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SHORELINE RESTORATION PLAN FOR THE CITIES OF OCEAN SHORES AND WESTPORT

Prepared for the Cities of Ocean Shores and Westport

Prepared by
Herrera Environmental Consultants, Inc.

on behalf of
AHBL

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from the Washington Department of Ecology.

SHORELINE RESTORATION PLAN
FOR THE
CITIES OF OCEAN SHORES AND WESTPORT

Prepared for
City of Ocean Shores
P.O. Box 909
801 Minard Avenue Northwest
Ocean Shores, Washington 98550

and

City of Westport
P.O. Box 505
604 North Montesano Street
Westport, Washington 98550

Prepared by
Herrera Environmental Consultants, Inc.
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121
Telephone: 206-441-9080

on behalf of
AHBL
2215 North 30th Street, Suite 300
Tacoma, Washington 98403

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LIMITATIONS

As with any report, there are limitations (inherent or otherwise) that must be acknowledged. This report is limited to the subjects covered, materials reviewed, and data available at the time the report was prepared. The authors and reviewers have made a sincere attempt to provide accurate and thorough information using the most current and complete information available and their own best professional judgment. Any questions regarding the content of this report should be referred to staff at the City of interest.

INTRODUCTION

This restoration plan serves as a guide for the cities of Ocean Shores and Westport (the Cities) to achieve improvements in ecological functions of degraded shoreline areas as required by WAC 173-26-201(2) (f). The plan identifies proposed and planned, site-specific, restoration projects identified by others and by Herrera on a 1-day field visit.

The plan includes recommendations for shoreline cleanup, debris and armoring removal, beach nourishment, and invasive species removal. It also describes types of programmatic activities that would support shoreline restoration. Finally, this document describes partners and grant opportunities that could facilitate implementation of the restoration plan, and provides suggested implementation mechanisms for achieving restoration goals.

PURPOSE AND INTENT

The purpose of this restoration plan is to improve degraded areas of shoreline within the Cities over time by restoring shoreline ecological functions and processes. This plan will be accomplished through voluntary and incentive-based public and private programs to restore and enhance shoreline areas.

This plan serves as a guide for the Cities to support and develop projects that are planned to improve ecological functions (physical, chemical, and biological) of degraded shoreline areas as required by WAC 173-26-201(2)(f). Preliminary and general restoration recommendations were made in the Shoreline Inventory and Characterization (Herrera and AHBL 2015). However, this plan expands on that work and:

- Identifies current planned restoration projects
- Suggests targets for shoreline habitat protection and conservation
- Summarizes existing studies that prioritize where future restoration can be most effective and should have highest priority
- Identifies programmatic restoration opportunities that could be applied to candidate shorelines within the Cities

Scope

The scope of this plan is to identify restoration and programmatic opportunities to improve shoreline ecological functions along the marine and freshwater shorelines of the Cities. As directed by Ecology, projects to improve shoreline access and other shoreline attributes are beyond the scope of this plan. The shoreline areas included in this plan are defined as the water body and all uplands within 200 feet from the ordinary high water mark (OHWM) of lakes greater than 20 acres, marine waters, and associated tidelands and wetlands. This includes those portions of streams within the OHWM of Grays Harbor in both cities and the network of canals and lakes within the city of Ocean Shores.

Context

This plan relies on multiple strategies that use physical restoration to improve and protect shoreline functions and resources. This plan's success depends on the involvement of a number of government and nonprofit organizations that are stewarding and restoring land in the Cities. They include, for example, Wild Fish Conservancy, The Nature Conservancy, the Friends of Grays Harbor, Quinault Indian Nation, US Fish and Wildlife Service, National Oceanographic and Atmospheric Administration, Washington Department of Natural Resources (WDNR), Washington Department of Fish and Wildlife (WDFW), and Washington State Department of Ecology (Ecology).

