Home Eco Health Estuaries Healthy San Francisco Water

What is Water Quality?

Images

Caption

slide show

Text

QUESTIONS ANSWERED

How and where is water quality monitored in the SFE?

What are water quality trends in the SFE?

How do we determine the quality of water in the SFE?

What’s being done to protect water quality in the SFE?

How and Where is Water Quality Monitored in the SFE?

Map with locations and icons for what’s monitored where

Select water quality constituent, sites of interest and time frame to view animations

QUESTIONS ANSWERED

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What’s being done to protect water quality in the SFE?

The water quality data used for this animation come from the Department of Water Resources CDEC, Water Boards CEDEN, and Federal NWIS databases. General water quality parameters (e.g., salinity, temperature, dissolved oxygen, pH, and nutrients) are monitored relatively quickly and inexpensively; whereas, chemical analysis for the presence and concentrations of contaminants (e.g., pesticides and metals), and biological testing for the effects of those contaminants take more time. Changes in water quality parameters over time help elucidate the suitability of aquatic habitats for wildlife, human uses like swimming and drinking, and other Beneficial Uses.

Where are the Data?

Another summary of programs that are monitoring for water quality can be found at the Central Valley Monitoring Directory. Programs focused

Which Programs are Monitoring Water Quality?

- Citizen Monitoring-linked to section below
- Interagency Ecological Program-linked to section below
- Irrigated Lands Regulatory Program-linked to section below
- National Pollutant Discharge Elimination System-linked to section below
- Non-Point Source-linked to section below
- Regional Monitoring Programs-linked to section below
- Surface Water Ambient Monitoring Program-linked to section below
- Total Maximum Daily Load-linked to section below

Citizen Monitoring

Citizen monitoring is monitoring performed by community members interested in the health and protection of their watersheds. Activities include collecting water quality data, evaluating fish habitat, counting birds, or making visual observations of stream health. Learn more about the SWAMP Clean Water Team's citizen monitoring here.

Interagency Ecological Program

The Interagency Ecological Program (IEP) is a collaborative effort among multiple state and federal agencies to monitor, research, model, and synthesize critical information for adaptive management, water project operations, planning and regulatory purposes relative to endangered fish and the aquatic ecosystem in the San Francisco estuary (Bay-Delta). The IEP agencies have conducted cooperative long-term monitoring of aquatic resources in the Bay-Delta since 1970.

Irrigated Lands Regulatory Program

In 2003, the Central Valley Regional Water Quality Control Board adopted the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. These regulations provide for a watershed approach that includes a basin-wide monitoring program to assess impacts of irrigation water discharge. Since that time, several agricultural coalitions throughout the basin have performed characterization monitoring at sites dominated largely by agricultural effluent. You can visit their site here.

National Pollutant Discharge Elimination System

What are Water Quality Trends in the SFE?

Line graph with multi constituents
one site at a time

Animations of DO, EC, pH, turb and temp

QUESTIONS ANSWERED

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What's being done to protect water quality in the SFE?

General water quality parameters dissolved oxygen (DO), electrical conductivity (EC), pH, turbidity, and temperature are the most commonly collected in the San Francisco Estuary. These parameters are measured manually with meters from grab samples, or by real-time stations at select sites. Scientists can use these as a proxy to determine if the "vital signs" of the San Francisco Estuary appear to be healthy or not. Temperature is a "vital sign" for humans as well as waterbodies, similarly, DO can be viewed like our blood's oxygen saturation, EC can be viewed like our body's electrolyte balance. If these coarse measurements are showing unexpected changes, it may indicate that something is not working properly and the need to perform more sophisticated diagnoses or analyses.

Nutrients

Looking at nutrients and the balance of difference nutrients types is one form of more sophisticated analysis. Nutrient analyses are typically performed in a laboratory. Elevated nutrient concentrations may indicate potential for overgrowth of phytoplankton, and likewise, depressed

How do we Determine the Quality of Water in the SFE?

Photos of very good and very impacted sites

QUESTIONS ANSWERED

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How do we determine the quality of water in the SFE?

