallize visionary regional planning.

Marin and Sonoma Counties have also been national leaders in the use of easements and land trusts to protect working landscapes. As longtime land conservation activist Phyllis Faber recounts, agriculture and ranching was on the edge of extinction in Marin County in the early 1970s due to falling prices and urbanization pressures. "We wanted them to feel secure enough that they would invest in their ranches and make improvements, and so that their kids would stay on the farms," Faber says.

Spurred on by Faber, Ellen Strauss, and other local activists, county supervisors helped create a land trust to purchase easements that compensated farmers for the loss of development potential on their land. For those farmers who participated, the removal of development pressure freed them to make long-range re-investments in their farming operations, reinvigorating the agricultural economy throughout the county. "It really did the certainty thing," Faber concludes. "We now have second-generation ranchers on the MALT board." The experience of Marin County shows that removing the threat of destructive and dangerous urbanization does not need to come at the expense of local farmers.



Two maps from the "Keep Tahoe Blue" project. Photos courtesy of Bob Twiss.

The Delta as a water resource

The Delta is not the first water body in California where preservation of water quality is of the essence. Lake Tahoe has been threatened with water quality degradation ever since large-scale urbanization of the Lake's watershed began in the 1960s. Given that the extraordinary clarity of its water has been one of the prime aspects of the Lake's appeal, water quality degradation was seen as a serious threat to the region's future. "Unlike the Delta, Tahoe had the benefit of having a single focal point," recalls Bob Twiss, former chairman of Governing Board of the California Tahoe Regional Planning Agency (CTRPA). "Everyone could agree to 'Keep Tahoe Blue.'"

Lake Tahoe's watershed includes two states (California and Nevada) and five counties, making political coordination difficult and contentious. Rather than leave the Lake's future to voluntary actions and ad hoc arrangements, the two states and the federal government agreed to create the TRPA and give it binding regulatory authority over land use in the Tahoe Basin. By creating two maps of the Basin – one that defined categories of land-use capability relative to the Lake's water quality, and another that zoned the Basin on that basis – the TRPA has been able to protect the Lake's water quality for more than 25 years.

Twiss believes strongly that clear, easily understood plan images and regulations are a key to long-term success. "We had an attorney sitting with the scientists and the planners in developing [the plan maps], and he said 'No, you cannot have a thousand indices, you cannot have fifty different things to do. You've got to have only a few levels of land capability,'" Twiss recounts. "The Delta is too complicated to have one map that shows what to do where, but I think unless we can get close to that level of visualization of where to build and where not to build, what to do and what not to do, we're going to have a hard time."

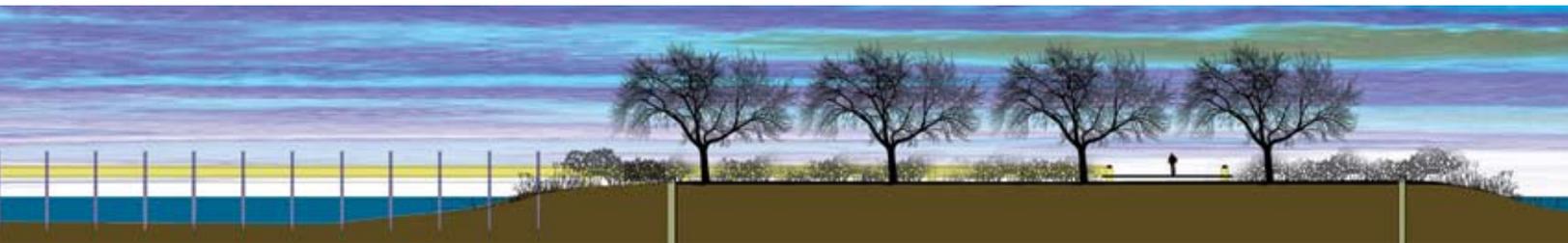


Image created by Eva Huang and Liyan Yang

The Delta as open space

There have also been major land conservation successes that do not involve regulatory control over land use. In the Santa Monica Mountains, located in the heart of metropolitan Los Angeles, there has been more than \$750 million in land conservation since the early 1970s. The vehicle for that investment has been the Santa Monica Mountains Conservancy, which purchases land from willing sellers and stitches it together into a regional open space system that provides wildlife habitat, recreation, and visual beauty.

