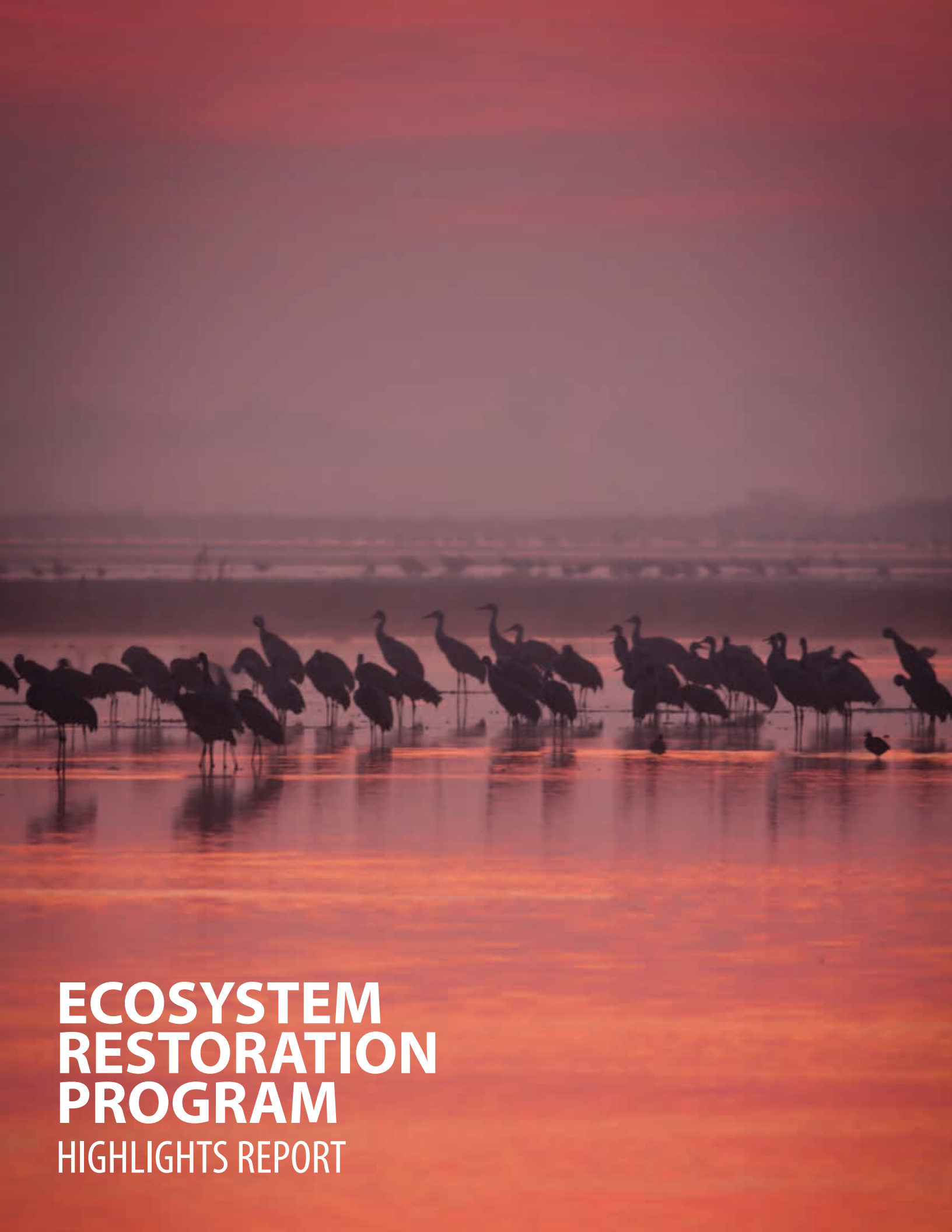


ECOSYSTEM RESTORATION PROGRAM

HIGHLIGHTS REPORT

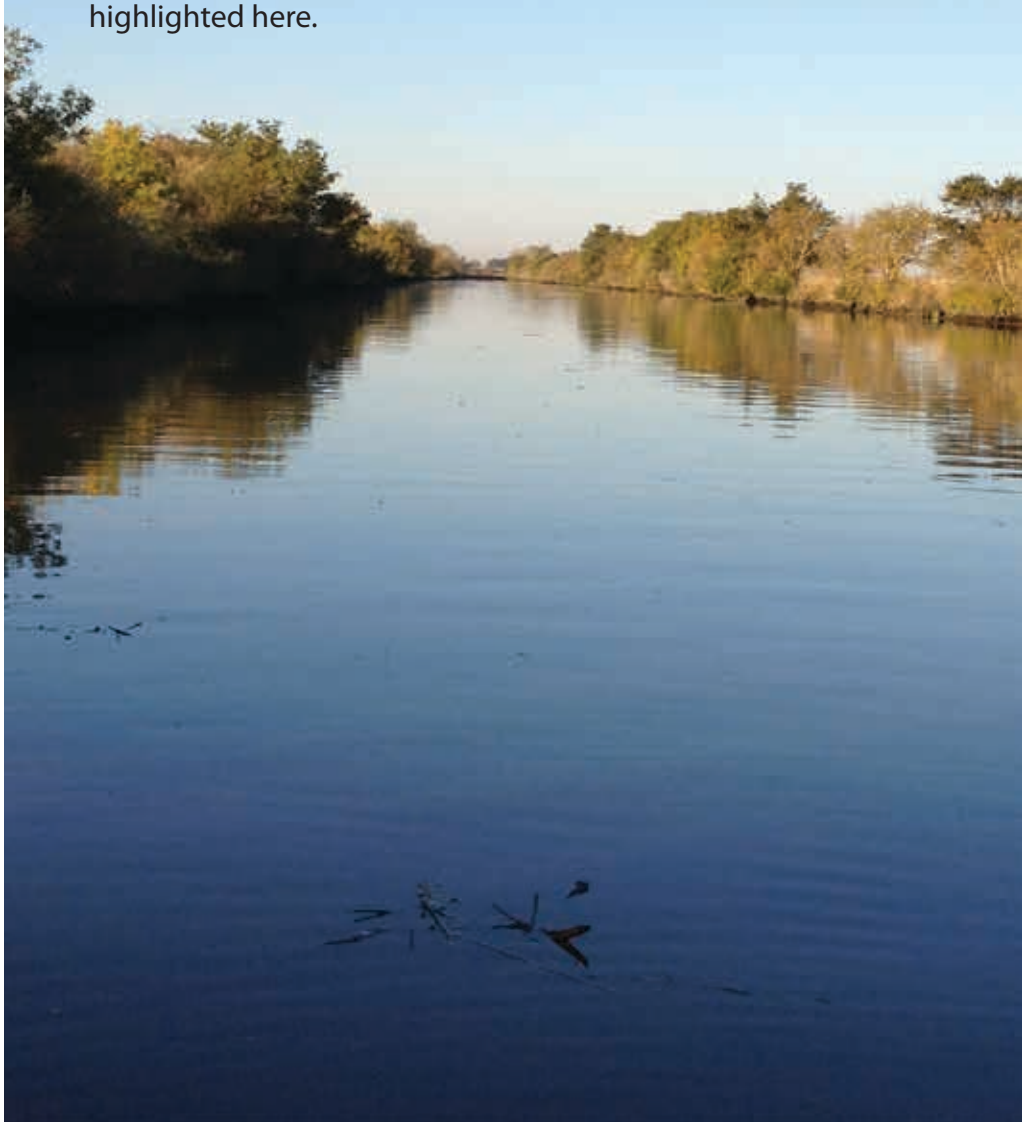
FALL 2014

Front cover: Sandhill Cranes on Staten Island, Bay-Delta Region. Photo by B. Burkett.
Back cover: Butte Creek Canyon, Sacramento Valley Region. Photo by T. McReynolds.

FOREWORD

California's Bay-Delta ecosystem is the largest estuary on the west coast of North America, draining almost 40,000 square miles via the state's two largest rivers—the Sacramento and San Joaquin. The Bay-Delta ecosystem is home to hundreds of native fish, wildlife, and plant species, many of which are threatened or endangered.

Since its inception in 1994 with the signing of the Bay-Delta Accord, the Ecosystem Restoration Program has been an unprecedented collaboration among local partners and governmental agencies to improve ecosystem processes and diverse habitats for species in the Bay-Delta watershed. Implemented by the California Department of Fish and Wildlife, the United States Fish and Wildlife Service, and the National Marine Fisheries Service, the primary focus of the Ecosystem Restoration Program is to increase the extent of aquatic and terrestrial habitats and improve ecological functions to support sustainable populations of native plant and animal species in the Bay-Delta ecosystem. Some of the Ecosystem Restoration Program's accomplishments over the last two decades are highlighted here.



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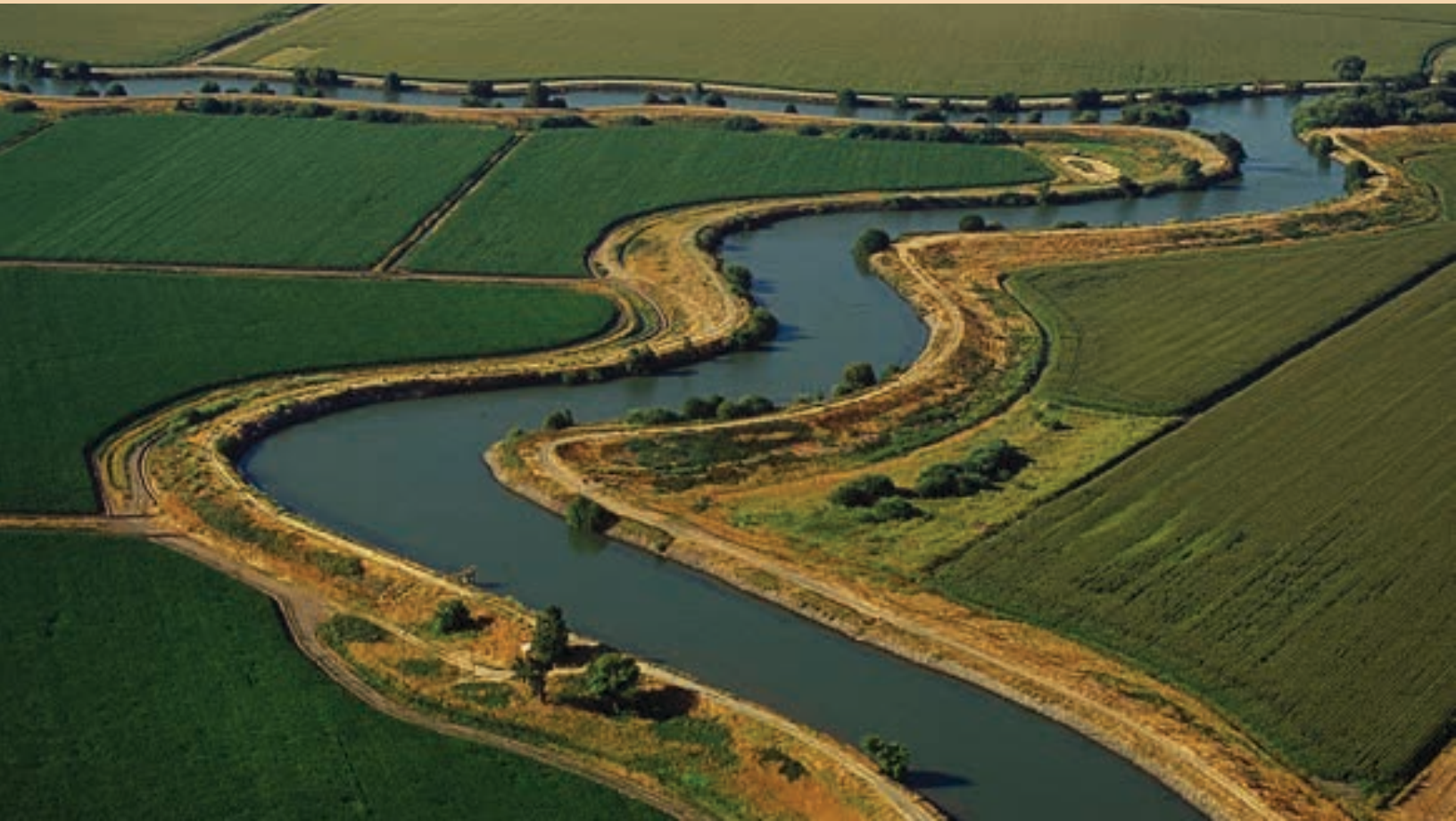
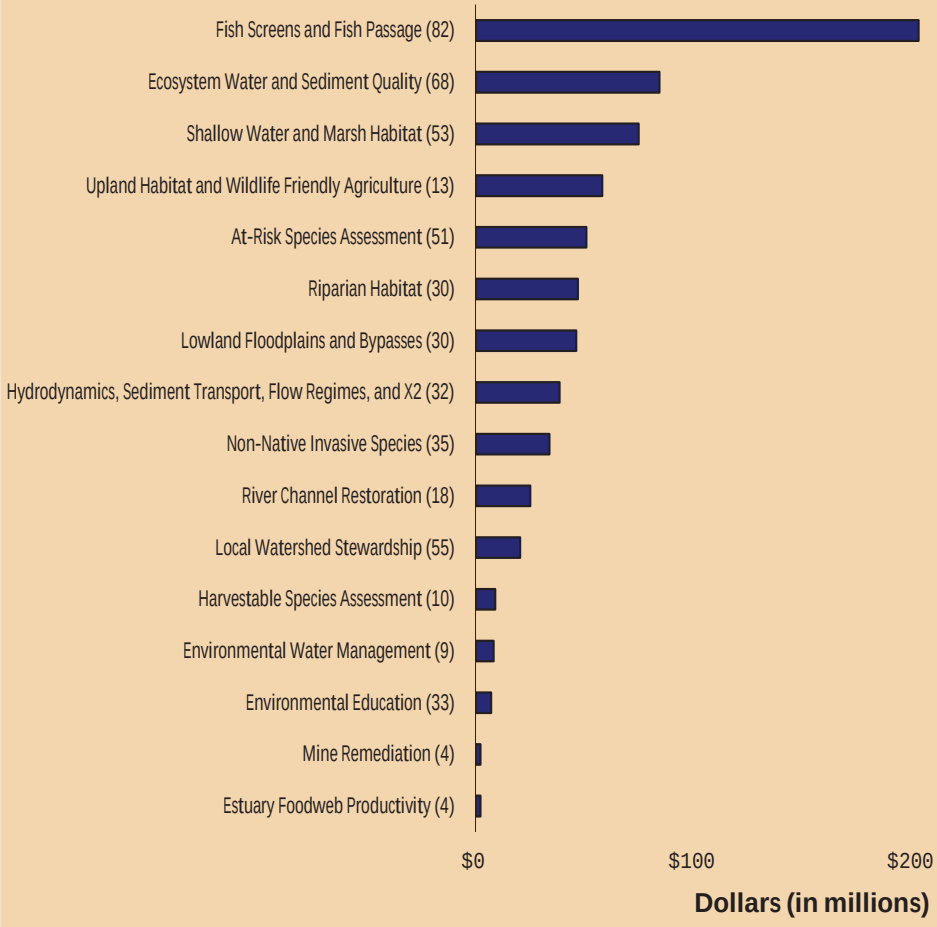


ERP STRATEGIC GOALS

The Ecosystem Restoration Program Strategic Goals, developed collaboratively by scientists, agency representatives, and stakeholders in 1998, provide the framework for implementing ecosystem restoration actions, as well as providing a vision of restoring ecological health to the Bay-Delta system. The six goals include:

- Recover at-risk species (at-risk means threatened or endangered species or native species in decline)
- Rehabilitate natural ecological processes in the Bay-Delta watershed
- Maintain and enhance fish populations critical to commercial and recreational fisheries
- Protect and restore functional habitat types for their ecological and public values
- Reduce and prevent the negative ecological and economic impacts of non-native invasive species
- Improve and maintain water and sediment quality to better support native species and ecosystem health

