



STATE OF THE ESTUARY 2015

STATUS AND TRENDS UPDATES ON 33 INDICATORS OF ECOSYSTEM HEALTH

A REPORT FROM
THE SAN FRANCISCO ESTUARY PARTNERSHIP

SAN FRANCISCO BAY & SACRAMENTO-SAN JOAQUIN RIVER DELTA
THE ESTUARY

EXECUTIVE SUMMARY

J. LETITIA GRENIER
LEAD SCIENTIST

The *State of the Estuary Report* is the most comprehensive health report ever completed for the San Francisco Bay-Delta Estuary. It uses the best available science and most recent data contributed by over 30 scientists to assess the status of various parts of the ecosystem. The purpose is to identify problems with estuarine health, so that conservation and restoration efforts can focus on solutions. This 2015 report expands on the scope of its predecessor in 2011, including Delta indicators for the first time, various new indicators for San Francisco Bay, and new sections linking the Estuary to the Gulf of the Farallones. The results show that the Upper Estuary (Suisun Bay and the Delta) is in critical condition. San Francisco Bay is in better health but jeopardized by climate change. Immediate action, significant investment, and bold changes to status quo management will be needed if we choose to recover and maintain a healthy estuary.

HOW HEALTHY IS THE ESTUARY?

The Upper Estuary (Suisun Bay and the Delta) is in fair to poor condition and getting worse, while the Lower Estuary (San Francisco Bay) is healthier. The status of half of the Delta indicators (most of which include Suisun Bay) is fair and the other half is poor. These indicators suggest that many Delta ecosystem components are either deteriorating over time, or have mixed trends across subregions. In contrast, the status of most Bay indicators is fair, with trends either improving or mixed across subregions.



Photo: Shira Bezalet

WHY ARE THE DELTA AND SUISUN BAY IN CRITICAL CONDITION? WHY IS SAN FRANCISCO BAY IN BETTER CONDITION?

The Delta and Suisun Bay ecosystems are in poor health because human activities have had more profound impacts on the Upper Estuary than on San Francisco Bay. Also, restoration efforts are further along in the Bay, and the results show. Throughout the Estuary, the same three intertwined aspects of ecosystem degradation, described below, stand out as critical areas to address through management action.

First, we have severely altered the physical processes that create and maintain habitats. Freshwater inflows and beneficial floods now exert such a small fraction of their former influence that they no longer build and maintain the physical structure of habitats in the Estuary, nor support critical ecological functions. Indeed, diversions for human use have so reduced inflows that the Bay is in a state of chronic, artificial drought. This great loss means that low salinity habitat occurs over too small a space, too short a time, and too far upstream to support dependent food webs and wildlife. In the Lower Estuary, similar changes to the hydrology of Bay watersheds and the diking of tidal areas have deprived estuarine wetlands of the sediment they need to build up their elevation in relation to sea-level rise, something the Estuary's unfettered physical processes once accomplished. In the absence of more sediment, many Bay marshes will likely be lost to the advancing Bay in the decades to come.

Second, this impairment of critical physical processes is intertwined with habitat loss, degradation and fragmentation, which are generally more severe in the Upper Estuary. Tidal marsh now covers just 2% of its former extent in the Delta and most of the remaining patches are too small to support thriving populations of marsh-dependent wildlife. By contrast, the

amount of current marsh and newly restored tidal areas in San Francisco Bay and Suisun Bay recently reached 50,000 acres – a landmark threshold halfway to the regional goal set just 16 years ago. In other habitats, low-salinity open waters in the Upper Estuary and woody riparian areas in the Delta have steeply declined. Eelgrass is in poor condition in the Bay but making a comeback due to restoration efforts.

Third, these losses of physical processes and habitats have reverberated through biological systems, contributing to unproductive food webs, small and declining native wildlife populations, and the dominance of invasive species. Indicator status consistently shows problems with burgeoning invasions (aquatic vegetation, invertebrates, and fish) and anemic food webs in the Upper Estuary. Food webs seem to be in somewhat better condition in the lower Estuary. The health of native fish communities strongly declines going upstream, with Bay fish in good condition and Upper Estuary fish in poor to very poor condition. Birds and mammals are generally in fair condition across the Estuary, although declines in the endangered Ridgway's rail in the South Bay and diving ducks in North and Central Bays are cause for concern.



Photo: Bird's Eye View

CAN WE MAKE THE ESTUARY HEALTHY?

Improvements in the status of several parts of the ecosystem show that we are very successful at restoring ecosystem health when we choose to make that investment. Water quality has improved over the last few decades due to substantial investment in sewage treatment, along with better management and regulation. Some legacy contaminants remain a problem, so managers are concentrating on reducing inputs from urban runoff. Focused collaboration along with significant funding have resulted in large gains in tidal marsh restoration over the last two decades, and improvements in marsh-dependent wildlife populations are now detectable as restored marshes mature. Investments in water conservation and recycling are reducing demand for potable water from sensitive ecosystems even while our population is increasing.