One of the largest stressors on the ecological health of the Cities are the past shoreline modifications, such as fill and the placement of hard infrastructure like the two jetties, that enable the existence of each of the cities. Natural disturbance due to the intense wave activity common on the beaches of the outer coast must be considered when planning restoration activities. These same disturbance processes will likely generate an apparent need for future shoreline armoring, as they have historically along the southern shoreline in Ocean Shores.

This plan recommends preservation of habitat and ecological functions where possible. While protecting shorelines from future development does not directly restore or improve habitats, preservation does help maintain no net loss. For example, where marine riparian areas with intact native vegetation can be preserved, they will help maintain shoreline habitat for salmon and other economically important species, provide a native plant seed source, and supply large woody debris—all functions that support adjacent shoreline ecological processes.

Shoreline Master Program

Ecology Shoreline Master Program Guidelines (Ecology 2011) require the development of a shoreline restoration plan as part of the shoreline master program (SMP) update process. This plan supports the goals, policies, and regulations of the Cities' SMPs. Although the protective and mitigation provisions of the SMPs are intended to achieve no net loss of ecological functions from new adverse impacts, this restoration plan will help ensure that the shoreline ecological functions within the Cities achieve no net loss with potential for improvement over time. As such, this plan serves as a technical companion to the Cities' SMPs.

Restoration Plan Objectives

- Encourage and facilitate cooperative restoration programs between local, state, and federal public agencies, tribes, nonprofit organizations, and landowners to address shorelines with impaired ecological functions or processes.
- Restore and enhance shoreline ecological functions and processes, as well as shoreline features, through voluntary and incentive-based public and private programs.
- Target restoration and enhancement toward improving habitat required to support the life cycles of priority or locally important fish and wildlife species.
- Ensure restoration and enhancement is consistent with and, where practicable, prioritized based on the biological recovery goals for steelhead, salmon (CBPHWG 2008), and other species or populations, such as snowy plover, for which a recovery plan is available.
- Seek funding for restoration, enhancements, easements or acquisitions using federal, state, county, grant, private donation, or other funding sources.

Restoration Policies

The following policies will guide the Cities' restoration projects:

- **Policy 1**. Restoration and enhancement actions will improve shoreline ecological functions and processes and should be designed using principles of landscape and conservation ecology. The primary goal is to restore or enhance physical and biological ecosystem-wide processes that create and sustain shoreline habitat structure and functions.
- **Policy 2**. Encourage and facilitate cooperative shoreline restoration and enhancement programs between local, state, and federal agencies, tribes, nonprofit organizations, and landowners to address shorelines with impaired ecological functions.
- **Policy 3**. Target restoration and enhancement projects that will support the life cycles of priority species, such as Chinook and other anadromous fish; locally important plants, fish and wildlife (e.g., snowy plover); and other populations or habitats for which a prioritized restoration or recovery plan is available (CBPHWG 2008, USFWS 2007).
- **Policy 4**. Integrate restoration and enhancement with other natural resource management efforts such as the Grays Harbor Estuary Management Plan.
- **Policy 5**. Seek and support funding opportunities from state, federal, private, and other sources to implement restoration and enhancement projects.
- **Policy 6**. Encourage restoration and habitat enhancement projects by developing project permitting and processing guidelines that will streamline their review.
- **Policy 7**. Avoid adverse impacts on existing critical areas, fish and wildlife habitat conservation areas, water quality, and water storage capacity in all shoreline restoration and enhancement projects.

METHODS

Inventory Data and Information Sources

A variety of information sources were examined and used to develop this plan. Most of the existing information on restoration projects relate to plans developed by others to assess the needs of wild fish and their prey. They include a series publications produced by the Wild Fish Conservancy (Sandell et al. 2011, 2013, and 2014; Sandell and McAninch 2013). None of the projects identified by these works are within the city limits of either city, but the general goals of the studies do lend themselves to certain projects within the bounds of this plan.