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Water Quality Indicators

There are many different things that can be measured as indicators of water quality like dissolved oxygen (DO), electrical conductivity(EC), pH, turbidity, and temperature. Other parameters like chlorophyll a, nutrients, metals, pesticides, and chemicals of emerging concern can also be used to address specific issues. Scientists can use multiple water quality indicators to determine the health of the ecosystem. For example, if you wanted to know if the ecosystem had enough primary productivity to support the system, you might look in the water and sediment to find the amount of nutrients, types of nutrients, and amount of time they were available to phytoplankton. You might also want to look at the intensity and amount of time light was available to them. You would also want to know how many things would eat the phytoplankton and how much they would typically eat. It's like preparing for a meal, you want to make sure you have the ingredients and time to make the right amount of food for

What's Being Done to Protect Water Quality in the SFE?

Slide show of the five highlighted TMDLs that they can click on for details (like SFE LR page)

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Pollutant Control Through Cooperation Among Regulatory Agencies and Stakeholders

There are a number of control programs that help protect water quality, but sometimes, cooperation among interested parties can accomplish a lot to protect water quality. Agencies like US EPA, the Water Boards, and the Department of Pesticide Regulation work together and with industry representatives and other stakeholders to cooperatively decrease risks to aquatic ecosystems. Some examples of such cooperation are implementation of best management practices like installation of drip irrigation to minimize the movement of pollutants, or changing labels on pesticides to encourage safer applications.

Pollutant Control Through Total Maximum Daily Loads

Control of pollutants (e.g., the prevention or correction of pollution) can also come from the implementation of Total Maximum Daily Loads

Water Quality Progress Report
Diazinon and Chlorpyrifos
Sacramento-San Joaquin River Delta

(Approved 2007)

STATUS

☒ Conditions Improving

☐ Data inconclusive

☐ Improvement needed

☐ TMDL targets achieved

Total Maximum Daily Load (TMDL) Summary

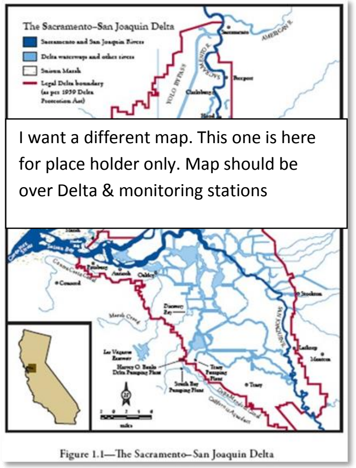
Waterbody – all waterways within the legal Delta, see map.

Water quality objectives

Chlorpyrifos	Acute	0.025 ug/L (1 hr average)
	Chronic	0.015 ug/L (4 day average)
Diazinon	Acute	0.16 ug/L (1 hr average)
	Chronic	0.10 ug/L (4 day average)

*Not to be exceeded more than once in a three year period.

Targeted Attainment Date – December 1, 2011



I want a different map. This one is here for place holder only. Map should be over Delta & monitoring stations

Figure 1.1—The Sacramento–San Joaquin Delta

Water Quality Impairment – Freshwater aquatic life is impaired by diazinon and chlorpyrifos concentrations. The delta was first listed as impaired by diazinon and chlorpyrifos in 1998. Aquatic invertebrates appear to be the aquatic organisms most sensitive to exposure. Diazinon and chlorpyrifos are more toxic when they are together in solution. Toxic substances, including pesticides, are considered one of the stressors contributing to the collapse of the aquatic ecosystem in the San Francisco Bay Delta Estuary. Abundance of aquatic invertebrates in the Delta has been declining and community composition has substantially changed over the last three decades contributing to severe and abrupt population losses for many of the resident and migratory fish that feed exclusively on aquatic invertebrates in early life stages. Other stressors contributing to the collapse of the aquatic ecosystem in the Bay Delta Estuary include insufficient freshwater flows, loss of aquatic habitat, invasive species, and hydromodification.

Pollutant Sources – Agricultural applications are the primary sources of diazinon and chlorpyrifos in the Delta after the registrations for non-agricultural uses were cancelled in the early 00's. Prior to cancellation of residential uses,Agricultural diazinon use includes irrigation season applications on crops such as tomatoes, pears, cherries, walnuts, prunes and apples. Diazinon is also applied to pear, cherry, plum, apple, walnut, and almond orchards outside the irrigation season. Chlorpyrifos is applied to a variety of commodities including walnuts, corn, alfalfa, sugar beets, cotton, grapes, sunflowers, and asparagus. Irrigation, precipitation runoff, and atmospheric deposition from spray drift are the primary mechanisms that transport diazinon and chlorpyrifos from urban surfaces and agricultural landscapes to waters.

