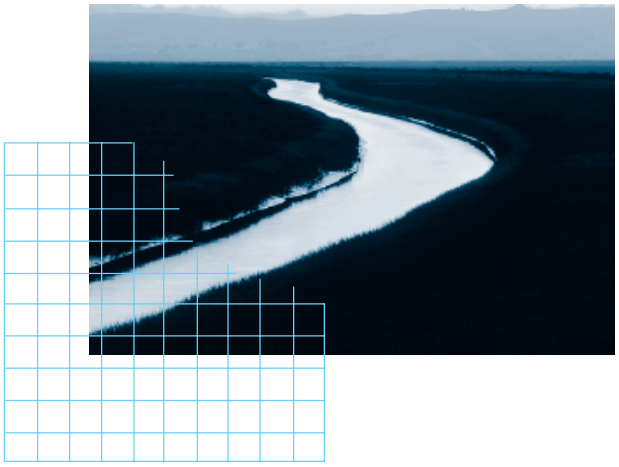
THE BAY INSTITUTE
Ecological Scorecard

SAN FRANCISCO BAY INDEX

2003
Executive Summary



The Bay Institute (TBI) is a non-profit research, education and advocacy organization dedicated to protecting and restoring the ecosystems of San Francisco Bay, the Sacramento-San Joaquin Delta, and the estuary's tributary rivers, streams, and watersheds. Since 1981, TBI's policy and scientific experts have worked to secure stronger protections for endangered species and habitats; improve water quality; reform how California manages its water resources; and promote comprehensive ecological restoration from the Sierra to the sea.

To order copies of the 2003 Bay Index, or a CD of the report and the Technical Appendix, contact:

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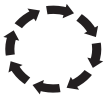
The entire 2003 Bay Index report and Technical Appendix can also be downloaded from our website at www.bay.org.

The 2003 San Francisco Bay Index, and the Bay-Delta Ecological Scorecard Project of which it is a part, were made possible by the generous financial support of the Compton Foundation, Inc.; the Mary A. Crocker Trust; the Fred Gellert Family Foundation; the Richard and Rhoda Goldman Fund; the William and Flora Hewlett Foundation; the Marin Community Foundation; the Rose Foundation for Communities and the Environment; the San Francisco Foundation (Switzer Environmental Leadership Program); the San Francisco Estuary Project; the U.S. Fish and Wildlife Service; the Weeden Foundation; and the Dean Witter Foundation, as well as individual supporters of the Bay Institute.

Cover photo: Napa Slough, by David Sanger.

San Francisco Bay Index

Ecological Scorecard

	**D+** Score = 32	**Habitat** Bay habitat loss is slowly being reversed, but it could take nearly 200 years to reach the tidal marsh restoration goal.	long-term ↓ short-term ↑
	**D** Score = 29	**Freshwater Inflow** Reduced inflows are still degrading the Bay ecosystem, and recent gains from wetter years and new standards are being eroded	long-term ↓ short-term ↓
	**C** Score = 55	**Water Quality** Open waters are cleaner, but standards are not met in parts of the Bay. Toxic sediments and storm runoff are a major problem.	long-term ↑ short-term ↔
	**F** Score = 10	**Food Web** Plankton levels in the upper Bay have crashed, reducing food sources for fish and birds. Alien species are locally dominant.	long-term ↓ short-term ↔
	**B-** Score = 63	**Shellfish** Crab and shrimp numbers are increasing, but commercial harvest is still down from previous high levels.	long-term ↓ short-term ↑
	**C-** Score = 39	**Fish** After a long decline, fish populations are stable at low levels, but some species are still endangered.	long-term ↓ short-term ↔
	**D+** Score = 31	**Fishable-Swimmable-Drinkable** Fish are harder to catch, and unsafe to eat. Beach closures are up, drinking water violations are down.	long-term ↓ short-term ↔
	**C-** Score = 43	**Stewardship** Water conservation, pollution limits, monitoring, and restoration efforts are finally underway, but progress is slow.	long-term ↓ short-term ↔