ERP has funded over 500 restoration projects totalling over $700 million



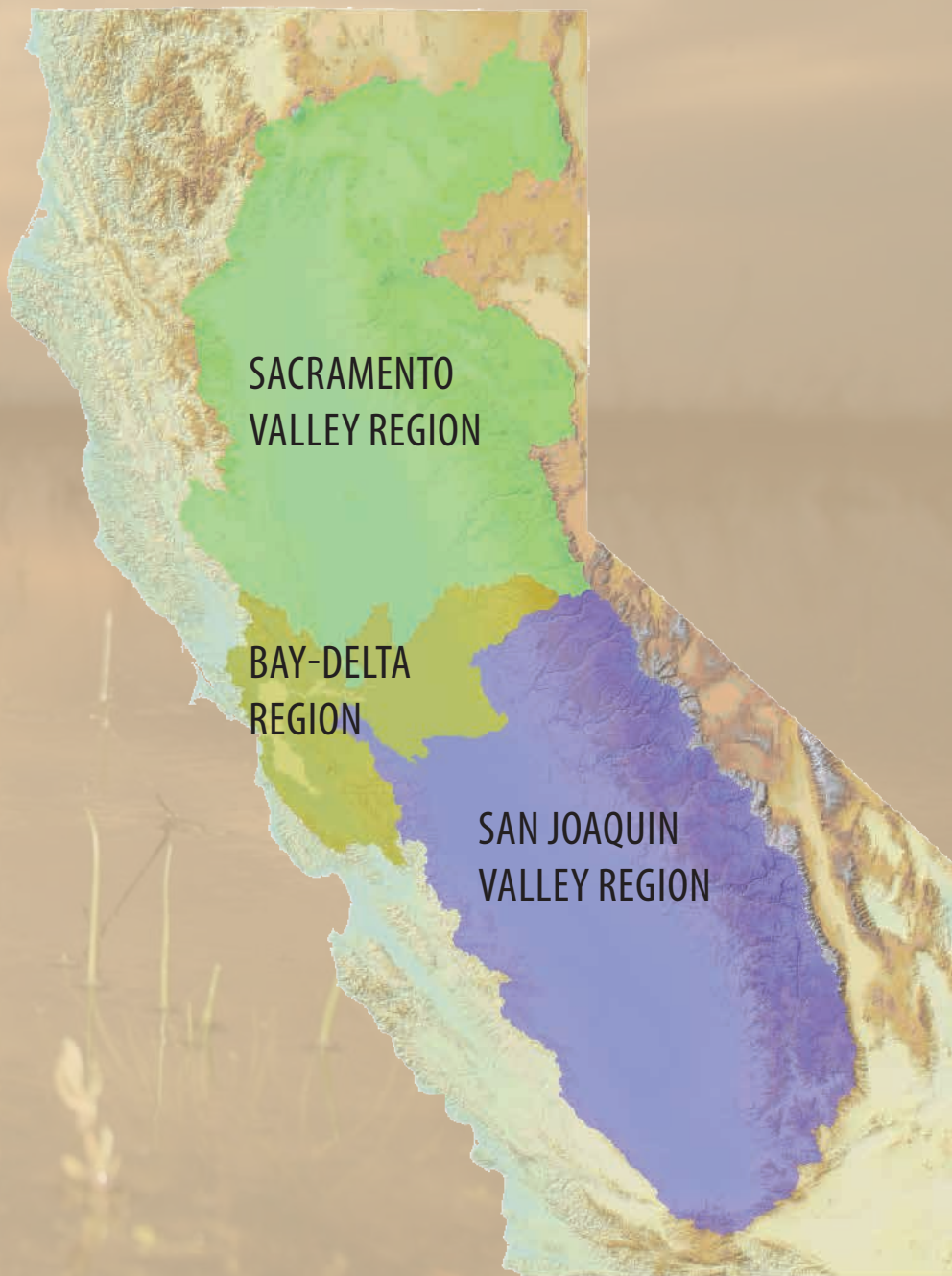
REGIONAL PERSPECTIVE

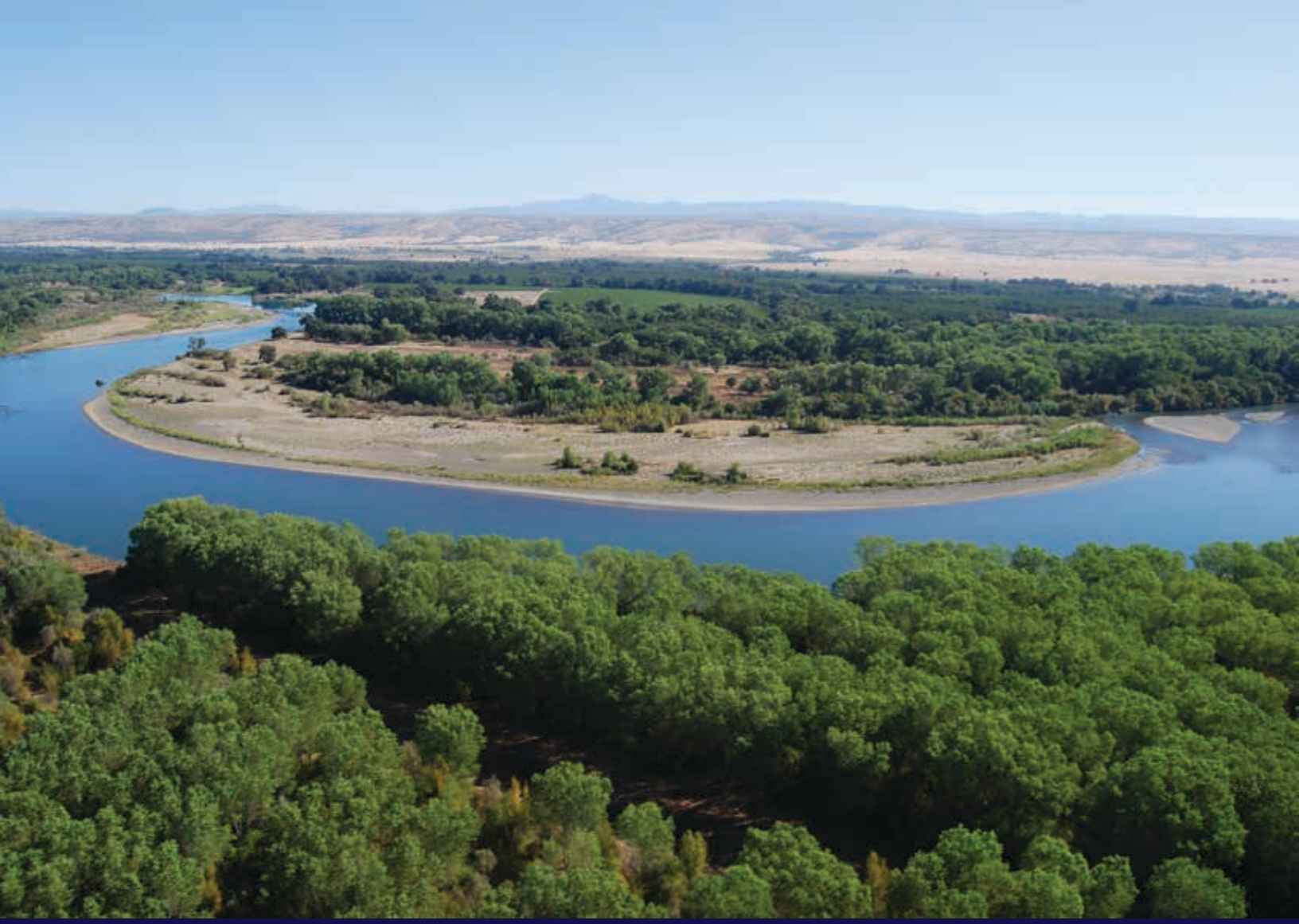
The Ecosystem Restoration Program recognizes the need for multi-regional actions as well as regional goals, strategies, performance, and solutions. The Ecosystem Restoration Program focuses on regional implementation in three regions, including:

- The Sacramento Valley Region
- The Bay-Delta Region
- The San Joaquin Valley Region

MULTI-REGIONAL ACTIONS

- Wildlife-friendly agriculture programs
- Reduction of non-native invasive species
- Multi-regional science
- Fish screens and fish passage improvements
- Environmental water quality





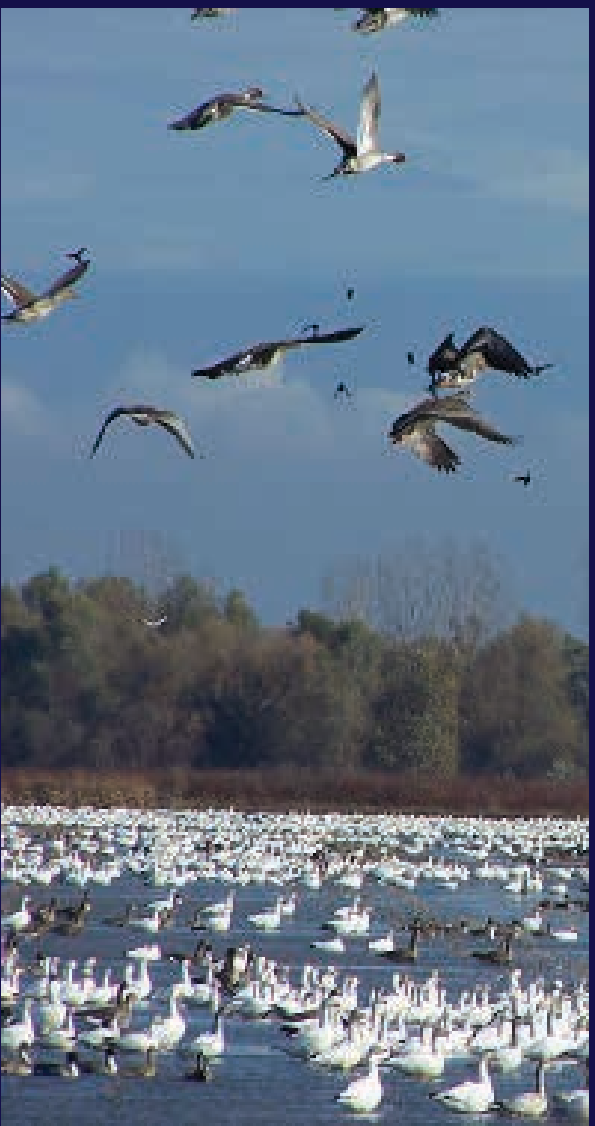
SACRAMENTO VALLEY REGION

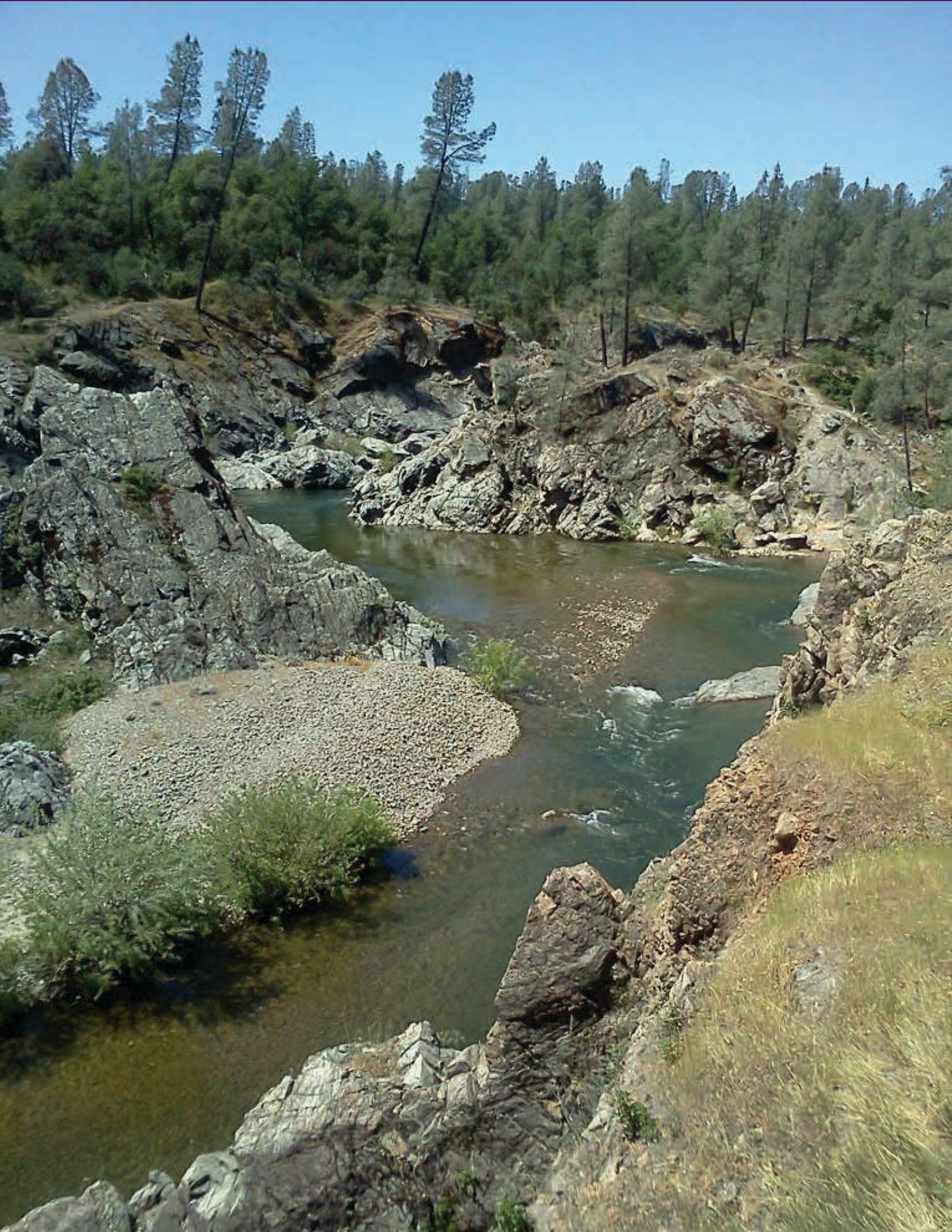
Flowing for more than 300 miles from Lake Shasta to Collinsville in the Delta, where it joins the San Joaquin River, the Sacramento River provides about 80 percent of the inflow to the Delta. It is the largest and most important riverine ecosystem in California and is an essential spawning, rearing, and migratory pathway for many anadromous fish populations, such as all runs of Chinook salmon and steelhead. The river corridor encompasses more than 250,000 acres of natural, agricultural, and urban lands upstream of Sacramento. Various cropland habitats occur on flat and gently rolling terrain adjacent to most of this area. Irrigated crops are mostly rice, grains, alfalfa, and orchard crops. Most of this cropland is irrigated with water diverted from the Sacramento River or its tributaries. Five national wildlife refuges (Sacramento, Delevan, Colusa, Sacramento River, and Sutter) are either adjacent to or within five miles of the Sacramento River.

Ecological factors having the greatest influence on the anadromous fish in the Sacramento River include streamflow, coarse sediment supply (including gravel for fish spawning and invertebrate production), stream channel dynamics (meander), and riparian and riverine aquatic habitat. Stressors that have affected the health of the anadromous fish populations include dams, harvest, high water temperatures during salmon spawning and egg incubation, toxins from mine drainage, hatchery stocking, and unscreened or poorly screened diversions.

Regional Highlights:

- Enhancement or restoration of over 9,000 acres of non-tidal perennial aquatic, riparian and riverine aquatic, perennial grassland, and seasonal wetland habitats, and agricultural lands on the Sacramento River, Willow and Cottonwood Sloughs, and Alamo, Butte, Clear, Coon, Elk, Last Chance, Mill, and Red Bank Creeks
- Protection of over 48,000 acres of existing riparian and riverine aquatic, fresh emergent wetland, and perennial grassland habitats, and agricultural land on the Sacramento and Feather Rivers, Willow Slough, and Battle, Big Chico, Butte, Deer, Mill, and Mud Creeks
- Installation or improvement of fish screens on 87 diversions (eight that draw >250 cubic feet per second), either in place or through consolidations, on the American, Feather, Sacramento, and Yuba Rivers, and Antelope, Battle, North Fork Battle, Butte, Coon, Deer, Mill, and Paynes Creeks
- Fish passage improvements including 17 new and upgraded fish ladders on the Sacramento River, and Butte, Deer, Mill and North Fork Battle Creeks, and removal of seven diversion dams on Battle Creek, Butte Creek, Mill Creek, and the Natomas Cross Canal
- Spawning gravel augmentation on the Sacramento River and Lower Clear Creek to benefit anadromous fish
- Flow enhancements including a synchronous bypass valve on the Yuba River and new weirs on Butte Creek to benefit anadromous fish
- Assessments of stream temperature, flow patterns, and flow regime management on the Sacramento and Middle Fork American Rivers, Antelope, Battle, Big Chico, Butte, Clear, Cottonwood, Deer, and Mill Creeks, and the Upper Yolo Bypass
- Assessments of sediment transport on Clear and Cottonwood Creeks
- Annual population estimates and life history research on all runs of Chinook salmon, steelhead trout, and green sturgeon throughout the Sacramento Valley watershed
- Assessment of abandoned mines in the North Fork of the Yuba River Watershed, and inventories of selected abandoned mines in the Middle Yuba River, Cottonwood Creek, Middle Fork American River, South Fork American River, and Feather River watersheds
- Local watershed stewardship group collaboration





CLEAR CREEK

Clear Creek is a major tributary to the Sacramento River and drains approximately 238 square miles. It originates in the mountains east of Trinity Lake and flows into the Sacramento River near Redding. Historically, spring-run Chinook salmon may have migrated to the uppermost reaches of Clear Creek above the town of French Gulch, and steelhead likely also ascended Clear Creek at least as far as French Gulch. Gold mining, gravel extraction, and dam building have altered the channel morphology of Lower Clear Creek between Whiskeytown Dam and the Sacramento River significantly. These activities resulted in the loss of spawning gravel, reduced stream flow, disconnected floodplain, channel scouring and entrenchment, degraded riparian vegetation, and fish stranding in isolated dredger ponds.

Recognizing that habitat in Clear Creek had the potential to support anadromous fish, the Ecosystem Restoration Program has been a partner in a multi-agency and stakeholder effort to transform Clear Creek into a functional stream ecosystem. This ongoing restoration effort utilizes an adaptive management approach to improve learning through active experimentation.

Lower Clear Creek Floodway

Beginning in 1995, state and federal agencies together with the Western Shasta Resources Conservation District and the Clear Creek Coordinated Resource Management Planning Group began site assessment and the development of a restoration plan to create a new channel, functional floodplain, gravel supply, and native riparian vegetation along Lower Clear Creek. Work began in 1998 and has been completed in a series of phases that involved reduction of salmon stranding, floodplain creation, instream channel improvements, and gravel supply augmentation. Highlights thus far include construction of a large gravel berm to isolate salmon from gravel pit stranding, 70 acres of riparian planting, construction of a new primary channel and restored floodplain surfaces with riparian vegetation, and restoration of 0.8 mile section of the creek and revegetation of 20 acres of new floodplain. Planning is currently underway to create a floodplain and stream channels in the lowest part of the floodway.

U.S. Fish and Wildlife Service researchers have found late-fall, winter, spring, and fall Chinook salmon in Clear Creek since restoration of the Lower Clear Creek Floodway began and the McCormick Saeltzer Dam was removed to allow fish access to the reach between Saeltzer and Whiskeytown Dams. The majority of the floodway restoration and monitoring work has been funded through the Ecosystem Restoration Program and the Central Valley Project Improvement Act Restoration Fund. In addition, Bureau of Reclamation has funded significant land purchases along the floodway making restoration possible.

BAY-DELTA REGION

The San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) Region includes the largest estuary on the West Coast. The Bay-Delta is a mosaic of habitats supporting a significant number of fish, wildlife, and plant species, including many unique to the estuary. All anadromous fish of the Central Valley either migrate through the estuary or spawn in, rear in, or are dependent on the Bay-Delta for some critical part of their life. Many of the Pacific Flyway's waterfowl and shorebirds pass through or winter in the Bay-Delta Region, while many migratory songbirds and raptors migrate through the Region or depend on it for nesting or wintering habitat. Fish and wildlife resources of significance in the Bay-Delta Region include Chinook salmon, steelhead, Delta smelt, splittail, giant garter snake, salt marsh harvest mouse, California clapper rail, waterfowl, sandhill crane, and numerous plant species.

Ecological factors having the greatest influence on the Bay-Delta Region include freshwater inflow from rivers and creeks, tidal action and climate, flood and floodplain processes, water quality, water temperature, channel configuration and hydraulics, wetlands, riparian vegetation, and diversity of aquatic habitat. Stressors include water diversions, channelization, levee maintenance, flood protection, placement of rock for shoreline protection, poor water quality, contaminants, legal and illegal harvest, wave and wake erosion, agricultural practices, urbanization, pollution, and introductions of non-native plant and animal species.

Regional Highlights

- Enhancement or restoration of over 8,800 acres of saline emergent wetland, tidal perennial aquatic, riparian and shaded riverine aquatic, instream riverine aquatic, seasonal wetlands, and perennial grasslands in San Francisco, San Pablo, and Suisun Bays, Napa-Sonoma, Petaluma, and Suisun Marshes, on the Napa and Mokelumne Rivers, Tolay Creek, and within the Jepson Prairie Reserve
- Enhancement or restoration of over 19 stream miles of riparian and shaded riverine aquatic, instream riverine aquatic, saline emergent wetland, freshwater emergent wetland, and in-channel island habitat on Montezuma, Barker, Georgiana, Steamboat, and Miner Sloughs, the Sacramento, Mokelumne, and Cosumnes Rivers, Carriger, Graham, and Nathanson Creeks in the Sonoma Creek Watershed, and Willowbrook, Lichau, and San Antonio Creeks in the Petaluma River Watershed
- Protection of over 28,300 acres of tidal emergent wetland, tidal perennial aquatic, riparian, shaded riverine aquatic, fresh emergent wetland, seasonal wetlands, Delta slough, perennial grassland, valley oak woodland, vernal pool, perennial grassland, and upland habitats and agricultural lands in San Pablo Bay, Petaluma Marsh, Dutch Slough, on the San Joaquin, Sacramento, Mokelumne, and Cosumnes Rivers, on Liberty and Staten Islands, and within Stone Lakes National Wildlife Refuge
- Installation or improvement of fish screens on seven diversions (one that draws >250 cubic feet per second) on the San Joaquin River and Steamboat Slough in the Delta, and Montezuma Slough in the Suisun Marsh
- Removal of fish passage barriers and construction of low flow passage structures opening up fish passage to 12 additional stream miles on the Cosumnes and Guadalupe Rivers, and Asbury and Carriger Creeks in the Sonoma Creek Watershed
- Agricultural activities benefiting fish and wildlife
- Evaluation of water and sediment quality and non-native invasive species impacts
- Assessment of foodweb productivity
- Environmental education

BAYLANDS

The North Bay is composed of the Napa River, Sonoma Creek, Petaluma River, and San Pablo Bay. It extends through five counties including Solano, Napa, Sonoma, and Marin, all west of Suisun Marsh. Evolutionary history, varied topography, unusual soils and geology, wide differences in local climate, and the estuarine influence created a diverse array of habitats ranging from aquatic to xeric terrestrial types. These habitats form a mosaic pattern across the landscape and include tidal, brackish and seasonal freshwater wetlands and sloughs, diked seasonal ponds, upland grasslands and riparian/riverine corridors. San Pablo Bay provides habitat for many species of plants, fish, and wildlife, in addition to wintering and nesting habitat for waterfowl on the Pacific Flyway.

