



## Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

## California

### Grasslands Bypass Project Reduces Selenium in the San Joaquin Basin

#### 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 1988. The listing of two local tributaries, Mud Slough (northern reach) and Salt Slough, followed in 1990. 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 de-listing of Salt Slough (10 miles) in 2008 and three segments of the SJR (totaling 40.4 miles) in 2010.

#### Problem

Bordering the SJR in California's Central Valley, the 370,000-acre Grasslands Watershed (Figure 1) contains the largest freshwater wetland ecosystem in California. The watershed also includes approximately 97,000 acres of irrigated farmland. Irrigating the area's selenium- and salt-rich soils allowed selenium to leach into shallow groundwater. To protect their crops from this salty groundwater, farmers installed tile drain systems to lower the water table below the root zone. Subsurface drainage from this agricultural area increased selenium concentrations in wetland supply channels and other downstream water bodies.

Selenium is a highly bioaccumulative trace element that, under certain conditions, can move through the food chain and cause acute and chronic toxicity to fish and wildlife. In 1988, 8,224 acres of Grasslands marshes were listed on California's CWA section 303(d) list of impaired waters because water samples routinely exceeded the U.S. Fish and Wildlife Service's (USFWS) recommended selenium criterion of 2.0 micrograms per liter ( $\mu\text{g/L}$ ) to protect waterfowl and other wildlife uses. The lower SJR downstream from the subsurface drainage was also included on the state's 1988 CWA section 303(d) list because water samples routinely exceeded the U.S. Environmental Protection Agency's (USEPA) total selenium criterion of 5.0  $\mu\text{g/L}$ . Salt Slough and Mud Slough were placed on the 1990 CWA section 303(d) list for exceeding the selenium water quality objective established to protect waterfowl and other wildlife uses. In 1999 and 2000, respectively, selenium total maximum daily loads (TMDLs) for Salt Slough and Grasslands Watershed marshes were set at a monthly mean of 2.0  $\mu\text{g/L}$  to protect waterfowl and other wildlife. In

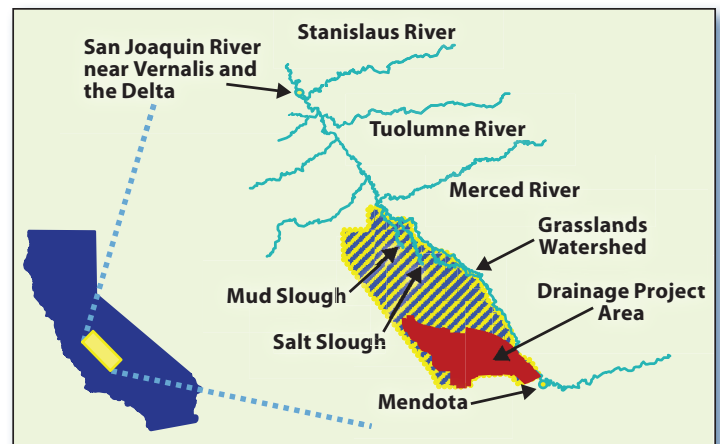


Figure 1. The Grasslands Watershed is in the San Joaquin Basin.

2001 selenium TMDLs for the lower SJR and Mud Slough were set at a four-day average of 5.0  $\mu\text{g/L}$ .

#### Project Highlights

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 mainstem 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.

## Results

Between 1998 and 2009, BMPs implemented by the GAF prevented more than 22,300 pounds of selenium and 80,735 acre-feet of drainage from discharging to waters. These load reductions brought Salt Slough into compliance with the 2.0  $\mu\text{g/L}$  selenium monthly mean objective (Figure 2), and reduced selenium loading in the lower SJR below the four-day average of 5.0  $\mu\text{g/L}$ . As a result, California removed several water bodies from its impaired waters list, including Salt Slough (10 miles) in 2008 and three segments (a combined 40.4 miles) of the SJR—Merced River to Tuolumne River (29 miles), Tuolumne River to Stanislaus River (8.4 miles), and Stanislaus River to the Delta Boundary (3 miles)—in 2010. Although the GBP has made significant progress, additional work is required to achieve the ultimate project goal of zero discharge. As scientific understanding of selenium problems improves, selenium water quality standards are being revised to better support beneficial uses.

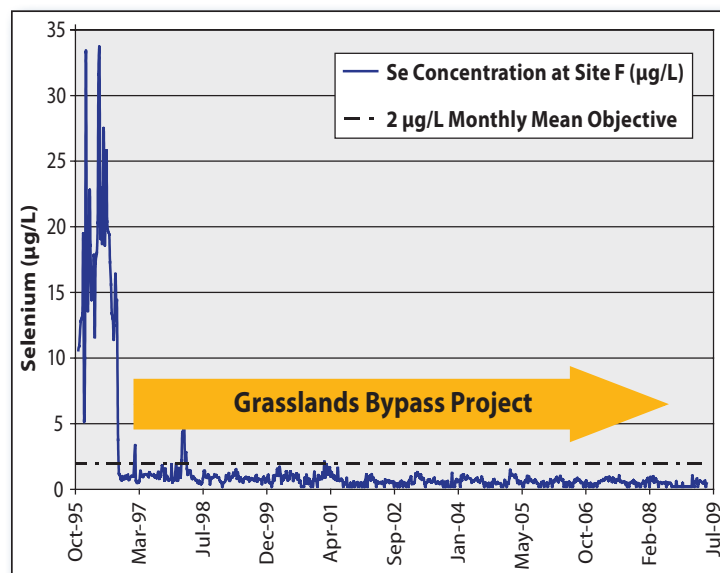


Figure 2. Selenium concentrations in Salt Slough (October 1995–May 2009).

## Partners and Funding

The GBP was instrumental in improving cooperation between federal, state and local agencies to address regional water management issues. The GAF formed a regional drainage entity to implement the project, which included the Broadview, Firebaugh Canal, Pacheco and Wildren Water Districts; the Charleston and Panoche Drainage Districts; and the Camp 13 Drainers (an association of landowners in the Central California Irrigation District).

The GBP oversight committee includes the USBR, the USFWS, USEPA, California Department of Fish and Game, and the Regional Water Board. The Contra Costa Water District helped to negotiate terms of the San Luis Drain Use Agreement. In addition, the San Luis and Delta-Mendota Water Authority represented the GAF; the U.S. Geological Survey provided technical support; and the Environmental Defense Fund provided support in developing the GBP.

To date, GBP participants have invested approximately \$93 million in selenium-control activities. A \$250,000 CWA section 319 grant to the San Luis and Delta-Mendota Water Authority helped to develop the selenium trading program. The GAF allocated selenium load reductions efficiently among the participating users in the GBP area.



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