California Estuaries

Description: The Delta, the most obvious section of the Estuary, is a thousand-square-mile triangle of tidal and drained swamps. Only the narrow arms of the delta's tributaries remain, now narrow, rushing streams and channels that wind through flat, evergreen forests. The tidal delta contains the Port of Oakland and the cities of Berkeley, Emeryville, and Richmond, and is home to thousands of species of birds, fish, and other wildlife. The delta is also home to several of California's largest cities, including Oakland, Berkeley, and Emeryville. The delta is a major shipping route, and is home to a number of large industries, including the Port of Oakland and the Oakland International Airport.

Images/Video

Why are estuaries important?

Estuaries provide a vital role in the health of the ocean and the surrounding ecosystem. They are a critical source of food for many species of fish and wildlife, and are also important for the development and survival of young fish. They also provide重要的 role in the health of the ocean and the surrounding ecosystem. They are a critical source of food for many species of fish and wildlife, and are also important for the development and survival of young fish. They also provide an important source of fresh water for the surrounding area.

Environmental benefits

Estuaries provide a vital role in the health of the ocean and the surrounding ecosystem. They are a critical source of food for many species of fish and wildlife, and are also important for the development and survival of young fish. They also provide an important source of fresh water for the surrounding area.

Economic benefits

Estuaries have a great economic value, providing important benefits for the surrounding area. They are a critical source of food for many species of fish and wildlife, and are also important for the development and survival of young fish. They also provide an important source of fresh water for the surrounding area.
**What are Phytoplankton?**

Phytoplankton are small organisms that can be found floating in most water bodies. Like plants, they are primary producers, meaning that they convert light energy from the sun and carbon dioxide into the living matter of their bodies through photosynthesis. Phytoplankton from the SF Estuary fall into four broad categories: cyanobacteria, diatoms, green algae, and various flagellate groups.

**Why are Phytoplankton Important?**

- Phytoplankton are the foundation of the aquatic food web. They feed a diverse array of organisms, ranging from microscopic, animal-like zooplankton to multi-ton whales. Small fish and bottom-dwelling organisms also graze on these creatures, and then those smaller animals are eaten by bigger ones. Changes in phytoplankton populations in the SF Estuary can have cascading effects that are felt throughout the food web.
- Phytoplankton can also affect elements of water quality including:
  - pH
  - dissolved oxygen
  - algal blooms (toxic and non-toxic)
  - water transparency
- Monitoring changes in phytoplankton can be useful in assessing water quality trends. It is important to note, however, that because of the transient and broad-ranging nature of phytoplankton, their use as water quality indicators is limited and should be interpreted in conjunction with chemical, physical, and biological data.
Monitoring Stewardship

**QUESTIONS**

Are excess nutrients a problem in the San Joaquin River?

Nutrients are vital to the functioning of aquatic ecosystems, and, in their absence, there can be no aquatic life. Aquatic systems, depending on location and type, can have a range of natural... More

Is salt affecting beneficial uses in the San Joaquin River?

Excesses amounts of dissolved salt in water can affect agriculture, drinking water supplies and ecosystem health. Salinity is a significant issue in the San Joaquin River Basin. More

What is the level of aquatic toxicity in the San

**MANAGEMENT ACTIVITY**

Irrigated Lands Regulatory Program

California agriculture is extremely diverse and spans a wide array of growing conditions from northern to southern California. California’s... More

San Joaquin River Restoration

The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows throughout the 500-mile length of the San Joaquin.

**RESOURCES**

Amendments to the water quality control plan for the Sacramento River and San Joaquin river basins for the control of Diazinon and Chlorpyrifos runoff into the Lower San Joaquin River. (Final Staff Report)

This report provides the technical and policy foundation for a proposed amendment to the Water Quality Control Plan for the Sacramento River... More

**Mokelumne River**

Originating in the Sierra Nevada Mountain Range, the Mokelumne River flows into the Camanche... More

**Tuolumne River**

The headwaters of the Tuolumne River begin at 13,000 feet in Yosemite National Park in the Sierra... More

**Fish of the San Joaquin River**

Habitats for fish on the Refuge include rivers, permanent wetlands, oxbows and sloughs. Three... More
Monitoring Stewardship

**Questions**

- Are excess nutrients a problem in the San Joaquin River?
  
  Nutrients are vital to the functioning of aquatic ecosystems, and, in their absence, there can be no aquatic life. Aquatic systems, depending on location and type, can have a range of natural... [More]

- Is salt affecting beneficial uses in the San Joaquin River?
  