Much of the tidal marsh that originally flanked the northern border of San Pablo Bay has been diked and drained. Tributaries to the Bay suffer from reduced and impaired flows and the fragmentation of riparian corridors. Despite this, there is significant potential for restoring diked historic baylands to tidal influence and for reestablishing floodplain and upstream riparian habitat along many portions of the tributaries. Recognizing that many parts of the watershed were undergoing rapid urbanization and conversion to vineyards, the Ecosystem Restoration Program made the watershed an urgent priority and has focused support on partnerships that have realized significant long-term restoration progress following the Program's initial investments.

Napa River Salt Marsh

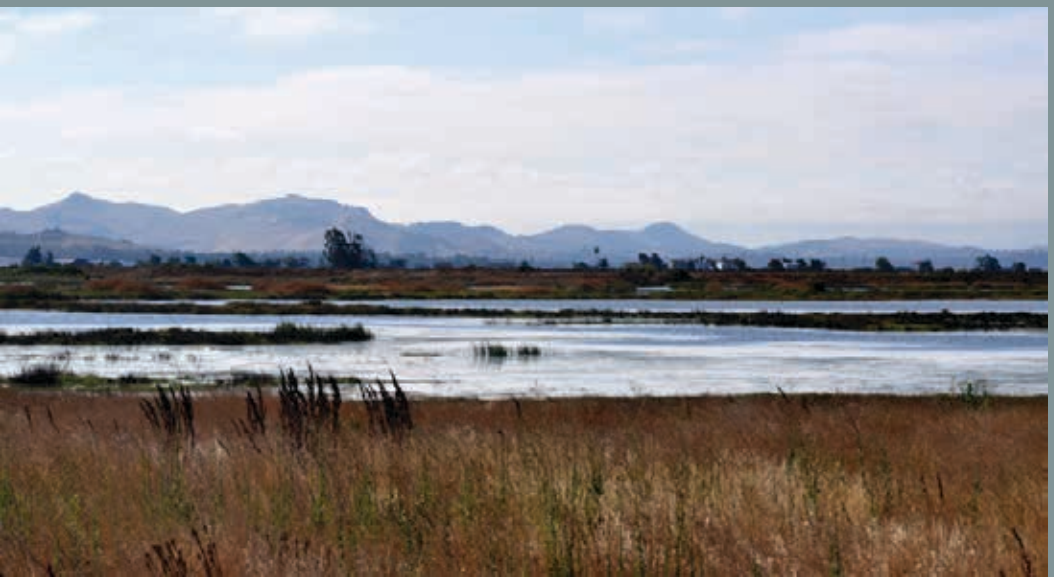
The Napa River salt pond complex is located along the western edge of the lower Napa River and is managed as part of the Napa River Unit of the Napa-Sonoma Marshes State Wildlife Area. The Napa River Unit was first diked off from the San Pablo Bay during the 1850s for hay production and cattle grazing. Dike construction continued for several years and much of the land was converted to salt ponds in the 1850s for salt production through the solar evaporation of bay water. In the early 1990s, Cargill Salt Company stopped producing salt in the ponds on the west side of the Napa River and sold the evaporator ponds to the State of California, which assigned ownership and management to the California Department of Fish and Wildlife.

Following the purchase of the salt pond complex, the California State Coastal Conservancy, U.S. Army Corps of Engineers, and California Department of Fish and Wildlife proposed habitat restoration and salinity reduction on the 9,460-acre Napa River Unit that would occur in three phases. The Ecosystem Restoration Program provided the majority of funding for restoration design and environmental compliance, as well as funding for Phase 1 of restoration which resulted in the opening of 3,000 acres of salt ponds along the Napa River to full tidal action in 2006. In 2007, Phase 2 of the restoration was completed with funding from the Wildlife Conservation Board and the California State Coastal Conservancy in which an additional 1,700 acres of salt ponds were converted to managed ponds providing waterfowl and shorebird habitat. Phase 3 of restoration is expected to be complete by 2015, funded by the U.S. Army Corps of Engineers, and is expected to restore the final 1,900 acres of salt ponds to managed shallow and deep water ponds suitable for a variety of waterfowl, shorebirds, and other wildlife.

Cullinan Ranch

Cullinan Ranch is a 1,525-acre diked bayland that was added to the San Pablo Bay National Wildlife Refuge in 1991. Historically, Cullinan Ranch was part of a network of tidal marshes and sloughs along the Napa River. The first permanent dikes on the ranch were constructed to prevent flooding in the early 1900s and it was farmed primarily for oat hay until the 1980s. A century of active farming caused the ranch to sink as the rich organic soils of the marsh dried out, oxidized, and blew away. Currently, the site has subsided 6 feet and is below mean sea level. In 1987, several conservation groups defeated the proposed development of Cullinan Ranch into a residential marina community. Subsequently, it was acquired by the U.S. Fish and Wildlife Service to protect endangered species, and to provide habitat for migratory shorebirds, waterfowl, and other wildlife, fish, and plants. In 1993, water was allowed to inundate the ranch and passively restore the area to a seasonal wetland.

Following the passive restoration to seasonal wetland, the U.S. Fish and Wildlife Service proposed restoration of the ranch to combine tidal salt marsh habitat for endangered species, waterfowl, waterbirds, and fish, as well as public access features to increase accessibility to wildlife resource values in the San Pablo Bay, while minimizing project-induced flood impacts to Highway 37. Ducks Unlimited performed the planning and implementation of the tidal marsh restoration working on behalf of the U.S. Fish and Wildlife Service. The Ecosystem Restoration Program partially funded restoration planning activities, and restoration construction began in 2011 with funding provided by other partners (the Wildlife Conservation Board, National Oceanic and Atmospheric Association, Castro Cove Trustee Council, Environmental Protection Agency, and the North American Wetlands Conservation Council). In 2015, the perimeter levees will be breached and/or lowered to return natural tidal hydrology to the ranch. It is believed that the reintroduction of tidal flows to the site will create open water habitat initially, with suspended sediment in the freshwater flows of the Napa and Sacramento-San Joaquin Rivers eventually depositing inside the site and slowly building up to where vegetation can colonize. Restoration of the ranch to tidal marsh is estimated to take nearly 60 years depending on sediment availability and the rate of sea level rise.



Tolay Creek

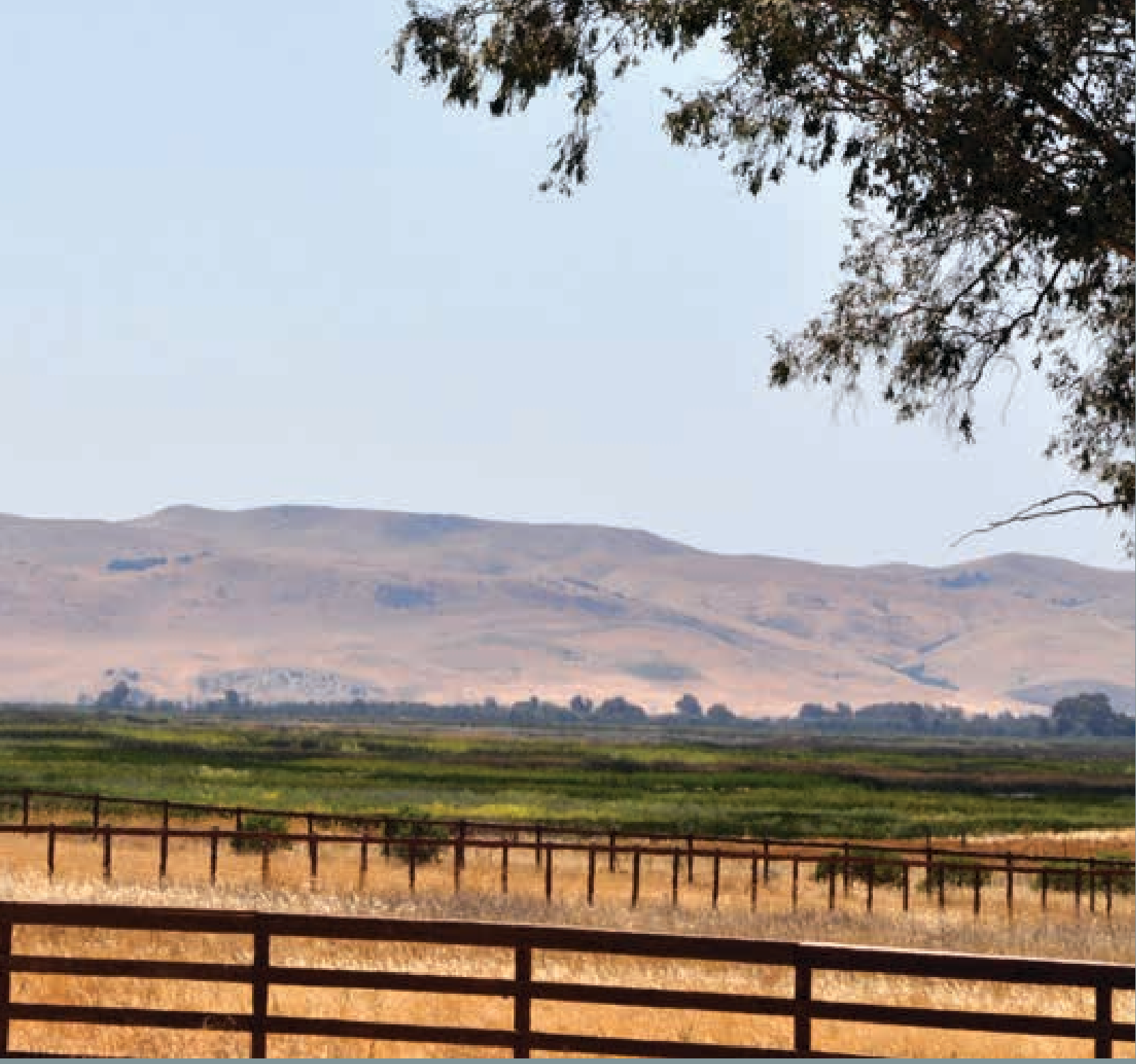
Tolay Creek is located south of Highway 37 in the center of the San Pablo Bay National Wildlife Refuge. Historically, Tolay Creek was part of a series of tidal sloughs that surrounded marsh islands. The creek received freshwater input from Tolay Lake and intermittent streams in the Sonoma Mountains. During the early 1900s, much of the area west and east of Tolay Creek and south of Highway 37 were partially diked and drained for agricultural use. The creek was channelized over time, and the majority of the surrounding marsh was lost or degraded. The extent of tidal influence also decreased as a result of siltation in the upper reaches of the creek. The result of these human activities has dramatically altered the landscape of Tolay Creek, decreasing the size of the tidal floodplain and associated marsh.

Tolay Creek was acquired by the California State Lands Commission in 1981 and is currently managed by the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service and California Department of Fish and Wildlife began restoration of portions of Tolay Creek in the 1980s with the last major effort in 1999. The 1999 effort, which was partially funded by the Ecosystem Restoration Program, restored and enhanced 435 acres of saline emergent wetlands in the Tolay Creek floodplain for the benefit of threatened and endangered species, restored tidal action to Tolay Creek, and restored and enhanced former tidelands degraded by construction of levees, agricultural practices, and other human activities. In addition, 123 acres of agricultural land were restored to tidal action, channels were constructed to connect tidal areas, and the creek channel was expanded to improve upstream tidal action.
The restoration effort was focused on providing habitat for shorebirds, waterfowl, and sensitive species through restoration of tidal hydrology.

Today, Tolay Creek enters San Pablo Bay along a remnant wetland corridor on the northwest shore between the Petaluma River and Sonoma Creek. There are now open water/tidal creek channel, tidal mudflat, and tidal marsh habitat types in Tolay Creek, and thousands of shorebirds and waterfowl use this habitat during winter and migratory periods. Since the completion of restoration actions in 1999, increased sediment deposition has resulted in the mudflats at low tide. In addition, invasive plant cover had declined from 38 percent to 2 percent by 2002.

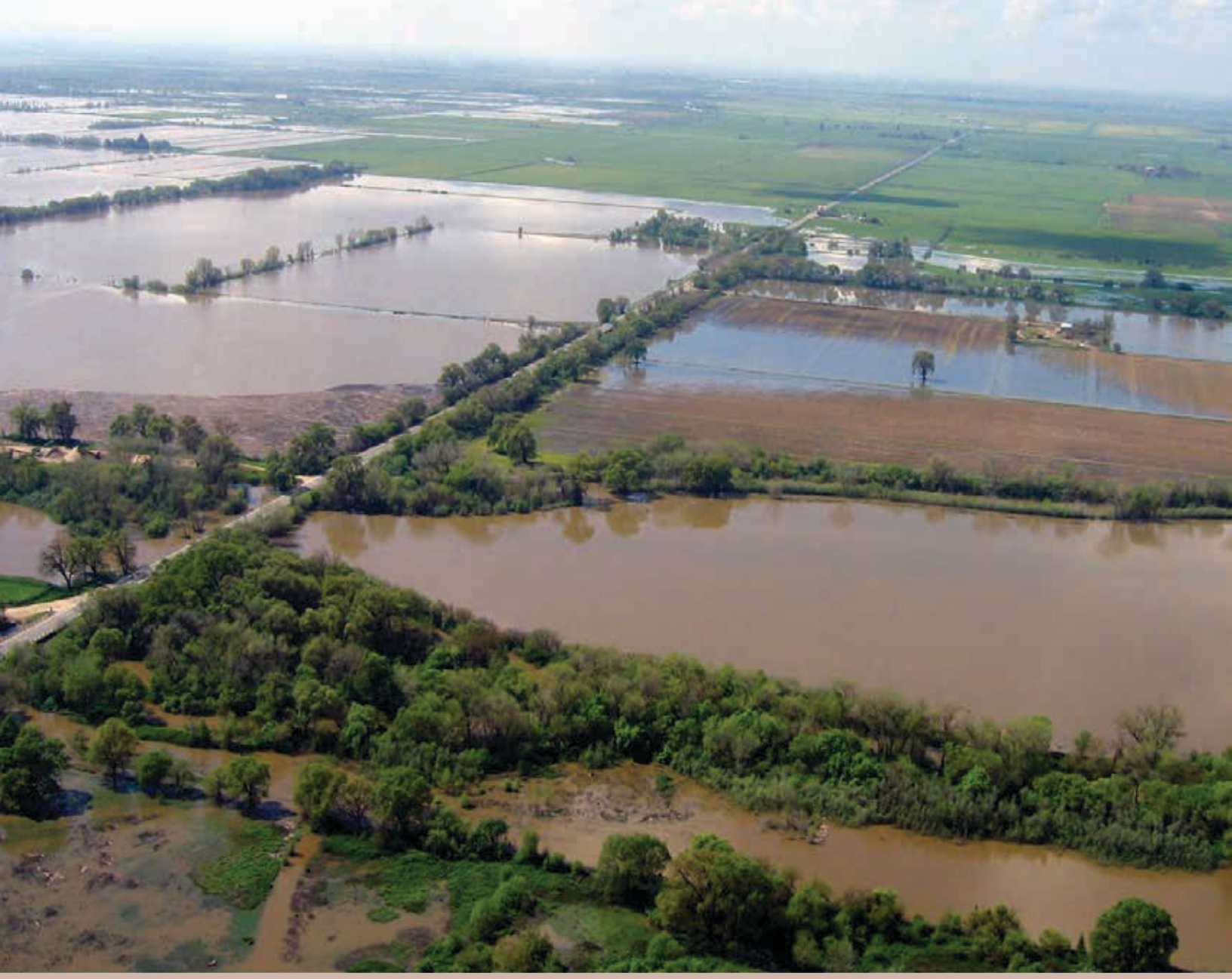
Bahia

The 632-acre Bahia property is located on the lower Petaluma River less than a mile upstream from its mouth, within the city of Novato in Marin County. The property is virtually surrounded by publicly owned marshes, with the exception of an existing development along the southern boundary. Bahia was diked for agricultural use, but has not been cultivated for several decades. Since being diked, the site has subsided several feet and some seasonal wetlands



have developed. While the existing diked wetlands provided some habitat for the salt marsh harvest mouse and seasonal habitat for waterfowl and shorebirds, they had minimal complexity, significantly reduced ecological richness, limited habitat for endangered species, and provided no fish habitat.

In 2003, Marin Audubon Society completed the purchase of the Bahia property with funding from the Ecosystem Restoration Program as well as several other federal, state, and local partners. The upland portion of the property consisting of 208 acres of oak woodland was transferred to the Marin County Open Space District and 362 acres of diked baylands were transferred to the California Department of Fish and Wildlife, while Marin Audubon Society retained ownership of 62 acres. Between 2008 and 2013, tidal marsh restoration, seasonal pond enhancement, and re-establishment of natural hydrology were completed on the Marin Audubon Society and California Department of Fish and Wildlife lands. The restoration was undertaken with the goals of creating productive estuarine emergent tidal wetland habitat, including associated upland transition zone, enhancement of existing ponds and possibly seasonal wetlands. Restoration of the Bahia property has benefited endangered and special status species such as the clapper rail, as well as waterfowl, shorebirds, raptors, upland bird species, and fish.



COSUMNES RIVER

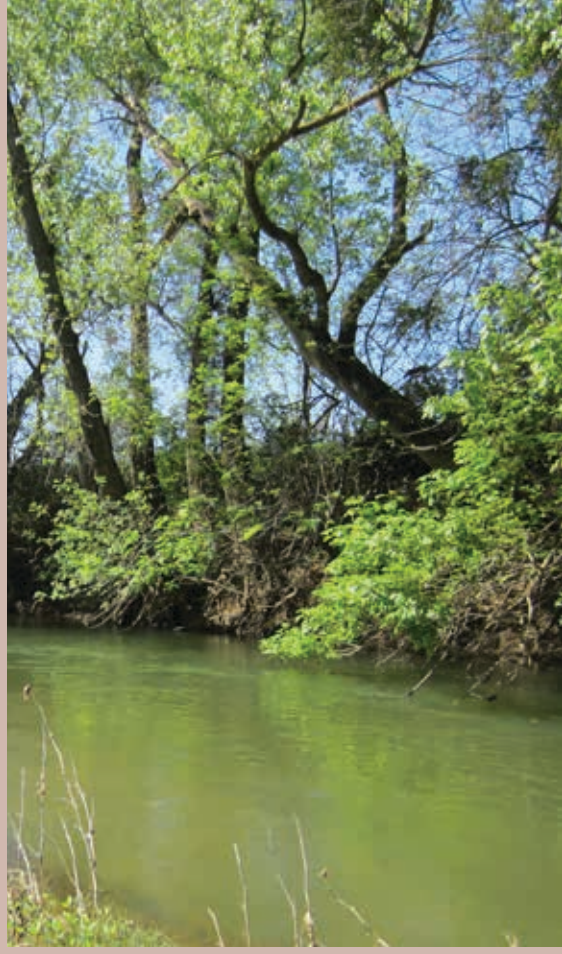
The Cosumnes River is the last undammed river flowing from the Sierra Nevada into the Central Valley. The lower reach of the Cosumnes River serves as critical Chinook salmon spawning habitat and the floodplain includes valley oak riparian forest and seasonal wetlands that are used by resident and migratory birds such as the sandhill crane. Floodplains are utilized by a variety of species which take advantage of seasonally flooded habitats. Many species of native fish, such as Chinook salmon and splittail, use floodplains for spawning and rearing and they benefit from increased food production on the floodplain. Various waterfowl and shorebird species as well as sandhill cranes use floodplains for feeding. In addition, seasonal floodplains provide flood attenuation, improved water quality, and groundwater recharge.