Grades based on data from 2000-2003 period

- **A** Excellent
- **B** Good
- **C** Fair
- **D** Poor
- **F** Critical

- ↑ improving
- ↓ declining
- ↔ stable

The Bay Institute

Executive Summary

San Francisco Bay is a unique national treasure. The largest estuary—where ocean and fresh water meet—on the west coast of the United States provides habitat for hundreds of plant and animal species, many found nowhere else in the world. The Bay supplies seafood for businesses and anglers. Its watershed is a major source of water for cities and agriculture. Residents and tourists sail and swim in its waters, play along its shoreline and tributary creeks, and value its wildlife and scenic qualities.

But the Bay's vital signs are not good. Over the last century, once abundant native fish and wildlife populations have declined drastically, while harmful alien species have invaded the Bay. The amounts of wetland habitat and freshwater flows into the Bay have decreased dramatically, while pollution levels have risen. Commercial and recreational fisheries have collapsed, and those fish that are caught in the Bay are not safe to eat. The fair to poor grades reported in the 2003 Bay Index reflect this long-term decline in the Bay region's ecological health—but the current situation is not all bleak. In most cases, the decline has been halted and short-term conditions are relatively stable. In some cases, such as habitat and shellfish populations, there have been small but noticeable improvements.

Many efforts are underway to improve the Bay's health. The Bay Institute's Ecological Scorecard is intended to improve our understanding of how the entire Bay watershed is doing, to monitor how effective our stewardship of this vital resource is, and to identify future directions for management, monitoring, and research. The 2003 Bay Index focuses on the Bay itself, which is the first of four major ecological regions of the estuary—Bay, Delta, San Joaquin River and Sacramento River—to be assessed as part of the Ecological Scorecard project.

The Scorecard's Bay Index uses science-based indicators to grade the condition of the Bay region: how well its ecological resources are faring, how much human activities are harming or helping the Bay, and how human uses of the Bay's resources are affected by the Bay's health. These indicators are combined into eight Indexes that track the Bay's environment (Habitat, Freshwater Inflow, Water Quality), its fish and wildlife (Food Web, Shellfish, Fish), our management of its resources (Stewardship), and its direct value to the people who use it (Fishable-Swimmable-Drinkable). The grading system compares current conditions in the Bay and its watershed to historical conditions, environmental and public health standards, and restoration targets.

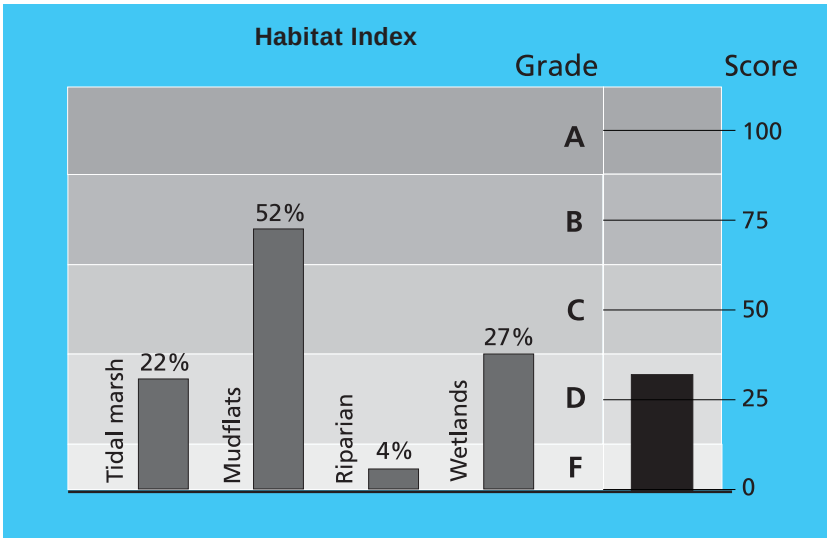
San Francisco Bay Index

Grade	Score	Long-term Trend	Short-term Trend
D+	32	↓	↑

Habitat

Wetlands, mudflats, and riparian areas are rich sources of food and nutrients, and provide critical spawning, nesting, and rearing habitat for the Bay's fish and wildlife species. These habitats also improve water quality and flood control, and support birding, fishing, hunting, and other recreational activities. Converting these areas for agriculture, salt production, and urban development has reduced the Bay's productivity and restricted the amount of habitat available for use by endangered plants and animals.

