Executive Summary

The State of San Francisco Bay 2011

The broad blue-green water body in the center of it all—San Francisco Bay—provides Bay Area residents with their inimitable sense of place and iconic geography. Underneath the water and at its surface, in its wetlands and watersheds, the Bay is also habitat for hundreds of species of fish and wildlife, including several endangered species and the multitudes of birds that reside here or migrate along the Pacific Flyway of North America. It is San Francisco Bay that defines a world-renowned tourist destination and supports a thriving state and local economy, enabling our region to be a global center of water-borne commerce and providing an enviable quality of life for over 7.5 million residents.

Bay Area residents and many other Californians—upwards of 30 million people—use freshwater diverted from the Bay's watersheds for drinking and other residential uses, industrial applications, and to irrigate over four million acres of agricultural land. At the same

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time, each day we rely on the Bay to absorb over 500,000,000 gallons of treated wastewater and even greater quantities of urban floodwaters during rainstorms. Each year we mine two million tons of sand from its bottom for construction, and 65,000 cubic yards of oyster shell deposits for calcium supplements, while the Bay continues to support a fishing industry and spectacular recreational opportunities.

By protecting the health of the Bay we demonstrate to ourselves and the world that we are doing our part to care for this national treasure and the ecological services it provides. This report examines the current state of the Bay's health, by reporting on five key attributes: water quality and quantity, habitats, ecological processes, and living resources (See Summary of Bay Health, 2011, page v).

So how are we doing? Is San Francisco Bay healthy?

The Bay is certainly less polluted than in past decades, thanks to our investment in sewage treatment, improved solid waste handling, and regulation of chemicals like DDT and PCBs. Unlike the past, when raw sewage turned the Bay into "the Big Stench," the Bay today is safe for recreation and deeply valued by Bay Area residents and visitors from around the world.

Yet many of our remaining pollution problems will be challenging to clean up. Some of these problems, such as those caused by mercury, a legacy from the Gold Rush era, will take decades to resolve. Mercury and other pollutants accumulate in fish and other wildlife, so we must limit the amount of Bay fish we eat to protect our health. These pollutants also threaten birds and other animals at the top of the food web, and the smaller animals that live in the

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SUMMARY OF BAY HEALTH, 2011			
	STATUS	TREND	DETAILS
WATER			
Safe for aquatic life	Fair	Improving	Bay water quality is better than 40 years ago, but the rate of improvement has slowed. Mercury, exotic species, toxic sediments, and trash are still problems, with improvement expected for exotics and trash. Many potentially harmful chemicals have yet to be assessed.
Fish safe to eat	Fair	No change	Limited consumption of most popular Bay fish species is advised due to contamination from legacy pollutants. No signs of improvement since 1994.
Safe for swimming	Good	No change	Most Bay beaches are safe for swimming in summer, but bacterial contamination is still a problem at most beaches in wet weather.
Freshwater inflow	Poor	No change	Amounts and variability of freshwater inflows have been reduced, resulting in chronic drought conditions for the Estuary. Flow conditions have been predominantly poor for the last 10 years, with the Freshwater Inflow Index at a record low level in 2010.
HABITAT			
Estuarine open water	Fair to poor	Deteriorating	Quantity and quality of springtime habitat is declining. Since the 1980s, habitat conditions have generally been poor in all but wet years.
Baylands	Fair	Improving	Historic decline has ended; gradual restoration underway; there is a long way to go.
Watersheds	Fair	No change	Watersheds are largely stabilizing after damage from historical land use changes; monitoring in more watersheds is needed to improve assessment of status.
LIVING RESOURCES			
Fish	Mixed, mostly fair	Deteriorating	Fish abundance and diversity are declining in all regions of the Bay except near the Golden Gate. The fish community is in poor condition in Suisun Bay.
Shrimp/Crab	Good	Improving	Most shrimp and crab populations are increasing, but ocean species dominate in the Bay. The abundance of Dungeness crab juveniles fluctuates widely, but Bay shrimp are generally stable.
Birds	Mixed, mostly fair	Trends mixed	Some populations are increasing, some are static, and some are declining, with some earlier increases recently reversed. Tidal marsh birds are below desired levels. Reproductive success is generally low or has decreased since 1993.
ECOLOGICAL PROCESSES			
Flood events	Poor	Deteriorating	Dams and water diversions have cut frequency and duration of floods by more than half, reducing freshwater inflow variability and transport of sediment and nutrients to the Bay.
Food web	Fair	Deteriorating	Declines in reproduction of fish-eating birds suggest that less food is available.
STEWARDSHIP			
Individual/Community action	Fair	Improving	Active stewardship could be greater, but regional efforts appear to be increasing. Bay Area citizens are using water more efficiently, and we are gradually expanding our use of recycled water.
Management action (example)	Good	Improving	In-Bay disposal of dredged material has been greatly reduced since the Comprehensive Conservation and Management for the Estuary was adopted in 1993.