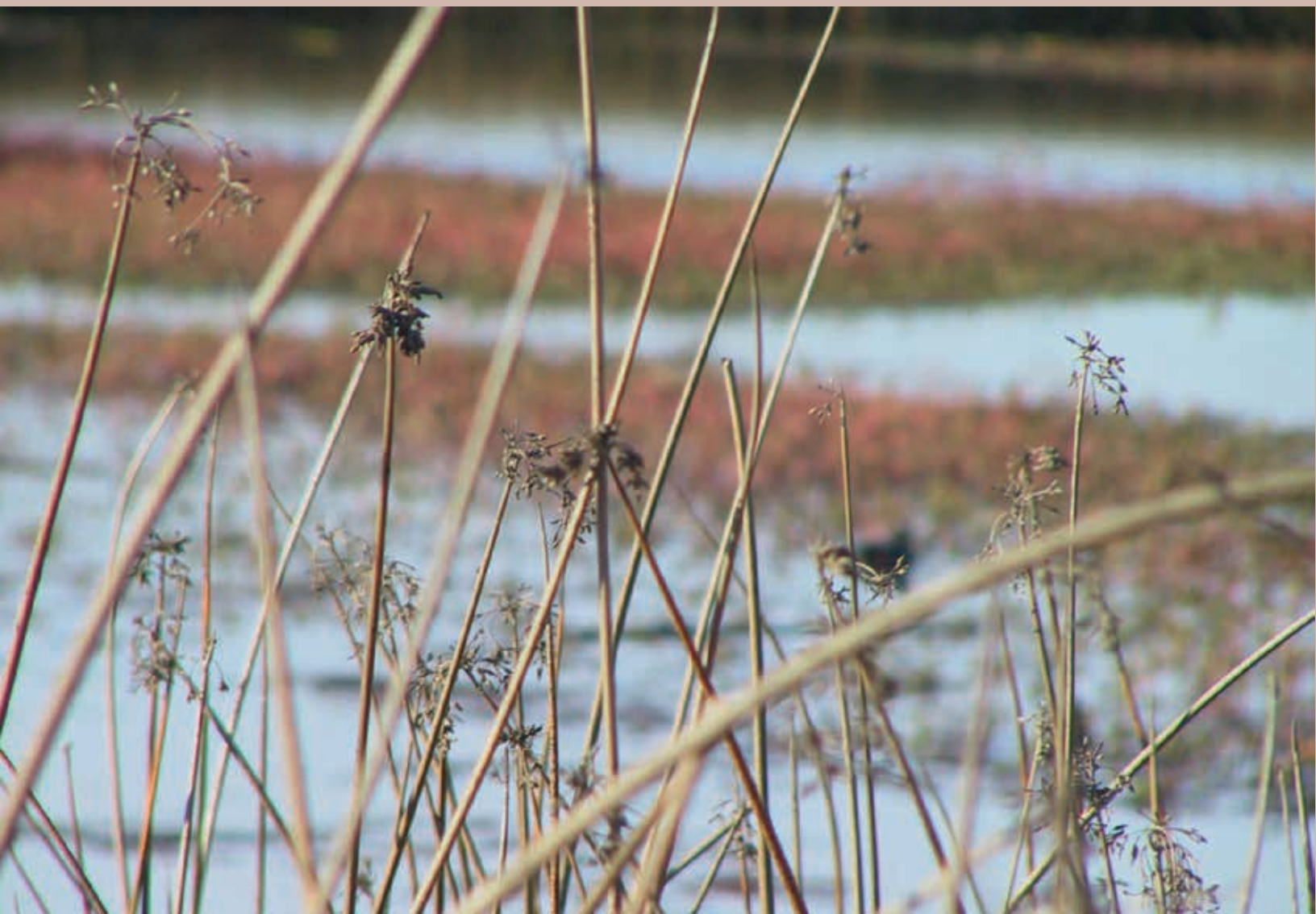
The Ecosystem Restoration Program has provided cost share funding for the purchase of about 18,000 acres, through conservation easements and fee-title acquisitions within the 46,000-acre Cosumnes River Preserve. In addition to habitat protection, the Ecosystem Restoration Program has supported planning, modeling, and research focused on restoration opportunities that would allow the Cosumnes River to inundate its floodplain.

Lower Cosumnes River Floodplain

The Nature Conservancy purchased the Oneto Horseshoe and Denier II properties, which are located in the lower floodplain area of the Cosumnes River Preserve, in 2001 and 2007, respectively, with funding from the Ecosystem Restoration Program and the Wildlife Conservation Board. Concurrent to the land acquisitions, the Ecosystem Restoration Program supported hydrologic modelling that resulted in the identification of opportunities to breach levees surrounding the Oneto and Denier II properties thereby reestablishing a flood pattern that would support restoration of about 500 acres of flooded riparian forest habitat. The Nature Conservancy began restoration of the site in 2014 with planning and construction funds provided largely by the Natural Resources Conservation Service.

Recognizing the unique opportunity to monitor changes in Bay-Delta ecosystem processes resulting from floodplain reconnection, the Ecosystem Restoration Program has funded an interdisciplinary group of researchers, including University of California Davis, University of California Merced, University of Idaho, Point Blue Conservation Science, and The Nature Conservancy, to conduct avian, biophysical, and vegetation monitoring on the floodplain pre- and post- restoration. The type, location, and scale of this restoration will not only have exceptional local and regional ecosystem value, but the findings from the monitoring are expected to have immense relevance to proposed floodplain restoration work across the United States. In addition, this monitoring program is expected to be instructive for future adaptive management and monitoring as it applies to the Ecosystem Restoration Program.





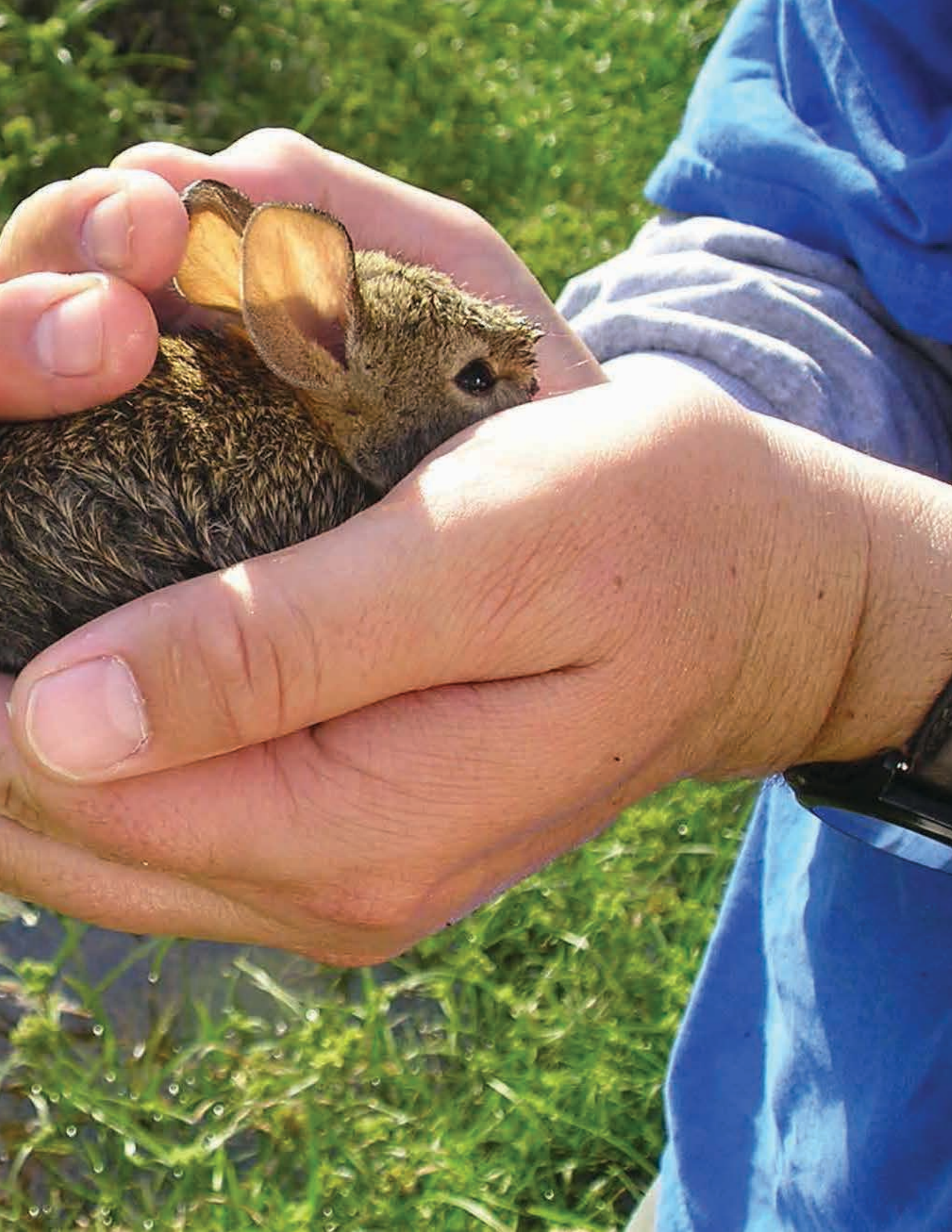
SAN JOAQUIN VALLEY REGION

The 290-mile-long San Joaquin Valley occupies the southern half of the Central Valley. The San Joaquin River basin is bounded on the west by the Coast Ranges and on the east by the Sierra Nevada. The San Joaquin River flows west from the Sierra Nevada and north through the valley into the Sacramento-San Joaquin Delta. The major eastside tributaries south of the Delta are the Stanislaus, Tuolumne, and Merced Rivers.

These tributaries flow through extensive and biologically valuable grassland and vernal pool complexes in eastern Stanislaus and Merced Counties. Two important national wildlife refuges (Merced and San Joaquin River) are in the San Joaquin Valley Region. In addition to the overall ecological values, the Stanislaus, Tuolumne, and Merced Rivers provide habitat for many fish, wildlife, and plant species. They are particularly important as spawning and rearing areas for Chinook salmon. Other at-risk species in the Region include riparian brush rabbit, San Joaquin Valley woodrat, neotropical migratory birds, and western yellow-billed cuckoo. Important ecological processes for this area are streamflow, stream meander, floodplain processes, coarse sediment supply including gravel recruitment, transport, and cleansing, and water temperature.

Regional Highlights:

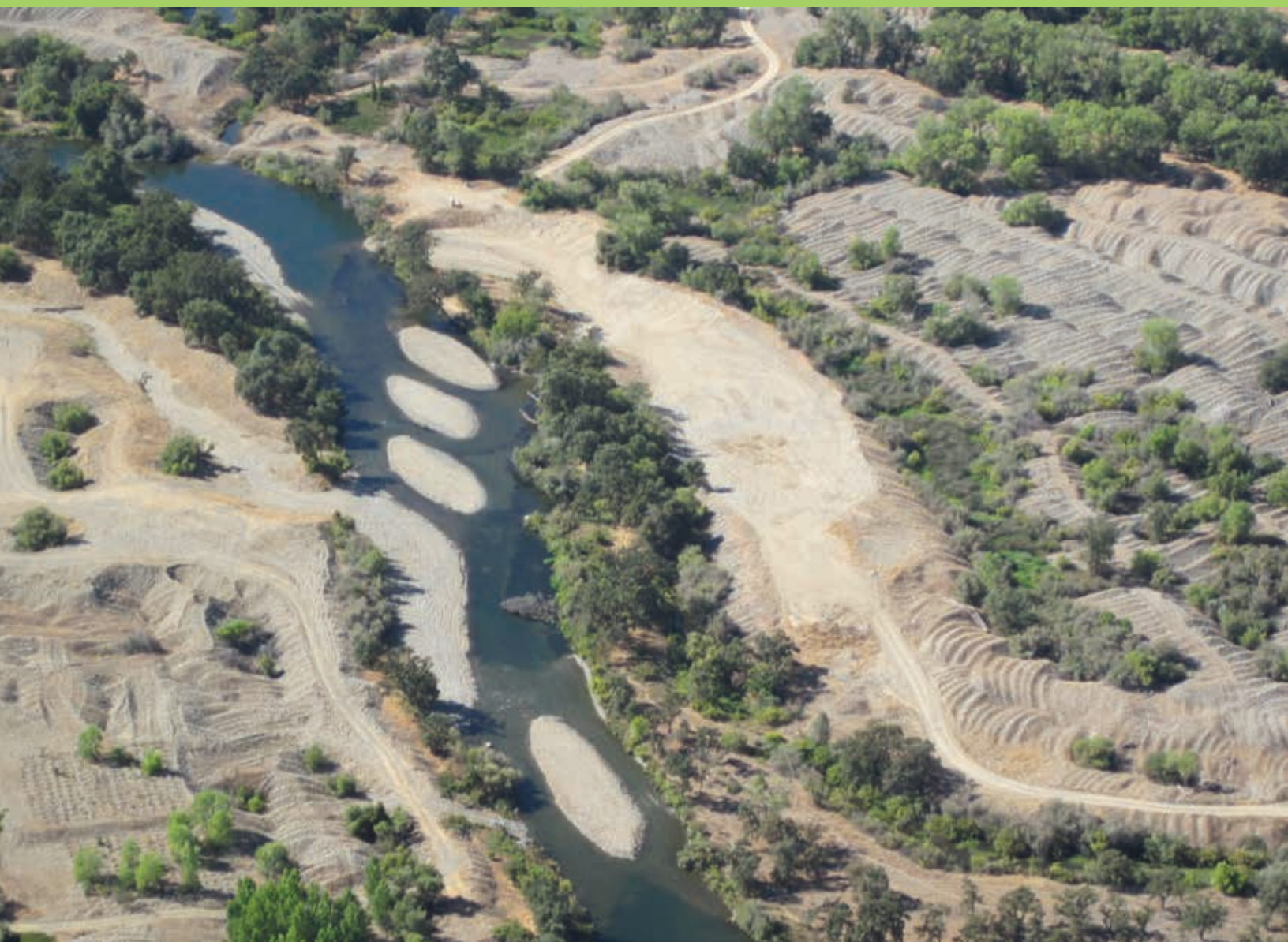
- Enhancement or restoration of over 1,250 acres of riparian and floodplain habitats, and over 12 stream miles of shaded riverine aquatic and essential fish habitats on the San Joaquin, Stanislaus, Tuolumne, and Merced Rivers
- Protection of over 5,600 acres of existing riparian habitat and agricultural land on the San Joaquin, Tuolumne, and Stanislaus Rivers through fee title acquisitions or conservation easements
- Development of stream temperature and flow management modeling tools, sediment transport, and dissolved oxygen monitoring and investigations on the main stem San Joaquin River and tributaries to benefit anadromous fish
- Spawning gravel augmentation (over 184,000 cubic yards) on the Stanislaus, Tuolumne, and Merced Rivers to benefit anadromous fish
- Local watershed stewardship group collaboration



RIVER CHANNEL AND HABITAT RESTORATION

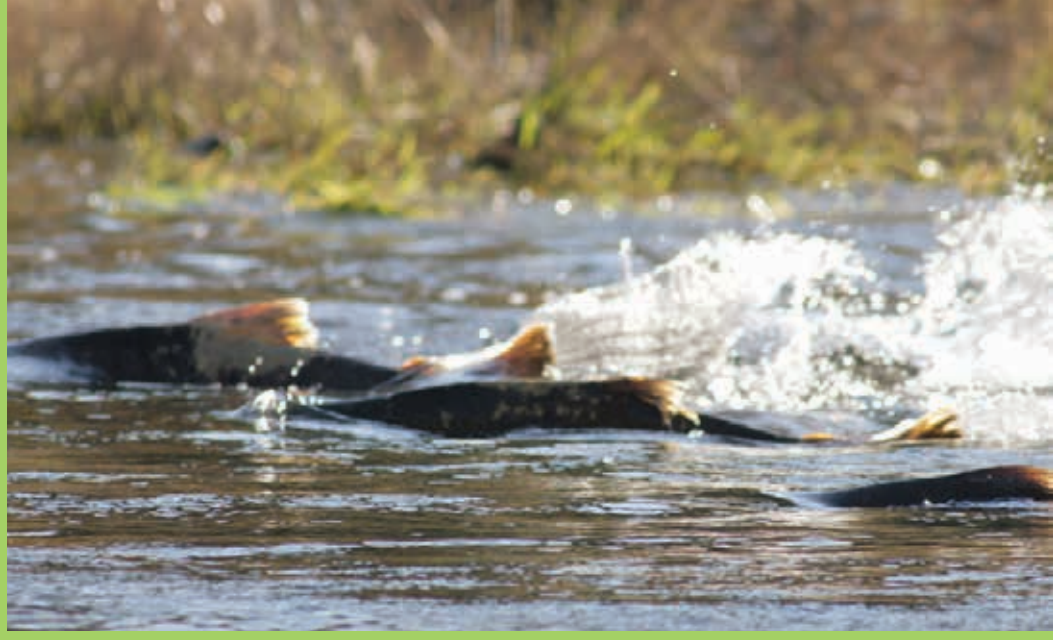
The Stanislaus, Tuolumne, and Merced Rivers are important as spawning and rearing areas for fall-run Chinook salmon, and for providing floodplain and riparian habitat for diverse wildlife and plant communities, including at-risk species. Riparian corridors and related instream riverine aquatic habitats on these rivers have been impaired over time by dams which interrupt the natural functioning stream meander process and sediment supply, confinement of the river channels by bank protection and levees, water diversions resulting in insufficient flows throughout lower reaches, high water temperatures during salmon and steelhead spawning and rearing, poor water quality, in-channel gravel mining resulting in gravel removal from long stretches of active spawning reaches, adverse livestock grazing practices, and high predation levels on juvenile salmon by non-native fish.

The Ecosystem Restoration Program focused efforts in the San Joaquin Valley Region on restoration of more natural, dynamic channel morphology and natural hydrological and geomorphic processes in the San Joaquin River and its tributaries to reactivate the ecological processes that create and maintain instream and shaded riverine aquatic, riparian, and floodplain habitats, resulting in self-sustaining stream meander corridors benefiting both at-risk fish and terrestrial species.



Tuolumne, Merced, and Stanislaus River Restoration

The Ecosystem Restoration Program funded channel-floodplain reconstruction, and improved rearing and spawning habitat and downstream fish passage on tributary streams and the main stem San Joaquin River resulting in the restoration of over 400 acres and 9.7 stream miles of floodplain, shaded riverine aquatic, riparian, and wetland habitats on the Tuolumne River, over 800 acres of floodplain riparian habitat on the Stanislaus River, and over 45 acres and 2.6 stream miles of floodplain riparian habitat on the Merced River.