The Conservancy's director, Joe Edmiston, argues that working through local planning agencies to protect environmental resources is "a hill that is impossibly steep to climb," given the political power of developers in local politics. Only by purchasing land outright, or becoming an investor in development projects in order to secure land set-asides, can a regional landscape be preserved by any means other than a TRPA-style regional planning body.

The conservancy approach not only has the virtue of efficiency, but also ensures economic fairness toward landowners and developers. "You have no idea the sea change that occurs, when you sit down at a table and say 'We'd like to become an investor in your project,'" says Edmiston. Even in the cases in which a developer doesn't want to partake of this offer voluntarily, local officials can make project approvals contingent on it. This gives officials a mechanism by which to secure conservation values without imposing economic hardship on the developers.

Edmiston believes that three conditions are necessary for the Conservancy model to work in the Delta. First, one needs a widespread perception of a significant problem, which already exists. Second, there must be a governmental mechanism that addresses conservation exclusively, as opposed to a multi-objective management agency that attempts to balance many values. Last but not least, there must be funding, preferably through a state bond issue. In order to get political support for such funding, statewide voter appeals and generous public access to the conserved lands are critical.

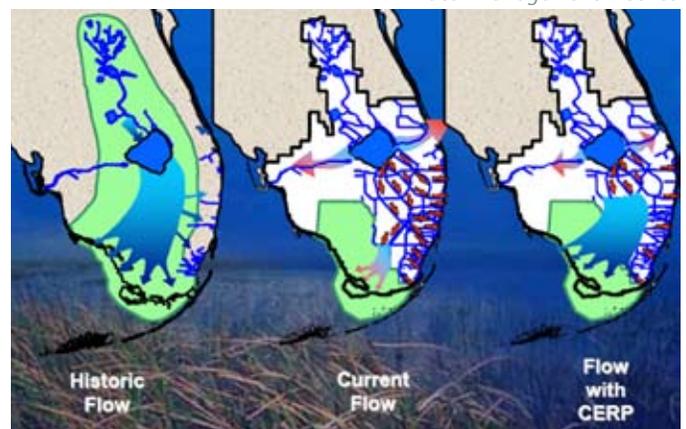
The Delta as wetland habitat

The Delta also contains wetland habitat of international significance, a crucial link in the Pacific Flyway along which countless birds migrate throughout the Americas. Like the Delta, the Everglades in South Florida are also an indispensable migratory bird habitat that has been compromised by anthropomorphic changes to land and water.

Restoration of historical flow patterns is crucial to the survival of the 68 endangered species that rely on the Everglades. Despite massive water diversions to South Florida's cities and sugar cane farmers, "many of us are confident that we can put the most crucial components of the ecosystem back together," says Pete Rhoads, formerly of the South Florida Water Management District. Doing so will require ecological restoration on an unprecedented scale. The Army Corps of Engineers and the District have already begun to restore the Kissimmee River (which flows into the Everglades), one of the largest river restoration projects to date.

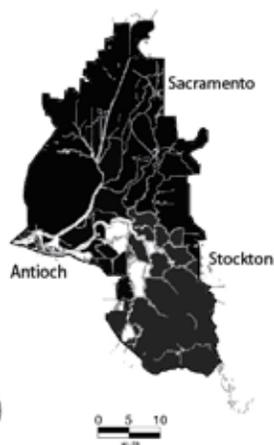
It also requires ownership of the land. The South Florida Water Management District is the largest landowner in Florida. The primary rationale for its land acquisitions is water management, but providing public access to the lands has also been critical for securing public support over a 40-year period. These holdings complement the public ownership of Everglades National Park and make it possible to implement the Comprehensive Everglades Restoration Plan (CERP) to bring the park back to health.

Restoring bird habitat in the Everglades involves restoring the native hydrology. Image courtesy of Pete Rhoads and the South Florida Water Management District.

