Habitat Restoration
Case Studies
The lower Columbia River and estuary is one of 28 water bodies in the nation designated an “Estuary of National Significance.”

The Estuary Partnership Goals Are:

Protect the ecosystem and species - restoring 16,000 acres of wetlands and habitat by 2010 and promoting improvements in stormwater management.

Reduce toxic and conventional pollution - conducting long term monitoring and advocating to eliminate persistent bioaccumulative toxics, bring water bodies up to water quality standards, reduce hydrocarbon and heavy metal discharges and reduce bacterial contamination.

Provide information about the river to a range of audiences - compiling and evaluating data, offering education programs for children and building public and private partners.

The National Estuary Program was authorized in the 1987 Clean Water Act and is administered by the US Environmental Protection Agency. Its purpose is to protect nationally significant estuaries that have been degraded by human activity. The Estuary Partnership does this by bringing together diverse parties to identify problems, defining a course of actions to address problems, and working collaboratively to implement actions through a regional framework.

The Estuary Partnership is a 501(C)(3) non-profit corporation. Our Board of Directors includes members from Oregon and Washington and represents diverse interests and geography.

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Introduction to Habitat Restoration Case Studies

Taking Action in the Estuary

Habitat restoration is one of the Lower Columbia River Estuary Partnership’s primary goals. The estuary has been degraded and its normal ecological processes have been disrupted largely due to impacts of human activities of the last 120 years. Three-quarters of the tidal swamps that formerly existed in the estuary have disappeared, along with many marshes and other wetlands, leaving the remaining habitat in fragments (Bottom et. al 2005). River flow has been directed in many areas to a single channel, water and sediments are contaminated with toxins, and invasive plant and animal species have taken up residence in the estuary. As a result, many populations of native fish and wildlife have declined—several have been listed as threatened or endangered.

The Estuary Partnership is working to reverse these trends by restoring tidal wetlands and other key habitats in the lower Columbia River and estuary, which extends from the river’s mouth 146 miles upstream to Bonneville Dam. The Estuary Partnership Comprehensive Conservation and Management Plan (Management Plan) calls for the restoration of 16,000 acres by 2010 through the habitat restoration program. This program is a large collaborative effort involving not only the Estuary Partnership but many local conservation groups, governments and watershed councils. The Estuary Partnership works with this collaboration to implement regional strategic approaches to habitat restoration and to secure funding for on-the-ground projects. One of the key components of the program is funding projects that restore lost habitat, enhance waterways and streamside areas, and reestablish natural processes and functions such as nutrient cycling and flood attenuation. Over three years, the Estuary Partnership has supported 26 projects ranging from levee breaches and culvert replacements in tidal floodplains to rehabilitation of salmon spawning areas in the lower reaches of estuary tributaries. All projects involve multiple partners, the local community, and strategies for lasting and self-sustaining ecological benefits.

A Chance to Learn

To date, close to 10,000 acres of habitat have been, is being, or is scheduled to be restored in the estuary in the coming years, either by the Estuary Partnership or by our collaborators. Each project improves the ecosystem in numerous ways. Because natural systems are always
changing, at times when conditions are marginal, such as during drought years, even a single site can play a role in maintaining regional biodiversity by providing needed habitat—habitat that in better years might be plentiful or even redundant. Given how interrelated ecological systems are, changes at one site can have benefits that ripple into the wider ecosystem. Increased salmon spawning, for example, affects the food web far beyond the spawning site (Johnson et. al 2003).

Restoration projects in the lower Columbia River and estuary not only provide benefits to habitats, but also serve to provide invaluable data by which to assess the immediate effects of different actions, the relationship among ecological components of the site, and the pace and direction of long-term change. Over time, monitoring will yield data on what works in the estuary and why, and this information will be disseminated to other restoration interests.

To begin this assessment, ten restoration projects are described here to capture and communicate the practical knowledge the Estuary Partnership has gained from its experience—keys to success, pitfalls to avoid, and ways of coping with unexpected obstacles. The ten highlighted projects have reached a point of completion at which there is a story to tell and lessons to be learned about planning and implementing restoration in the estuary, and the story will aid in our long term evaluation of project viability and future investments. Sharing such information is the purpose of this document.

What Is Habitat Restoration?

A Focus on Species Needs. Habitat restoration is providing species with what they need: particular habitat conditions and the ecological processes that create and maintain those conditions. For example, salmon in the estuary need food sources such as terrestrial and aquatic insects; cool water with the appropriate levels of oxygen, clarity, and salinity; shallow off-channel habitats for resting, feeding, and refuge from predators and high water; and spawning gravel at the appropriate depth, with the right channel contours and current velocities. These conditions are created by processes such as the movement of fresh and tidal water through channels and across floodplains, deposition and erosion of sediment, maintenance of native plant communities, and predator/prey interactions in the food web. Ideally, this happens within the context of a stable, functioning ecosystem.

An ecosystem’s stability comes in part from its complexity. The greater the number of distinct habitats within an ecosystem, the more species it can support, the more ecological processes and functions it can provide, and the better it can withstand disturbances (Johnson et. al 2003). Just as salmon need specific habitat conditions to thrive, an estuarine ecosystem needs complexity, and regular exchanges of energy, organic and inorganic material, and organisms if it is to be resilient over time and provide the functions we desire from it: production
of fish and wildlife, maintenance of water quality, flood attenuation, and recreational and aesthetic opportunities.

Categories of Restoration

Restoration project strategies fall into five broad categories that are appropriate in different sites and settings (Johnson et. al. 2003):

• **Conservation:** Maintaining biodiversity through the use of land management practices such as conservation easements and riparian fencing. Limited development can occur as long as existing ecological structures and functions are protected. Conservation allows existing natural processes to work to benefit species, in a self-sustaining manner.

• **Creation:** Creating a new ecosystem that did not previously exist on the site. This often involves converting one habitat type or ecosystem to another, usually by constructing or creating new habitat features that mimic conditions of an intact, functioning system. Examples include using dredged material to create marsh habitat or excavating new tidal channels. Creation projects normally require ongoing management, and their effectiveness is uncertain.

• **Enhancement:** Improving selected attributes of the ecosystem, such as the quality or size of a particular habitat. Examples of enhancement include riparian plantings, removal of invasive species, streambank stabilization, and replacement of tide gates and culverts.

• **Restoration:** Returning a site to a previously existing ecological state by altering controlling factors. Because restoration usually attempts to improve the entire ecosystem rather than just a few attributes, it typically involves intense modification and manipulation of site conditions. Restoration can be quite successful if the natural processes that create and maintain habitat at the site can be reestablished. Typical activities include breaching dikes, removing tide gates, installing or upgrading culverts, and adjusting site elevation.

• **Protection:** Using land acquisition or land use regulations to exclude activities detrimental to ecosystem structures, processes, or functions. Protection prevents degradation of existing areas that are in a desirable state.Unlike conservation, protection assumes no further development.

These strategies for restoration are sometimes used together. Restoration and enhancement are often paired, for example, and conservation can complement a newly enhanced or restored site.

The Estuary Partnership’s Restoration Approach

The Estuary Partnership takes an ecosystem-based approach to habitat restoration when selecting restoration projects. Among other factors, the Estuary Partnership considers whether the proposed project would take advantage of natural processes, restore lost habitat types, connect fragmented habitats, increase habitat complexity and stability, and incorporate monitoring and reference sites to evaluate the project’s effectiveness.

In the projects it funds, the Estuary Partnership relies on willing landowners and supportive communities to ensure restoration is successful. The Estuary Partnership supports projects that involve joint efforts by communities, organizations, individuals, and agencies, and Estuary Partnership funds are often only a portion of
the total project cost. This collaborative approach ensures that social and economic issues are considered early on, that community goals are addressed, and that there is support for projects over the long term.

Complete project selection criteria are available at www.lcrep.org/habitat_strategy.htm.

**An Ecosystem-Based Approach for Long-Term Success.** Current scientific literature indicates that natural processes are necessary to create and maintain habitats that support native species over the long term (Johnson et al. 2003; Thom et al. 2004; National Marine Fisheries Service 2000; and Bottom et al. 2005). In an estuary, tidal flushing cools channel waters, sediment accretion creates marshes that offer refuge areas for salmon, and riparian vegetation releases insects and plant material into waterways, helping to drive the food web. In a properly functioning ecosystem, these processes and conditions are self-perpetuating and do not require human intervention.