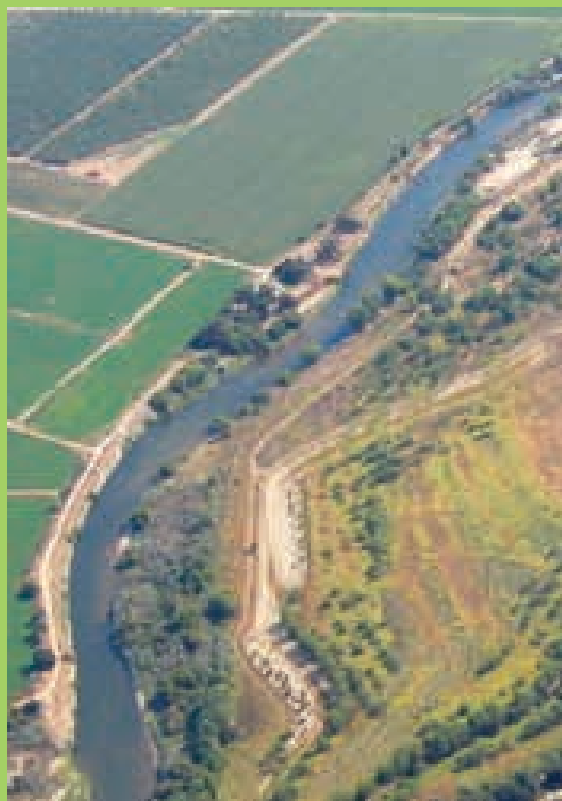


Tributary dams in the San Joaquin River watershed trap all of the gravel derived from upstream reaches, depriving downstream reaches of important material required to maintain aquatic and riparian habitat. A targeted action on these streams was to introduce spawning-sized gravel into the river channel to improve and increase the amount of spawning habitat available for anadromous fish by compensating for the coarse sediment load trapped behind dams.

Significant efforts to improve coarse sediment supplies through gravel augmentation included introducing over 31,000 cubic yards of gravel into select reaches of the Tuolumne River, and over 152,000 cubic yards of gravel into select reaches of the Stanislaus River.

San Joaquin River National Wildlife Refuge

The San Joaquin River National Wildlife Refuge is located where the Tuolumne, Stanislaus, and San Joaquin Rivers join in the San Joaquin Valley. The Refuge was established in 1987 to primarily protect and manage wintering habitat for the Aleutian Canada goose, which was a federally listed endangered species at the time. Since then, the Refuge's focus has expanded to include other threatened and endangered species, migratory birds, wildlife dependent on wetlands and riparian floodplain habitat, and restoration of habitat and ecological processes.

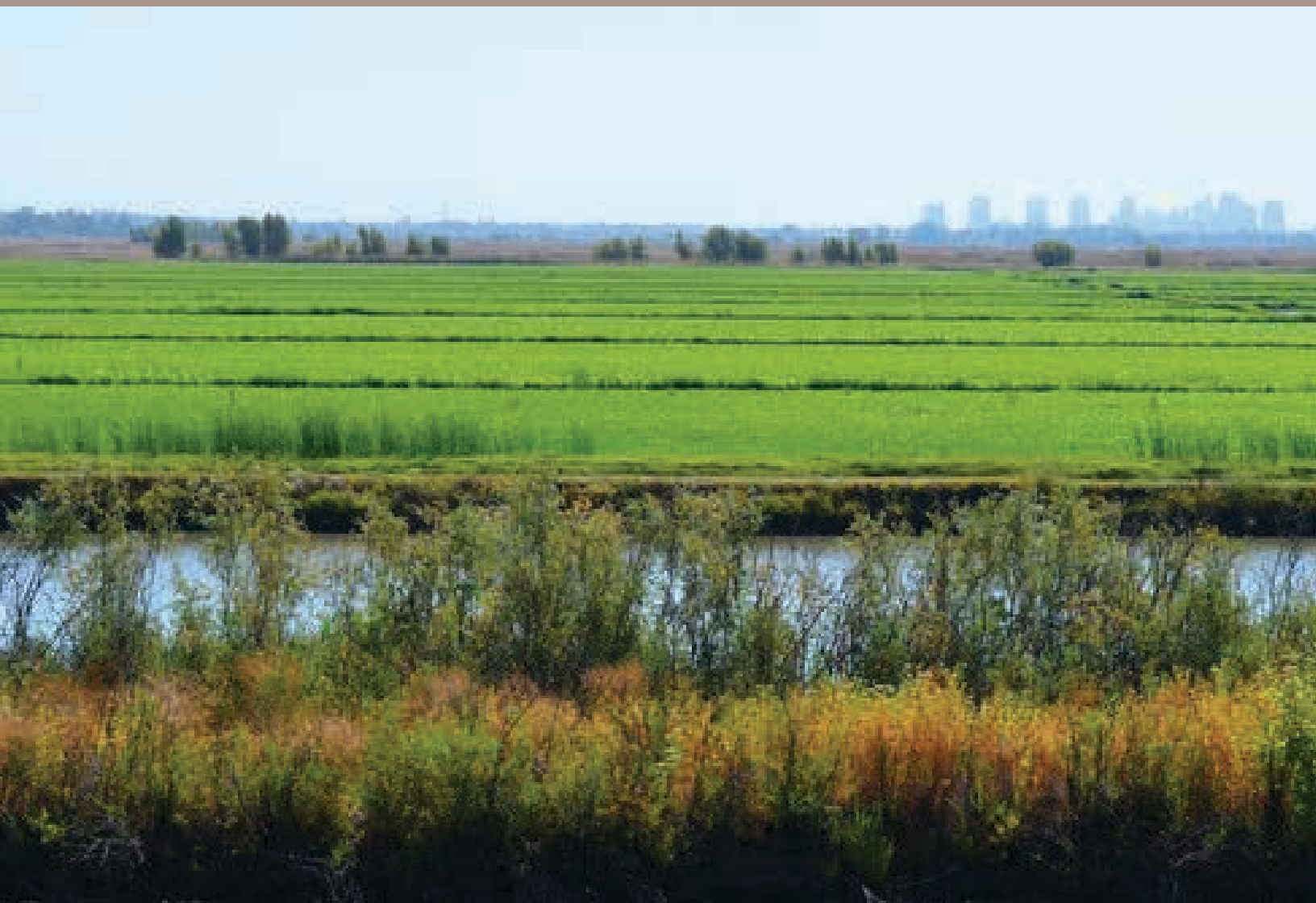


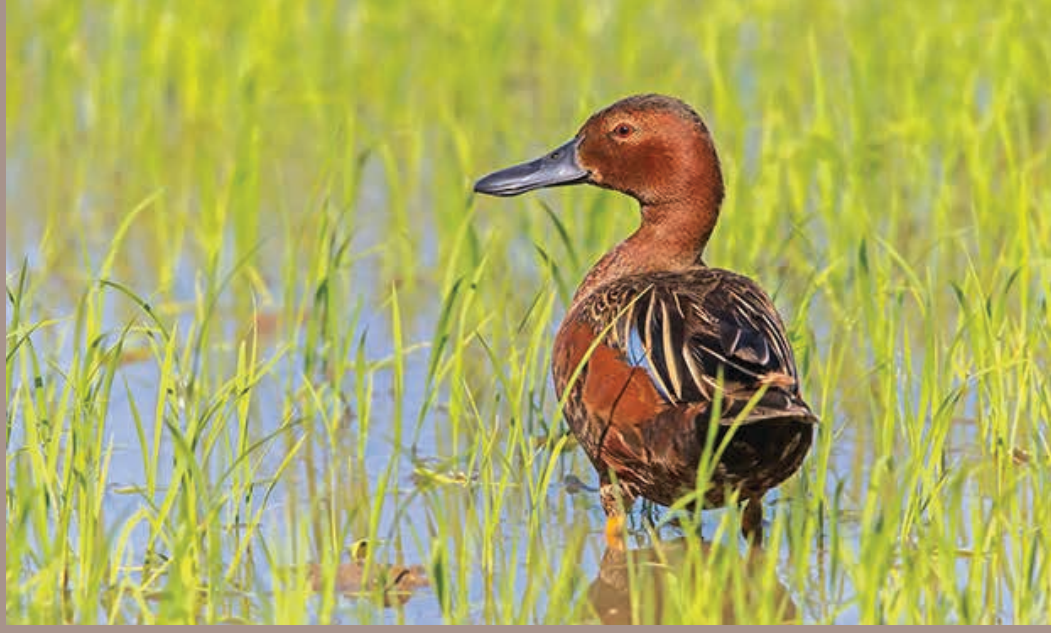
Starting in 1997, the Ecosystem Restoration Program engaged in a multi-phased effort with local, federal, and state partners, providing over $19 million for the long term protection, enhancement, and restoration of over 5,000 acres of fish and wildlife habitat on and adjacent to the San Joaquin River National Wildlife Refuge. The riparian brush rabbit reintroduction and monitoring efforts on the Refuge have improved our understanding of this unique at-risk species which may directly contribute to the eventual delisting of the rabbit from endangered species status.

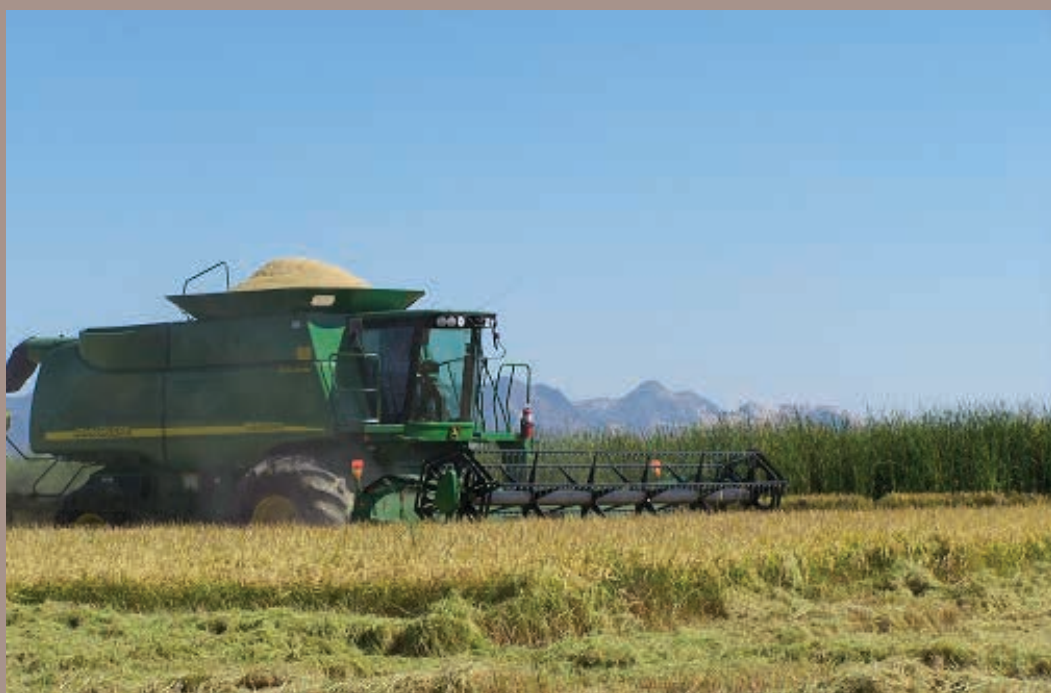
WORKING LANDSCAPES

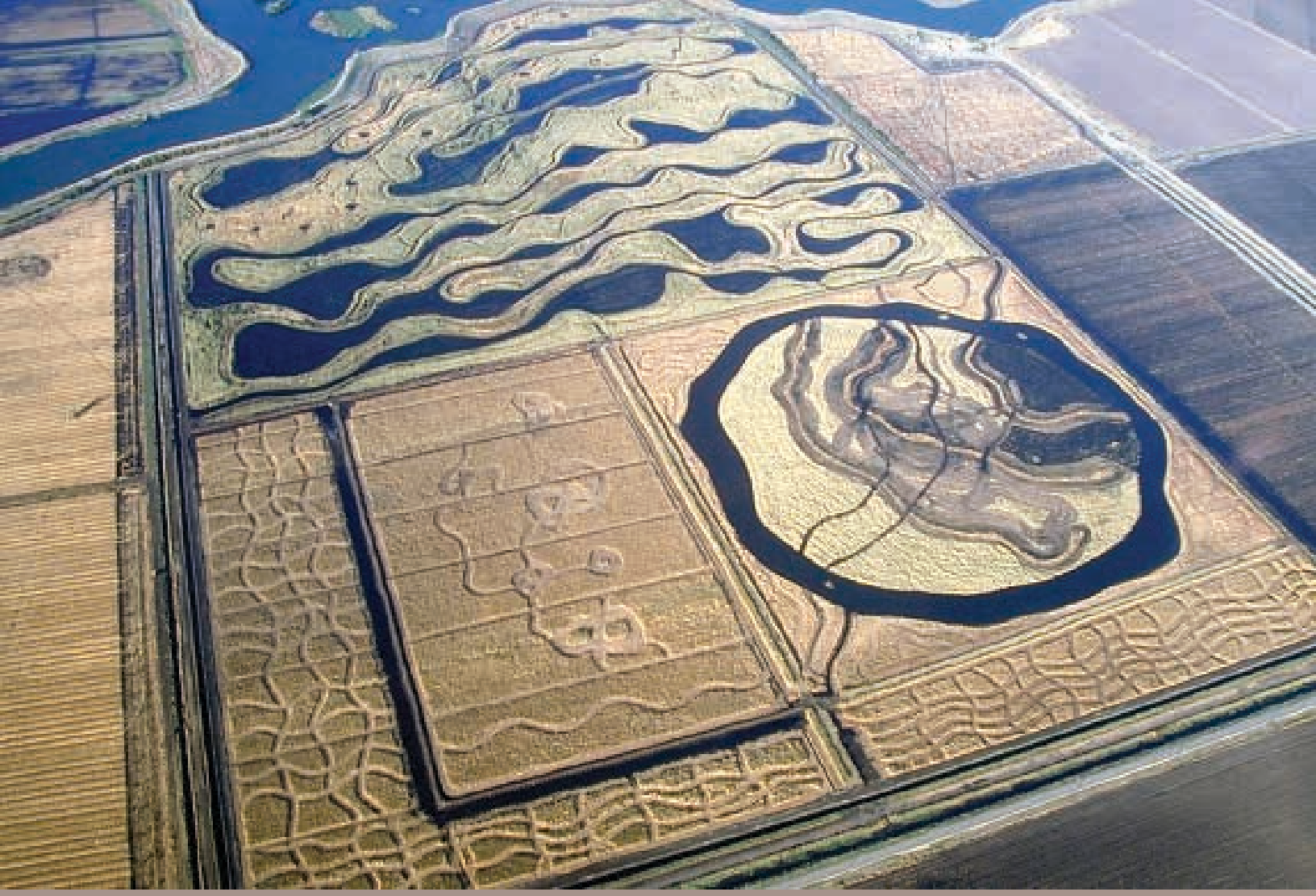
The Bay-Delta watershed is one of the most productive agricultural areas in the world. The Ecosystem Restoration Program recognizes the essential role of farmers working in concert with local organizations and cooperating agencies to undertake habitat-beneficial practices on working lands. Developing sustainable working landscapes includes minimizing the conversion of agricultural land to urban and suburban uses and maintaining habitat buffers in areas adjacent to existing and future restored aquatic, riparian, and wetland habitats, and managing agricultural lands in ways that are favorable to fish and wildlife.

Given the importance of agricultural lands to the overall restoration of the Bay-Delta, the Ecosystem Restoration Program has contributed significant resources toward assisting farmers in integrating agricultural activities with ecosystem restoration, including a focused solicitation in 2005 dedicating $20 million to this priority. To date, the Ecosystem Restoration Program has underwritten the purchase of more than 57,000 acres of agricultural conservation easements and fee-title acquisitions in the Sacramento Valley and Bay-Delta Regions. Agricultural land purchases in the Sacramento Valley Region total over 45,000 acres and are located in the Battle, Deer, and Mill Deer Creek watersheds, and in the Butte, Sutter, and Yolo Basins. The remaining 12,000 acres were purchased in the Bay-Delta Region in the Cosumnes River Watershed. These land purchases were made to protect existing wildlife friendly agricultural practices, or restoration to naturally functioning habitats where possible.









Mill and Deer Creeks Protection and Stewardship

Mill and Deer Creeks are key Sacramento River tributaries for aquatic resources in eastern Tehama County. With funding from the Ecosystem Restoration Program and the Wildlife Conservation Board, The Nature Conservancy purchased over 33,000 acres (approximately 52 square miles) of conservation easements in the Mill and Deer Creek watersheds from private landowners between 2004 and 2011. These conservation easements are expected to reduce the threat of water quality degradation for salmon and steelhead by limiting the negative impacts that are generated by residential development and intensive agricultural conversion. The easements, which prohibit development, overgrazing, logging, mining, and expansion of perennial agriculture, will result in reduced sedimentation, pesticide runoff, and point source pollution while maintaining existing native plant communities, at-risk species, and water sources that contribute to watershed health.

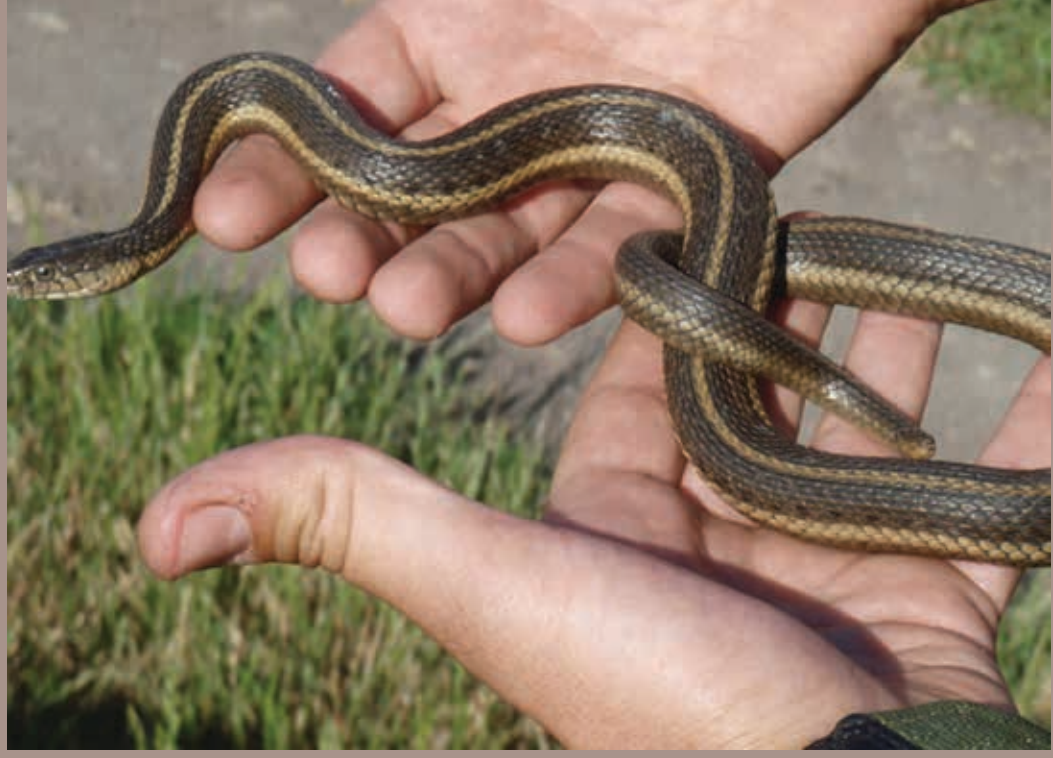
Conaway Ranch

Conaway Ranch is located in eastern Yolo County, between the cities of Davis, Woodland, and West Sacramento. The ranch is located within the Pacific Flyway and when flooded provides one of the largest and most significant off-channel riverine habitats for Sacramento River fish populations. In partnership with the Ecosystem Restoration Program and the Wildlife Conservation Board, the California Waterfowl Association purchased a 4,000-acre conservation easement on Conaway Ranch for the protection of floodplain and wetland habitat areas in the northern Yolo Bypass. This conservation easement protects existing aquatic and migratory bird habitat values by restricting land uses to current wildlife friendly agricultural practices on the property. In addition to the agricultural easement, the Wildlife Conservation Board purchased three other conservation easements totaling 2,224 acres on Conaway Ranch specifically for the recovery of Swainson's hawk, giant garter snake, and tricolored blackbird. All of these conservation easements allow for continuation of agricultural uses so long as those uses maintain the existing resource values.