Bay's sediments. So while the Bay is cleaner than it was, pollution still poses a threat to aquatic life and human health.

Many of the remaining sources of pollution are widespread and diffuse, such as the runoff from streets, driveways, and other urban surfaces, making them harder to control than discharges from a few major facilities. And we continue to release new chemicals into the Bay that do not break down easily, without first analyzing their ecological risks. Concentrations of these chemicals—such as certain flame retardants—are rising in the Bay, suggesting that our grandchildren may confront a new pollution legacy.

Filling the Bay with sediment has essentially ended, and thousands of acres of wetlands are being restored in one of the largest habitat restoration projects in the nation. Restoration takes time, and animal populations will respond slowly as these restored landscapes mature. Yet already native fishes and birds are using newly restored marshes, and these productive nursery areas should bolster their populations in the future. Wildlife face additional threats, however, from pollutants that can have subtle toxic effects on their health, and from invasive species and ubiquitous urban-dwelling or introduced predators like crows, feral house cats, and rats. This results in bird populations that are increasing in some areas but declining in others.

Many fish populations are declining in the Bay, indicating that the goals of the Comprehensive Conservation and Management Plan for San Francisco Bay (signed by over 100 regional leaders in 1993) of reversing these trends has still not been met. These declines are due, at least in part, to continued low annual freshwater flows into the Bay as water is diverted from its rivers and the Delta. Our water diversion capacities and practices now result in low freshwater inflows to the Bay even when California is not experiencing a drought.

Shrimp and crab populations, representing the important invertebrate part of the food web, have been growing, although the composition of these populations is changing. With less fresh water coming into the Bay, the brackish water habitat of the native San Francisco Bay shrimp is shrinking, and populations of shrimp that live in more ocean-like conditions are growing. Favorable conditions in the nearby ocean are contributing to the recent growth in shrimp and crab populations.

The good news is that our efforts to improve the health of the Bay are having an impact. Rather than disposing of much of the sediment we dredge from shipping channels and ports into the Bay, we now use much of this material to create new wetlands, and we've reduced the discharge of chemicals such as copper, nickel, and mercury from our municipal and industrial wastewater plants. We have greatly improved access to the Bay through ongoing efforts to complete the Bay Trail, and more citizens than ever before are volunteering their time to clean and restore the Bay's wetlands and watersheds.

The future state of the Bay will be influenced not only by humans—either as stressors or stewards—but also by dynamic ecological forces beyond our control. We are so accustomed to the biological richness of the central California coast that it is easy to forget we live within one of four great ocean upwelling zones on earth, where global-scale winds and currents bring nutrient-rich waters to the surface. These dynamic oceanic processes influence the Bay ecosystem and will continue to do so in the future.

Climate change driven by emissions of greenhouse gases will also impact the future health of the Bay. Whether by droughts altering freshwater flows and water use, or by floods and sea level rise altering landscapes and human behavior, changes are coming in the decades ahead. The physics of our situation is unyielding; we can take action now to control the ultimate magnitude of the changes, but no longer can we prevent their arrival.

San Francisco Bay has played an important role in local and national history, and its natural beauty and ecological attributes support our quality of life and are integral to our regional identity. As we strive to protect and restore the Bay in a time of political and ecological complexity, periodic health assessments are essential. Through them, we improve our understanding of current conditions, and learn how we should adjust our actions and enhance subsequent assessments. The information in this report exists due to decades of work by many Bay Area professionals. To honor and sustain this commitment to our regional environment, we provide this well-documented description of the Bay as we know it today to inform those who will follow.

—Andrew Gunther, Project Leader