**Implications for Restoration Projects.** What does this mean for habitat restoration? First, the Estuary Partnership places a priority on restoration projects that strive to reestablish favorable habitat conditions and the natural processes that sustain them. Second, projects are assessed in an ecosystem or landscape context, not just as an isolated site. This is important because if a restoration project is to be sustained naturally over time, existing ecosystem processes of the surrounding landscape need to be able to maintain those conditions (Evans et. al., 2006). Third, the Estuary Partnership wants to foster greater understanding of how the controlling factors such as currents, habitats, and processes at a restoration site interrelate, how these components—and the ecosystem itself—will change over time, and whether the changes help ensure that action taken will bring about the desired outcome (Simenstad and Cordell 2000).

**Decision Making**

Understanding ecosystem processes and the five restoration categories help project planners decide what type of restoration projects to do at the appropriate location, and which actions will provide the highest benefit to the target species. If the level of disturbance at a site is high but the habitat-forming processes in the surrounding landscape still intact, full-fledged restoration is likely to be a good approach because the existing processes will help establish and maintain it. If a site is degraded and located in a highly disturbed area, enhancement or creation activities may be more appropriate. A relatively undisturbed site in a landscape of intact ecological processes suggests protection or conservation measures.

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In the Columbia River estuary, much of the landscape is moderately disturbed (National Research Council 1992; Thom et. al. 2004).
The Estuary Partnership, its Habitat Restoration Program, and Funding

The Estuary Partnership was established in 1995, when the lower Columbia River and estuary were accepted into the US Environmental Protection Agency National Estuary Program. As the coordinating body for efforts to enhance and restore the lower Columbia River and estuary, the Estuary Partnership engages in a variety of planning, monitoring, restoration, and educational efforts. It receives guidance on scientific and technical issues from its Science Work Group, which consists of representatives of public agencies, tribes, academic institutions, non-governmental organizations, and the private sector who play a role in assessing estuary conditions and setting future actions.

The Estuary Partnership initiated the habitat restoration program in 2000 with a habitat inventory. In 2003, with funding from the Bonneville Power Administration, on-the-ground restoration work was launched. The Bonneville funding was supplemented by two years of project funding through the US Environmental Protection Agency Targeted Watersheds Program and three years of funding through the NOAA Fisheries Community-Based Habitat Restoration Program.

Primary activities of the Estuary Partnership habitat restoration program are securing funds for projects; soliciting, reviewing, prioritizing, and selecting estuary restoration projects; administering project funding; providing management support as needed and providing a regional strategy and criteria for restoration. The program also has conducted habitat mapping and developed an extensive inventory of restoration projects by various parties in the estuary. This inventory gives project details and shows annual trends of restoration activities in the region.

Two other tools have been developed to help guide the strategy of the program in achieving habitat restoration goals:

- A digital video inventory of estuary shorelines. By coupling visual information with Geographic Information Systems (GIS) data, such as shoreline modifications and habitat types, this interactive tool helps quantify the amount of degradation in the estuary and the level and quality of ecosystem functions at specific locations.
- A GIS-based restoration prioritization framework. This strategic tool is useful in identifying the most ecologically beneficial sites for restoration and the best strategies to use at those sites. It incorporates GIS data, project selection criteria, and scoring and evaluation methods and reflects the Estuary Partnership’s ecosystem-based approach (Evans et al. 2006).
Project Facts

**Project sponsor:** Columbia River Estuary Study Taskforce


**Location:** River Mile 30, 17 miles east of Astoria, Oregon, between Knappa and Brownsmead

**Watershed context:** Diked floodplain in the brackish zone of the lower Columbia River estuary

**Restoration category:** Enhancement

**Linear reconnection:** Seven miles of inland slough channels

**Expected benefits:** Increased connectivity and tidal flushing, lower water temperatures, increased fish access to spawning and off-channel rearing habitat

**Monitoring parameters:** Water temperature, dissolved oxygen, and salinity; water elevation; fish presence

**Funding:** Bonneville Power Administration Fish and Wildlife Program
Blind Slough Restoration

Summary

Installation of three self-regulating tide gates and eight fish-friendly culverts to (1) restore a partial tidal connection between Cathlamet Bay and seven miles of inland channels and sloughs, (2) reduce water temperatures, and (3) increase access to juvenile salmonid rearing habitat.

Situation

Blind Slough is the main channel between the Columbia River’s brackish Cathlamet Bay and a network of small, inland waterways that ordinarily would provide high-quality spawning and rearing habitat for salmonid species. But in the early 1900s the area was diked to control flooding and accommodate agricultural and residential land uses in the floodplain. Wetland habitat has been lost in the area, and a series of levees, road crossings, and undersized culverts has reduced water flow through the channels. The Blind Slough Levee in particular completely blocks tidal circulation and fish passage to the inland channels and sloughs, which today are characterized by stagnant water, sedimentation, high water temperatures, and low levels of dissolved oxygen.

The Columbia River Estuary Study Taskforce (CREST) proposed two actions: installing fish-friendly tide gates and culverts in the Blind Slough Levee (to reestablish a partial tidal connection), and replacing undersized culverts (to increase water flow within the channel network). The designs of the tide gates allow adjustments to be made to control the amount of tidal water entering the network of channels. Likewise, inland waters could flow through the tide gate to the estuary on an outgoing tide. Breaching the levee and upgrading culverts restores ecological processes associated with tidal flushing, opens the inland waterways to salmon, and improves water quality and fish habitat in the slough.
Challenge

Construction of the project proceeded as proposed: three 60-inch culverts and three self-regulating tide gates were installed in the Blind Slough Levee. This effectively breached the levee in a controlled manner so that tidewater could enter the network of inland channels in the floodplain. Farther up the slough two 36-inch culverts were replaced with five 60-inch culverts to allow better circulation of water within the channels. Also, because improving water quality was a goal of the project, water temperature gauges were installed throughout the newly connected channels and sloughs to monitor the effectiveness of these actions. After construction, it became apparent that the tide gates had not been opened for operation. Inquiries revealed that community concerns about possible flooding had prevented the local diking district, which manages the tide gates, from opening them. Although an informal topographic survey was completed before construction, community members received little information about the effects of the tide gates and feared flooding of their property.

Solution

CREST installed three staff gauges and continuous depth gauges in the area that show water elevation. These serve as both visual references and important tools to inform community members about the level of flooding that can be expected from the tide gates and whether individual properties are at risk of flooding. Having such specific elevation data will help the community, CREST, and the diking district agree on how the tide gates should be operated to provide the greatest potential benefit to salmon while still preventing the flooding of agricultural lands.

Results

The eight culverts and three tide gates were installed as planned. Although tidal connection has not been reestablished because the tide gates have yet to be opened, replacing the culverts at the upstream location has aided the movement of water within Blind Slough. Preliminary results suggest that water temperatures are declining, but more data are needed before this aspect of the project can be evaluated.
Lessons Learned

- **Community support is crucial.** Community concerns about flooding kept the diking district from opening the tide gates. The elevation gauges are intended to help address those concerns.

- **Data gathering should occur first, followed by outreach.** Community members will feel more comfortable if they clearly understand the effects of a project. A strong outreach program, supported by data, allows issues to be brought out into the open and addressed before construction begins. In this case, conducting a full topographic survey of the area, sharing the results, and explaining the benefits of having salmon in the slough may have allayed many people’s fears.

- **Stay on top of social implications.** Although CREST regularly attended the diking district’s board meetings and those of the local watershed council, the concerns about flooding were influential enough to persuade the district to keep the tide gates closed. The Clatsop Diking Improvement Company Board of Directors weighs local concerns heavily in deciding how tide gates will be operated, and in this case it resulted in the delay of tidal fluctuation. This underscores the importance of using outreach to air issues, ease concerns and gain community support before the project is implemented.