Unlike many other areas in western Washington, there have been very few restoration projects undertaken in the Cities, and even fewer restoration projects planned. Despite the lack of restoration projects, there have been a number of innovative ecological management approaches to the particular challenges faced in the Cities. Each City has developed positive, effective innovative solutions to the unique environmental challenges of the outer coast of Washington. Because each City struggles with many of the same physical constraints, these approaches and the lessons learned from them could be shared across the channel.

To augment the Cities' efforts, the primary source of information for specific projects, aside from interviews with local interest groups, was a 1-day visit to the Cities to identify projects on the ground. The site visit was prefaced by an in-office meeting attended by a geomorphologist, a fisheries biologist, a restoration engineer, and a wetlands scientist, where the best available science described in the Shoreline Inventory and Characterization Report and other related studies was discussed. The entire shoreline was examined during this meeting, and potential targets for restoration were identified after more detailed examination on the site visit. The site visit occurred on October 17, 2014, which had a high tide of 8.45 feet above mean lower low water (MLLW) at 9:48 a.m. and a low tide of 4.48 feet above MLLW at 3:00 p.m., as observed at Westport, Washington (NOAA 2014).

Identification of Restoration Opportunities

Restoration opportunities were identified in each city on the site visit, focusing on habitat limiting factors identified in Sandell et al. (2011) and other relevant literature, such as the Western Snowy Plover Recovery Plan (USFWS 2007). Sandell et al. (2007) identified estuarine creeks and wetlands as heavily affected by past development. As a result, rearing opportunities for juvenile anadromous fish have been lost and can only be regained if these habitat types are restored or created. Project information sheets are provided below for each site-specific project that is proposed, planned, or currently active. In the case of the Cities, the majority of restoration projects target rearing habitat for variety of salmonid species, including Chinook, coho, chum, steelhead, and cutthroat trout. This is because there is much more scientific analysis of restoration needed to support salmonid species with ESA listings, and very little information on limiting factors for other shoreline dependent species in the Cities (aside from the snowy plover). For salmonids, rearing habitat has been shown to be a

critical factor in population sustainability, but has been diminished due to development throughout the harbor (Sandell et al. 2011).

In particular, restoration activities were identified according to the following site characteristics found to be good targets for restoration in the Cities' Shoreline Inventory and Characterization Report (Herrera and AHBL 2014) in conjunction with conditions observed on the 1-day reconnaissance:

- The site is degraded with respect to key species' habitats and presents an opportunity for restoration that will produce a net gain in shoreline ecological functions and habitat in the future.
- The site has unused or relict shoreline armoring and infrastructure, which if removed would likely lead to gains in habitat or improvements in physical processes.
- Site has or is adjacent to areas having specific, high-value, biological features such as mature riparian forest or wetland habitats that support important fish species, birds, and other wildlife.
- Site would provide public access for water dependent and shoreline recreational use.
- Site is potentially contributing contamination to the surrounding landscape.

Identification of Restoration Priorities

Priorities for restoration were largely drawn from local studies that generally prioritized projects that restore previously modified shorelines, improve salmon recovery, and increase intertidal marsh area. These studies are:

- A series of studies performed by the Wild Fish Conservancy to improve wild salmonid populations in the harbor (Sandell et al. 2011, 2013, 2014; Sandell and McAninch 2013)
- The Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIA 22 and 23 (CBPHWG 2008)
- Salmonid habitat limiting factory analysis (WSCC 2001)

These studies used field surveys and analytical methods to determine restoration priorities and make recommendations for sites that would provide the greatest gain towards improving critical habitats and shoreline ecological functions. Summaries of their findings are provided in this plan to inform users about already documented priorities for additional restoration and protection in the Cities. The information provided and the results of these studies can be effectively used as a basis for planning and prioritizing future projects.