  Excesses amounts of dissolved salt in water can affect agriculture, drinking water supplies and ecosystem health. Salinity is a significant issue in the San Joaquin River Basin. [More]

- What is the level of aquatic toxicity in the San...

**Management Activity**

- **Irrigated Lands Regulatory Program**
  
  California agriculture is extremely diverse and spans a wide array of growing conditions from northern to southern California. California's... [More]

- **San Joaquin River Restoration**
  
  The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows in approximately 1,800 miles of the San Joaquin... [More]

**Resources**

- **Amendments to the water quality control plan for the Sacramento River and San Joaquin river basins for the control of Diazinon and Chlorpyrifos runoff into the Lower San Joaquin River. (Final Staff Report)**
  
  This report provides the technical and policy foundation for a proposed amendment to the Water Quality Control Plan for the Sacramento River... [More]

**Images**

- **Mokelumne River**
  
  Originating in the Sierra Nevada Mountain Range, the Mokelumne River flows into the Camanche... [More]

- **Tuolumne River**
  
  The headwaters of the Tuolumne River begin at 13,000 feet in Yosemite National Park in the Sierra... [More]

- **Fish of the San Joaquin River**
  
  Habitats for fish on the Refuge include rivers, permanent wetlands, oxbows and sloughs. Three... [More]
Are excess nutrients a problem in the San Joaquin River?

Nutrients are vital to the functioning of aquatic ecosystems, and, in their absence, there can be no aquatic life. Aquatic systems, depending on location and type, can have a range of natural... More

Is salt affecting beneficial uses in the San Joaquin River?

Excessive amounts of dissolved salt in water can affect agriculture, drinking water supplies and ecosystem health. Sufficiently is a significant issue in the San Joaquin River Basin. More

What is the level of aquatic toxicity in the San Joaquin River?

Irrigated Lands Regulatory Program

California agriculture is extremely diverse and spans a wide array of growing conditions from northern to southern California. California's... More

San Joaquin River Restoration

The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows in approximately 50 miles of the San Joaquin... More

RESOURCES

Amendments to the water quality control plan for the Sacramento River and San Joaquin river basins for the control of Diazinon and Chlorpyrifos runoff into the Lower San Joaquin River. (Final Staff Report)

This report provides the technical and policy foundation for a proposed amendment to the Water Quality Control Plan for the Sacramento River... More

Mokelumne River

Originating in the Sierra Nevada Mountain Range, the Mokelumne River flows into the Camanche... More

Tuolumne River

The headwaters of the Tuolumne River begin at 13,000 feet in Yosemite National Park in the Sierra... More

Fish of the San Joaquin River

Habitats for fish on the Refuge include rivers, permanent wetlands, oxbows and sloughs. Three... More
Does Water Temperature in the San Joaquin River and its Tributaries Support...

Monitoring temperature in the San Joaquin River and its tributaries will help us better understand if conditions support migration and other life stages of the Chinook Salmon. Two San Joaquin River...

Learn More...
Does Water Temperature in the San Joaquin River and its Tributaries Support Chinook Salmon (Oncorhynchus tshawytscha) Migration?

Chinook Salmon and the SJR  Current Conditions for Salmon  Fun Facts  Water Quality Objectives and Beneficial Uses

Caption: Click on the stations above to see real-time temperature conditions. The graphs display the last 14-day temperature values.

July to December 64 Degree F
Fallon Chinook salmon migrate upstream between September and December. They are sexually mature when they enter freshwater streams and spawn between October and December. 64°F Warm Freshwater Habitat and 55.4°F Spawning, Reproduction and/or Early Development (warm)

January to July 69.8 Degree F
Fallon Chinook salmon migrate upstream between September and December. They are sexually mature when they enter freshwater streams and spawn between October and December. 64°F Warm Freshwater Habitat and 55.4°F Spawning, Reproduction and/or Early Development (warm)
San Joaquin River Tributary Temperature Stations (1-Year)

Caption: The above graph illustrates the last year temperature conditions for the tributaries to the SJR river. January to July temperature criteria is set at 60.8 Degree F for Cold Freshwater Habitat, July to December criteria is set at 64 Degree F for Warm Freshwater Habitat.
**Does Water Temperature in the San Joaquin River and its Tributaries Support Chinook Salmon (Oncorhynchus tshawytscha) Migration?**