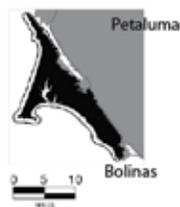




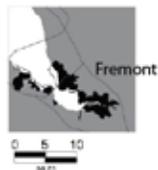
Everglades National Park



Delta National Recreation Area



Point Reyes National Seashore



Don Edwards National Wildlife Refuge

National Park Comparison

A Delta park would be comparable in scale to Everglades National Park. Image created by Patricia Fonseca, Alex Westhoff, and Chryssa Udvardy.

The Delta as multiple-use resource

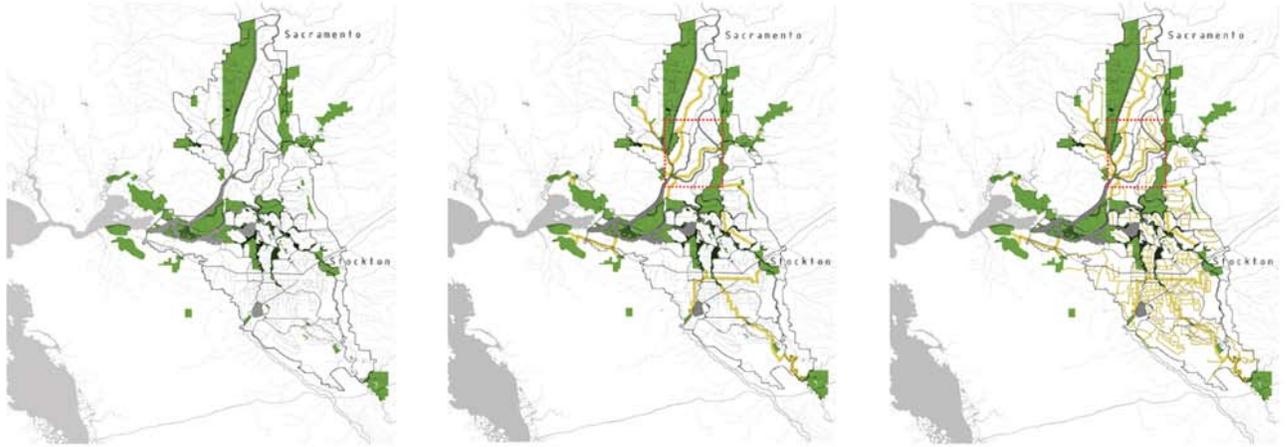
Like all water bodies, planning for the Delta must balance the needs of multiple users. Conservation priorities must be balanced with the needs of shipping, recreation, and water use, among others. Any comprehensive plan for the Delta must therefore address these needs and more.

The San Francisco Bay Conservation and Development Commission (BCDC), created in the mid-1960s, faced the same challenge. "I used to say that the most important word in that title was 'and,'" says former executive director Joseph Bodovitz. "It's not conservation *or* development; it's conservation *and* development." In the Bay as in the Delta, the economic uses are of statewide importance. According to Bodovitz, "the challenge was to prepare a plan for the future of the Bay designating where necessary development ought to go – because the Bay after all is a major world harbor and port uses presumably were going to continue – and what areas ought to be conserved."

BCDC's success over a 40-year period shows that such a balance is possible. The filling of the Bay – occurring at a breakneck pace when BCDC was formed – has been completely halted, and restoration of large wetland areas is underway at the south end of the Bay. Furthermore, allowing economically productive uses to continue sometimes can be compatible with environmental goals. Drawing from this experience, Bob Twiss recalls how salt companies, for example, were encouraged to continue operating in the south Bay as an economic water-oriented use. Restoration began when salt production was no longer viable. Twiss thinks that if "productive agriculture, water storage, water conveyance, transportation routes, [and] gas fields...can be done in an environmentally compatible way [in the Delta], I think we ought to do that."

Photo by Alex Westhoff





Re-Thinking Boundaries

The Delta as a Habitat Web

Moving forward

Image created by Tonia Wall

Given these precedents, there is a rich menu of alternative futures for the Delta. Spatial visions, policy prescriptions, and institutional architectures will all be critical in guiding the region toward a sustainable future.