Cosumnes River Preserve

The Cosumnes River Preserve is centered along the Cosumnes River, its floodplains and riparian habitat, and is owned by seven land-owning partners including The Nature Conservancy, Bureau of Land Management, California Department of Fish and Wildlife, Sacramento County, Department of Water Resources, Ducks Unlimited, and the California State Lands Commission. The partners utilize stewardship and compatible ranching and farming activities as

methods to sustain native plant and wildlife communities and the processes that perpetuate a dynamic mosaic of habitats. The Ecosystem Restoration Program provided cost share funding for the purchase of approximately 12,000 acres of agricultural land, through conservation easements and fee-title acquisitions, that were added to the Cosumnes River Preserve. The largest of these agricultural acquisitions was Staten Island. Agricultural lands within the Preserve are farmed primarily to benefit wintering migratory waterfowl and waterbirds, especially sandhill cranes and Swainson's hawks.



Battle Creek

The Ecosystem Restoration Program provided cost share funding for the purchase of the Miller (Burton) and Eagle Canyon conservation easements in the Battle Creek watershed. These conservation easements are meant to limit future impacts and to preserve high quality riparian habitat adjacent to wildlife compatible agriculture. The Miller (Burton) Ranch easement protected over 1,500 acres and approximately 3 miles of frontage on the main stem of Battle Creek. Much of this frontage straddles both sides of the creek. The property features freshwater springs which provide cold water input to Battle Creek. Wildlife supported by the Miller (Burton) Ranch easement includes habitat for steelhead and all runs of Chinook salmon. The Eagle Canyon conservation easement protected over 980 acres and approximately 2 miles of frontage along the North Fork of Battle Creek. This property is located in an area of Battle Creek considered to be critical for winter- and spring-run Chinook salmon spawning and holding areas. This property also features a tributary to the North Fork Digger Creek, which is an important source of cold water to Battle Creek.

Rancho Llano Seco

As one of the last remaining intact Mexican Land Grant ranches in California, Llano Seco Rancho in Butte County on the Sacramento River has a rich history of balancing agriculture, ranching, and conservation, and remains a classic example of how productive agricultural lands can be managed and maintained in a manner that is both beneficial to wildlife and sustainable agriculture. By early 2006, all but 4,235 acres of the 18,434-acre ranch were protected from development by being in permanent fee title or conservation easements held by the U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife, and The Nature Conservancy. In cooperation with the Wildlife Conservation Board, the Department of Conservation's California Farmland Conservancy Program, the California Oak Foundation, and the Northern California Regional Land Trust, the Ecosystem Restoration Program provided funding to purchase a conservation easement on the remaining acreage, ensuring that virtually the entire ranch would remain a working landscape and not be vulnerable to the pressures of urban development. Of the 4,235 acres protected under this easement, approximately 1,870 acres are intensely managed agricultural orchards and crops and 1,715 acres are grazing

lands. The easement also provides for the protection of over 730 acres of slough and riparian habitats including grasslands, seasonal and perennial marshes, oak riparian forests, mixed riparian forests, and open water areas that provide habitats for a variety of fish and wildlife species including winter run Chinook salmon, wintering waterfowl and sandhill cranes, and Swainson's hawk, while preserving important agricultural lands and a working organic cattle operation.

Montna Farms

Located in the Sutter Basin, Montna Farms has successfully integrated commercial rice production with wildlife friendly farming practices, providing key migratory waterfowl and shorebird habitat, as well as important habitat for at-risk species including giant garter snakes and Swainson's hawks. The Ecosystem Restoration Program's Working Landscapes strategy involves providing support for voluntary agricultural conservation easements that maintain land in private ownership while protecting associated wildlife and economic values, including agricultural lands that buffer riparian and wetland systems. In cooperation with the Department of Conservation's California Farmland Conservancy Program, and Ducks Unlimited's Conservation Easements for Agricultural Lands Program, the Ecosystem Restoration Program provided funding to purchase a conservation easement protecting more than 748 acres of ricelands adjacent to

existing protected wetlands, providing permanent habitat for special status species and wintering migratory birds, protecting flows through the Sutter Bypass for special status fish species, and preserving wildlife connectivity across the Sutter Basin landscape.

American and Sutter Basins Working Landscapes Strategy

The American and Sutter Basins Working Group developed a Working Landscapes Strategy to assist Placer and Sutter Counties in developing a collaborative program to implement conservation-based farm management practices to benefit wildlife on working agricultural lands. The basis of the Strategy is the creation of four core wetland reserves located within a matrix of agricultural uses that support the protection and enhancement of biodiversity. Agricultural uses in turn, are supported by policies and actions aimed at reducing pressures to convert agricultural lands to urban development. The four proposed locations for Strategy implementation are located in and around Honcut Creek in northern Yuba and southern Butte Counties (Honcut Wetlands), west of Wheatland in Yuba County (Southwest Yuba Wetlands), near the Sutter Bypass in Sutter County (Sutter Bypass), and on Coon Creek in Placer and Sutter Counties (Coon Creek Corridor). The tools used for implementation included land acquisition from willing sellers, conservation easements, modification of agricultural practices, and riparian and wetland restoration. The Strategy is voluntary and represents a blueprint for conserving and improving wildlife habitat, recognizing the key role that agriculture plays in sustaining wildlife populations.

Bluebird and Tealbrook Farms

Consistent with the American and Sutter Basins Working Landscapes Strategy, two conservation easements were purchased on agricultural lands that buffer riparian and wetland systems, maintaining those lands in private ownership while protecting associated wildlife and economic values. The Ecosystem Restoration Program funded the purchase of an easement located in the Southwest Yuba Wetlands permanently protecting 189 acres of rice land on Bluebird Farms. This easement also buffers 147 acres of wetlands that were previously protected through a Natural Resources Conservation Service Wetland Reserve Program perpetual conservation easement. In cooperation with the Department of Conservation's California Farmland Conservancy Program, the Ecosystem Restoration Program provided costshare funding for the purchase of an easement located in the Coon Creek Corridor permanently protecting 121 acres of rice land on Tealbrook Farms and 65 acres of floodplain habitat, including a portion of Coon Creek.

NON-NATIVE INVASIVE SPECIES

One of the Ecosystem Restoration Program's primary goals was to prevent the establishment of additional non-native invasive species and reduce the negative ecological and economic impacts of established non-native species in the Bay-Delta estuary and its watershed. During the first 10 years of Ecosystem Restoration Program implementation, it was unclear to what extent non-native invasive species could be eradicated or effectively controlled, and to what extent non-native species might preclude achieving Ecosystem Restoration Program objectives.

In 1998, the Ecosystem Restoration Program established the Non-Native Invasive Species Program. To minimize the risk of potentially massive ecological and biological disruptions associated with non-native species that could threaten to negate the benefits of restoration efforts, the Ecosystem Restoration Program initiated actions that supported the following immediate goals:

- Prevent new introductions and establishment of non-native invasive species into the ecosystems of the Bay-Delta, the Sacramento and San Joaquin Rivers and their watersheds
- Limit the spread or, when possible and appropriate, eliminate populations of non-native invasive species through management
- Reduce the harmful ecological, economic, social, and public health impacts resulting from infestations of non-native invasive species through appropriate mitigation
- Increase our understanding of the invasion process and the role of established non-native invasive species in ecosystems

Priority research efforts increased understanding of non-native invasive species and their effects on estuarine systems, including Chinese mitten crab and introduced clams, as well as determining ballast water composition and risk factors. Additional restoration efforts focused on control and eradication of non-native invasive plant species such as giant reed, cordgrasses, purple loosestrife, perennial pepperweed, water hyacinth, and Brazilian waterweed. Outreach and education programs, and the development of brochures, posters, and field guides, have proven to be successful in supporting awareness of non-native invasive species introduction.

Northern Pike Eradication from Lake Davis

Northern pike, an aggressive non-native predatory fish was discovered in Lake Davis on the Feather River in 1994. The potential for expansion downstream, and establishment of the pike in the Sacramento-San Joaquin Delta and adjoining watersheds, was expected to have irreversible ecological and economic impacts on at-risk fish species and important salmonid fisheries. Consistent with the strategic objective for eradicating populations of non-native invasive species through focused management efforts, starting in 2005, the Ecosystem Restoration Program provided $19.4 million in funding for the Lake Davis Pike Eradication Project. Due to the success of this eradication effort, the prized Lake Davis trout fishery has been reestablished, and a major threat to downstream aquatic resources and ecological functions has been eliminated.

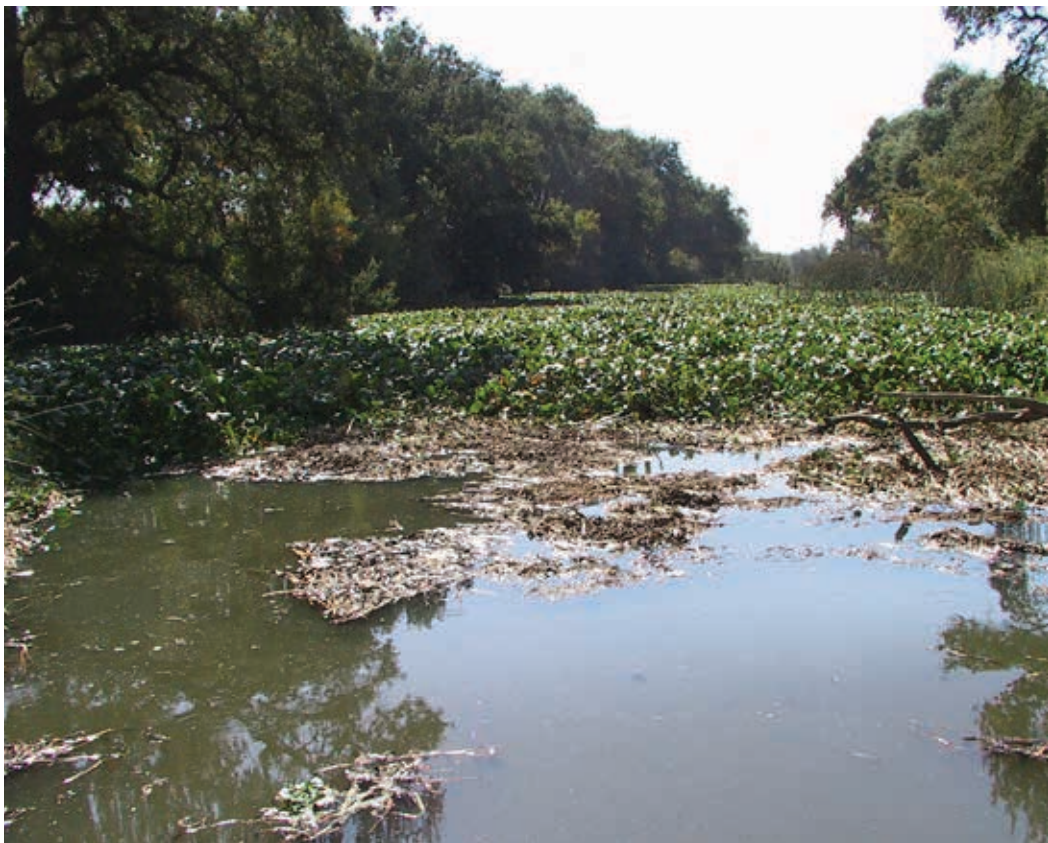
Zebra Mussel Early Detection and Prevention

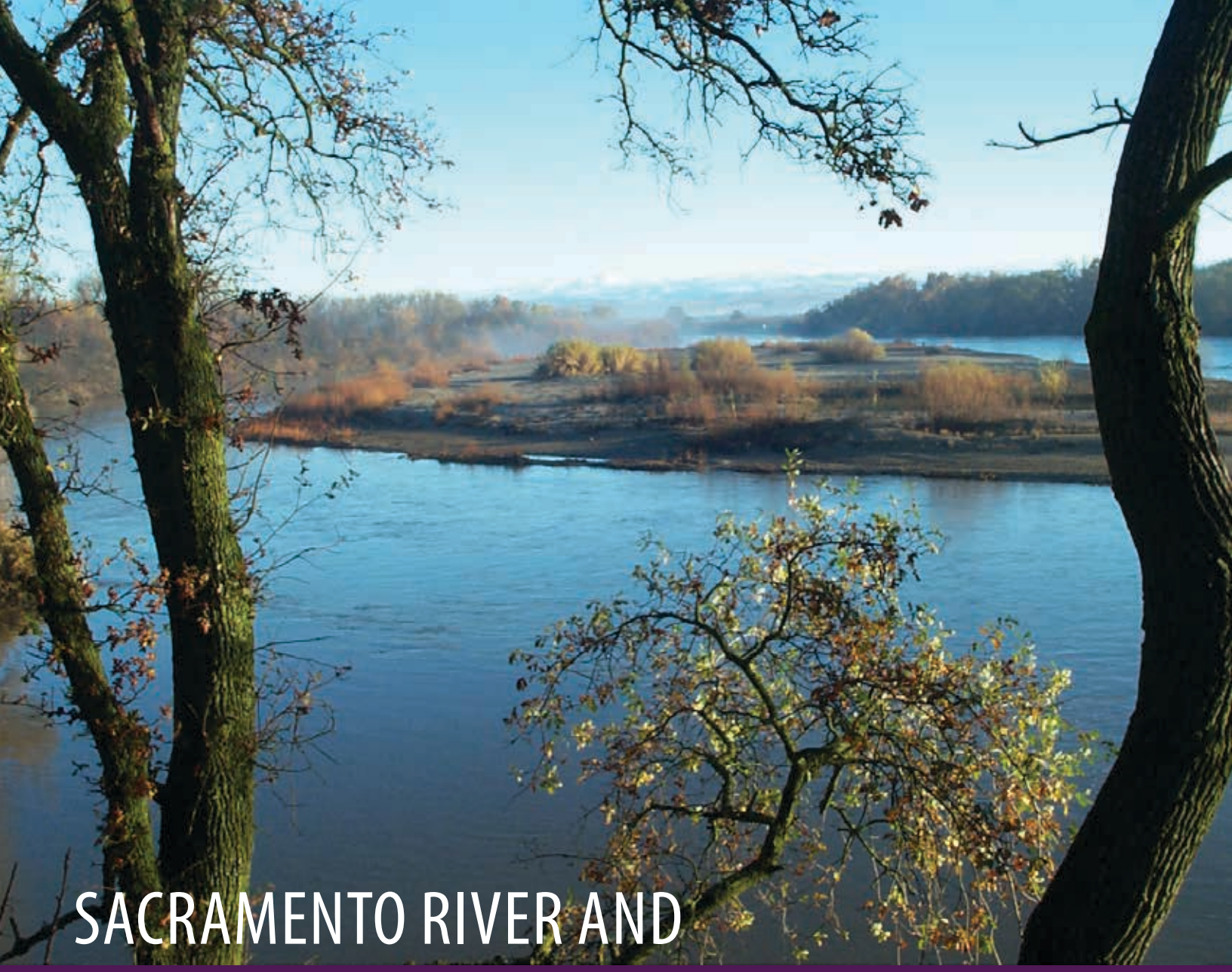
In order to avoid the magnitude of water supply infrastructure and ecosystem damage caused by zebra mussel invasions in the eastern United States, starting in 1996 the Ecosystem Restoration Program implemented the following priority actions in California, laying the foundation for all statewide zebra mussel (and now quagga mussel) prevention and eradication efforts that continue today:

- Assessment of the threat to water diversion operations and fish screens by determining areas in the Bay-Delta and its watershed susceptible to mussel infestation
- Establishment of statewide procedures for trailered boat inspections at all border check stations and other potential sources of introduction
- Increased public awareness about zebra mussels and the means by which they spread, and established a reporting mechanism for mussel sightings by developing brochures, posters, and a website
- Development of field sampling protocols and training guides, and conducting early detection field monitoring in reservoirs and rivers of the Bay-Delta Region and its watershed
- Development of the Bay Delta Rapid Response Plan for Dreissenid Mussels to quickly contain and eradicate any suspected or proven mussel occurrences

Invasive Spartina Project

Since 2000, the Ecosystem Restoration Program has provided over $3.3 million to support the Introduced Spartina Eradication Project and the Invasive Spartina Project through the California State Coastal Conservancy to develop a regionally coordinated program to address the rapid spread of four introduced and highly invasive cordgrass (Spartina spp.) species in the San Francisco Estuary, to implement control measures, contribute to the overall scientific understanding of the species, and build a bay-wide infrastructure to detect and prevent its future invasions. This effort has successfully raised awareness of the negative ecological impacts of non-native invasive cordgrass species.





SACRAMENTO RIVER AND DELTA ECOLOGICAL FLOWS TOOL

The enduring challenge confronting the management of water in the Sacramento-San Joaquin Delta is deciding how to balance and reconcile trade-offs among competing ecosystem values and water supply needs. In need of finding a practical solution to integrate multi-species and multi-habitat needs in the evaluation of water operations, the Ecosystem Restoration Program supported The Nature Conservancy in developing the Ecological Flows Tool (EFT). The EFT, a decision support tool , facilitates the inclusion of a broad suite of ecological considerations into water use planning exercises by integrating 25 site specific, functional flow algorithms (conceptual models) for 13 representative species and key habitats across the Sacramento River and Delta ecoregions, with widely used hydrogeomorphic models. The EFT's life-history stage conceptual model algorithms are then linked with multiple physical hydrogeomorphic models of flow, water temperature, salinity, channel migration, and sediment transport (e.g., CALSIM, USRDOM, SRWQM, DSM2) to enable ecological effects analyses, as well as development and testing of flexible, dynamic flow criteria. In this way, EFT transparently relates multiple attributes of the flow regime to multiple species' life-history needs, providing a more comprehensive understanding of the effects of water operations on representative focal species and their habitats.