Next Steps

Fish presence will be monitored once the tide gates are opened. In the meantime, as part of a separate effort, CREST is removing culverts at two other locations within the network of inland channels, to improve circulation within Blind Slough. In 2006, three additional culverts are planned for installation to reconnect an additional mile of tidal slough habitat.
Project Facts

**Project Sponsor:** Scappoose Bay Watershed Council

**Partners:** The Wetlands Conservancy, Malarkey Ranch, US Fish and Wildlife Service, Northwest Watershed Institute

**Location:** River Mile 85, between St. Helens and Scappoose, Oregon

**Watershed context:** Tidally influenced bottomlands of Scappoose Bay

**Restoration category:** Restoration

**Area of reconnection:** 30 acres of tidal floodplain

**Linear reconnection:** One-half mile of stream habitat

**Expected benefits:** Improved water quality and tidal wetland functions, increased biodiversity, fish access to off-channel habitat

**Monitoring parameters:** Fish and bird presence, water temperature, dissolved oxygen, turbidity, pH, nitrogen, phosphorus, baseline channel morphology, vegetative composition

**Funding:** Bonneville Power Administration Fish and Wildlife Program, US Environmental Protection Agency Targeted Watersheds Program, and US Fish and Wildlife Service
Malarkey Ranch Restoration

Summary
Replacement of two undersized culverts with steel bridges on private property in a tidal floodplain to (1) restore tidal flows, (2) improve fish access to Honeyman Creek and off-channel areas of Scappoose Bay, and (3) restore native plant communities and wetlands. Activities included removing invasive plants and planting native species.

Situation
Located near the confluence of the Multnomah Channel and the Columbia River, the Malarkey Ranch is a large, low-lying property set in the tidally influenced bottomlands at the south end of Scappoose Bay. Unlike many floodplain areas, the Malarkey property has undergone little diking and draining, so it has an extensive network of channels, vegetation is abundant, and the area is free of urban impacts. The site’s topography and quality of habitat make it a high priority for restoration, as described in the Scappoose Bay Bottomlands Conservation and Restoration Plan (The Wetlands Conservancy 2004) and the Scappoose Bay Watershed Assessment (Scappoose Bay Watershed Council 2000). The ranch has been used mostly for cattle grazing, duck hunting, horseback riding, and special events.

Unfortunately, significant portions of the wetland complex at Malarkey are cut off by undersized culverts. These structures restrict tidal flows, impede juvenile salmon access to off-channel habitat, and contribute to sediment build-up around the culverts, which changes the shape and flow characteristics of the stream and alters surrounding vegetation. In 2001, the Scappoose Bay Watershed Council completed an assessment of fish passage barriers in the bay and identified several on the Malarkey property.

Before this restoration project began, the owners of the ranch—a local farming family and business owners—had already replaced three culverts to improve access to the property and benefit fish and wildlife. The owners were willing to work with the watershed council to do more,
so two additional culverts were targeted for replacement with steel bridges. One of the two culverts was reducing tidal exchange in the floodplain and fish access to a large area of off-channel habitat. The flow velocity and constriction of the other culvert was restricting salmonid access to resting and feeding areas in Honeyman Creek.

**Challenge**

The first culvert was removed and a steel bridge installed without incident. However, a delay in completing a cultural resources survey pushed construction of the second bridge beyond the time frame allowed for in-water work. By the time the watershed council obtained an extension from the Oregon Department of Fish and Wildlife to do the in-water work later in the season, steel prices had jumped to three times the amount originally budgeted for the project. With steel now accounting for 50 percent of the total cost, available funds were inadequate to pay for both bridges.

**Solution**

Adjusting the project timeline and work schedule helped meet the constraints of the in-water work period. This bought time but still left the project underfunded given current market pricing. The Scappoose Bay Watershed Council was able to provide some additional funding and the landowners assumed the cost of paying for the culvert removal themselves, which represented about half of what was needed to complete the work. Estuary Partnership funds were then able to pay for the higher steel costs so the second bridge could be installed.

**Results**

With the removal of both culverts, 30 acres of floodplain and one-half mile of stream were reconnected to the tidal flows of the lower Columbia River via Scappoose Bay. The culvert sites have been planted with native trees and shrubs to improve the riparian areas. Conservation organizations are working with the property owners to consider other enhancement opportunities. With permission from the property owners, the watershed council brings groups to the site to view the projects and learn more about the Scappoose Bay bottomlands.

**Lessons Learned**

• **Expect the unexpected.** The spike in steel prices could not have been foreseen. It took flexibility, determination, and effort by all parties to make the project work once circumstances changed. Prices,
conditions, and situations do not remain static during the typically months-long period between project proposal and actual construction. Including contingency funds is helpful, although some funding sources do not allow contingency line items. Consulting with others about related experiences and project assumptions can help to develop a budget that accommodates unexpected bumps. Being creative and working together to find solutions is key.

- **Experience matters.** Having done a similar project before, the landowners understood the practical and ecological value of the culvert replacements and were willing to extend themselves to receive the benefits.

- **Outreach and communication can bring new options to light.** The Estuary Partnership and watershed council went directly to the landowners about the funding and schedule problems. The council’s ongoing partnership with the landowners helped them see themselves as part of the solution.

- **Persistence pays off.** The watershed council kept the landowners involved throughout the project. The council and the Estuary Partnership stayed focused on completing the project successfully, in spite of staff changes at both organizations.

- **Adapt techniques to specific site conditions.** Tidal fluctuations of up to five feet a day made it difficult to isolate the site during the construction period, and stream fluctuations interfered with water temperature monitoring. Implementing this project required adaptive management and flexibility in monitoring schedules and techniques to acquire enough reliable data.

**Next Steps**

Future projects at the site could involve working with other landowners and removing additional culverts on Honeyman Creek. When complete, the suite of culvert removals will open six miles of stream habitat to juvenile salmon.
Project Facts

**Project Sponsor:** Oregon Parks and Recreation Department

**Partners:** Oregon Department of Transportation, Ducks Unlimited, US Forest Service—National Scenic Area Office, US Fish and Wildlife Service, Oregon Habitat Joint Venture

**Location:** River Mile 130, ten miles east of Troutdale, Oregon, at Rooster Rock State Park

**Watershed context:** Remnant backflow area of the lower Columbia River in the Columbia River Gorge

**Restoration category:** Restoration

**Area affected:** 30 acres of blackberry removal

**Linear reconnection:** One-half mile of stream habitat

**Expected benefits:** Increased salmonid access to potential spawning areas, lower water temperatures, establishment of native streamside vegetation

**Monitoring parameters:** Water temperature, plant survival, stream hydrology (depth, pool retention, and scouring)

**Funding:** US Environmental Protection Agency Targeted Watersheds Program
Mirror Lake Restoration

Summary

Replacement of a failing culvert and earthen dam with a 70-foot bridge to (1) give salmon species access to upstream spawning areas, (2) reduce water temperatures both above and below the culvert, and (3) improve the hydrology of Young Creek, which feeds a lake and wetland complex designated as a Natural Heritage Area. Activities included removing blackberries along the stream and planting native willows and cottonwood.

Situation

Young Creek is one of two small streams that feed a high-quality emergent wetland complex at Mirror Lake, which is part of the historical floodplain of the Columbia River at Rooster Rock State Park in the Columbia River Gorge. This wetland complex is isolated from the river by Interstate 84, with the single connecting culvert passable to fish only at high water. Nevertheless, coho salmon, steelhead, and lamprey have been observed at Mirror Lake, as have other native species such as red-legged frog, bald eagle, and a variety of waterfowl. The Mirror Lake wetland complex is a registered State Natural Heritage Area. The lake holds water year-round, supports high-quality wetland habitat, and includes remnant ash/cottonwood stands. The surrounding area is degraded as a result of past land clearing, agriculture, and grazing.

The streambed in the upper reach of Young Creek has a cobble substrate suitable for salmon spawning, but access has been blocked by a failing culvert in an earthen dam that formerly was used as a farm access road. The creek’s naturally low flow has contributed to high stream temperatures, which have averaged 61° to 63° F during summer months and reached 78° F where the stream enters Mirror Lake. Temperature problems have been exacerbated by constriction at the culvert, with pooled, upstream water heating in the sun and downstream flow being reduced. Vegetation along Young Creek is dominated by blackberry in the upper reach and reed canary grass in the lower reach, leaving the stream exposed to the sun.

Initial restoration plans called for manipulating the hydrology of Young Creek to control blackberry and reestablish native plant communities. However, a feasibility study raised questions about how hydrologic modifications would affect the ecology of Mirror Lake,
roughly one mile downstream. After considering several alternatives, the site owner (the Oregon Parks and Recreation Department) decided to replace the culvert with a 70-foot bridge on concrete abutments located above the high water line.

