

Humboldt Bay National Wildlife Refuge

Mad River Slough Restoration Project

Project Summary

The California Department of Transportation (Caltrans) purchased the 73.19-acre parcel containing the Project Area with the intention of developing a wetland mitigation bank for regional wetland impacts from highway construction. Caltrans completed extensive site investigations of the Project Area during a 10-year period, including plant surveys, hydraulic monitoring, and wetland delineations. Eventually, Caltrans abandoned the wetland banking project because they determined that the project would not meet Caltrans requirements for wetland mitigation credits.

In September 2022, U.S. Fish and Wildlife Service (USFWS) acquired the land from Caltrans. The parcel is adjacent to and shares boundaries with the Humboldt Bay National Wildlife Refuge (NWR) Lanphere Dunes Unit. In addition, the parcel contains rights-of-way that USFWS utilizes for access to the Lanphere Dunes office, main public trailhead to Lanphere Dunes, and public parking area for Lanphere Dunes. Not only does acquiring this parcel allow USFWS to better manage and develop its public use access, but it also allows USFWS to restore habitat on the parcel for fish, wildlife, and plants found within the area.

USFWS developed preliminary concept plans for the restoration of the Wadulh Lagoon. The concept plan is informed by the previous extensive studies conducted by Caltrans and investigations by USFWS staff. The project objectives are to restore the site to historical, pre-diking conditions and recreate a natural shoreline that provides an unhindered transition space from uplands to freshwater wetlands to salt marsh to slough channel. The design will account for projected sea level rise by providing additional accommodation space for marsh migration relative to current conditions.

USFWS plans to complete the project in the summer of 2024. In 2023, USFWS will complete National Environmental Policy Act (NEPA), California Environmental Quality Act (CEQA) and National Historic Preservation Act (NHPA) compliance requirements. Once compliance is complete, USFWS will obtain the required permits for the project. Further details are found in the project narrative to follow.

Project Narrative

- Project Need:** The project is necessary because human activities altered the habitat of the Mad River Slough through diking and draining. Once drained, the salt marsh and open water areas were used for agricultural production. Over time, the drained lands subsided due to decaying organic soils. The project will restore historical wetland types, increase adaptation to sea level rise (SLR), and provide protection as part of the Humboldt Bay NWR in perpetuity. The project will also assist the recovery of four federally listed endangered fish species, as well as special status bird and plant species.

Humboldt Bay has lost 90 percent of its salt marshes since 1900, largely through diking and draining. More than 75 percent of Humboldt Bay's shoreline has been armored or otherwise altered. Humboldt Bay's loss of shoreline and salt marshes resulted in significant loss of ecosystem services essential to the environment, flora, fauna, and people. Ecosystem services of salt marshes include wildlife food and habitat, water quality, recreation, buffering against SLR

impacts, and carbon sequestration. The project will support state and federal goals for restoring and conserving 30 percent of coastal waters by 2030.

2. **Project Objectives:** The project goals are to restore the full tidal prism with connectivity to Mad River Slough by dike removal and lowering to create suitable conditions for salt and brackish marsh through placement of fill and eelgrass habitat through excavation, and to restore and protect riparian habitat by creating a natural shoreline buffer between freshwater wetlands and the slough, thereby creating a resilient complex of estuarine and palustrine wetlands. Specific objectives include:
 - a. Conducting planning and environmental compliance. In support of environmental compliance, USFWS staff have prepared 30 percent concept plans and will complete full construction plans after analyzing the public review and comments. USFWS will prepare required NEPA and CEQA documents. USFWS will also obtain required permits from the U.S. Army Corps of Engineers, California State Water Resources Control Board, Humboldt Bay Harbor District, and California Coastal Commission. USFWS will complete a consultation for Section 7 of the Endangered Species Act (ESA) with USFWS and National Oceanic and Atmospheric Administration (NOAA). Additionally, USFWS staff will undertake compliance work for cultural resources, including an on-site survey.
 - b. Restoring the tidal prism. Objectives in support of Direct Habitat and Species Management include:
 - i. Lowering existing levees to salt marsh elevations in one or more places, restoring full tidal flows to the site.
 - ii. Excavating low-lying areas of pasture to create a channel network at elevations that will support eelgrass (*Zostera marina*)
 - iii. Using excavated fill in strategic areas to create suitable conditions for establishment of salt and brackish marsh. The freshwater that drains from the adjacent dune system will support the creation of fringing brackish marsh.
 - iv. Placing fill against an existing dike that protects the property owner to the south and along Lanphere Road to the north to create a buffer of salt marsh, increasing SLR adaptation.
 - v. Placing fill strategically to create conditions to trap tidally transported suspended sediment and promote salt marsh expansion.
 1. The project will require approximately 43,500 cubic yards (CY) of fill. All fill will be generated on site by excavating tidal channels and eelgrass habitat and levee lowering and removal. Reuse of on-site sediment will result in lower project costs. Increase the availability of habitat benefits for avian, invertebrate, mammal, and other species.
 - c. Providing signage that inspires and supports appropriate public education. The project will take the following steps to support public education:
 - i. Local nonprofit groups, Friends of the Dunes and Redwood Region Audubon Society, have each committed to providing a total of six guided tours over the course of three years.

