



Coastal Watershed Restoration Project: Restoring Tides in Estero de Limantour

Background and Importance: *Dams built across tidal marshes in the Estero de Limantour in the 1950s and 60s separated freshwater from the tides and prevented fish passage.*

Although Point Reyes National Seashore is close to a major city, today it offers visitors a natural and relatively undeveloped experience. However, its lands were privately held from the 1800s and supported numerous ranching operations, some of which still exist. Then in the 1950s, residential development began in and near Drakes and Limantour Esteros, including the creation of dams, roads, and culverts. A beach access berm was completed at Limantour Beach in 1952, and Muddy Hollow Creek was dammed in the 1960s to create a recreational pond for a proposed residential development. These dams obstructed tidal dynamics and fish passage, and dramatically affected natural processes and habitat. Concern over this and other extensive development and a desire for public coastal access led directly to the establishment of the Seashore in 1962. The Seashore continues to remove legacy structures to provide a natural place for fish and other wildlife, as well as its human visitors.



Extensive development was underway in the Estero de Limantour area when Point Reyes National Seashore was established. (Photo taken in 1961.)

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Project Overview: *The National Park Service (NPS) removed Muddy Hollow Dam and Limantour Beach Pond Dam, returning tidal processes to more than 15 acres of coastal marsh habitat in the Estero de Limantour.*



(Left: Before; Right: After) Removal of the Limantour Beach Pond Dam (supporting the path on the left) allows tidal flows through the area while maintaining visitor access to Limantour Beach.

Removal of the dams restored estuarine processes and fish passage and eliminated long-term maintenance requirements of unneeded structures that were in danger of failure. The planned deconstruction allowed for NPS to remove these facilities while protecting natural resources and processes. Unplanned dam collapse at Muddy Hollow Pond would have released more

than 30 acre-feet of water, resulting in loss of pond, estuarine, and upstream wetland habitat.

Tidal influence provides everyday renewal of the sort created by a freshwater flood event. While freshwater only supports six to seven fish species, marine areas support around 30. NPS staff found smolting steelhead trout in Muddy Hollow Creek prior to dam removal; smolting involves bodily changes to adapt from freshwater to saltwater, indicating that the fish wanted to get to the ocean. This is now possible. Vegetation in the areas will change from the freshwater species tules and bulrushes to the saltwater species pickleweed and cord grass.

Restoration makes ecosystems more adaptable to global climate change, as the system is able to evolve without infrastructure

or barriers impinging on natural processes. Resilient habitats can support a wider variety of aquatic, estuarine, and riparian species. In addition, removal of dams from estuarine habitat at Muddy Hollow and Limantour provides natural freshwater/estuarine transition zones that can shift with anticipated changes due to sea level rise.

Project Details: *NPS removed the dams, rerouted Estero trail, placed a bridge for Limantour Beach access, and constructed frog ponds for mitigation.*

Removal of Muddy Hollow Dam: Muddy Hollow Creek discharged into the upstream end of the 11.4-acre freshwater pond created by the construction of the dam in the early 1960s. The 400-foot long dam impeded access to the Muddy Hollow watershed by anadromous fish such as the federally threatened steelhead trout and allowed only a narrow



(Left: Before; Right: After) Removal of Muddy Hollow Dam (left) restored hydrologic connectivity between Muddy Hollow Creek and tidal flows (right).

freshwater/tidal mixing zone. NPS drained the reservoir and removed the existing earthen dam to restore full hydraulic connectivity and expand the estuarine transition zone between the upper, freshwater portion of the watershed and the Estero proper. Estero Trail, which followed the crest of the dam, was rerouted as part of the project. NPS retained a smaller area of freshwater pond habitat for the federally threatened California red-legged frog and waterbirds in a manner that would not affect the transition zone.

Removal of Limantour Beach Marsh Dam: In 1860, Limantour Marsh was originally a tidal marsh with no connection with the Laguna Creek basin. That connection, allowing freshwater flows to enter, was made in 1943. The beach access berm was constructed between 1943 and 1952, separating 4.8 acres of freshwater pond habitat from the tides. The top of the berm was a paved roadway that served as the primary pedestrian route to the beach, also allowing access to NPS maintenance vehicles. Immediately downstream of the beach access berm was an intermediate tidal marsh, formed by a second berm, constructed by 1963. Constrained tidal exchange occurred through a breach on the south end of the berm. NPS removed a culvert and 100 feet of the beach access berm and replaced the structures with a bridge to provide beach access while restoring estuarine habitat and anadromous fish access to the Laguna watershed. NPS also removed the second berm, allowing tidal energy to be conveyed through the former constructed intermediate tidal marsh and freshwater marsh.

Construction of Frog Ponds for Mitigation: As part of the mitigation effort for the removal of the dams, NPS put in five frog ponds at Limantour Beach in 2007 and 2008. The frog ponds were created through excavation adjacent to existing wetland areas and are isolated from the tidal areas. While the old dams provided habitat to frogs, they required maintenance, altered natural processes, and were bound to fail. The new ponds provide open-water habitat that will last longer and will be able to naturally function without human intervention.

Current Condition: *High tides now flow through historic channels, inundating a large portion of the former Muddy Hollow Pond and Limantour Marsh. Over time, the estuarine transition zone will continue adapting to impacts of climate change including sea level rise.*

The Drakes Estero Coastal Watershed Restoration Project was completed in 2008 using \$2.44 million in federal funding received in 2006. The project restored estuarine and stream habitat, fish passage, and tidal connectivity by removing or replacing infrastructure associated with previous development. These facilities were located in five different coastal watersheds, both agricultural and wilderness, all draining into Drakes Estero. Each of the watersheds support federally threatened steelhead trout and contain potential habitat for endangered coho salmon. More information about these projects, including environmental compliance documents, can be found at: http://www.nps.gov/pore/parkmgmt/planning_cwr.htm.

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