Challenge

Before the project was implemented, Oregon Parks and Recreation was approached by the Oregon Department of Transportation about establishing the Mirror Lake complex as a wetland banking site. They proposed paying for extensive wetland restoration at the site and funding a perpetual endowment for maintenance. This would serve as partial mitigation for bridge replacement work that the Oregon Department of Transportation was performing under the Oregon Transportation Improvement Act State Bridge Delivery Program.

The Oregon Parks and Recreation Department agreed to participate in the wetland banking program and incorporated the culvert replacement into this much larger, multi-phase restoration effort. However, establishing the 480-acre Mirror Lake complex as a wetland bank would require more planning and preparation than could be completed in the two-year time frame allowed under the terms of the grant.

Solution

The Oregon Parks and Recreation Department negotiated an extension of the grant so that in-water work could occur a year later than originally planned. This delay allowed them time to develop a broad base of partners and funders, including the many agencies, governments, and non-profit organizations represented on the Wetland Mitigation/Conservation Bank Review Team. Several open houses helped garner the support of neighbors. Preparatory work included planning comprehensive restoration for roughly one-third of the 480-acre Mirror Lake site, conducting baseline monitoring, preparing a site review application, signing a formal wetland banking agreement, and completing permitting for the expanded scope of work. The culvert removal, bridge installation, and revegetation were completed as one of the first management actions for the site.

Results

Removal of the culvert opened roughly a half mile of stream habitat to anadromous fish and the bridge provides access to lands identified for further restoration work. Additionally, 30 acres of invasive blackberry have been removed and will be replaced with native willow and cottonwood that eventually will shade the stream. Water temperature and plant survival are being monitored, and maintenance of the site will continue through the endowment associated with the wetland banking program. Because this project is just one element of a full site restoration plan, the ecological benefits that will accrue over the long term are expected to be exponentially greater than if the project had been completed in isolation.
Lessons Learned

- **Recognize opportunities.** It is important to recognize opportunities as they come along, and to be flexible enough to take advantage of them. Wetland banking is enabling the Oregon Parks and Recreation Department to approach restoration at Mirror Lake in a much more comprehensive way—one that will amplify the ecological benefits of the work at Young Creek.

- **Establishing a broad partnership improves results.** The expanded restoration could not have taken place if Oregon Parks and Recreation Department had not assembled an effective wetland banking team. This required initiative and considerable time and effort.

- **Stay focused on project goals.** During the initial project planning the Oregon Parks and Recreation Department rejected several alternatives that would not have achieved its specific goals. Also, the Oregon Parks and Recreation Department was willing to wait for funding, make some adjustments, and select staff, contractors, and partners that together could deliver the desired project.

- **Appreciate timelines and constraints.** Large projects with multiple phases take time. Permitting in particular can take longer than expected. This can be especially true for a site that has other designations, such as Mirror Lake and its location in the Columbia Gorge National Scenic Area; those designations often carry additional land use controls and review processes. By communicating with partners early in the process, issues can be identified and addressed to keep projects on schedule.

Next Steps

Ten other management actions, ranging from wetland excavation to native forest regeneration, are planned for the Mirror Lake site and a long-term maintenance plan will be implemented as part of the perpetual endowment.
Project Facts

**Project Sponsor:** Wahkiakum Community Foundation

**Partners:** Washington Department of Fish and Wildlife, Lower Columbia Fish Recovery Board, Columbia Land Trust, Columbia River Estuary Study Taskforce, local timber companies, local landowners, Wahkiakum County Public Works

**Location:** River Mile 48, one-and-one-half miles west of Cathlamet, Washington

**Watershed context:** A four-mile tributary of the Elochoman River, which flows into the Columbia River mainstem in the tidal freshwater zone

**Restoration category:** Education and restoration

**Area affected:** 195 trees planted in a one-and-one-half mile riparian area

**Expected benefits:** Reduced water temperature

**Monitoring parameters:** Water temperature, dissolved oxygen, flow

**Funding:** NOAA Restoration Center Community-based Restoration Program
Nelson Creek Education and Restoration

Summary
A revegetation project with education and data gathering components, which employed local high school students to (1) assess conditions in a severely degraded stream, (2) plant native vegetation to reduce stream temperatures, and (3) lay the groundwork for future restoration efforts, including removal of a culvert.

Situation
Nelson Creek is a degraded fish-bearing stream in Washington’s timber-dependent Wahkiakum County. This four-mile-long creek passes through timberland, a culvert, and privately owned farmland before reaching the Elochoman River near the Julia Butler Hansen National Wildlife Refuge. Because the mouth of Nelson Creek is just a few miles upstream from the Columbia River, the creek is subject to tidal influence. In its lower one-and-one-half miles, Nelson Creek has been redirected from its sinuous historical course across the floodplain to a straight channel that parallels a road and dike.

Historically, Nelson Creek supported coho and chum salmon, resident cutthroat trout, and other fish species. Today it is in many respects a narrow, congested ditch. It suffers from sediment build-up, invasion of blackberry and reed canary grass along its edges, slow current, high water temperatures, loss of sinuosity and habitat complexity, and the presence of garbage. Turbidity and the lack of riparian vegetation are particularly problematic. Yet Nelson Creek has runs of chum salmon and steelhead every fall. To improve conditions for salmonid species, the Wahkiakum Community Foundation proposed an education project that would train students from Wahkiakum High School to do assessments and restoration work at the creek over the summer, with guidance from professional scientists and natural resource managers.

Challenges
In Wahkiakum County, habitat restoration projects have been few and opinions differ on the amount and type of restoration that is warranted, especially when a proposed action directly affects timber practices. There has been little experience with how environmental projects
interface with a natural resources based economy. In addition, the level of interest, commitment, and skill of the student participants was an unknown. The students had summer vacation and other activities competing for their time and attention.

**Solution**

A competitive application process ensured that the seven students selected for the project were motivated to engage in hands-on environmental science. The six-week project schedule was long enough for students to accomplish something but short enough that they could maintain an intense learning pace without burning out. Much of the success of the program was due to the energetic, dedicated high school science teacher, Jeff Rooklidge, who prepared students during the school year and worked with them daily in the field.

Perspectives from throughout the community were included as part of the project. Students met, received training, or conducted fieldwork with representatives of local logging companies, the Wahkiakum County Public Works Department, the Columbia Land Trust, the Washington Department of Fish and Wildlife, the Columbia River Estuary Study Taskforce, (CREST) and fish hatcheries. They also met with a Wahkiakum County commissioner and an area historian. As local residents themselves, the students could raise awareness of environmental issues from within the community, based on what they had learned.

**Results**

The students conducted a professional habitat assessment on the lower one-and-one-half miles of Nelson Creek. They surveyed riparian vegetation, gathered stream flow and water quality data, characterized instream habitat, and developed stream cross sections. The data they gathered will support future broad-scale restoration efforts in the area. For example, their assessment of the effect of a culvert on fish passage lays the groundwork for possible removal of the culvert in the future.

As a restoration action, the students planted 195 red cedar, dogwood, willow, and spruce trees along the streambank. This was in accordance with preliminary restoration recommendations they developed and presented to the community in various forums. They also competed successfully in the statewide Future Farmers of America Agri-Science Competition, winning first place in the small-group environmental science projects division and second place in the Reserve Grand Champion division, against larger schools. Their wins qualified them to participate in the national competition in Indianapolis in November 2006.

Community support for the students’ work has grown with their successes, which included securing funding for a second year of the program and expansion to neighboring Naselle High School. The students also developed an informational brochure with guidelines on streambank care that is available at the county courthouse and sent to new residents of the county.

**Lessons Learned**

- **Kids are capable.** The students in this project came in with little prior knowledge or experience and demonstrated a capacity to learn an incredible amount in a short time. They performed scientifically sound,
college-level fieldwork that will be used by the county, the Columbia Land Trust, staff at the Julia Butler Hansen National Wildlife Refuge, and others.

- **Bringing citizens of all ages together helps.** The students have been able to influence the behavior of long-time property owners and property owners can share their concerns with the students. As this project progressed, landowners invited students to their farms and property to discuss management of weeds, streams, and fish habitat.

- **Projects open doors and raise aspirations.** Several students who participated in the Nelson Creek project are considering environmental science as a career. One was hired as an intern with the Columbia Land Trust.