- Tidal marsh area decreased by 78% during the last 150 years, from 190,000 acres to just 40,000 acres.
- Tidal mudflats decreased by 42% in the same period.
- Seasonal wetlands decreased by nearly 75% over the 150-year period.
- Riparian habitat decreased 95% along the Bay margins, and 84% throughout the entire Bay region's watershed, from its full extent 150 years ago.
- Since 1998, restoration of 1,700 acres increased tidal marsh habitat by more than 4%. At this rate, it will take nearly 200 years to achieve the 50-100 year targets set for Bay tidal marsh restoration by the Baylands Habitat Goals Project.
- The recent acquisition of South Bay salt ponds, following similar efforts in the North Bay, created a unique opportunity to restore up to 23,000 acres of tidal marsh around the Bay. Wetland acquisitions since 1997 total 40,000 acres, and at least two-thirds of these acres are slated for restoration in the next 30 years.
- During the past 5 years, almost 500 acres of non-tidal diked wetlands have been created or enhanced, nearly 3% of the target for this habitat type.



The Habitat Index aggregates the results of the tidal marsh, tidal mudflat, seasonal wetland, and riparian habitat indicators.

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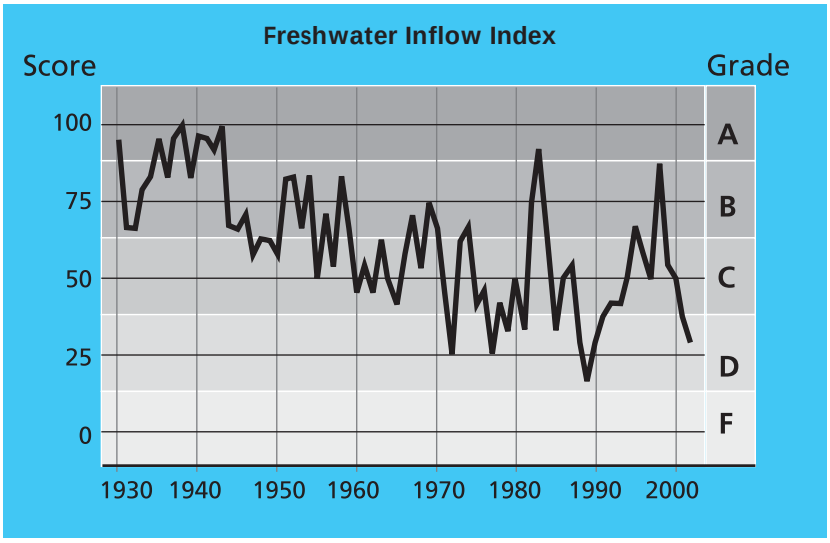
San Francisco Bay **Index**

Grade	Score	Long-term Trend	Short-term Trend
D	29	↓	↓

Freshwater Inflow

The amount and timing of freshwater inflow to San Francisco Bay defines the quality and quantity of its estuarine habitat. Flows transport organisms and nutrients, improve water quality, and provide the low salinity habitat on which many Bay species depend. Irrigating the Central Valley, constructing a massive system of reservoirs and canals, and exporting water directly from the rivers and Delta have reduced the amount of freshwater reaching the Bay, and changed its timing.