The 2006 Thomas Church Design Competition (held annually by the UC-Berkeley Department of Landscape Architecture and Environmental Planning) challenged student teams to envision the future Delta as a regional park serving northern California. The term “park” was interpreted broadly to include ecological restoration, infrastructure, and appropriately sited housing in addition to recreation facilities.

Two winners were selected (see page 25). “Delta Byways,” by Brooke Ray Smith and Stephen Miller, proposed a Delta Conservancy so convincingly that some jurors thought it already existed. It proposed both specific landscape interventions, such as restored wetlands at the base of levees, and specific funding and institutional mechanisms. “Wet Feet Wanted,” by Elke Grommes, Mei Minohara, and Zachary Rutz focused on creating a visual and experiential identity for the Delta through landscape design. It proposed, for example, a network of bike paths on top of re-built levees, the creation of visitor infrastructure at legacy towns like Locke and Walnut Grove, and a Delta-wide waterborne transportation system, as primary means of establishing this identity. As juror John King pointed out, these two proposals complemented one another, the first one looking at the Delta from the inside out (taking the existing Delta and protecting it), and the second one looking at the Delta from the outside in (shaping and “branding” the Delta for visitors).

Before we can reach such futures, however, Tom Zuckerman argues that any lasting solution to the Delta’s

problems will require four things. First, we must decide what level of risk is acceptable for inhabitation before we allow new housing to be built. Second, we should conduct an inventory “almost on a foot-by-foot basis” of the condition of the levees and the soils underneath them. Third, we should consider instituting a specific set of structural standards for the levees that are based on local requirements and risk levels, not on generalized engineering models like FEMA’s. Finally, we should finance water conservation and demand reduction in southern California as a way of easing some of the pressure for freshwater export from the Delta and reducing the disaster risk over the long term.

The building industry itself shares some of these goals. Fixing and maintaining levees should be a top priority for state government, according to Mike Webb of the California Building Industry Association. At the same time, the building industry supports the legal status quo that the state government be held liable for any damages resulting from levee failure, which makes building below sea level a no-liability proposition for developers. Webb argues that people moving into the Delta need to be made aware of the risks to which they expose themselves and have access to good flood insurance, but that it is not wise to restrict urbanization given California’s perpetual housing crisis.



As even the building industry admits, then, living in the Delta means living with floods. The key is to create a "flood culture" that explicitly recognizes the risks and encourages rational preparation for the inevitable. With so many newcomers in the region, Ron Baldwin of the San Joaquin County Office of Emergency Services urges us to think creatively about how to create such a flood culture, perhaps by things as simple as having school children name the levees, or recounting the dramatic stories of flood fights throughout the region's history. Combining this kind of cultural familiarity with better physical design of communities to withstand floods, Baldwin argues, can help Delta residents come to grips with the nature of the place they call home.

Marci Coglianesi, former mayor of Rio Vista, argues that although Delta communities are not well understood or represented in statewide Delta planning efforts, the principle of local control enshrined in California's public policy apparatus since the 19th century will not be adequate to the challenges of the 21st. The continuation of the "California Dream" in the next generation depends on bringing local, regional, and state interests together in some equitable and workable fashion. The alternative may be a solution imposed by the state that doesn't adequately consider local concerns.

Margit Aramburu, former executive director of the Delta Protection Commission, shares this apprehension, noting that it is local farmers who maintain levees today. "The worst scenario I can think of is that we have public ownership of all the agricultural lands in the Delta," she says. "I can just imagine: budget cutbacks, nobody to patrol the levees...we [would have] lost that deep-seated commitment to making sure the levees are staying intact." Christine Rosen of the Haas School of Business also points out that engaging private business interests in the Delta may be essential to raising the large amounts of capital needed to upgrade the levees.