- **Small projects can yield big results.** In terms of on-the-ground acres, this was the smallest project the Estuary Partnership funded, yet it offers great returns: the opportunity for more extensive restoration, shifts in the community’s perception of environmental work, awareness of environmental science, and exposure to environmental stewardship. In addition, the success of the program led to a dramatic expansion of the program to a second year and the program doubled its budget, growing to 18 students, four teachers, and multiple project sites.

- **This model is transferable.** Theoretically, every on-the-ground project could be connected to a classroom, as long as there are motivated teachers and willing landowners.

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**Next Steps**

Vegetation, water quality, and fish monitoring will continue at Nelson Creek as the program continues, fencing will be installed to keep cattle out of a neighboring stream, and more riparian vegetation will be planted. These actions will support a culvert removal application to the county. Several returning students will mentor first-year participants as the program continues; other students will be going to college.
**Project Facts**

**Project Sponsor:** Columbia Slough Watershed Council

**Partners:** Metro, City of Portland Bureau of Environmental Services, Port of Portland, Oregon Department of Fish and Wildlife, Ducks Unlimited, Rhodia, Inc., Fish America Foundation, NOAA Restoration Center

**Location:** River Mile 102, in Portland, Oregon

**Watershed context:** Tidally influenced backwater slough in an urban area, two miles from the confluence of the Willamette and Columbia rivers

**Restoration category:** Restoration

**Area of reconnection:** 1.3 acres of off-channel habitat, plus 1.7 acres of revegetation

**Expected benefits:** Additional high-quality resting and feeding habitat for juvenile salmonid species, improved wetland habitat for terrestrial and bird species

**Monitoring parameters:** Fish presence, vegetation survival, erosion

**Funding:** NOAA Restoration Center Community-based Restoration Program
Ramsey Lake Restoration

Summary
Removal of a berm, enlargement of an existing alcove, and excavation of a remnant backwater channel within an urban area to (1) reestablish tidal connections, (2) reconnect off-channel habitat for juvenile salmon, and (3) enhance wetland functions and habitat for other native species. Activities included placing large woody debris in the inlet and planting native grasses, shrubs, and trees in the surrounding area.

Situation
The Ramsey Lake site is located along the tidally influenced Columbia Slough, a slow-moving channel that runs through the city of Portland and joins the Willamette River near its confluence with the Columbia River. Part of a former lakebed, the area has largely been filled with dredge spoils to accommodate urban and industrial land uses. As a result, the forested Ramsey Lake wetland is one of the last relatively intact natural wetlands in what used to be a 650-acre network of marshes, lakes, and side channels.

Although the Ramsey Lake site is flanked by an industrial complex on one side, it is owned by the City of Portland and adjoins the 2,000-acre Smith and Bybee Wetlands Natural Area, publicly owned by Metro. Together with the Columbia Slough, this interconnected system of shallow lakes and wetlands supports bald eagles, great blue herons, Western meadowlarks, painted turtles, and native freshwater mussels. Juvenile coho and Chinook salmon, steelhead trout, and Pacific lamprey use the area for feeding and refuge from November until June.

Given its relative ecological integrity and proximity to Smith and Bybee wetlands, the Ramsey Lake area was identified by the City of Portland and Columbia Slough Watershed Council as core habitat for restoration. The watershed council proposed enlarging and reconnecting
the alcove and enhancing off-channel habitat in two locations only a few miles from the mouth of Columbia Slough.

**Challenges**

This project proposed restoring only a few acres in a disturbed environment, which can make the project both more expensive and therefore less competitive on a regional scale. In addition, planning and permitting can be complex and time-consuming, and the watershed council did not have the capacity to complete all of the planning, permitting, and engineering tasks for the project.

**Solution**

The Estuary Partnership worked with the Columbia Slough Watershed Council to break the project into two phases and selected the first phase for funding. Changing the phasing and investment by the project partners helped keep the costs in line with project goals. The City of Portland contributed the engineering design and guided the project through the permitting process, the Port of Portland relinquished ownership of a portion of property it still held title to, and Ducks Unlimited and the Oregon Department of Fish and Wildlife conducted pre- and post-construction monitoring, as did various student and community volunteers.

**Results**

The berm that blocked movement of slough water was removed, the alcove was enlarged 200 percent, and the remnant slough channel was excavated to create approximately 1.3 acres of off-channel salmon habitat. Blackberry and reed canary grass were removed and native grasses, shrubs, and trees were planted to bring the total area of restoration to three acres. Juvenile Chinook were observed at the alcove within three months of the project’s completion as were frequent sightings of adult steelhead.
Lessons Learned

- **Restoration in disturbed areas makes a difference.** Although highly disturbed areas can pose special challenges in terms of cost and habitat connectivity, this project got near immediate results, with salmon appearing in the restored habitat in just a few months, making it highly beneficial.

- **Partnerships bring more resources.** The cost of the project was shared through the participation of the many partners, including volunteers who contributed hundreds of hours to monitor conditions, remove invasive vegetation, and salvage native plants.

- **Experience counts.** The expertise and experiences of city staff with other restoration projects helped the planning, design, and construction for the Ramsey Lake project go smoothly.

- **Successful restoration projects create education opportunities.** Local students from the elementary school level through community college learned about wetland ecology and fish biology by participating in the project, as did community members who received training on site monitoring. The Columbia Slough Watershed Council frequently leads tours of the completed project.

Next Steps

The Columbia Slough Watershed Council and City of Portland have received funding from other parties to complete the second phase of the project, which will restore an additional five acres of off-channel floodplain wetland habitat adjacent to this project site.
Project Facts

**Project Sponsor:** Columbia Land Trust

**Partners:** Pacific States Marine Fisheries Commission, Washington Department of Fish and Wildlife, Washington State Salmon Recovery Funding Board, Lower Columbia Fish Recovery Board

**Location:** River Mile 56, ten miles west of Longview, Washington

**Watershed context:** Lowest portion of a tributary to the Columbia River in the tidal freshwater zone; one-quarter mile of the tributary is tidally influenced

**Restoration category:** Protection

**Affected area:** 155 acres of riparian, floodplain, and upland habitat acquired

**Linear extent:** One mile of stream

**Expected benefits:** Increased opportunity for salmon spawning and rearing; improved watershed processes related to sediment, large woody debris, and vegetative community

**Monitoring parameters:** Vegetative composition, soils, stream hydrology, groundwater

**Funding:** Bonneville Power Administration Fish and Wildlife Program
Germany Creek Restoration

Summary

Acquisition of 155 acres of privately owned property along a small tributary at its confluence with the Columbia River to (1) protect existing salmon spawning and rearing habitat, and (2) restore additional off-channel salmon habitat and improve watershed processes.

Situation

Ecologically, the lowest reaches of Germany Creek are some of the most important in the Germany Creek watershed. In its last mile, this small tributary to the Columbia River is flanked by red alder with an understory of mostly native plants, such as salmonberry and sword fern. The area supports federally listed bald eagle and Columbian white-tailed deer, along with steelhead, cutthroat trout, and coho, Chinook, and chum salmon. All five of these salmonid species use the creek for spawning and rearing, and important populations of chum salmon spawn at two locations in the lowest mile of the stream. The area has been identified by the Lower Columbia Fish Recovery Board as a high priority for salmon recovery efforts.

The owner of this property approached the Columbia Land Trust to sell 155 acres for purposes of conservation. The parcel in question consisted of high-quality upland, floodplain, and riparian habitat in the lowest mile of the creek, including one-quarter mile that is tidally influenced. The Columbia Land Trust requested funding to acquire the property to protect it from development. Acquisition also would enable future restoration to improve ecosystem processes and increase opportunities for salmon spawning and rearing.
Challenges
A non-profit organization works to keep its costs effective so its budget for acquisition is often finite as it tries to work with the property’s fair market value. This can restrict a non-profit organization’s ability to negotiate for purchase of the property if there are other competing buyers. Determining the fair market value can take time and be difficult to assess. In the case of the Germany Creek parcel, multiple property appraisals were done and reached different conclusions. (Differences centered mostly on the value of timber on the property.) These differences resulted in negotiations extending beyond the twelve month contract period for the project, with no guarantee that an agreement would be reached.