- In 2002, just over 50% of total annual runoff from the Sacramento-San Joaquin watersheds reached the Bay.
- In recent years, reduced freshwater inflow cut the frequency of "wet" years for the Bay by 50% and imposed drought conditions more frequently.
- In 2002, a "below normal" year in the Bay's watershed, the Bay received only the amount of freshwater as expected in a "critically dry" year.
- Freshwater flow during the ecologically sensitive spring period decreased by as much as 75% since 1940. In 2002, only 32% of the spring runoff reached the Bay, still an improvement compared to spring inflows during the 1987-1992 drought.
- Spring inflows are extremely important to Bay fish. In 2002, reduced spring inflows shifted low salinity habitat upstream by nearly 15 kilometers (9 miles) compared to historic conditions, corresponding to a predicted three-fold decrease in the abundance of several Bay fish species.
- Seasonal variation in fresh water inflow—high flows in spring and lower flows later in the year—are an important environmental signal for many Bay species. This variation was reduced by 46% in 2002, compared to historic conditions.
- Peak flows, which periodically freshen Bay waters, occurred for only eleven days in 2002, compared to the expected 58 days of peak flows under historic conditions.
- The 1940-94 downward trend in the Freshwater Inflow Index reflected increases in upstream water diversions. Wetter hydrologic conditions and increased flow requirements after 1994 temporarily improved Bay flow conditions, but the trend has been reversed in the past few years.



The Freshwater Inflow Index aggregates the results of the annual inflow, water year type, spring inflow, change in spring inflow, seasonal variation, and change in peak flow indicators.

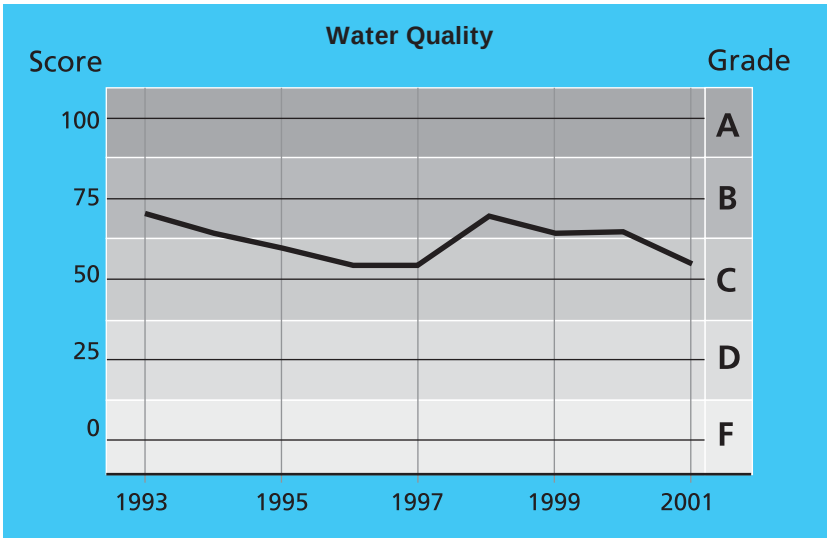
San Francisco Bay Index

Grade	Score	Long-term Trend	Short-term Trend
C	55	↑	↔

Water Quality

San Francisco Bay, one of the most urbanized estuaries in the United States, receives polluted runoff from urban, industrial, and agricultural areas along its shores and from its vast watershed. Pollution can harm the plants, animals, and people that live in and around the Bay, reduce the productivity and health of the ecosystem, and contaminate fish, birds, and shellfish to the point at which they are not safe to eat.

- The Bay's open waters are cleaner than they were thirty years ago, but during the past decade pollution levels have not changed. The less visible but more persistent toxic chemicals continue to be the main water quality problem.
- In most years, water quality standards for mercury, copper, selenium, nickel, pesticides, PCBs, hydrocarbons, and dissolved oxygen are still exceeded in some locations. Portions of the South and San Pablo Bays are the most polluted areas in the Bay.
- PCB pollution is the most widespread—nearly all water samples collected from the Bay contain unhealthy concentrations of PCBs.
- Trace element concentrations are declining in most parts of the Bay's open waters, but still exceed water quality standards in most years.
- Pesticide standards were exceeded in 16% of open water Bay samples. Contamination by diazinon, dieldrin, heptachlor epoxide and DDT compounds is much more severe in some areas. Stormwater runoff in urban creeks, and sediments at their mouths, are frequently contaminated with pesticides.
- Although the role of contaminants in affecting ecosystem productivity and population levels is not fully understood, current levels of several contaminants exceed those known to harm fish and wildlife species. The Water Quality Index tells only part of the Bay's story because it measures concentrations of contaminants in open waters, not in sediments or stormwater runoff, and does not reflect uptakes of contaminants by plants and animals (see Fishable-Swimmable-Drinkable Index).