WHAT WILL IT TAKE TO ACHIEVE A HEALTHY BAY AND DELTA?

The mixed results of this assessment in different areas of the Estuary indicate that we are not doing enough to restore and maintain ecosystem health. A bolder approach will be needed to recover from past and ongoing impacts, especially since future impacts from climate change further jeopardize the ecosystem.

The Upper Estuary will require significant investment in restoring critical physical processes (notably freshwater inflows and floods) and habitats, as well as managing non-native species and preventing new arrivals. Protecting the Estuary will also require much greater efficiencies in human use of the system's fresh water, as well as changes in upstream water management and policy, to make the conserved water available to nourish the Estuary.

The Bay's wetlands are also at risk unless we take a new watershed-based, regional approach to managing sediment and fresh water as essential resources. We must also make room for tidal wetlands to migrate landward. Wildlife conservation efforts should aim to ensure successful reproduction and habitat connectivity over time as climate change alters landscapes. These management actions must all occur in the context of change in the ocean as well, requiring stronger planning for rising seas and more marine conditions in the Bay.

In short, the physical and biological processes that operate at the foundations of estuarine health are deeply damaged and must be fixed if we are to retain the Estuary's native plants and animals, wetlands (and their shoreline protection services), recreational opportunities, and clean water. This assessment of ecosystem health agrees with other regional science reports calling for stronger commitments to a healthier estuary.

This State of the Estuary Report, in conjunction with the more detailed report on Bay water quality in *The Pulse*, will be followed by a vision for how to restore the Bay's wetlands (the *Baylands Goals Science Update*, Oct 2015) and a new management plan for a more resilient estuary (CCMP, early 2016).

SUMMARY OF ESTUARY HEALTH 2015



This table offers a brief, simplified summary of the 80 pages of information that follow in this report. The report, in turn, is based on painstaking work to assess the status and trends of the 33 indicators of estuary health listed below by teams engaging more than 100 scientists. Their in-depth analysis and methods are presented in the online technical appendix associated with this report. In a system as diverse as San Francisco Bay and the Sacramento-San Joaquin River Delta, status and trends findings resulting from any one indicator or another can be difficult to summarize in one ranking or trend. In addition, data from a wide variety of monitoring, sampling, and research programs are summarized here – many of which divide up the Estuary into different zones. In particular, Suisun Bay, which links upper and lower estuary, is sometimes included in information provided about the Bay, and sometimes in that provided about the Delta. As part of the San Francisco Estuary Partnership's commitment to communicating the best available science to the community, so they can be well-informed in efforts to sustain the Estuary, we provide this summary and invite you to learn more about how it came to be by exploring the rest of the report.

ESTUARY HEALTH 2015

LEGEND

STATUS

TREND:

IMPROVING

NO CHANGE

DETERIORATING

MIXED



WATER

	BAY STATUS	BAY TREND	DELTA STATUS	DELTA TREND	AT-A-GLANCE
 SAFE FOR SWIMMING	GOOD	NO CHANGE			Conditions are excellent at most Estuary beaches most of the time. Conditions have been poor at 7% of beaches in summer, and 27% of beaches in wet weather at times during recent years.
 SAFE FOR AQUATIC LIFE	ESTUARY - WIDE		FAIR	IMPROVING	Estuary water quality is much better than 40 years ago, but the rate of improvement has slowed. Mercury, invasive species, pesticides, and trash are still problems. Improvement has been achieved for PBDEs and copper. Many potentially harmful chemicals have yet to be assessed.
 FISH SAFE TO EAT	ESTUARY - WIDE		FAIR	NO CHANGE	Limited consumption of most popular Estuary fish species is advised due to contamination from two legacy pollutants (mercury and PCBs). Routine monitoring in place since 1994 has shown no declines in these contaminants.
 FRESHWATER INFLOW	ESTUARY - WIDE		POOR	MIXED	The amounts and variability of freshwater inflow to the Estuary have been substantially reduced, resulting in degradation of habitat conditions and ecological function in the Estuary.

HABITAT

 OPEN WATER HABITAT	POOR	MIXED	POOR	DETERIORATING	In Suisun Bay, good quality, low salinity habitat occurs too infrequently, and for too short a time, to support flow-dependent organisms and the estuarine food web. In Delta channel habitats, net downstream flow is too low to support native fish species.
 EELGRASS	POOR	IMPROVING			The extent of eelgrass beds in the Estuary has increased, but is highly variable year to-year. The current total acreage is significantly less than the estimated maximum potential extent.
 TIDAL MARSH	FAIR	IMPROVING	POOR	NO CHANGE	Delta marshes have been lost and fragmented to a much greater degree than Bay marshes, despite covering a greater area historically. Restoration efforts have made a significant impact on Bay habitats, but are only just getting underway in the Delta.