Solution
The property had been in the landowner’s family for decades and was part of the history of the area. In fact, the local community had a strong sense of its logging and iron-working past, which it honored in a small museum and associated outbuildings. The landowner recognized the ecological significance of the property and valued it in its current, undeveloped state. This attitude helped the Columbia Land Trust negotiate with the landowner to accept long-term conservation and stewardship of the property as partial compensation in the sale, instead of selling the parcel for top dollar. The land trust also worked to speed up the appraisals and reach an agreement on fair market value.

Results
The Columbia Land Trust purchased 155 acres of riparian, floodplain, and upland habitat for permanent conservation and future restoration.
Lessons Learned

- **Build on the stewardship ethic of landowners.** The Columbia Land Trust could not necessarily compete dollar-for-dollar with other potential purchasers. But the seller understood the ecological significance of the property, valued conservation, and was motivated to ensure long-term stewardship in lieu of his personal compensation for the land.

- **Land acquisition can be complicated.** Many factors come into play in land transactions, from determining the actual value of the land to working with the sellers’ needs to potential competing buyers. It took care and time—more than a year—to complete the final appraisal and negotiate a deal with the seller.

- **Negotiations are sensitive.** Until a deal is struck, it is important to be discreet and keep the potential transaction confidential.

Next Steps

The Columbia Land Trust is in the process of evaluating and implementing restoration projects for the property, such as planting unvegetated areas, enhancing the floodplain forest, and placing large woody material in the creek. In addition, one side of the creek has a series of springs and an old, cobbled stream channel that has filled with sediment and become overgrown; this could be excavated to create additional chum spawning habitat. The other side has several deep, man-made ponds—also fed by springs—that could be reconnected to the creek to create additional off-channel habitat. Restoration actions are expected to improve floodplain connectivity, habitat diversity, and sediment loading. In some cases, Germany Creek’s location near existing conservation projects, such as Abernathy Creek and Crims Island, could help magnify the benefits of restoration at the site.
Project Facts

**Project Sponsor:** Columbia Land Trust

**Partners:** Columbia River Estuary Study Taskforce, Ducks Unlimited, Washington Salmon Recovery Funding Board, Lower Columbia Fish Recovery Board, Pacific Coast Joint Venture, US Fish and Wildlife Service Private Stewardship Grant Program, Washington Department of Fish and Wildlife, Wetland Reserve Program, Charlotte Y. Martin Foundation, National Fish and Wildlife Foundation, USDA Wildlife Habitat Incentive Program

**Location:** River Miles 19–23, near the towns of Grays River, Rosberg, Oneida, and Deep River, Washington

**Watershed context:** Tributaries and diked floodplains of Grays Bay, in the brackish zone of the Columbia River estuary

**Restoration category:** Protection and restoration

**Affected area:** 880 acres protected, 440 acres of floodplain reconnected, 300 acres of salmon habitat restored

**Linear extent:** Three miles of riparian shoreline

**Expected benefits:** Increased off-channel habitat for salmonids, tidal reconnection, improved water quality and wetland processes, regeneration of native vegetation, conservation of intact habitat and watershed functions, monitoring opportunities

**Monitoring parameters:** Water quality (temperature, dissolved oxygen, conductivity, and salinity), water depth, channel morphology, sediment accretion and erosion, fish presence, vegetative composition, topography

**Funding:** Bonneville Power Administration Fish and Wildlife Program, US Environmental Protection Agency Targeted Watersheds Program
Grays River Protection and Restoration

Summary

*Land acquisition, tide gate removal, dike breaching, and other restoration activities at neighboring sites along three tidally influenced tributaries to (1) protect intact habitat for salmon, bald eagles, and other native species, (2) reconnect the floodplain, (3) improve water quality and ecosystem processes, (4) restore native vegetation, (5) provide off-channel rearing opportunities for salmonid species, and (6) study the effects of large-scale, multi-site restoration.*

Situation

Grays River, Deep River, and Crooked Creek all empty into the Columbia River at Grays Bay, within just a few miles of each other. Dikes and levees have largely separated these meandering, tidally influenced tributaries from the floodplain to allow for logging, farming, and grazing. Yet the area still has remnant old-growth Sitka spruce forests, intact wetland swamps, and backwater channels that, if reconnected to the river, could be high-quality rearing habitat for cutthroat trout, steelhead, coho, Chinook, and limited but important populations of chum salmon. These species already use the three tributaries for spawning and rearing. In fact, the Grays River area supports the largest chum population in the lower Columbia River. Bald eagles nest at three sites along the tributaries, and 100 acres of habitat appear suitable for nesting by the threatened marbled murrelet. Although logging has caused sedimentation and other problems in the waterways, the area is relatively free of urban impacts.

Challenge

Frequently, restoration is constrained by the size, condition, location, and availability of potential sites. In the Columbia River estuary, many sites are simply unavailable because they are being used for urban, agricultural, industrial, or residential purposes, or will be in the future. Those sites selected for restoration tend to be relatively small and isolated from each other, and they may be located within moderately to heavily disturbed landscapes. Given how complex and far-reaching ecosystem processes are, it can be difficult to take action at the ecosystem level, affect systemwide change, and improve understanding of restoration science when working at the scale of individual restoration sites.
Solution

When several landowners in the Grays River area approached the Columbia Land Trust about protecting their property through conservation, the Land Trust saw the potential for a unique endeavor: a large, coordinated, multi-site restoration project that would employ a variety of restoration strategies and include rigorous monitoring to evaluate their effectiveness. Because the parcels in question were sizeable (up to 160 acres) and could be acquired from willing sellers, it would be possible to implement ecosystem-scale actions such as removing tide gates and breaching dikes to reconnect the river and the floodplain.

Local landowners (including The Nature Conservancy) and potential project partners and funders recognized the ecological significance of the Grays River area and were willing to support the multi-site restoration effort. The Columbia Land Trust worked with The Nature Conservancy to acquire several parcels, obtained grants to purchase other properties from willing sellers who valued conservation, and mobilized local support for the project through numerous public meetings and other community outreach. The Land Trust also engaged the Columbia River Estuary Study Taskforce (CREST) to develop and manage a comprehensive, strategic monitoring program.

Results

The Columbia Land Trust acquired eleven properties along Grays River, Deep River, and Crooked Creek. The parcels, which varied in size from 20 to 226 acres, included spruce swamps and other intact wetland habitats, diked farm and forestland, disconnected backwater channels, and small roads—all within roughly two miles of each other. In all, more than 800 acres of habitat were acquired for protection and restoration.

A topographic survey and baseline monitoring were completed before restoration work began. On several sites, tide gates were removed, culverts were upgraded, and dikes were breached to reestablish the tidal connection to the floodplain. These actions have allowed tidal flushing of formerly stagnant backwater sloughs and have opened or created roughly 300 acres of potential salmonid rearing habitat. Approximately 500 acres of backwater, riparian, and wetland forested habitat have been reconnected to the Columbia River estuary via the tributaries. Activities have included road decommissioning and construction of cross-dikes to protect neighboring properties.

One site, Secret River, is serving as a reference site for others. This 226-acre parcel is hydrologically connected to the Columbia River and has intact upland forests, high-quality wetlands and intertidal areas, and excellent rearing habitat for salmonid species. Secret River provides information on forest composition and structure, intertidal and channel wetland functions, fish and wildlife use, and water quality dynamics that are useful in evaluating the effects of restoration actions at the other sites.

In addition, the US Army Corps of Engineers and Battelle National are using the Grays River sites to test protocols for monitoring the cumulative effects of multiple
restoration actions. Once final, the protocols will be promulgated for use at other complex restoration sites. So far, monitoring at Grays River indicates that juvenile salmonids and other fish are using the restored sites, water within the sites has cooled and is sometimes richer in dissolved oxygen than previously, and native vegetation is returning unaided to the emergent wetlands.

**Lessons Learned**

- **Recognize the complexity of large-scale projects.** Projects with as many components as this one require organization, flexibility, and persistence. Many factors need to be orchestrated, and a delay in one area can affect other components.

- **Respect timelines.** In every project, much needs to be accomplished during the contract period, so it is important to prepare well, track progress, and keep everything in order during the inevitable changes in the project.

- **Work together and have a plan.** A coordinated effort by all parties helps ensure timely completion of the work and high-quality results.

- **Stewardship ethics matter.** Stewardship of the land extends beyond the project boundaries to neighboring properties and the surrounding community. Community involvement needs to be ongoing.