Loading Capacity and Allocations – The Loading Capacity for diazinon and chlorpyrifos in Delta waterways is the maximum amount of diazinon and chlorpyrifos that can be assimilated without exceeding water quality objectives. The diazinon and chlorpyrifos Loading Capacity and source allocations are concentration-based limits measured in the receiving water. Mass based limits were not established due, in part, to complex hydrology influenced by tides and diversions. Additive toxicity was addressed in the Loading Capacity because diazinon and chlorpyrifos can be present at levels of concern in Delta Waterways and they are more toxic to aquatic life when together than individually. The diazinon and chlorpyrifos Loading Capacity in Delta Waterways is represented by a numeric limit where the sum of measured diazinon and chlorpyrifos concentrations divided by the

Water Quality Restoration Progress Report
Diazinon and Chlorpyrifos
Lower Sacramento and Feather Rivers TMDL
(Approved 2003)

STATUS
🟨 Conditions Improving
☐ Data inconclusive
☐ Improvement needed
☐ TMDL targets achieved

Total Maximum Daily Load (TMDL) Summary

Waterbodies – Sacramento River below Shasta Dam and Feather River below Oroville Dam.

Water quality objectives

Chlorpyrifos	Acute	0.025 ug/L (1 hr average)
	Chronic	0.015 ug/L (4 day average)
Diazinon	Acute	0.16 ug/L (1 hr average)
	Chronic	0.10 ug/L (4 day average)

*Not to be exceeded more than once in a three year period.

Targeted Attainment Date – May 2007

Water Quality Impairment – Freshwater aquatic life is impaired by diazinon and chlorpyrifos concentrations. Data collected by several agencies since the early 1990s document concentrations of diazinon and chlorpyrifos in Sacramento County urban streams at levels that can cause toxicity to some aquatic invertebrate species. These waterways were first identified as impaired in 1998. Diazinon and chlorpyrifos are insecticides that can be acutely toxic to aquatic life, wildlife, and humans. Aquatic invertebrates appear to be the aquatic organisms most sensitive to chlorpyrifos and diazinon exposure. When ingested by an organism, diazinon and chlorpyrifos cause toxicity by interrupting nerve impulse transmission which minimizes respiration and movement. Diazinon and chlorpyrifos are more toxic when they are together in solution. Toxic substances, including pesticides, are considered one of the stressors contributing to the collapse of the aquatic ecosystem in the San Francisco Bay Delta Estuary. Abundance of aquatic invertebrates in the Delta has been declining and community composition has substantially changed over the last three decades contributing to severe and abrupt population losses for many of the resident and migratory fish that feed exclusively on aquatic invertebrates in early life stages. Other stressors contributing to the collapse of the aquatic ecosystem in the Bay Delta Estuary include insufficient freshwater flows, loss of aquatic habitat, invasive species, and hydromodification.

Pollutant Sources – Agricultural applications are the primary sources of diazinon and chlorpyrifos in the lower Sacramento and Feather River Delta after the registrations for non-agricultural uses were cancelled. Agricultural diazinon use includes irrigation season applications on crops such as tomatoes, pears, cherries, walnuts, prunes and apples. Diazinon is also applied to pear, cherry, plum, apple, walnut, and almond orchards outside the irrigation season. Chlorpyrifos is applied to a variety of crops including walnuts, corn, alfalfa, sugar beets, cotton, grapes, sunflowers, and asparagus. Irrigation, precipitation runoff, and atmospheric deposition from spray drift are the primary mechanisms that transport diazinon and chlorpyrifos from urban surfaces and agricultural landscapes to urban storm drains, irrigation return drains, and into to aquatic habitats such as streams, wetlands, bays, and other open waters. Urban uses of these insecticides include applications by professional pest control personnel, municipal workers, and homeowners to control pests (aphids, spider mites, fleas, ants, roaches, and boring insects) on residential and commercial landscapes, around building foundations and roadways, and at commercial and industrial locations. Prior to cancellation of residential uses, approximately 75 percent of diazinon products and nearly 50 percent of chlorpyrifos products sold were used in and around homes in the United States. The product registrations for most urban (non-agricultural) uses of diazinon and chlorpyrifos were cancelled in 2004 and 2000, respectively.