The Water Quality Index aggregates the results of the trace element, pesticide, PCBs, PAHs, and dissolved oxygen indicators for open Bay waters.

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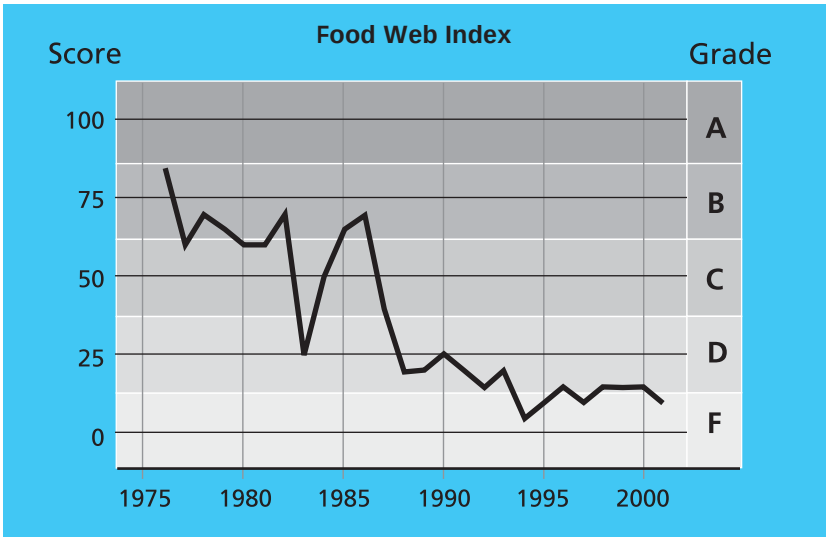
San Francisco Bay **Index**

Grade	Score	Long-term Trend	Short-term Trend
F	10	↓	↔

Food Web

Phytoplankton and zooplankton—microscopic plants and animals—are the foundation of the San Francisco Bay aquatic food web. Healthy populations of these organisms provide food for Bay fish and wildlife, fueling the Bay's vibrant ecosystem and supporting its recreational and commercial fisheries.

- Phytoplankton biomass declined 80% since 1976 in Suisun Bay, the upper portion of the Bay.
- Rotifers, small zooplankton, declined 98% in Suisun Bay between 1974 and 2001.
- Most copepods (medium sized zooplankton species) now found in the upper Bay are alien species.
- The Bay's largest native zooplankton species, *Neomysis*, an important food for many fish species, has nearly disappeared from its Suisun Bay habitat.
- Average zooplankton size decreased by 80% since 1974, making them less valuable as a food source for Suisun Bay species.
- The extreme food web changes since the mid-1970s are strongly associated with reduced freshwater inflow and alien species introductions.



The Food Web Index aggregates the results of the phytoplankton, rotifer, copepod, mysid, and zooplankton size indicators for Suisun Bay.