**Next Steps**

Revegetation is scheduled, and other restoration activities are being considered at the Grays River sites. Monitoring will continue for several years. The results will be used to refine plans for future restoration at the various sites.
Project Facts

**Project Sponsor:** Scappoose Bay Watershed Council

**Partners:** The Wetlands Conservancy, Ducks Unlimited, Oregon Department of Fish and Wildlife, Bonneville Power Administration, Natural Resource Conservation Service, Columbia River Youth Corps, Bureau of Land Management.

**Location:** River Mile 85, between St. Helens and Scappoose, Oregon

**Watershed context:** Tidally influenced bottomlands between Multnomah Channel and Scappoose Bay

**Restoration category:** Conservation and enhancement

**Affected area:** 173 acres in conservation easement, five acres of revegetation

**Expected benefits:** Improved water quality; establishment of native vegetation; increased use by fish and wildlife, including salmonids and birds

**Monitoring parameters:** Fecal coliform bacteria, water temperature, dissolved oxygen, pH, turbidity, and conductivity, fish and bird presence, vegetation, and photo points

**Funding:** US Environmental Protection Agency Targeted Watersheds Program
Hogan Ranch Conservation and Enhancement

Summary
Conservation, revegetation, and grazing management of privately owned wetlands and tidal sloughs along Multnomah Channel to (1) improve water quality, and (2) enhance wetland habitat for native fish and wildlife, including salmon and steelhead, beaver, river otter, waterfowl, bald eagles, osprey, and pond turtles. Activities included a topographic and vegetation survey using light detection and ranging (LIDAR).

Situation
Hogan Ranch consists largely of a low-lying, tidally influenced wetland complex in the floodplain of Multnomah Channel roughly four miles from the lower Columbia River. High-quality riparian and slough habitat, native Oregon ash and wetland vegetation, some oak savanna, and a location near Scappoose Bay, the Sauvie Island Wildlife Area, and Oregon Parks and Recreation Department land make Hogan Ranch attractive to a variety of native fish and wildlife species. Beaver and river otter can be found on the property, along with migratory sandhill cranes, tundra swans, and other waterfowl. Hydrologically, several creeks and side channels connect the ranch with Scappoose Bay, and these waterways are used by salmonid species—steelhead, Chinook, coho, and cutthroat trout—for feeding, rearing, and resting during high flows. Because Hogan Ranch is one of the last tidally connected wetland complexes in the Scappoose Bay bottomlands, it was identified as a high priority for conservation and enhancement in the Scappoose Bay Bottomlands Conservation and Restoration Plan (The Wetlands Conservancy 2004) and the Scappoose Bay Watershed Assessment (Scappoose Bay Watershed Council 2000).

Although Hogan Ranch offers many ecological benefits, its creeks and riparian areas have been degraded as a result of livestock grazing. Cattle have trampled the streambanks and wetland areas, damaged the substrate, and contributed fecal runoff to the waterways, with obvious impacts on water quality, both at the site and downstream. The vegetative understory also has been
degraded, and invasive species such as reed canary grass, Canadian thistle, and Himalayan blackberry have gained a foothold at the ranch.

The property owner, a local rancher, was interested in enhancing and conserving the wetlands at Hogan Ranch. He applied to enroll the ranch in the Natural Resource Conservation Service Wetland Reserve Program; enrollment would provide a permanent easement on the property so that it would be managed for conservation in perpetuity. In support of the application, the property owner and the Scappoose Bay Watershed Council sought funding to fence cattle away from streambanks at the ranch, begin removing invasive species, and plant native vegetation to improve water quality and wetland habitat.

Challenges

The dynamic nature of this tidal wetland complex posed several challenges, particularly related to fencing and monitoring. Variations in precipitation and tide levels caused unpredictable flooding and drought conditions, to the point that at times the fencing was completely submerged or the wetlands were completely dry. High water levels also interfered with fencing installation, deposited woody debris that damaged fencing, and made it difficult to complete revegetation and conduct appropriate monitoring. Because of the size of the property (173 acres), conditions varied considerably from one area to the next; this meant that the site could not be effectively managed as a single unit. Also, grazing had degraded much of the native understory, and a suitable reference site that would have guided selection of new plant communities could not be found.

Solution

The landowner invested considerable time and effort repairing fencing and will continue to work on fence maintenance and repair. The watershed council proceeded with revegetation using native species. For the purposes of future management, the watershed council is breaking Hogan Ranch into smaller units that better reflect the varying conditions on the site.

Results

Volunteers recruited by the watershed council and members of the Columbia River Youth Corps removed invasive species from ten acres of Hogan Ranch and replanted selected areas with native ash, willow, dogwood, and other species. More than 10,000 feet of fencing was installed to keep cattle out of the wetlands and sloughs and the ranch was successfully enrolled in the Wetlands Reserve Program. The associated conservation easement will protect the property from future development and provide the landowner with a tax benefit. As part of the easement, a grazing management plan was developed by the landowner and the Natural Resources Conservation Service that will balance selective grazing—some for suppression of reed canary grass—and protection of sensitive wetland habitats. The property will be used for educational programs and tours.

Lessons Learned

• Baseline monitoring is important. In the absence of a reference site, thorough baseline monitoring gave the watershed council valuable information on ecological
conditions at Hogan Ranch. Such information is useful in evaluating progress and deciding on next steps in the restoration process.

- **Comprehensive monitoring is key.** The watershed council collected data on small fish in shallow water. Only later did the council realize that larger salmonids were using neighboring wetlands at higher water levels and might also be present at Hogan Ranch at certain times of the year. Given more time, the watershed council might have been able to document changing salmonid use at the project site. Monitoring requires organization, effort, and experience, and each site presents its own monitoring challenges. In this case, it was difficult to find monitoring protocols that were appropriate for the freshwater tidal system at Hogan Ranch. Connecting with other organizations may help identify suitable resources.

- **Work together.** The Hogan Ranch project partners included hunters, farmers, public agencies, and conservation organizations. In any project, partners can at times have conflicting goals; open communication can help each party understand and respect the others intentions and help reach a compromise on restoration measures.

Next Steps
Reestablishment of wetland forests, emergent wetlands, and wetland prairies is being considered for Hogan Ranch.
Project Facts

**Project Sponsor:** The Wetlands Conservancy

**Partners:** The Nature Conservancy, Oregon
State University Institute for Natural Resources,
Scappoose Bay Watershed Council, Columbia
Land Trust

**Location:** River Mile 85, between St. Helens and
Scappoose, Oregon

**Watershed context:** Tidally influenced
bottomlands of Scappoose Bay

**Restoration category:** Planning

**Study area:** 8,960 acres

**Expected benefits:** Protection, conservation,
and restoration of high-quality wetlands in
the floodplain

**Funding:** Bonneville Power Administration Fish
and Wildlife Program
Scappoose Bay Conservation and Restoration Plan

Summary

Development of a plan that characterizes the remaining high-quality wetlands in the Scappoose Bay bottomlands, identifies and describes the seven most important sites to be conserved and restored, and proposes conservation and restoration strategies for those top-priority sites.

Situation

Located on the western side of Multnomah Channel, near its confluence with the Columbia River, the Scappoose Bay bottomlands are in a rural area with a history of agriculture, logging, and industry. Because dikes and levees separate much of this low-lying floodplain from the tidal action of the lower Columbia River and Multnomah Channel, non-native plants have become established in the area. Also, with the growing human population in northwest Oregon, more people are taking up residence around Scappoose Bay and industrial activities, especially gravel mining, are increasing.

Still, the area has some of the largest intact habitats in the lower Columbia River that reflect historical conditions yet remain unprotected by formal conservation agreements. Mudflats and emergent marshes, ash riparian forests, and oak and Douglas fir savanna support a variety of special-status species, including several rare plants, five salmonid species (coastal cutthroat, steelhead, and Chinook, chum, and coho salmon), and painted turtle, bald eagle, and sandhill crane. Many other native species also are found in the bottomlands and in nearby protected areas, such as the Sauvie Island Wildlife Area and Oregon Parks and Recreation Department land. The combination of high ecological value and the increasing development and industrial pressures in the Scappoose Bay bottomlands makes the area important for conservation and restoration.
Challenge

The conservation potential of the Scappoose Bay bottomlands was clear: Pacific Coast Joint Venture, the Oregon Biodiversity Project, and independent consultants all acknowledged the area’s ecological significance in various planning documents. What was missing was a conservation roadmap for the bottomlands that identified the most important sites for conservation, appropriate restoration actions, or strategies for achieving conservation. With limited funding, it was important that money was spent to yield the best ecological results. This called for a strategic approach to guide project selection—a strategy that would consider the relative value of different projects from an ecosystem perspective.