### About the Chinook salmon life-cycle

Chinook salmon are anadromous, which means they spawn in freshwater, but migrate to the ocean where they remain for their adult lives. After years of living in the open ocean, they return to their natal freshwater streams to reproduce. Females dig nests in gravel-bottomed streams called redds where they deposit their eggs. After the male fertilizes the eggs, the female covers the redd with gravel. The embryos hatch into lepto-hatch, which remain in the gravel redd nourished by the yolk sac of the egg from which they were born. The elver absorbs the yolk sac and grows, emerging from the gravel as fry. (See life stage illustration below.) The fry begin their migration downstream toward the ocean. As they grow, they develop scales and dark vertical bars on their sides called parr markings. At this stage, they are called parr. Smmotification is a physiological change that enables the fish to adapt from living in freshwater to living in saltwater. At the completion of this process, they are called smolt. Smolts typically remain in brackish water estuaries as juveniles before they move into the open ocean. Adults migrate through the North-east Pacific until returning to the freshwater streams to reproduce.

### Chinook Salmon and the San Joaquin River?

There are two distinct runs of Chinook salmon in the San Joaquin River. Runs are designated based on the timing that adults enter into freshwater from the ocean toward their natal spawning streams. Many factors, however, influence the precise timing of the runs such as water temperature, flow characteristics, and natural food for the fish.

- Fall-run Chinook salmon migrate upstream between September and December. They are sexually mature when they enter freshwater streams and spawn between October and December.

- Spring-run Chinook salmon typically migrate upstream between February and May. They remain in cold freshwater habitats while they sexually mature and spawn between August and October.

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Migration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spawning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incubation and Emergence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rearing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ocean Migration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**The life cycle of a Salmon takes it from rivers to the ocean and back again. At every step, they face challenges of a changing world, shown in the shaded bubbles. Source: Washington State Recreation and Conservation Office.**
Is Salt Affecting Beneficial Uses in the San Joaquin River Basin?

Water quality in the San Joaquin River has degraded significantly since the late 1940s. During this period, salt concentrations in the River, near Yermallis, have doubled. Concentrations of boron, ...

Learn More...
Current Electrical Conductivity Conditions

SALINITY IN THE SAN JOAQUIN BASIN

There are more than 23 stations monitoring Salinity and other Water Quality parameters in the San Joaquin Basin. The stations below monitor Electrical Conductivity daily on a 15 minute interval.

HOW SALINITY IS MEASURED

There are two main methods of determining the salt content of water. Total Dissolved Salts (or Solids) and Electrical Conductivity. Total Dissolved Salts (TDS) is measured by evaporating a known volume of water to dryness, then weighing the solid residue remaining. Below, Electrical Conductivity is used to monitor salt in the SJR River.

Real Time Salt Conditions in the Basin (Measure in EC)

Caption: Click on the stations above to see real time Electrical Conductivity conditions. The graphs display the last 30-day EC values. The San Joaquin River at Yerrita EC Objectives are 700 uS/cm from April through August and 1,000 uS/cm from September through March (30 day running average). The south Delta EC objectives are the same as the Yerrita EC objectives at the three compliance locations: SJR at Branch Bridge, Old River at Union, and Old River at Tracy Boulevard.
**EC Objectives at Vernalis (1-Year)**

The Vernalis Electrical Conductivity Objectives:
- September to March objective is 1000 µS/cm.
- April to August objective is 700 µS/cm.

Caption: The primary stressor addressed by the Program is contaminants entering the lower SJR. The main objective of the project is to facilitate the control and timing of wetland and agricultural drainage to coincide with periods when dilution flow is sufficient to meet Vernalis salinity objectives. By increasing the frequency of meeting Vernalis EC objectives, the project may reduce the number and/or magnitude of high-quality releases (e.g., releases of Stanislaus River flows from New Melones Reservoir) made specifically for meeting Vernalis EC objectives.
Salinity and the SJR River and Tributaries

Salinity is simply a measure of the amount of salts dissolved in water. Salinity is usually expressed in parts per thousand (ppt) or 0/00. The fresh water from rivers has a salinity of 0.5 ppt or less. Within the estuary, salinity levels are referred to as oligohaline (0.5-5.0 ppt), mesohaline (5.0-18.0 ppt), or polyhaline (16.0~30.0 ppt). Near the connection with the open sea, estuarine waters may be euhaline, where salinity levels are the same as the ocean at more than 30.0 ppt (Mitsch and Gosselink, 1988).