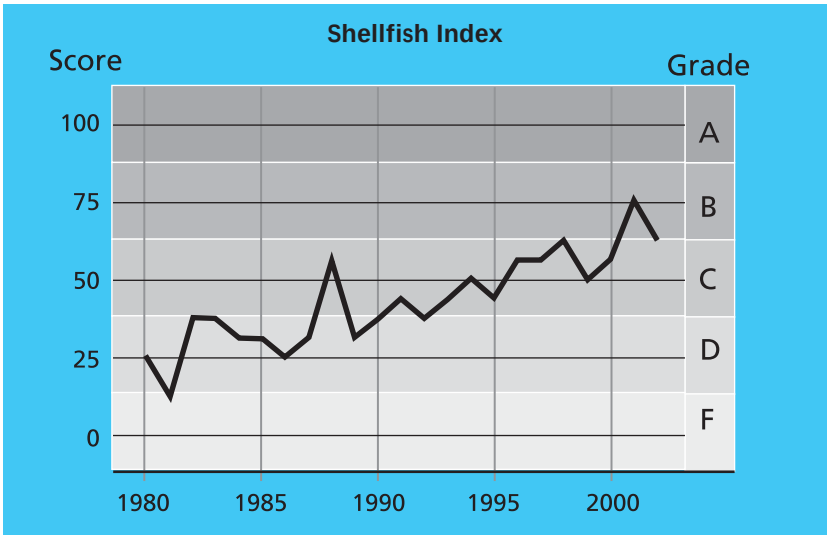
San Francisco Bay Index

Grade	Score	Long-term Trend	Short-term Trend
B-	63	↓	↑

Shellfish

San Francisco Bay is an important habitat for crabs, shrimp, clams and other shellfish. Many shellfish species are consumed by Bay fish and birds and also are harvested for commercial and recreational uses.

- Juvenile Dungeness crab numbers increased dramatically over the last five years, but commercial landings are still only about 20% of the 1940s-50s levels.
- Rock crab abundance increased 900% between the early 1980s and the early 1990s but has leveled off since then. Their historic abundance is not known.
- Bay shrimp species increased 150% over the 1980–1995 average, but are still at less than 10% of historic population levels.
- Although the Bay has been invaded by a number of alien shellfish, more than 95% of shrimp collected in the Bay are native species.
- Some shellfish populations increased during the drier years of the late 1980s and early 1990s, while others such as the Bay shrimp increased in wetter years.



The Shellfish Index aggregates the results of the Dungeness crab, rock crab, native shrimp, and percent native shrimp indicators.

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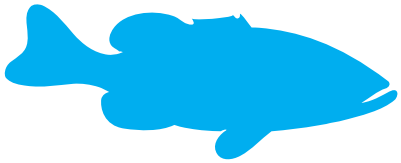


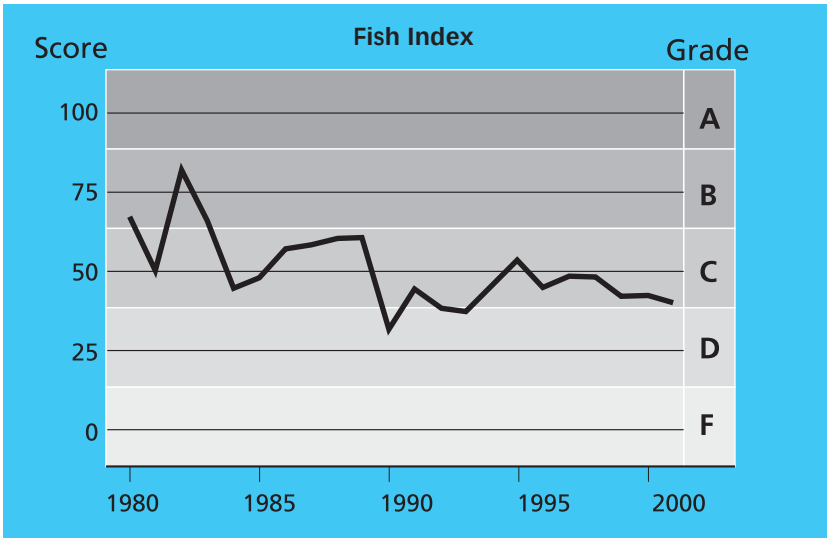
San Francisco Bay Index

Grade	Score	Long-term Trend	Short-term Trend
C-	39	↓	↔

Fish

San Francisco Bay is essential habitat for many fish species, including commercially important Pacific herring and chinook salmon, popular sport fishes like striped bass, and many sensitive estuary-dependent species like delta smelt and starry flounder.