Loading Capacity and Allocations - The Loading Capacity is the maximum amount of a contaminant or stressor that can be assimilated without exceeding water quality objectives. The diazinon and chlorpyrifos Loading Capacity and source allocations in this TMDL are concentration-based limits measured in receiving waters. Additive toxicity was incorporated into the Loading Capacity because diazinon and chlorpyrifos can be present at levels of concern at the same time and they

Water Quality Restoration Progress Report
Lower San Joaquin River
Diazinon & Chlorpyrifos TMDL
(Approved 2006)

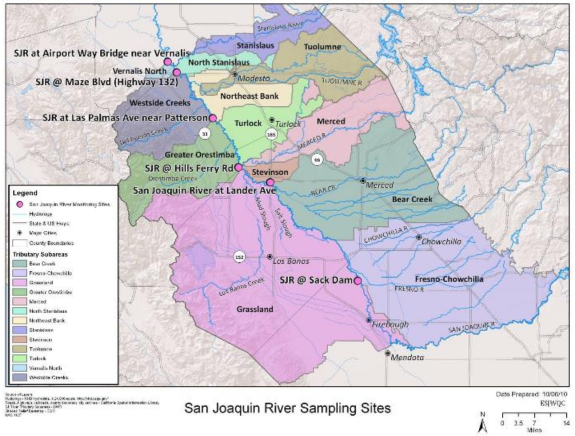
	Conditions Improving
	Data inconclusive
	Improvement needed
X	TMDL targets achieved

Total Maximum Daily Load (TMDL) Summary

Waterbody – This TMDL covers 130 miles of the Lower San Joaquin River from Mendota Dam to Vernalis at Airport Way bridge.

Map shows the watershed covered by the TMDL as well as the six sampling points that are also the six compliance points in the TMDL.

Figure 5. San Joaquin River monitoring sites and drainage subareas.



Source:http://www.swrcb.ca.gov/rwqcb5//water_issues/irrigated_lands/management_plans_reviews/coalitions/east_sanjoaquin_waterquality/esjwqc_2012jul25_amr_amend.pdf

Water quality objectives

Chlorpyrifos	Acute	0.025 ug/L (1 hr average)
	Chronic	0.015 ug/L (4 day average)
Diazinon	Acute	0.16 ug/L (1 hr average)
	Chronic	0.10 ug/L (4 day average)

*Not to be exceeded more than once in a three year period.

Pesticides: No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.

Targeted Attainment Date – December 1, 2010

Water Quality Impairment – Freshwater aquatic life is impaired by diazinon and chlorpyrifos concentrations. Monitoring since 1991 by state and federal agencies and other groups has

STATUS
🟨 Conditions Improving
☐ Data inconclusive
☐ Improvement needed
☐ TMDL targets achieved

Water Quality Restoration Progress Report
Diazinon and Chlorpyrifos
Sacramento County Urban Streams TMDL
(Approved 2004)

Total Maximum Daily Load (TMDL) Summary

Waterbodies – Arcade Creek, Elder Creek, Elk Grove Creek, Morrison Creek, Chicken Ranch Slough, and Strong Ranch Slough, see map (need a good map).

Water quality objectives

Chlorpyrifos	Acute	0.025 ug/L (1 hr average)
	Chronic	0.015 ug/L (4 day average)
Diazinon	Acute	0.16 ug/L (1 hr average)
	Chronic	0.10 ug/L (4 day average)

*Not to be exceeded more than once in a three year period.

Targeted Attainment Date – not specified in the TMDL

Water Quality Impairment – Diazinon and chlorpyrifos are insecticides that can be acutely toxic to aquatic life, wildlife, and humans. Freshwater aquatic life is impaired by diazinon and chlorpyrifos concentrations. Data collected by several agencies since the early 1990s document concentrations of diazinon and chlorpyrifos in Sacramento County urban streams at levels that can cause toxicity to some aquatic invertebrate species. These waterways were first identified as impaired in 1998. Aquatic invertebrates appear to be the aquatic organisms most sensitive to chlorpyrifos and diazinon exposure.. Toxic substances, including pesticides, are considered one of the stressors contributing to the collapse of the aquatic ecosystem in the San Francisco Bay Delta Estuary. Abundance of aquatic invertebrates in the Delta has been declining and community composition has substantially changed over the last three decades contributing to severe and abrupt population losses for many of the resident and migratory fish that feed exclusively on aquatic invertebrates in early life stages. Other stressors contributing to the collapse of the aquatic ecosystem in the Bay Delta Estuary include insufficient freshwater flows, loss of aquatic habitat, invasive species, and hydromodification.