WILDLIFE		BAY STATUS TREND		DELTA STATUS TREND		AT-A-GLANCE
	BENTHIC INVERTEBRATES					The benthic community at the foundation of the food web still includes many native species, but there are now many non-native species present as well. In some places, most individual benthic organisms are non-native.
	FISH					The fish community differs across the Estuary with increasingly poor conditions toward the upper Estuary. Native fish abundance in the brackish and fresh upper Estuary has declined markedly during the past three decades and is in poor condition.
	HARBOR SEALS					Harbor seal numbers in the Bay are relatively stable, but have not increased in tandem with coastal populations.
	WINTER WATERFOWL					Wintering dabbling duck populations are strongly increasing across all parts of San Francisco Bay. Wintering diving duck populations are strongly decreasing in Central and North Bays but remain stable in the South Bay.
	BREEDING WATERFOWL					Populations of dabbling ducks that breed in the Estuary are mostly decreasing across Suisun Marsh and the Delta. Less common dabblers (non-Mallards) are increasing in the Delta.
	SHOREBIRDS					The Estuary's population of large shorebirds is declining, especially in the South Bay. In the Central and North Bay, populations of medium and small shorebirds are stable or increasing, while in the South Bay they are on the decline.
	HERONS & EGRETS					Heron and egret nest density is increasing over the long term. Nest success, in terms of fledged chicks, is relatively stable. Subregions reveal more complex patterns.
	TIDAL MARSH BIRDS					Tidal marsh bird densities are increasing for two of three species. As restored marshes mature, they are supporting more resident marsh birds.
	RIDGWAY'S RAIL					In the North Bay, endangered Ridgway's rail populations have rebounded since a 2007-2009 decline. South Bay populations have stabilized at low levels after a similar decline, but not rebounded.

LEGEND

STATUS



TREND:

IMPROVING

NO CHANGE

DETERIORATING

MIXED



PROCESSES	BAY		DELTA		AT-A-GLANCE
	STATUS	TREND	STATUS	TREND	

E S T U A R Y - W I D E



MIGRATION SPACE



NO DATA

Most land around the Estuary available for estuarine habitats to migrate landward, and accommodate higher sea levels, has been developed. Very little of the undeveloped portion is protected.



BENEFICIAL FLOODS



Flood flow events are now too infrequent, too small and too short in the Estuary to support important ecological processes. Dams, levees and water diversions have cut high volume inflows and beneficial inundation of the Yolo Bypass floodplain.



ZOOPLANKTON AS FOOD



The abundance of zooplankton has decreased in Suisun Bay and the Delta since the 1980s invasion by the clam *Potamocorbula amurensis*, resulting in reduced food availability for fish. In recent years zooplankton populations have been stable.



FISH AS FOOD



The abundance of fish varies across the Upper Estuary. In the historically productive marsh and open water zones, small forage fish are declining, but in the Delta beach zone, they are increasing.



CORMORANT CHICKS RAISED



The breeding success of Brandt's cormorants in recent years indicates that they are finding enough food in the open waters of the Estuary to feed their young, following a severe decline in success from 2009-2012.



HERON & EGRET CHICKS RAISED



Heron and egret brood size is relatively stable across the Bay.

PEOPLE	BAY		DELTA		AT-A-GLANCE
	STATUS	TREND	STATUS	TREND	
 URBAN WATER USE	FAIR				In the Bay Area, urban water conservation efforts have lowered water use while population has increased. Short-term water use reductions in response to the drought have exceeded State-mandated targets but they may be short-lived.
 RECYCLED WATER USE	FAIR				The Bay Area currently offsets 5% of its urban water demand with recycled water, but lags behind other urban centers in the state.
 TRAIL ACCESS	FAIR				In recent years, public access to Bay and Delta trail systems has steadily increased.



The San Francisco Estuary Partnership was established more than 25 years ago by the State of California and the U.S. Environmental Protection Agency to prepare and implement a plan to better protect and restore the Estuary. Today, the Partnership manages over \$100 million in regional restoration and water quality projects. The Estuary Partnership's local sponsor is the Association of Bay Area Governments. The Partnership is one of 28 National Estuary Programs across the country. More information about the Partnership, our staff, partners, programs, and projects can be found at: www.sfestuary.org

San Francisco Estuary Partnership
 1515 Clay Street, 14th Floor
 Oakland, CA 94612

Copyright 2015
 San Francisco Estuary Partnership
 All rights reserved

Please cite as The State of the Estuary 2015,
 San Francisco Estuary Partnership

Cover photos:
 False River & Sears Point: Bird's Eye View
 Golden Gate Bridge & Kids on Beach: Rick Lewis

Report Editor: Ariel Rubissow Okamoto

Design: Darren Campeau

Maps: Amber Manfree

Photo Editor: Kathleen M. Wong

Editorial support:
 Joe Eaton, Lisa Owens Viani, Tira Okamoto

Online Materials and Support Team:
 Tony Hale, Gemma Shusterman, Jen Hunt

Report Coordinator: Amy Richey

Published by the San Francisco Estuary Partnership,
 Oakland, California