THE PROBLEM

Water quality in the San Joaquin River has degraded significantly since the late 1940s. During this period, salt concentrations in the River, near Vernalis, have doubled. Concentrations of boron, selenium, molybdenum and other trace elements have also increased. These increases are primarily due to reservoir development on the east side tributaries and upper basin for agricultural development, the use of poorer quality, higher salinity, Delta water in lieu of San Joaquin River water on west side agricultural lands and drainage from upslope saline soils on the west side of the San Joaquin Valley. Point source discharges to surface waters only contribute a small fraction of the total salt and boron loads in the San Joaquin River.

The water quality degradation in the River was identified in the 1975 Basin Plan and the Lower San Joaquin River was classified as a Water Quality Limited Segment. At that time, it was envisioned that a Valley-wide Drain would be developed and these subsurface drainage water flows would then be discharged outside the Basin, thus improving River water quality. However, present day development is looking more towards regional solution to the drainage water discharge problem rather than a valley-wide drain. Because of the need to manage salt and other pollutants in the River, the Regional Water Board began developing a Regional Drainage Water Disposal Plan for the Basin. The development began in FY 87/88 when Basin Plan amendments were considered by the Water Board in FY 88/89. The amendment development process included review of beneficial uses, establishment of water quality objectives, and preparation of a regulatory plan, including a full implementation plan. The regulatory plan emphasized achieving objectives through reductions in drainage volumes and pollutant loads through best management practices and other on-farm methods.
Is it Safe to Swim in the San Joaquin River and its Tributaries

The San Joaquin River boasts 330 miles of beautiful wildlife habitat, and superb recreational opportunities. The incredibly scenic San Joaquin River Gorge near the town of Auberry boasts excellent... Learn More...
Swim in the SJR Basin

Places to Swim in the San Joaquin River Basin - Highlights

Mammoth Pool Reservoir

North Fork of the San Joaquin River

Mammoth Pool Reservoir is a reservoir on the San Joaquin River in the Sierra Nevada, within the Sierra National Forest in California. It straddles the border of Fresno County and Madera County. It is about 45 miles (72 km) north-northeast of Fresno.

North Fork, which starts 1.8 mi (2.9 km) southeast of Mount Lyell. The upper San Joaquin River system runs 97 mi (156 km) above Friant Dam in the Sierra is characterized as a steep-gradient, rocky mountain stream. Over millions of years, the upper San Joaquin, as well as the upper reaches of most of its tributaries, have eroded enormous amounts of rock and sediment from the mountains.
The San Joaquin River flows through a spectacular gorge encompassing more than 6,000 acres of public land managed by the Bureau of Land Management (BLM) in the Sierra foothills northeast of Fresno. An extensive trail system provides access to the Gorge for hikers, mountain bikers, equestrians, hunters, and wildlife/wildflower aficionados. One of the few publicly owned recreation areas in the lower foothills of Fresno and Madera Counties, the Gorge also boasts two campgrounds and is used as an outdoor environmental education classroom.

Tuolumne Rainbow Pools

Rainbow Pools are natural swimming holes along the south fork of the Tuolumne River, where one can dip their feet, take a plunge or just watch courageous kids jump the rock ledges into the largest of the inviting pools. Originally a Toll Stop on the Big Oak Flat Road to Yosemite, and later

Minaret Creek

Glacier-fed Minaret Lakes are at the foot of the Minaret Pinnacles in the Ritter Range. From the Devil's Postpile Visitor Center (shuttle stop #6) it is less than a mile to the junction with the John Muir Trail. A bridge across the river leads to several trail junctions. Follow the John Muir Trail as it climbs...
HOW BACTERIA IS MEASURED

There are various programs focused on measuring and evaluating bacteria in California’s waters. Below are the current assessment methods.

**USEPA’s 2012 Recreational Water Quality Criteria**

The geometric mean (GM) should not be exceeded in any 30-day interval.
The statistical threshold value (STV) should not be exceeded by more than 10 percent of the samples taken in any 30-day interval.

<table>
<thead>
<tr>
<th></th>
<th>Recommendation 1 (estimated illness rate 36/1,000)</th>
<th>Recommendation 2 (estimated illness rate 32/1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli (cfu/100 mL)</td>
<td>GM 126</td>
<td>STV 410</td>
</tr>
</tbody>
</table>

**Water Quality Control Plan for the Sacramento and San Joaquin River Basins**

Fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 mL, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 mL.

