

## WERC Studies in the San Francisco Bay-Delta



### WERC studies within the San Francisco Bay-Delta support Federal and state goals in species and habitat recovery.

The **Western Ecological Research Center (WERC)** is a USGS Ecosystems Mission Area science center mandated to provide resource managers and policy-makers with science to support sustaining or restoring natural resources, protecting vital ecosystem services, and securing environmental health and economic well-being for U.S. citizens. WERC's focus is California and Nevada, and its scientists are at the forefront of research in the San Francisco Bay-Delta. The Bay-Delta's ecosystems offer habitat for sensitive wildlife and plant species, include the largest wetland restoration project on the U.S. west coast, provide important ecosystem services, and promote a healthy economy.

Human development and water diversion have fragmented or eliminated many of the Bay-Delta's original habitats, challenging wildlife and ecosystem health. Multiple Federal and state agencies, non-profit organizations, and universities lead efforts to restore these ecosystems, monitor changes in remaining habitats, and recover threatened and endangered species. At the request of agencies like the U.S. Fish and Wildlife Service, National Park Service, California Department of Fish and Wildlife, and the U.S. Army Corps of Engineers, WERC scientists engage in studies from the Bay-Delta's infamous Alcatraz Island to the shores of its inland wetlands.

WERC researchers study investigations include the listed giant gartersnake, San Francisco gartersnake, Ridgway's rail, and salt marsh harvest mouse; effects of sea level rise on tidal marsh communities; effects of wetland restoration efforts on wildlife and methylmercury production; waterbird ecology and impacts of water abatement, drought, and climate on crucial Pacific Flyway habitat; prevalence of avian influenza in Central Valley waterfowl; and ecology of bat species of concern in Marin County.

Find us online at [www.usgs.gov/centers/werc](https://www.usgs.gov/centers/werc).

### RESEARCH CONTACTS

Main Research Page  
<https://www.usgs.gov/centers/werc>

**A. Keith Miles**  
Center Director  
[keith\\_miles@usgs.gov](mailto:keith_miles@usgs.gov)

**Josh Ackerman**  
[jackerman@usgs.gov](mailto:jackerman@usgs.gov)

**Mike Casazza**  
[mike\\_casazza@usgs.gov](mailto:mike_casazza@usgs.gov)

**Susan De La Cruz**  
[sdelacruz@usgs.gov](mailto:sdelacruz@usgs.gov)

**Brian Halstead**  
[bhalstead@usgs.gov](mailto:bhalstead@usgs.gov)

**Karen Thorne**  
[kthorne@usgs.gov](mailto:kthorne@usgs.gov)

**Amy Vandergast**  
[avandergast@usgs.gov](mailto:avandergast@usgs.gov)

# USGS WERC Studies in the SF Bay-Delta



Scientist with San Francisco gartersnake/USGS

## GENETICS OF LISTED SPECIES

To aid species recovery efforts, WERC provides resource managers with data on the genetic diversity and connectivity of species such as the giant and San Francisco gartersnake, and the Ridgway's rail. Habitat loss and fragmentation can affect rates of migration and gene flow between populations, leaving species at the risk of extinction.

## PROGRESS OF WETLAND RESTORATIONS

WERC's Federal, state, and non-profit partners lead extensive restoration efforts in Bay-Delta tidal wetlands. WERC supports these projects with studies that inform the response of endangered Ridgway's rails to the removal of invasive plants in Bay-Delta wetlands, best strategies for attracting waterbirds to newly restored habitat in a National Wildlife Refuge, influence of wetland restoration on the production of toxic methylmercury, and the U.S. Fish and Wildlife Service's Salt Marsh Recovery Plan.

## BAT ECOLOGY OF MARIN COUNTY

The Bay-Delta is home to as many as 15 sensitive bat species. WERC collaborates with four open space management agencies in Marin County to lead a three-year study on the foraging, roosting, and mating behavior of bats. WERC scientists are leading a broad acoustic survey to identify which species are using specific habitats, along with mist-netting efforts to examine sex distributions. Results provide resource agencies with information to effectively manage these species at regional and national scales.



Measuring turbidity in coastal wetland/USGS

## SEA LEVEL RISE EFFECTS ON COASTAL WETLANDS

WERC leads sea level rise studies across 17 Pacific coast estuaries from Canada to Mexico, including the Bay-Delta. The research identifies estuaries vulnerable to flooding under rising sea levels, factors affecting wetland resilience to sea level rise, habitat response to water quality changes in salinity and flooding levels, and rates at which wetlands accumulate sediment within the Bay-Delta system. This information helps resource managers preserve Pacific tidal marshes, plan up-slope marsh migration, and protect the species and services estuaries provide for future generations.

## CONTAMINANTS IN WILDLIFE

Methylmercury and selenium are environmental contaminants toxic to wildlife reproduction and health. Within the Bay-Delta, contaminants pose risks to the numerous migrating shorebirds and waterfowl that rest, winter, or breed along the Pacific Flyway. To support management efforts on local and regional scales, WERC scientists study contaminants' effects on waterbirds, fish, and other wildlife ranging from the Delta's wetlands and rice fields to south San Francisco Bay.

## ECOLOGY OF WETLAND SPECIES

WERC studies Bay-Delta wildlife and wetland ecology. Current projects provide insight into waterbird ecology, surveys of benthic invertebrate diversity as food sources for waterbirds and fish, and ecology of listed species like the salt marsh harvest mouse, giant gartersnake, and Ridgway's rail. Results inform endangered species recovery and migratory bird management, and support aquatic and terrestrial habitat management and conservation.



Field scientists in Central Valley marshes/USGS

## WATERBIRD HABITAT OF THE PACIFIC FLYWAY

WERC leads studies to inform the understanding and management of Pacific Flyway species and their habitat, which is inextricably linked to the Bay, Delta, and vast Central Valley. Studies examine the effects of drought, water management, conservation planning, urban development, and climate on waterbird habitat and population health in these critical regions. Other projects address habitat and foraging requirements of sea ducks, shorebirds, and wading birds, like the black-crowned night herons of Alcatraz Island. Together, the Bay-Delta's tidal marshes and the wetlands and flooded agriculture of the Central Valley provide critical wintering habitat for waterbirds migrating along the Pacific Flyway.

## AVIAN INFLUENZA IN WILD WATERFOWL

Avian influenza can transfer from wild waterfowl to domestic poultry and cause serious economic losses. WERC research examines local and broad-scale patterns of virus movement throughout habitats supporting wintering and migratory waterbirds in the Bay-Delta. WERC scientists are assisting partners to develop an early warning system for poultry owners to monitor avian flu risks in their region.

Partners on these studies include: U.S. Fish and Wildlife Service • Central Valley and San Francisco Joint Ventures • National Wildlife Refuges • Department of Water Resources • U.S. Army Corps of Engineers • NPS • NOAA NERR • Bureau of Reclamation • Bureau of Land Management • Department of Defense • EPA • California Department of Fish and Wildlife • Local universities • South Bay Salt Pond Restoration Project • Municipal counties • Grizzly Island Wildlife Area • Suisun Marsh Resource Conservation District • San Francisco Bay Bird Observatory • Ducks Unlimited • Coastal Conservancy • Point Blue • Water Quality Control Board • Consumnes River Preserve • California Waterfowl