Solution

The Wetlands Conservancy worked with several project partners to develop a conservation and restoration plan for the 8,960-acre Scappoose Bay bottomlands. The plan assembles existing information on current and historical ecological conditions, identifies the seven most ecologically significant sites in the area and the threats to those sites, and proposes specific conservation and restoration strategies for each site. The focus of the plan is not just salmonids, but wetland and upland habitats and the variety of native fish and wildlife that depend on them. Preliminary land appraisals were performed for several sites, and the plan suggests three protected, nearby natural areas as reference sites for future restoration projects in the Scappoose Bay bottomlands.

Results

The *Scappoose Bay Bottomlands Conservation and Restoration Plan* has moved the discussion of the future of the bottomlands to a more strategic approach, integrating site-specific opportunities with an overall plan. Potential restoration projects in the area now can be compared in terms of their strategic value, and the plan is helping the Scappoose Bay Watershed Council describe the significance of various restoration opportunities to its Board of Directors. Several restoration projects in the area have been implemented with more confidence because they are known to be consistent with the conservation plan. Additionally, the Scappoose Bay plan served as a springboard for the Wetlands Conservancy to develop a similar plan for Youngs Bay in the Columbia River estuary.

Lessons Learned

- **A strategic conservation plan provides direction, scientific justification, and a communication tool for stakeholders.** The Scappoose Bay plan delineates the next steps to take for conservation in the bottomlands, provides scientific justification for those steps, and helps communicate the ecological value of particular sites to landowners, the local community, and potential project partners and funders.

- **Involving multiple parties increases confidence in the results.** Many organizations participated in development of the Scappoose Bay plan. Having diverse perspectives helps ensure the final results are scientifically sound and can be relied on during decision making.
• **A plan can streamline subsequent project selection and implementation.** The Scappoose Bay plan provides baseline data and scientific justification for specific restoration actions. Having this information in advance can save time when preparing project proposals, communicating the value of projects to potential funders, and preparing for project implementation.

• **A thorough analysis of ecological conditions requires good resources.** GIS maps, tax lot information, and other data are essential in determining the ecological resources on different parcels of land, yet not all of this information was readily available when the Scappoose Bay plan was being developed. The accessibility of data influences how quickly a plan can be completed.

• **Early efforts provide an opportunity to learn and adapt.** The Scappoose Bay plan was a chance to test drive a planning methodology later refined for the Youngs Bay plan. For the Scappoose Bay plan, existing ecological conditions were assessed and then the best available sites for conservation and restoration were identified. For the Youngs Bay plan, the desired conditions—habitat type, plant communities, fish presence, etc.—were defined first, and then planners looked for sites that had or currently have those attributes. This methodology is expected to better identify sites with high ecological value or potential.

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**Next Steps**

With a solid plan in place, efforts in the Scappoose Bay bottomlands will shift to project implementation. Project partners will meet with landowners to discuss the possibility of formal conservation agreements such as easements, fee title sales, and land donations to protect additional high quality habitat.
Project Facts

**Project Sponsor:** City of Portland Bureau of Environmental Services, Watershed Revegetation Program

**Partners:** Metro, Friends of Smith and Bybee Lakes, Columbia Slough Watershed Council

**Location:** River Mile 102, in Portland, Oregon

**Watershed context:** Tidal freshwater wetlands in the floodplain near the confluence of the Columbia and Willamette rivers and the Columbia Slough

**Restoration category:** Enhancement

**Affected area:** 22 acres of scrub-shrub and forested wetland revegetation

**Expected benefits:** Restoration of native vegetation, increased native canopy, reduced water temperature

**Monitoring parameters:** Vegetation survival and cover

**Funding:** US Environmental Protection Agency Targeted Watersheds Program
Smith and Bybee Lakes Revegetation

Summary
Revegetation of wetland and riparian scrub-shrub and forest habitats between two shallow, interconnected lakes in the Columbia River floodplain to (1) reestablish native plants along the lakeside, and (2) reduce water temperatures over time. Activities included preparing the site for planting; removing non-native, invasive plants; planting native trees and shrubs; and monitoring.

Situation
Located two miles from the confluence of the Willamette and Columbia rivers, Smith and Bybee Lakes are two shallow bodies of water that form the centerpiece of a 2,000-acre designated natural area within the city of Portland. The lakes, which are interconnected, alternately drain to and receive flow from the Columbia Slough, which is connected to the Columbia and Willamette rivers. A recently installed water control structure, complete with fishway, is used to regulate water levels in the lake to mimic historical levels: high in the winter and spring, and low in the summer, when native wetland plants such as wapato appear in the lake’s mudflats. The Smith and Bybee Lakes area has several different wetland and riparian habitats and supports a variety of wildlife, including beaver, river otter, osprey and bald eagles, and one of the last sizeable populations of Western painted turtles in the state.

The stretch of land between the two lakes had become dominated by invasive plants such as blackberry and reed canary grass, leaving the shoreline exposed to the sun. As part of a larger revegetation effort around Smith and Bybee Lakes, the City of Portland Bureau of Environmental Services proposed removing invasive plants and planting the inter-lakes area with native trees and shrubs. Over time this portion of the lakeside will eventually be shaded, causing water temperatures to decrease.
Challenges
The Bureau of Environmental Services Revegetation Program has extensive experience implementing and managing large projects. This resulted in a high level of efficiency, which saved both time and money on the project—enough to allow the project to expand the revegetation area by four acres, from 18 to 22. Even with the larger revegetation area, it became clear several months before the contract ended that the project would come in well under budget—plant costs were lower than expected, it was easier than anticipated to maneuver around large woody debris when planting on the site, and water retained by the water control structure had significantly suppressed the reed canary grass, thus reducing the number of treatments necessary to address it. This left funds that were used for additional work, increasing the overall value of the project.

Solution
The Bureau of Environmental Services received a contract extension to plant additional native trees and shrubs in the inter-lakes area, roughly doubling the density of the revegetation thus increasing the value of the project. This will likely improve the viability of the newly planted vegetation and accelerate the process of shading the lakeshore and reducing water temperatures.

Results
More than 13,000 big leaf maples, alders, ash, cottonwoods, and willows were planted in the area between Smith and Bybee Lakes, along with such understory plants as red osier dogwood, Oregon grape, Douglas spirea, and snowberry. Existing weedy vegetation was sprayed and cut several times, and areas with heavy reed canary grass were mulched. Because the lakes are populated by beaver, the new plantings were protected with plastic mesh tubes and steel wire cages. Community awareness of activities in the area is high. The Columbia Slough Watershed Council and Friends of Smith and Bybee Lakes both lead tours of the area and involve citizens in restoration and monitoring activities, the Bureau of Environmental Services provides educational signage on its projects, and Metro, which manages the area, has built a paved trail and wildlife viewing platforms in the inter-lakes area.
Lessons Learned

• Sometimes projects go more smoothly than expected. Actual costs were lower than projected and the Bureau of Environmental Services has the expertise that required minimal oversight from the Estuary Partnership. These efficiencies resulted in more restoration for the same funds.

• Tracking the project’s progress helps keep options open. Revising the scope to include additional work was possible because the Estuary Partnership and the Bureau of Environmental Services knew how the project was going early enough to make adjustments and still meet deadlines.

• Urban projects offer unique opportunities. This project was in a natural area that is threatened on all sides. Community support for Smith and Bybee Lakes is high, and it is likely that other restoration projects, such as the water control structure, will magnify the benefits of this single project. Effects also are likely to be amplified by restoration that the Bureau of Environmental Services Revegetation Team has completed—with Metro—on an additional 70 acres at Smith and Bybee Lakes.

Next Steps

Plant survival will be monitored by Metro for ten years, with competing non-native vegetation being sprayed or cut as needed to allow native species to become established.
Additional Reading

These reports are available for viewing on the Estuary Partnership web site at www.lcrep.org/library.htm.