- **Read the Basin Plan for more information**

Choose a region using the map to see monitoring results from that area:
Monitoring for Recreation Uses

The San Joaquin River boasts 330 miles of beauty, wildlife habitat, and superb recreational opportunities. The incredibly scenic San Joaquin River Gorge near the town of Auberry boasts excellent hiking, mountain biking and horseback riding trails as well as guided nature walks, camping, swimming, and more. Keeping our water safe for recreational uses is a national priority.
Are excess nutrients a problem in the San Joaquin River?

Nutrients in rivers serve the same basic function as nutrients in a garden. They are essential for growth. In a garden, growth and productivity are considered beneficial, but this is not necessarily... Learn More...
Are excess nutrients a problem in the San Joaquin River?

Content: Nutrients and the San Joaquin River Basin

Nutrients in rivers serve the same basic function as nutrients in a garden. They are essential for growth. In a garden growth and productivity are considered beneficial, but this is not necessarily so in a river. The additional algae and other plant growth allowed by the nutrients may be beneficial up to a point, but may easily become a nuisance.

The main nutrients of concern are phosphorus and nitrogen. Both elements are measured in several forms. Phosphorus can be measured as total phosphorus (TP), or soluble reactive phosphate (SRP) (also sometimes called phosphate (PO4) or orthophosphate (ortho-P)). The last, three represent different terms used to describe the fraction of TP that is soluble or available to organisms for growth.

THE PROBLEM

The San Joaquin River Basin is predominately used for agriculture. Fertilizers are used on agricultural lands because nitrogen and phosphorus are often depleted from the soil. Excess or unused amounts are carried by surface runoff or as tail water into river systems. During the low-flow summer periods, agricultural water tail discharges account for the major portion of the river’s flow in many sections of the river. Nutrients from agriculture can also infiltrate with water into ground water aquifers. Many wells in the basin area have been closed due to high nitrate levels. (CRWQCB 1998)

Livestock operations, such as dairy farms, are another source of pollution. Water that drains from the facilities transports waste nutrients, along with sediments and bacteria directly into the river system via surface water runoff.

Urban population has expanded throughout the basin area over the last century. This has placed increasing demands on waste water treatment facilities, which contribute excess nutrients into the river system. Construction and urban runoff are major contributors of sedimentation.

REASONS FOR NATURAL VARIATION
Constituents of Concern

NITRATE AS N (Total, Dissolved and Not Recorded)

(Nitrate as N (Total) + Nitrate as N (Dissolved) + Nitrate as N (Not Recorded)) + (Nitrate + Nitrite) (Dissolved) + (Nitrate + Nitrite) (Total) + (Nitrate + Nitrite) (Not Recorded)

Graphs

Using the menu below choose a region to graph Nitrate. Data is not real time and varies on region. The red line represents maximum contaminant level (MCL) for nitrate in drinking water is 10 milligrams per liter as nitrogen (mg/L, as N):
Top half of the website
What is the level of aquatic toxicity in the San Joaquin River?

California River and Streams Portal

How toxic is the water in our streams, rivers, and lakes?

The California River and Streams Portal measures how well a water body supports aquatic life. Water samples from a given water body are taken to the laboratory and test organisms are exposed to that water to see if they exhibit any adverse effects. Toxicity tests are especially useful in water quality monitoring because they show the overall effect on aquatic life of all the chemicals found in the water sample. Toxicity tests can assess mortality, behavioral changes, reproductive status or physiological and biochemical changes. Follow-up tests called Toxicity Identification Evaluations are used in the laboratory to identify the probable cause of toxicity. In California, pesticides have been a common cause. Visit the portal for more information and interactive data experience.
Success Stories

San Joaquin River Stakeholders Cooperate to Reduce Diazinon in River

Waterbodies Improved: Widespread use of the pesticide diazinon resulted in elevated concentrations in the San Joaquin River (SJR) that were toxic to aquatic invertebrates and exceeded water quality standards. Consequently, the SJR was placed on California’s Clean Water Act (CWA) section 303(d) list of impaired waters for diazinon in 1992. Watershed stakeholders implemented agricultural best management practices (BMPs) in orchards to lessen the use of organophosphate pesticides, including diazinon. Regulatory developments also reduced diazinon use. SJR diazinon concentrations decreased, prompting California to remove two reaches of the SJR from the state’s list of impaired waters for diazinon in 2010.