Regional as well as local and state interests need to be considered as well. Kathleen van Velsor of the Association of Bay Area Governments (ABAG) reports that the Delta is increasingly a topic of concern and planning focus for the nine-county Bay Area. Ever since the Jones Tract levee failure of 2004 threatened a water aqueduct supplying the Bay Area, "it has become essential that the nine-county Bay region consider what might happen to our urban infrastructure," she says. At the same time, conflicts over land use in the Delta should also be seen as part of a larger struggle to save prime farmlands throughout California, according to Eric Parfrey of the Yolo County Planning Department.

Program for 2006 Thomas Church competition "The California Delta: A Once and Future Park"

The objective of this competition was to re-imagine the California Delta region as a park with local, regional and national appeal. The Delta region is under tremendous development pressure despite the diverse resource value it presents to both the region and the State. If one could demark and design an area to be permanently free from the stresses associated with the expansion of residential development and urban growth, what would it look like? How could the transformation of current land uses in the Delta into a park match the economic standards being used to justify rampant residential growth?

Entrants were instructed to determine and illustrate the boundaries of the new Delta Park, considering the ecological, social, economic and political ramifications of such a powerful action, particularly how the boundary will alter existing patterns on either side over time. Agriculture was to be maintained as an on-going aspect of the future Delta Park, as it provides both necessary habitat for avian wildlife as well as recreational opportunities. Entrants were also instructed to assume that the role of the Delta in the California water supply system would remain unchanged despite the Delta's park status. In addition, the role of the historic "legacy towns" that are important to the continuity of California's social and cultural evolution was to be clearly addressed. Finally, entrants were instructed to design and describe how visitors from around the world will interface with this new park at the human scale.

This design competition was open to individuals and teams of students from the Department of Landscape Architecture and Environmental Planning, as well as from other UC departments, encouraging interdisciplinary teams. Entries were to be submitted as two boards, 30 inches by 40 inches in size. The team of jurors utilized the following criteria in evaluating entries: logic of boundary definition; clarity of Delta Park experience concept; suitability of proposed program to the social and ecological contexts; understanding of economic sustainability; creative and communicative presentation of ideas.

Achieving the long-range vision

But how to achieve a desired state in the Delta? In a place with as many stakeholders as the Delta, the process of finding broad consensus is arduous and full of pitfalls. As Bob Twiss points out, it is difficult to have numerous stakeholders develop visions and priorities independently and then bring them together, because each group can become fiercely attached to their own vision in the meantime. It is also difficult, however, to bring stakeholders into the process sequentially because then those brought in at the end seem like an afterthought. The remaining solution is to have stakeholders develop a vision jointly, which requires masterful coordination and large reservoirs of good will.

Equally importantly, there must be products, not just process. After the CALFED experience, many parties concerned with the Delta are hungry for a tangible plan and an action agenda. Because of that need for tangible outcomes, "there does need to be a leader" in any such process, says Tom Waters of the Army Corps of Engineers. Given the importance of the Delta to California as a whole, and local government's inability to control sprawl in flood-prone lands, that leadership will likely need to come from the state government.

Finally, throughout this long process, it is critical to remember that visions can become reality. In the mid-1960s, as the channelization of the Kissimmee River in Florida was being carried out, nothing seemed more improbable than the idea of putting it back the way it was. But by 1981, due to the committed action of a few individuals, the governor of Florida had agreed to do just that. Pete Rhoads recalled that biologist Art Marshall traveled the state of Florida for more than a decade talking to stakeholder groups, some very hostile. Marshall started each presentation by saying, "I want to talk to you about what the Kissimmee River *could* be." That is the spirit in which California must think about the Delta. What could it be?

A future of conflict and impending disaster is not inevitable or necessary. At every moment in California's history, unchecked urban growth and the destruction of irreplaceable resources has seemed unavoidable. Fatalists have always claimed that natural resources – no matter how valuable – couldn't survive the economic pressures of suburban growth. Sometimes they have been right. The rich farmland of Los Angeles County, for example, is now a distant memory.

But in many other cases they have been wrong. San Francisco Bay today is not a mere shipping channel, as was

feared in the 1960s. Public access to the California coast has been preserved at hundreds of sites over the last 30 years. There are black bear returning to the Santa Monica Mountains, within sight of Hollywood. The difference in these cases has been visionary planning, devoted citizen involvement, and inspired leadership on the part of elected officials and state agencies.