The functional relationships that relate to the EFT's performance indicators are based on the best available science, and represent the collective knowledge of more than 70 scientists from state and federal agencies, consulting firms, and research institutions, who participated in early project development or who wrote primary papers on which the functional relationships are based. The demand for and value of the EFT decision analysis tool is reflected in its use in several major investigations, including the evaluation of the relative ecological effects of several alternative North-of-the-Delta Offstream Storage scenarios, the application of the EFT to selected Bay Delta Conservation Plan alternatives, and use of a subset of focal species models (Sacramento River salmonids and green sturgeon) to support the Bay Delta Conservation Plan environmental effects analysis. In addition to these analyses, a prototype version of the Sacramento River branch of the EFT was used to study some of the early alternatives being considered as part of the Shasta Lake Resource Investigation. The EFT has demonstrated its ability to incorporate physical inputs simulated by a widely-used suite of planning tools and to provide defensible ecological outputs used as part of the decision-making process for water operation and conveyance investigations.

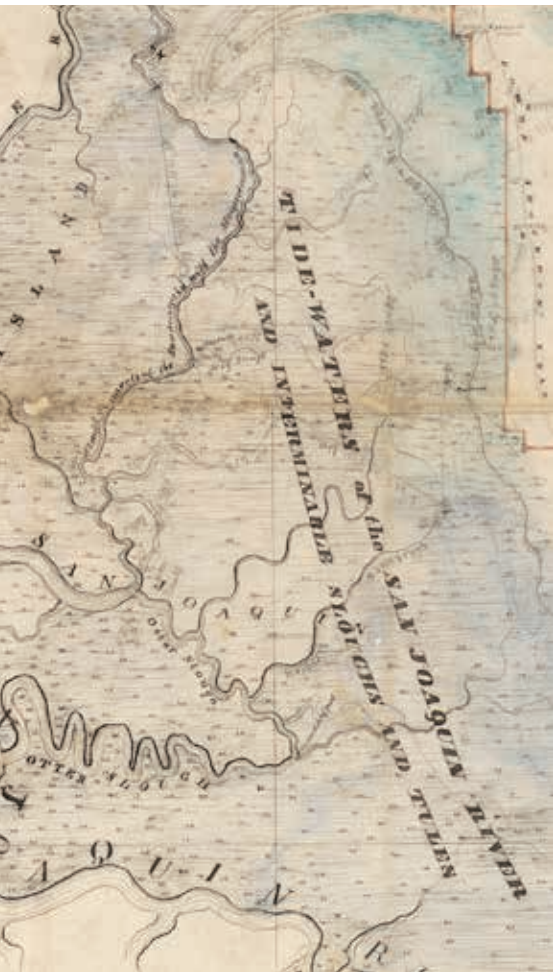
REPRESENTATIVE SPECIES

Sacramento River

- *Steelhead trout*
- *Chinook salmon*
- *Green sturgeon*
- *Bank swallow*
- *Western pond turtle*
- *Fremont cottonwood*

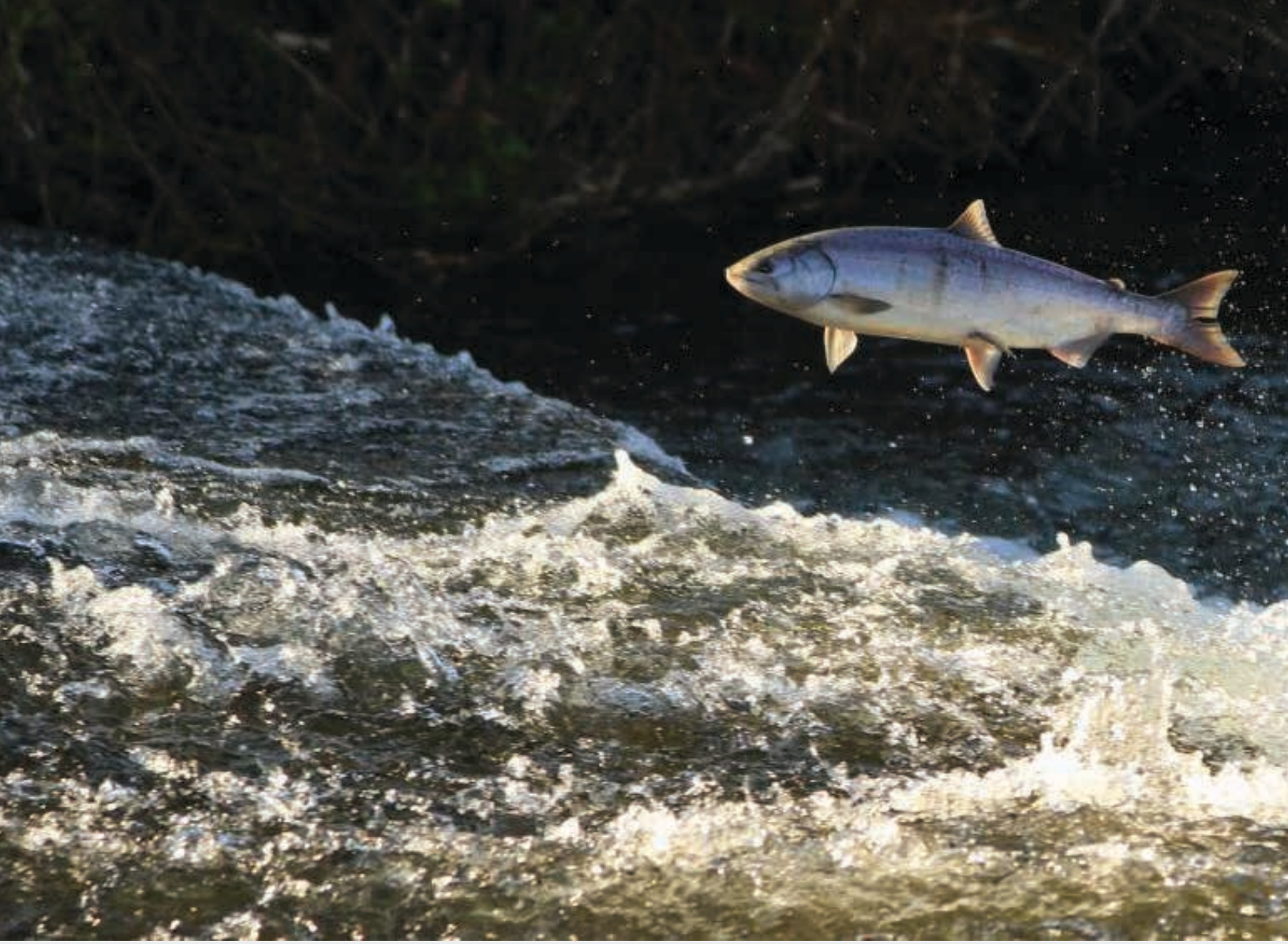
Delta Region

- *Steelhead trout*
- *Chinook salmon*
- *Delta smelt*
- *Longfin smelt*
- *Splittail*
- *Tidal wetlands*
- *Invasive species deterrence*


TIDE-WATERS of the SAN JOAQUIN RIVER
AND INNUMERABLE SLOUGHS AND TULES
SAN JOAQUIN
OTTER SLOUGH

SACRAMENTO-SAN JOAQUIN DELTA HISTORICAL ECOLOGY INVESTIGATION

Given the extensive changes to the Sacramento-San Joaquin Delta over the last 160 years, research was needed to better understand how large-scale restoration could support an ecosystem in the future Delta that reflects functions to which native species are adapted. With funding from the Ecosystem Restoration Program, researchers from the San Francisco Estuary Institute-Aquatic Science Center, in collaboration with the California Department of Fish and Wildlife, completed a Sacramento-San Joaquin Delta Historical Ecology Investigation that provided an improved understanding of what the Delta ecosystem looked like prior to significant modification. The results of the historical ecology investigation are being used by researchers to develop Delta landscape planning tools for implementing and communicating restoration strategies that establish landscape-scale ecological function. This information is expected to significantly improve the environmental outcomes of conservation and restoration investments in the Delta.



FISH SCREENS AND FISH PASSAGE IMPROVEMENTS

Water diversions, dams, and other fish passage barriers are found throughout Central Valley rivers and tributaries, and the Bay-Delta watershed. Water is diverted primarily for irrigated agriculture, and municipal and industrial use. Diversions cause loss of water, nutrients, sediment, and fish through entrainment. Dams block fish movement, alter water quality, remove fish and wildlife habitat, and alter hydrological and sediment processes. Other human-made structures, such as weirs, may block fish movement or provide habitat or opportunities for predatory fish and wildlife.

Recognizing that water diversions, dams, and other fish passage barriers are significant stressors, the Ecosystem Restoration Program has focused its effort on screening all of the diversions greater than 250 cubic feet per second and priority smaller diversions, and removing barriers to anadromous fish migration where feasible. To meet this end, the Program has invested over $205 million in fish screens (including planning, construction, and research) and fish passage improvements.

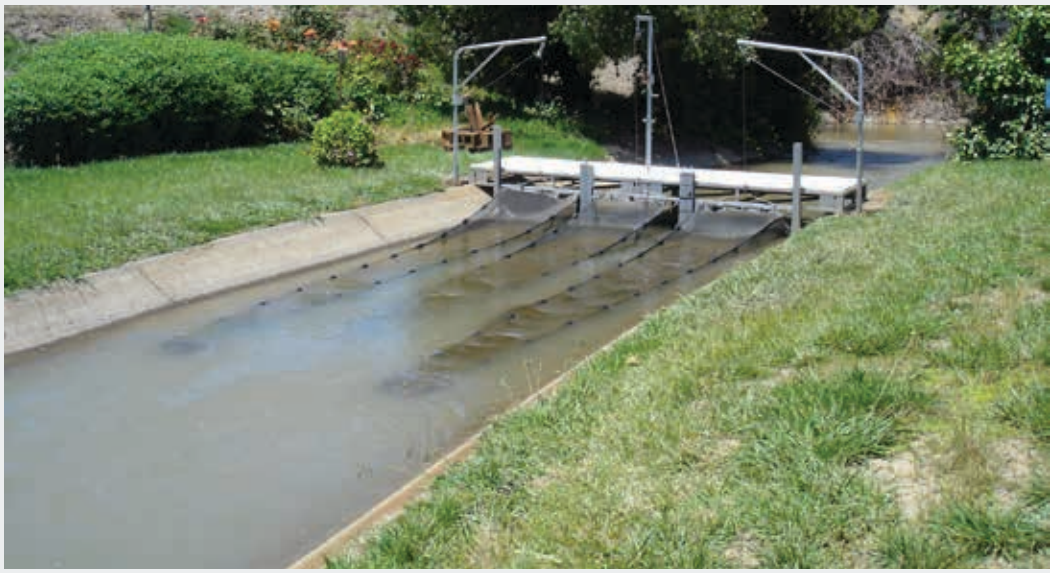
Anadromous Fish Screen Program

The U. S. Fish and Wildlife Service and the Bureau of Reclamation jointly implement the Central Valley Project Improvement Act Anadromous Fish Screen Program to assist the State of California in efforts to develop and implement measures to avoid losses of juvenile anadromous fish resulting from unscreened or inadequately screened diversions on the Sacramento and San Joaquin Rivers, their tributaries, the Sacramento-San Joaquin Delta, and the Suisun Marsh. These measures include, but are not limited to, construction of screens on unscreened diversions, rehabilitation of existing screens, replacement of existing non-functioning screens, and relocation of diversions to less fishery-sensitive areas. Given the common programmatic objectives and the high cost of fish screen installation, the Ecosystem Restoration Program and the Anadromous Fish Screen Program have partnered to fund the majority of high priority fish screens.

Small Fish Screen Programs

Since 1997, the Ecosystem Restoration Program has provided ongoing funding for small (usually less than 150 cubic feet per second) fish screen programs covering the Sacramento Valley and Bay-Delta. The Ecosystem Restoration Program has partnered with California Department of Fish and Wildlife, U.S. Department of Agriculture Natural Resources Conservation Service, and Family Water Alliance to install or upgrade 44 fish screens primarily on the Sacramento River and its tributaries.

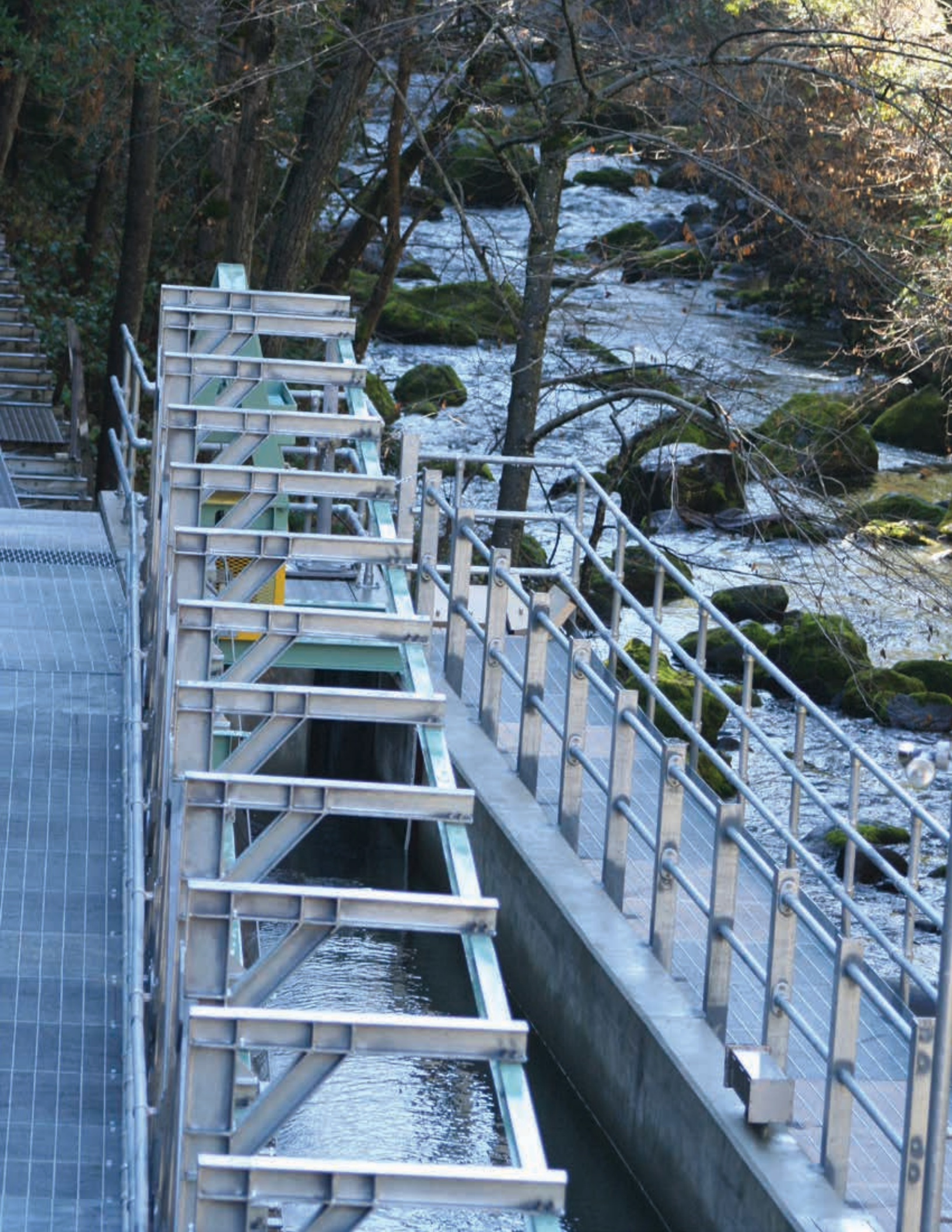
An example of one of these partnerships includes the Family Water Alliance fish screen programs, under which small privately-owned unscreened diversions are selected for screening by a team of state and federal biologists and engineers. After the sites are selected, Family Water Alliance coordinates environmental compliance and permitting, engineering construction management, and fish screen design and construction. To date, Family Water Alliance has coordinated the installation or upgrade of over 30 fish screens on diversions located on Butte Creek, the Sacramento and Feather Rivers, and Steamboat Slough in the Delta, using state-of-the-art fish screen technologies.

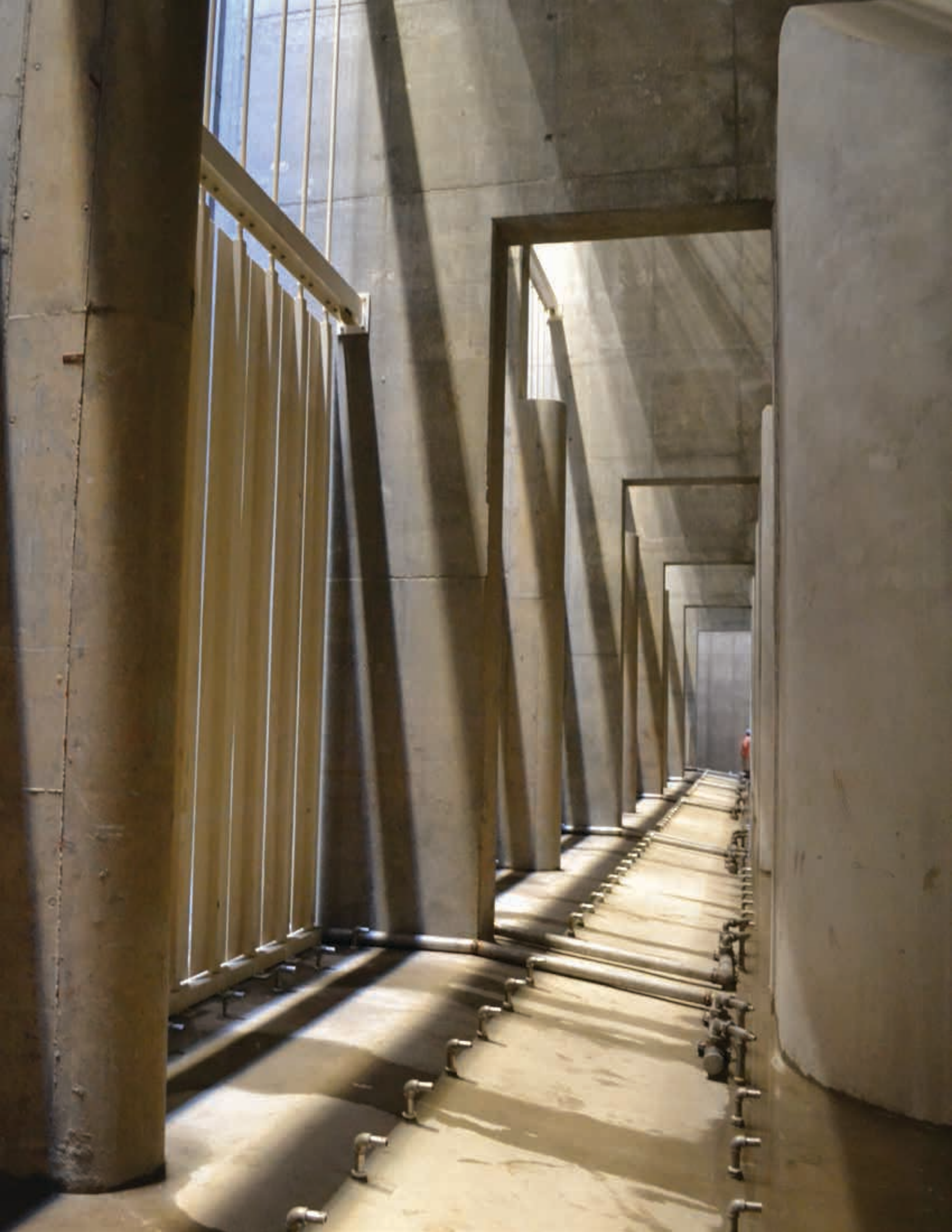


One of the Family Water Alliance programs also included an important research component in which fish entrainment monitoring was conducted at 12 diversion sites for two irrigation years prior to screening. Biological assessments prepared for each of the sites analyzed the effects of site-specific physical, hydraulic, and habitat characteristics of diversions on fish entrainment and were intended to lead to a better understanding of the benefits of fish screening for the reach of river monitored and for other locations with similar diversion and river characteristics. Analysis of the entrainment data resulted in the 2013 report titled, "Evaluation of Fish Entrainment in 12 Unscreened Sacramento River Diversions" that is now available to help managers prioritize which diversions are most important to screen.