A collaborative effort that included both voluntary and regulatory approaches motivated the agricultural community in the SJR watershed to reduce diazinon use. Beginning in the 1990s, a number of grants and research projects by the University of California (UC) and others supported the development of diazinon management practices and encouraged participation by local growers. In 1994 watershed partners initiated the Biologically Integrated Orchard System (BIOS) project, a community-based pollution prevention program that uses biological methods to replace chemical farming practices. Participating growers adopted whole-system management approaches to reduce the use of diazinon and other pesticides, while also adopting practices to increase production and improve crop quality. For example, BIOS uses biological controls, cover crops, and maintenance of natural areas and hedgerows to provide habitat for beneficial insects to control pests. Beginning in 2002, the CV-RWQCB began to regulate discharges from agricultural lands through its Irrigated Lands Regulatory Program (ILRP). The ILRP allows growers to attain regulatory compliance through coalition groups. In the San Joaquin Valley, the Westside San Joaquin River Watershed Coalition and East San Joaquin Water Quality Coalition organized to educate growers about water quality problems and management practices, monitored water quality, and served as intermediaries between regulators and growers. The work of the coalitions was critical in motivating growers to implement practices to reduce diazinon discharges. In 2003 the CV-RWQCB adopted a diazinon total maximum daily load (TMDL). The TMDL, along with the reductions required through the ILRP, played a key role in motivating the agricultural community to implement EMPs. In 2003 the U.S. Environmental Protection Agency (EPA) developed a special label for products containing diazinon, which noted that users must implement practices to reduce diazinon runoff. In 2004 EPA canceled all nonagricultural uses of diazinon. In 2005 the California DPR adopted dormant spray regulations that require that users implement protective practices when applying dormant orchard sprays. The diazinon-reduction practices used in CWA section 319(h) projects in the Central Valley also helped to solve other pesticide problems in the area. For example, in 2009 the Sustainable Cotton Project, a farm-based program dedicated to sustainable farming practices and integrated pest management (IPM), helped orchard growers near the SJR to adopt biologically based techniques, including using pest traps and scouting for pests and beneficial insects.
**San Joaquin Basin Grasslands Bypass Project Reduces Selenium in the Basin**

*(View the latest report card)*

Waterbodies Improved. Farmland irrigation contributed to selenium exceedances in subsurface drainage in the Grasslands Watershed, located in the San Joaquin River (SJR) Basin. As a result, the Grasslands Watershed marshes and a portion of the SJR were placed on California’s Clean Water Act (CWA) section 303(d) list of impaired waters in 1998. The listing of two local tributaries, Mud Slough (northern reach) and Salt Slough, followed in 1999. The Grasslands Bypass Project implemented agricultural best management practices (BMPs) and areawide measures to reroute drainage and reduce the total selenium loading. These efforts led to significant selenium load reductions, which in turn resulted in the delisting of Salt Slough (10 miles) in 2008 and three segments of the SJR (totaling 40.4 miles) in 2010.

In 1996 the Central Valley Regional Water Quality Control Board (Regional Water Board) adopted an amendment to the Central Valley Quality Control Plan for the Control of Subsurface Agricultural Drainage, which emphasized managing irrigation in the Grasslands Watershed agricultural area. The amendment included the Grasslands Bypass Project (GBP), which was designed to: Reroute agricultural subsurface drainage water around wetlands to the SJR via the San Luis Drain, a concrete-lined bypass, and a six-mile segment of Mud Slough to attain water quality objectives in the wetland supply channels; improve management practices to achieve selenium objectives in the mainstream of the SJR below the Merced River; achieve short-term load reductions by October 2010; and prohibit discharges not meeting objectives by 2019, to bring Mud Slough and a lower flow portion of the SJR (above the Merced confluence) into compliance. The U.S. Bureau of Reclamation (USBR) and the San Luis and Delta-Mendota Water Authority developed a use agreement that states that the San Luis Drain will be closed if annual load targets are exceeded by more than 20 percent and no acceptable explanation is provided. The Regional Water Board adopted the three selenium TMDLs, developed a Waste Discharge Requirement permit that required Grasslands area farmers (known as the GAF) to reduce the discharge of selenium below pre-GBP levels, and established a plan to guide coordinated implementation of these requirements. California’s Nonpoint Source Program provided funding to develop a selenium trading program, which established collective load limits for selenium discharge at the San Luis Drain outlet and fees for exceeding the limits. Over the past 15 years, the GAF have implemented various BMPs to meet the selenium targets, including changing crops, improving irrigation efficiency, reusing water and controlling discharge timing.

**Data Sources:**

The California Environmental Data Exchange Network is a statewide system that enables data sharing of water quality and aquatic resources related monitoring data.