- Between 1980 and 2001, abundance of native fish declined by 50%. In 2001, abundance still showed no sign of improvement from its previous steep decline.
- Longfin smelt and delta smelt declined by more than 90% between 1980 and 1990. In 2001, longfin numbers were 7% of former abundance and delta smelt less than 50%.
- Native species made up 82% of the Bay's fish community in 2001. In Suisun Bay, alien species are more prevalent, making up about a third of the total.
- The long-term decline in the Bay Fish Index is associated with reduced freshwater inflow, habitat loss, and the collapse of the Bay's food web in Suisun Bay.



The Fish Index aggregates the results of the abundance, diversity, percent native species, and sensitive species indicators.

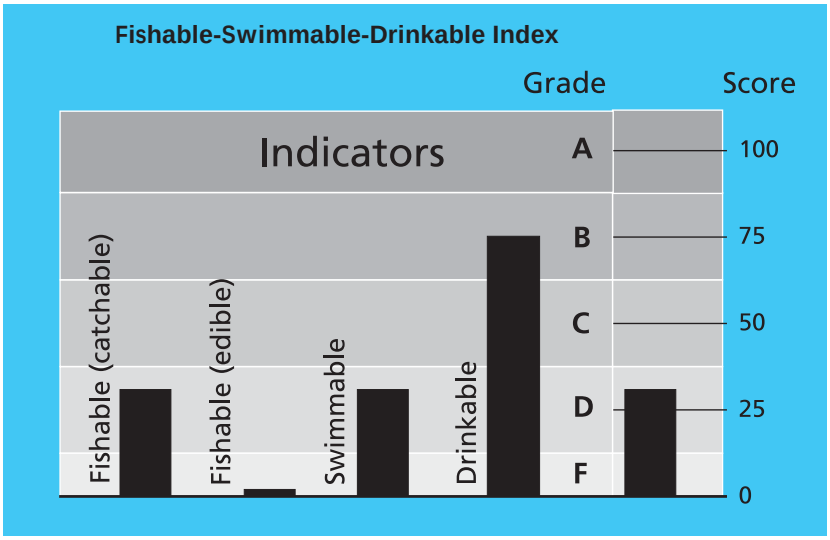
San Francisco Bay Index

Grade	Score	Long-term Trend	Short-term Trend
D+	31	↓	↔

Fishable, Swimmable, Drinkable

San Francisco Bay is an important and heavily used resource for the Bay Area's human population. Many Bay fish and crab species are caught by recreational and subsistence anglers. Bay beaches and nearshore waters attract swimmers, kayakers, and board sailors. Surface runoff and groundwater from the Bay's many watersheds—near and far—provide drinking water to Bay Area residents.

- Sport anglers caught, on average, less than one fish per day, a 60% decline compared to the early 1960s but an improvement over the low catch of 10 years ago.
- In 2000, 94% of all Bay fish sampled were contaminated with PCBs, mercury, DDT, or chlordane pesticides at levels that made them unsafe to eat.
- In 2002, San Francisco Bay beaches were reported posted or closed for 50 days, an increase of more than 200% over 2001.
- In 2003, 10% of drinking water suppliers reported exceedences for nitrogen compounds, heavy metals, or industrial chemicals in their source water supplies—a 25% improvement compared to levels measured 10 years ago. Maximum contaminant limits for pesticides and hydrocarbons have not been exceeded for the past six years. Groundwater supplies were the most contaminated.



The Fishable-Swimmable-Drinkable Index aggregates the results of the fish catch, fish consumption, beach posting, and drinking water exceedence indicators.