Patterson Irrigation District Fish Screen

Patterson Irrigation District provides irrigation water to nearly 13,500 acres of farmland and ranches in the San Joaquin Valley, with diversions on the San Joaquin River serving as the district's primary source of water for over 100 years. In partnership with the Anadromous Fish Screen Program and Patterson Irrigation District, the Ecosystem Restoration Program provided state cost share for the new 195 cubic feet per second Patterson Irrigation District Fish Screen and Intake Facility located on the San Joaquin River near the town of Patterson. Beginning in 2001, the Ecosystem Restoration Program provided grant funding for the planning, design and environmental compliance, and construction phases of the fish screen. Construction was completed in approximately one year and the new facility was dedicated in 2011. The facility prevents entrainment of at-risk native fish species, including Chinook salmon and Central Valley steelhead, by replacing the existing unscreened diversion with a state-of-the-art fish screen and intake facility which meets or exceeds federal and state screening criteria.



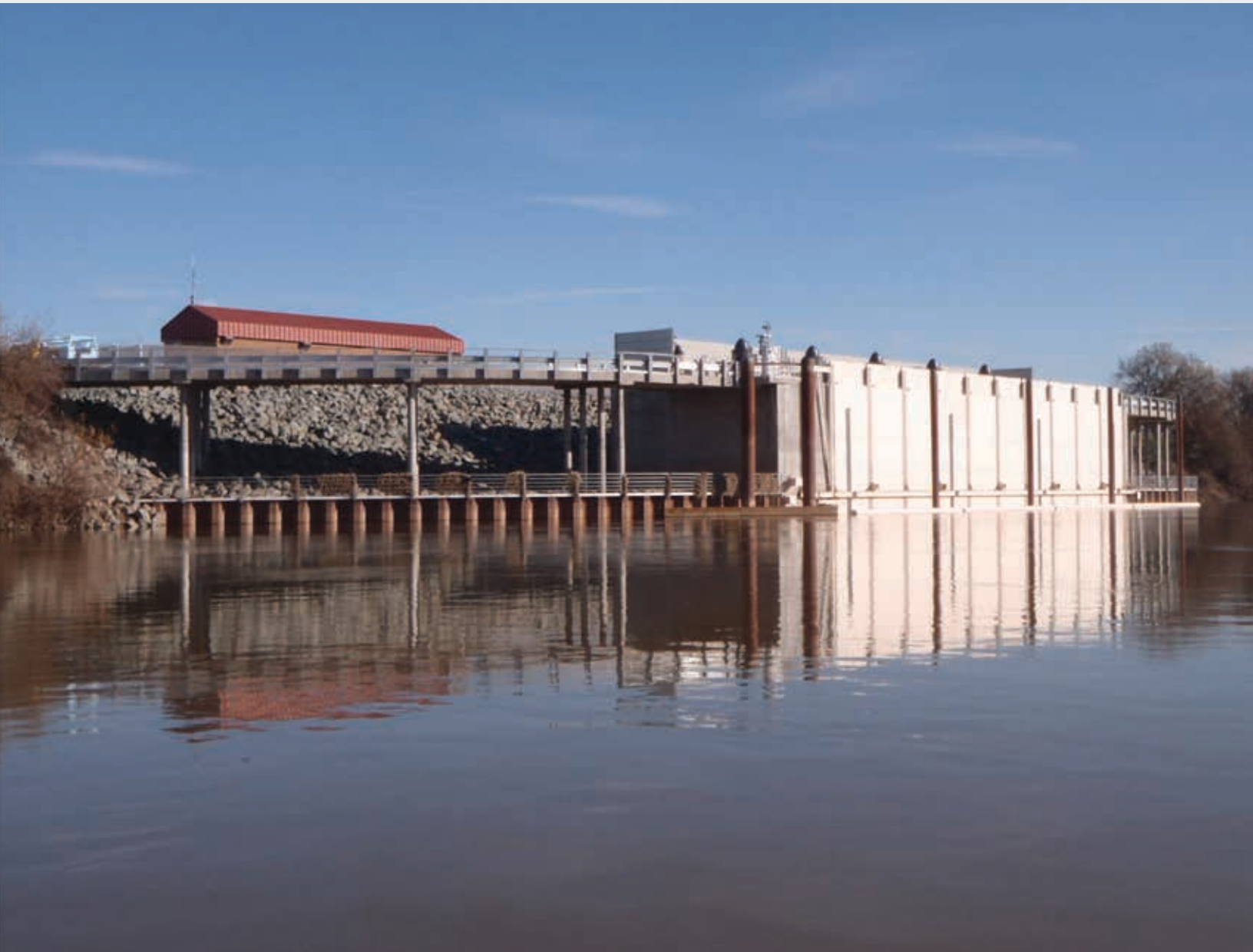


Natomas Mutual Water Company Fish Screen and Fish Passage Improvement

Natomas Mutual's shareholders include farmers, developers, pioneering families, the Natomas Basin Conservancy, and the city and county of Sacramento. Its water supplies are used for agriculture, habitat preservation, and habitat maintenance including the seasonal flooding of rice fields for rice straw decomposition that provides important wetland habitat for resident and migratory waterfowl.

Historically, Natomas Mutual operated five unscreened diversions, three of which were located on the Sacramento River and two on the Natomas Cross Canal. In addition, during some dry years, it was necessary for Natomas Mutual to install a seasonal dam (Verona Diversion Dam) at the mouth of the Natomas Cross Canal and pump water from the Sacramento River into the Natomas Cross Canal. These facilities had the potential to impact numerous fish species including listed species such as winter- and spring-run Chinook salmon and steelhead that use the lower Sacramento River and Natomas Cross Canal as part of their migration corridor for upstream migration of spawning adults and downstream migration of rearing juveniles.

In an effort to lessen impacts to fish species, Natomas Mutual, in partnership with the Ecosystem Restoration Program and the Anadromous Fish Screen Program, completed construction of the new 434 cubic feet per second Sankey Diversion on the Sacramento River in 2013. This state-of-the-art screened pumping facility was the culmination of nearly 20 years of planning, and allowed the permanent decommissioning of Natomas Mutual's two unscreened diversions and a small privately owned pump located on the Natomas Cross Canal, as well as decommissioning of the seasonal Verona Diversion Dam.



Reclamation District 108 Fish Screens

Reclamation District 108 (RD108) is located along the western edge of the Sacramento River and delivers water to nearly 48,000 acres of farmland within southern Colusa County and northern Yolo County. Since the mid-1990s, RD108 has worked with federal and state agencies to screen its largest diversions along the Sacramento River. In 1997, the resource agencies entered into a written agreement with RD108 to work cooperatively to develop and fund fish screening facilities on RD108's diversion pumping facilities on the Sacramento River for the protection of endangered and threatened fish species, including fall-, spring-, and winter-run Chinook salmon and Sacramento splittail.

WILKINS SLOUGH POSITIVE BARRIER FISH SCREEN

The Wilkins Slough Positive Barrier Fish Screen is the largest of RD108's diversions and is one of the largest fish screening facilities in the Sacramento River Basin at a capacity of 830 cubic feet per second. With funding from the Ecosystem Restoration Program, the Anadromous Fish Screen Program, and RD108, construction of the Wilkins Slough Positive Barrier Fish Screen was completed in 1999. The objectives of the fish screen were to make the Wilkins Slough Diversion fish-friendly, minimize the impact of water diversions on winter-run Chinook salmon, and meet current resource agency criteria for fish protection facilities. A critical goal that was successfully met was to construct the fish screen structure without interrupting irrigation water deliveries or interfering with fish migration in the Sacramento River.

EMERY POUNDSTONE PUMPING PLANT

Following construction of the Wilkins Slough Positive Barrier Fish Screen, the resource agencies requested that RD108 conduct a reconnaissance investigation of the feasibility of combining three of its larger unscreened Sacramento River diversion pumping plants into a single pumping plant with a state-of-the-art fish screen. The investigation confirmed that it would be less costly to build a new combined pumping plant with a fish screen than to install separate fish screens on each of the three existing pumping plants. Further it was determined that combining the three pumping plants would result in a lower water diversion requirement, thereby lessening the impact on protected fish species. The Emery Poundstone Pumping Plant was completed in 2008 with funding from the Ecosystem Restoration Program, the Anadromous Fish Screen Program, and RD108. The new facility included the abandonment of three existing pumping plants and the construction of a 300 cubic feet per second pump station and fish screen structure, an afterbay, 4.2 miles of lined canals, and two lift stations.

SOUTH STEINER PUMPING PLANT

RD108 participated in the Family Water Alliance Sacramento Valley Fish Screen Program which was funded jointly by the Ecosystem Restoration Program and the Anadromous Fish Screen Program. Under the Sacramento Valley Fish Screen Program, two seasons of pre-screen fish entrainment monitoring data were collected at the 30 cubic feet per second South Steiner Pumping Plant on the Sacramento River. Upon completion of the required entrainment monitoring, the Sacramento Valley Fish Screen Program was to install a screen at the diversion site. However, due to increased sedimentation at the diversion that made screening the existing South Steiner Pumping Plant infeasible, RD108 chose to consolidate the South Steiner Pumping Plant water diversion capacity with the previously screened Wilkins Slough Pumping Plant and Fish Screen Facility and abandon the South Steiner Pumping Plant in 2012.

Yuba City Fish Screen

Yuba City sits on the west bank of the Feather River, 43 miles north of Sacramento in Sutter County. Yuba City is home to 65,000 people and relies primarily on surface water from the Feather River. Groundwater in the area is of poor quality and, in planning for long-term service area supply, the City prefers to eventually provide surface water to all residents. The Feather River is critical habitat for listed spring-run Chinook salmon and steelhead. In 2014, Yuba City, in partnership with the Ecosystem Restoration Program and the Anadromous Fish Screen Program, completed construction of a new 74 cubic feet per second diversion just upstream of their existing diversion on the Feather River. The new diversion included a fish screen and increased diversion capacity, and the existing diversion was abandoned.

Battle Creek Salmon and Steelhead Restoration

The Battle Creek Salmon and Steelhead Restoration Project is being implemented near the town of Manton, in Shasta and Tehama Counties, to restore and increase the populations of state and federally listed winter- and spring-run Chinook salmon and steelhead in cold water and high-elevation habitats. Historically, Battle Creek was one of the most important Chinook salmon spawning streams in the Sacramento Valley. In partnership with the Ecosystem Restoration Program, U.S. Bureau of Reclamation, NOAA Fisheries, U.S. Fish and Wildlife Service, and Pacific Gas and Electric Company (PG&E), restoration is being accomplished through the modification of the Battle Creek Hydroelectric Project facilities and operations, owned and operated by PG&E. This includes increasing instream flow releases, removing five diversion dams, constructing fish ladders and fish screens on three diversion dams, and constructing tailrace connectors to minimize the diversion of water from North Fork Battle Creek to South Fork

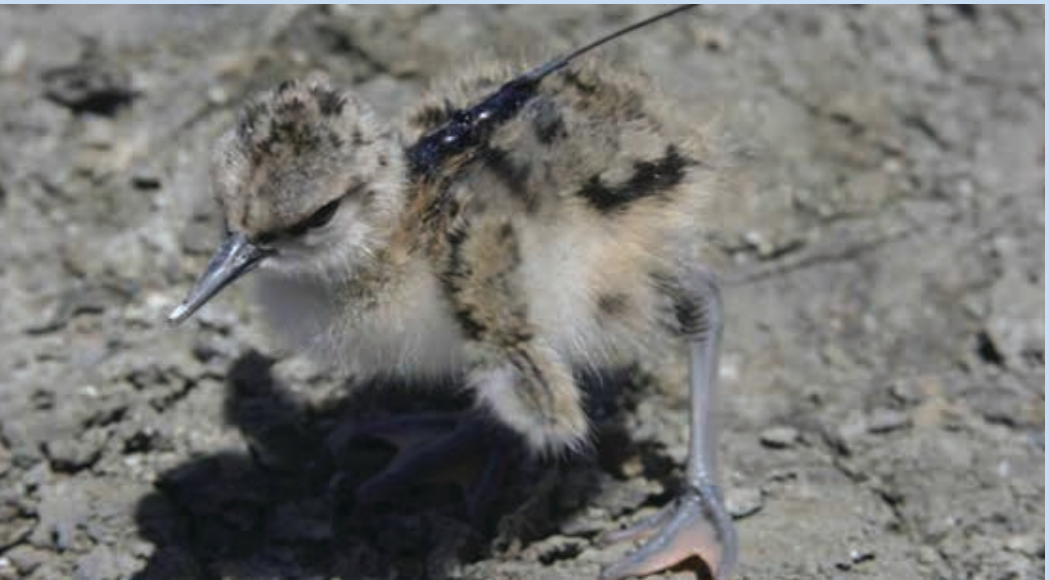
Battle Creek. Once all three phases are complete, approximately 42 miles of highly prized habitat in Battle Creek and an additional six miles of habitat in its tributaries will be restored. To date, fish screens and ladders have been installed at the North Battle Creek feeder and Eagle Canyon diversion dams, the Wildcat diversion dam and appurtenant conveyance system have been removed, and a fish barrier has been constructed on Baldwin Creek as Asbury dam.

Butte Creek Fish Passage Improvements

Butte Creek originates in the Lassen National Forest on the western slope of the Sierra Nevada. The creek is a tributary to the Sacramento River through Butte Slough near Colusa, and the Sutter Bypass and Sacramento Slough near Karnak. The watershed ranges from 7,087 feet in elevation at the headwaters to approximately 150 feet at the Sacramento River points of entry, encompassing approximately 797 square miles (excluding the Sutter Bypass). Butte Creek is one of only three tributaries to the Sacramento River that continues to harbor a sustaining population of the state and federally listed spring-run Chinook salmon. Since 1997, the Ecosystem Restoration Program has contributed significant funding toward Butte Creek fish passage improvements including dam removals, installation of fish screens and ladders, weir replacements, and water control structure upgrades. These fish passage improvements have increased the spring-run Chinook salmon population in Butte Creek and reduced the potential for extinction.

ENVIRONMENTAL WATER QUALITY

The Ecosystem Restoration Program's goal for environmental water quality is to improve and maintain water and sediment quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary, and eliminate to the extent possible toxic impacts to aquatic organisms and wildlife. Because species dependent on the Bay-Delta are affected by upstream water quality conditions in some areas, the scope of environmental water quality actions also extends to relevant watersheds. Focused efforts toward this goal have included research to identify the biological and human health impacts of toxic contaminant loadings in targeted aquatic and terrestrial species, and to identify the effects of oxygen-depleting substances on aquatic resources in the lower San Joaquin River, and their multiple contributing causes.

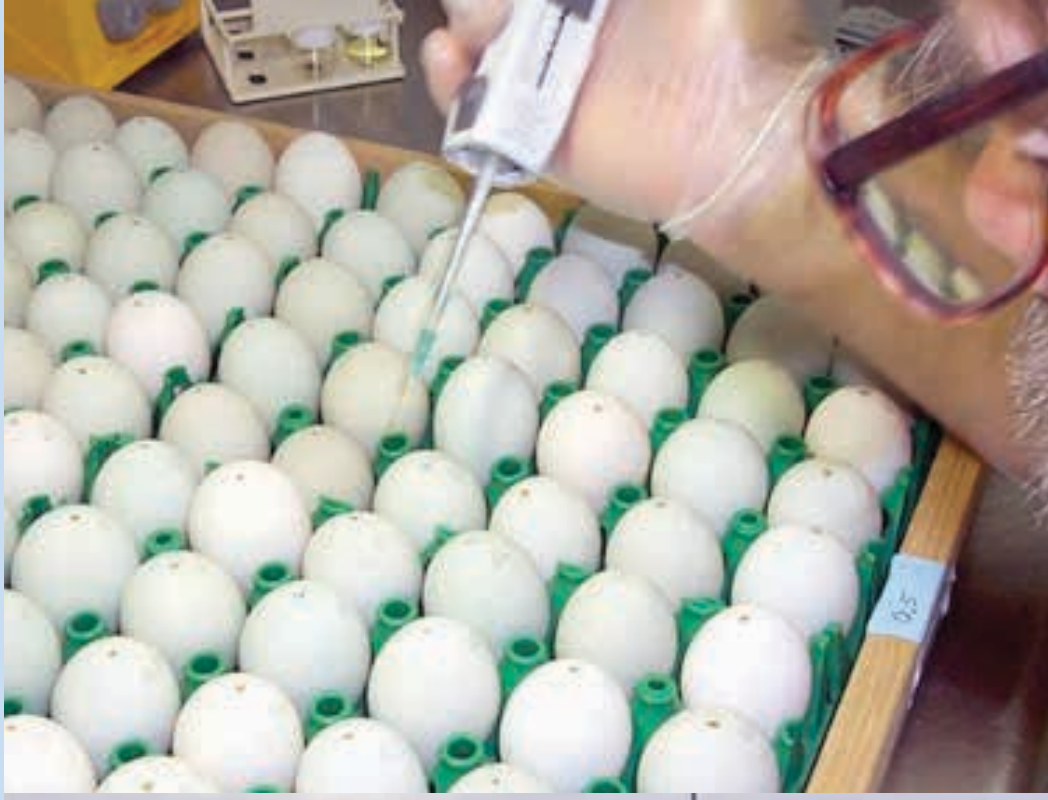


Understanding Mercury in the Environment

Ecosystem Restoration Program supported research has increased what we know about methylmercury in the environment and has provided critical information that reduces mercury related risks and uncertainty associated with wetland restoration decisions. Mercury contamination from both mercury mining and gold extraction in the upper watersheds has resulted in elevated mercury concentrations throughout most of the Bay-Delta system. Mercury can be converted to the more toxic chemical form, methylmercury, which accumulates in aquatic organisms like fish. Humans and fish-eating birds are exposed to methylmercury through their diet. Environmental processes can exacerbate the production of methylmercury and thereby increase the contamination in aquatic organisms. Ecosystem Restoration Program funded studies have described the level of contamination in recreational sport fish and tidal marsh birds, updated health advisories in the Delta and lower Sacramento and San Joaquin Rivers, and determined that water, sulfur, and carbon management can control the methylation process.

Water Quality on the San Joaquin River

Dissolved oxygen is a fundamental requirement for fish. The San Joaquin River Deep Water Ship Channel has had a long-term problem with low dissolved oxygen. The low dissolved oxygen interferes with the migration corridor for salmonids and contributes to other water quality issues. The Ecosystem Restoration Program has supported studies to better understand the relationship of these estuary water quality issues with upstream management activities. These activities have included support for watershed-wide monitoring and upstream and estuary oriented water quality models.



ECOSYSTEM RESTORATION PROGRAM

Ecosystem Restoration Program Implementing Agencies

CALIFORNIA

California Department of Fish and Wildlife

FEDERAL

United States Fish and Wildlife Service

National Marine Fisheries Service