Pollutant Sources –Urban storm water was a primary source of diazinon and chlorpyrifos in Sacramento County urban streams prior to cancellation of product registration for most non-agricultural uses. Urban uses of these insecticides include applications by professional pest control personnel, municipal workers, and homeowners to control pests (aphids, spider mites, fleas, ants, roaches, and boring insects) on residential and commercial landscapes, around building foundations and roadways, and at commercial and industrial locations. The product registrations for most urban (non-agricultural) uses of diazinon and chlorpyrifos were cancelled in 2004 and 2000, respectively. Irrigation, precipitation runoff, and atmospheric deposition from spray drift are the primary mechanisms that transport diazinon and chlorpyrifos from urban surfaces to urban storm drains and creeks. Atmospheric transport can also bring diazinon and chlorpyrifos from agricultural applcaton sites into urban waterbodies.

Loading Capacity and Allocations - The Loading Capacity is the maximum amount of a contaminant or stressor that can be assimilated without exceeding water quality objectives. The diazinon and chlorpyrifos Loading Capacity and source allocations in this TMDL are concentration-based limits measured in receiving waters. Additive toxicity was incorporated into the Loading Capacity because diazinon and chlorpyrifos can be present at levels of concern at the same time and they are more toxic to aquatic life when together than individually. The diazinon and chlorpyrifos Loading Capacity is represented by a numeric limit where the sum of diazinon and chlorpyrifos concentrations measured in receiving waters divided by the corresponding water quality objective is less than one (<1). This relationship is expressed in the following equation:

Water Quality Restoration Progress Report
Dissolved Oxygen
Stockton Deep Water Ship Channel TMDL
(Approved 2007)

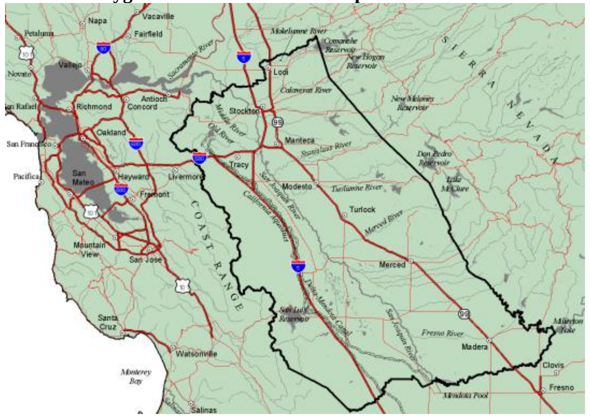
STATUS

☐ Conditions Improving
☐ Data inconclusive
🟨 Improvement needed
☐ TMDL targets achieved

Total Maximum Daily Load (TMDL) Summary

Waterbody – Stockton Deep Water Ship Channel. The source area for oxygen demanding substances includes portions of the SJR watershed that drain downstream of Friant Dam and upstream of the confluence of the San Joaquin River and Disappointment Slough. See Dissolved Oxygen TMDL Source Area Map below.

Dissolved Oxygen TMDL Source Area Map



Water quality objectives

Dissolved Oxygen to exceed 5.0 mg/L at all times on the San Joaquin River within the Delta and to exceed 6.0 mg/L between Turner Cut and Stockton from September 1 through November 30.

Targeted Attainment Date – None specified in TMDL.

Water Quality Impairment – Freshwater aquatic life and migration of anadromous fishes are impaired by low dissolved oxygen in the Stockton Deep Water Ship Channel (DWSC) from the City of Stockton to Disappointment Slough. This segment of the San Joaquin River was first listed as impaired for low dissolved oxygen in 1998. This condition results from loading of upstream oxygen demanding substances from point and non-point sources, reduced flow through the channel and increased residence time due to channel geometry. Low dissolved oxygen conditions can stress or kill aquatic species and can impact salmon migrations.

Pollutant Sources – There are three main factors contributing to this DO impairment:
- Loading of oxygen demanding substances, i.e. biodegradable material, from upstream sources that react by numerous chemical, biological, and physical mechanisms to remove dissolved oxygen from the water column in the DWSC.