The Bay Institute

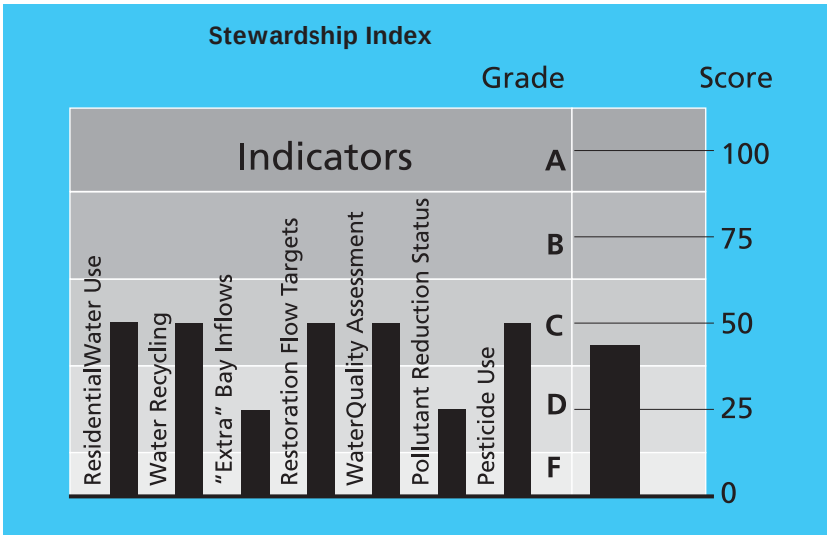
San Francisco Bay Index

Grade	Score	Long-term Trend	Short-term Trend
C–	43	↓	↔

Stewardship

Stewardship of the Bay involves more efficient use and reuse of current water supplies; adequate monitoring and evaluation of water quality conditions; and aggressive efforts to remedy the Bay's problems by such measures as reducing pollutant loads and increasing Bay inflow.

- Bay Area residents are becoming more efficient water users, but could still reduce residential use by another 30%. In 2003, the average residential user consumed 95 gallons per day, 43% more than the conservation target of 66 gallons each day.
- In 2003, the Bay Area recycled 68% of the amount targeted for reuse.
- Bay inflows exceeded the minimum spring requirements by only 16% in 2001, and were actually 20% less than the flow amount needed to maintain low salinity habitat at the expected position in 2002.
- Only one of the three restoration targets for enhancing Bay inflow was met in 2002. Export pumping rates were low in the April-May period, however.
- The waters of the Bay itself are adequately sampled, but only 56% of the watershed area and a third of the wetland area are monitored for ambient water quality.
- On average, government efforts to protect each of the most impaired water bodies in the Bay region have only completed two of the eight phases necessary to adopt pollutant load limits. None of the pollutant limits for high priority water bodies have been established or implemented yet.
- Use of diazinon and chlorpyrifos, two organophosphate pesticides banned for urban use, has declined by 75%, but these chemicals have been replaced by other compounds, such as pyrethroid insecticides, which are highly toxic to aquatic life and for which there are no water quality standards yet.



The Stewardship Index aggregates the results of the residential water use, water recycling, "extra" Bay inflow, restoration flow target, water quality assessment, pollutant reduction status, and pesticide use indicators.

5 Things to Do

The Five Most Important Things You Can Do To Improve the Bay's Grades

1. **Be a smart water user.** Fix leaks, replace inefficient toilets and washing machines, and switch to less water-intensive plants in your lawn and garden. Start by contacting your local water district or www.h2ouse.org.
2. **Don't pollute the Bay.** Use safe substitutes for household and lawn chemicals, adopt greener cleaning and gardening methods, and properly dispose of all toxic materials. The Pesticide Advisor (www.panna.org/resources/advisor.html) is a good place to begin.
3. **Restore your local habitat.** Join a community group helping to clean up and restore wetlands, streams and shorelines in your area. A listing of some of these groups is available at www.aoinstitute.org/creekcontacts.html. More about wetlands restoration projects can be found at the San Francisco Bay Joint Venture site (www.sfbayjv.org).
4. **Keep rivers flowing to the Bay.** Support the Bay Institute and other organizations in the Environmental Water Caucus that are working to reduce the amount of water diverted from the Bay's watersheds and change how water supplies are managed throughout the state. Visit www.bay.org to read the Caucus *Blueprint for an Environmentally and Economically Sound Water Supply Reliability Program*, and look for TBI's annual *The Year in Water* report.
5. **Vote for the environment.** Track politicians' voting records, and support legislation and ballot measures to protect the Bay. You can get the lowdown from the California League of Conservation Voters at www.ecovote.org.

It all adds up to educating yourself and others.
Congratulations – you've taken the first step by reading this!

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