- ii. USFWS will provide educational and interpretive signage in support of Outreach/Communication and coordinate with the Wiyot Tribe to provide educational guidance for highlighting Wiyot Tribe cultural history.
- 2. **Expected Results and Benefits.** The project will result in benefits for coastal wetlands and associated dependent species. The project will restore diked and drained salt marsh and intertidal areas, restore a natural transition from the uplands through the shoreline to the slough, and provide nursery habitat for federal- and state-listed fish species and habitat for shorebirds and raptors. Increasing public understanding of the value of coastal wetlands will catalyze future restoration. Project benefits include resilience to changing ocean conditions and SLR because the removal of the dike accommodates space for SLR. USFWS will provide management and long-lasting stewardship of the site.

Wildlife benefits. The loss of salt marsh habitat within Humboldt Bay is an important factor contributing to the decline of many fish, plant, and wildlife species, including salmon, steelhead and coastal cutthroat trout, Lyngbye's sedge, bald eagle, peregrine falcon, American kestrel, merlin, sharp-shinned and Cooper's hawks, and northern red-legged frog.

The project will play an important role in the recovery of these wildlife species and in a society benefitting from their presence. The project is adjacent to the Lanphere Dunes Unit of Humboldt Bay NWR, which is the only place on the bay where the transition from slough to salt marsh to freshwater wetlands to upland (dunes) is preserved. The project is an opportunity to restore a natural shoreline transitioning from slough to salt marsh to freshwater riparian wetlands. The project's salt marshes will support a broad array of shorebirds and raptors, including osprey, white-tailed kite, red-tailed hawk and northern harrier. Red-legged frogs will use the fringing brackish marsh. The project also enhances and protects existing riparian habitat. This habitat has been monitored for bird use for the past 30 years by the Humboldt Bay Bird Observatory and is used by a variety of neotropical migrants and other songbirds. This area will remain closed to hunting.

Restoring critical fisheries habitat. Diking and draining of salt marshes has contributed to substantial population declines of local salmonid species, including coho, Chinook, steelhead trout, and tidewater goby—all of which are threatened or endangered under the Federal Endangered Species Act. Restoration of tidal channels, eelgrass beds, and salt marsh will restore critical fish nursery habitat. Juvenile salmonids utilize the estuary, especially areas with eelgrass, as nursery areas for extended periods before entering the ocean. Estuaries provide the habitat where juveniles obtain the size needed to increase their chances of survival at sea. Similarly, studies of other Northern California estuaries and lagoons show that steelhead and coastal cutthroat trout use these habitats year-round. Tidewater goby employ salt marshes that border freshwater wetlands for both spawning and rearing.

- 3. **Project Approach.**
 - a. **Partners.** The project is a collaboration between local nonprofit organizations, State and Federal agencies, and the Wiyot Tribe. Key partners include the Humboldt Bay NWR (holds fee title and will manage in perpetuity), California State Coastal Conservancy, Humboldt Resource Conservation District, Friends of the Dunes, and Redwood Region Audubon Society.

- b. **Ownership and Management.** Caltrans donated the property to the Humboldt Bay NWR in 2022. USFWS will maintain the site in perpetuity for its habitat conservation and public education values.
3. **Restoration Approach.** Key components of the restoration are discussed in the following list.