The Delta will require no less over the next generation. Given the complexity of the challenge and the importance of the Delta to California, it is tempting to defer bold action and maintain the status quo as long as possible. But just as California as we know it cannot survive without the Delta, the Delta as we know it cannot survive in its present state. The status quo will lead to gradual urbanization, ecological deterioration, and eventually a natural disaster that shatters the entire system. Creating a comprehensive vision of the Delta that recognizes these realities is the first step toward a lasting resolution of the conflicts and threats that currently darken its future.

Channelization of the Kissimmee River. Photo courtesy of Pete Rhoads and the South Florida Water Management District.



Delta channels aren't straight, but are still controlled by levees. Photo by Matt Kondolf.



Key conclusions from the symposium

1. *Now is the time to take action on the Delta's problems. Crisis is the most effective impetus for change, and the sense that the Delta is in crisis is now universal. In August 2006, the governor and legislature began the Delta Vision Process, a multi-agency planning effort to create a comprehensive action plan for a sustainable Delta by 2008. It is crucial that this process articulate long-range solutions for the Delta, because the political will that gave birth to it may be fleeting.*

2. *Levee repairs alone will not solve the Delta's problems. To the contrary, upstream levee repairs are likely to send concentrated floodwaters downstream to the Delta and exacerbate the problem. In the 2006 elections, state voters passed two bond measures (1D and 84) that provide billions of dollars for flood risk reduction and levee repairs, but only part of those funds are earmarked for the Delta. Even if all Delta levees are strengthened to the prevailing 100-year flood protection standard used by the Army Corps of Engineers, there will still be very significant residual risks from river flooding (see page 15). The bond funds are only a down payment on what will be required just to meet this minimal goal. Earthquake and climate change risks to the levees will remain, and unchecked urbanization could badly damage the Delta even if the levees are fully secured.*

3. *Building houses in or around the Delta forecloses other options. Residential development tends to be irreversible, compromises other Delta services like water supply and habitat value, complicates flood fighting, and seriously limits ecosystem management flexibility over the long term. To date, there has been no analysis of the cumulative effects of urbanization in the Delta. This badly needed to understand the nature of the threat.*

4. *A limited amount of money can be used to leverage solutions to seemingly intractable resource problems. Local government planning has failed to protect Delta lands. The state-sponsored Delta Protection Commission has only partially succeeded. A well-funded Delta Conservancy, even without any regulatory authority, could make substantial progress protecting the Delta through the acquisition of conservation easements, and where necessary, fee simple rights. Conservancies are a proven, efficient and fair strategy to protect open space and agricultural lands, with demonstrated success in places as diverse as Marin County, the Santa Monica Mountains, and South Florida.*

5. *Long-term resolution of the Delta problem will require a balance between a sense of urgency and the need for considered analysis. While disaster could arrive at any time, that does not mean that unconsidered, knee-jerk actions are the appropriate way forward. Better data and information are necessary to chart a long-term solution. There are also several "no regrets" actions and policies that should be implemented now and that will serve us well under any future course we ultimately choose for the Delta.*

Ongoing studies should be coordinated. The Delta Risk Management Study (mandated by Assembly Bill 1200), the CASCaDe study (U.S. Geological Survey and CALFED), and the CALFED Science Panel are all tackling various key issues, but their results will not be available before 2008. Moreover, none of these ongoing efforts is analyzing risks to infrastructure and environment comprehensively. The Delta Vision Process should coordinate with these efforts as closely as possible, and the state should support further, targeted research needed to understand the nature of current and future risks.

6. *We need a spatially explicit long-range vision. The Delta Vision Process is a positive step, but to be truly effective it must deliver an actual plan for how to reshape the Delta landscape over time. Planning workshops now being implemented by the UC-Berkeley Delta Initiative and key stakeholders are developing alternative land use plans for a sustainable Delta fifty years in the future. This spatial perspective can help decision makers identify appropriate locations for programmatic measures and specific actions in the final plan.*



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