 - a. Restore 48.6 acres of agricultural wetland through placement of fill, excavation, and removal or lowering of exterior levees on Mad River Slough. The components of the project include:

 - i. Restoring 9.6 acres of intertidal salt and brackish marsh through the placement of fill. This area will consist of fringing wetlands, which will act as a living-shoreline buffer adjacent to the privately owned dike to the south and Lanphere Road to the north.
 - ii. Excavating 10.8 acres of the agricultural wetland to a suitable elevation for supporting eelgrass.
 - iii. Excavating 16.5 acres of subtidal/permanently flooded areas supporting eelgrass development and replicating the conditions of a perched pool to provide low-tide refugia for multiple fish species, including coho Salmon, tidewater goby, and longfin smelt.
 - iv. Restoring or enhancing 11.5 acres of riparian habitat by creating a protective buffer of freshwater and salt marsh, removing invasive species, including reed canary grass and Himalayan blackberry, and planting native willow and alder.
 - v. Increasing public awareness through educational and interpretive opportunities. The Friends of the Dunes and Audubon Society will each lead two guided tours per year. Each group has committed to a total of six guided tours over the course of three years.
 - c. Successful Examples of this Approach. A similar project was carried out at the Humboldt Bay NWR White Slough Unit. Fill was imported to create elevations suitable for salt marsh. Levees were breached and lowered to allow tidal inundation to return to the diked wetlands. Vegetation monitoring has demonstrated that salt marsh vegetation is colonizing the filled marsh areas.
4. **Readiness.** The project will be ready for construction in 2024. Design plans are attached that show the proposed construction elements, anticipated wetland classifications, and habitats following construction. The project team (State Coastal Conservancy, Humboldt Bay NWR, and Humboldt County Resources Conservation District) has worked together before on similar projects. USFWS will develop full plans in 2023 and 2024.
5. **Useful Life.** The project is a process-based restoration; although the individual features are likely to evolve in a dynamic tidal setting, the habitat features are equally likely to persist over time, providing value for at least 50 years, given SLR. Project design elements are intended to trap suspended sediment brought in by tides, which may allow marshes to keep pace with SLR for a longer duration. Barriers to up-slope salt marsh migration will be removed. The access features are permanent and will be maintained by USFWS in perpetuity.

6. **Timeline.**

Activity	Complete
Property Acquisition	2022
Project Management	2023–27
Cultural Survey	2023
Restoration Planning and Design	2022–23
Environmental Compliance	2023–24
Permitting	2024
Construction	2024
Invasives Species Removal	2024
Riparian Planting	2025
Monitoring	2024–27
Public Education	2024–27

4. **Compliance.** USACE §404, State Water Resources Control Board §401, California Department of Fish and Wildlife §1600 and consultations per Federal ESA and NHPA Section 106 will be required. On-site cultural surveys were completed by USFWS archaeology staff in May 2023 and a NHPA consultation has been initiated with the State Historic Preservation Officer SHPO and local Native American tribes. A consistency determination will be completed with the California Coastal Commission. The Humboldt Resource Conservation District and USFWS will be CEQA and NEPA leads, respectively. USFWS Refuge staff will request to apply NOAA's *Programmatic Environmental Impact Statement for Habitat Restoration Activities Implemented Throughout the Coastal United States* (Available online at <https://www.fisheries.noaa.gov/resource/document/restoration-center-programmatic-environmental-impact-statement>) through the USFWS Coastal PEIS Review Team. Previous permitting work by Caltrans has already resolved many permitting issues with regulatory agencies. Project site design could be modified based on consultation and compliance results.

7. **Relationship to Other Projects.** The project is within the approved boundary of Humboldt Bay NWR and would be consistent with the Humboldt Bay NWRC Comprehensive Conservation Plan. The project is adjacent to the Lanphere Dunes Unit, which has been designated a National Natural Landmark. The project will increase the acreage of preserved land on the Lanphere Dunes Unit, including both estuarine and palustrine wetlands.

Dike removal and restoration of living shorelines is consistent with adaptation policies in the Humboldt Bay Sea Level Adaptation Planning Project. In addition, this project is supported by an array of other management plans in Northern California and Humboldt Bay. It will also serve as a demonstration area and catalyze future conservation efforts of similar sites on the west coast.

The Project is consistent with the Humboldt Bay Harbor, Recreation, and Conservation District's Humboldt Bay Management Plan. Eelgrass restoration is consistent with the Humboldt Bay Eelgrass Comprehensive Management Plan.

Public Involvement and Interagency Coordination: The collaborative project includes the California State Coastal Conservancy, Humboldt Resource Conservation District (CEQA lead), Caltrans, USFWS, Wiyot Tribe (education and ecocultural interpretation), Friends of the Dunes (education outreach),

Redwood Regional Audubon Society (education outreach), and Humboldt Bay Harbor, Recreation and Conservation District (sediment). The project team is also consulting with NOAA National Marine Fisheries Service on development of eelgrass restoration components. The team met with neighbors during the preliminary development of the plan and plans to meet again during the public outreach portion of the process to address any questions or concerns about the plans. The public will have an opportunity to comment on the plans during a 30-day public comment period from December 27, 2023 through January 26, 2024.