RESTORATION PRIORITIES

The protection and recovery of anadromous salmonid species has been identified as the primary focus for shoreline restoration projects in the Cities, given past development and disturbance of shoreline areas (Sandell et al. 2011). The Cities, resource agencies, tribes, nonprofit organizations, and private interests are already coordinating protection and management efforts for salmonid species. Existing habitat conditions, habitat limiting factors, and proposed protection measures for salmonids in the Cities have been presented in several completed management documents (Sandell et al. 2011, CBPHWG 2008, WSCC 2001). These documents were developed with the intent of identifying specific habitat issues throughout the Cities. The authors of these documents also propose protections and strategies for conserving anadromous salmonid populations. Protection measures and goals that have been identified as priorities for the Cities include:

- Restore access to low-gradient habitats blocked by culverts or other barriers focusing on those cases with high potential benefits (i.e., reconnecting large areas of intact, forested habitat) and reasonable project costs.
- Reduce shoreline armoring and fill, and remove deleterious shoreline debris, including creosote-treated pilings. Consider the use of sandy dredge spoils as shoreline nourishment to improve intertidal habitat conditions.

Secondarily, the protection of shellfish resources is an important focus for shoreline restoration projects in the Cities. Shellfish harvesting is an important economic driver in the Cities, as well as an important shoreline dependent recreational activity for the Cities' residents. Most of the risk to shellfish resources comes from development, primarily via stormwater contamination from runoff. By creating buffers along shorelines that reduce stormwater contaminant loading to receiving waters (mostly metals, but also polycyclic aromatic hydrocarbons (PAHs) and other manmade contaminants); there is an improvement in human health of those that consume shellfish and potentially an expansion of the areas available to shellfish harvest.

SITE-SPECIFIC RESTORATION PROJECTS BY CITY

Site-specific proposed and planned projects are organized by city. As stated in the *Identification of Restoration Opportunities* section above, restoration projects were drawn primarily from field observations by Herrera and restoration goals outlined by others (primarily the Wild Fish Conservancy). Figure 1 shows the city boundaries and the general locations of these proposed and planned projects.

There are two site-specific opportunities in the city of Ocean Shores: Ocean Shores Marina and Protection Island Road Removal and RV Park Relocation. Both of these opportunities are associated with tribally owned property that bounds Grays Harbor at the southeast end of the city. Both of these projects would remove deleterious, decaying infrastructure.

There are four site-specific opportunities in the city of Westport: Airport Slough Ponds, Interdunal Wetland Bank, Montesano Street, and Winter Creek. These opportunities address a range of impairments in the city, from stormwater treatment and estuarine habitat disruptions to wetland destruction.

Ocean Shores

Overview

Ocean Shores contains a wide variety of shoreline types with 17.8 miles of Pacific Ocean waterfront, 23 miles of Grays Harbor shoreline and more than 30 miles of freshwater shoreline mainly associated with Duck Lake and its canal system. Ocean Shores' shorelines are predominantly residential, with a small portion of them being recreational and vacant/open space.

Restoration Priorities and Opportunities

Both of the site-specific restoration opportunities in Ocean Shores relate to the improvement of shoreline conditions along its Grays Harbor shoreline rather than its freshwater shoreline. Although by length, most of the shoreline is freshwater, along Duck Lake and its canals, the area is mostly artificial and is not accessible to salmonids or other marine species. It is also mainly in private ownership. All of these factors minimize ecological potential and complicate any restoration activity. Finally, the primary restoration/conservation action on these freshwater shorelines has already been implemented with the establishment of the Weatherwax wetland bank.

By contrast, the Grays Harbor shoreline has extensive use by commercially important species, such as salmonids and shellfish. The shoreline is largely in its natural alignment, but there are also several relict, decaying structures on this shoreline due to past, abandoned development (Tables 1 and 2). These attributes make it the logical place for restoration activities, at least compared to the freshwater shorelines and the outer coast, which is prone to extreme natural disturbance due to intense wave activity and rapid geomorphic change.

Table 1. Ocean Shores Marina.

Project Name	**Ocean Shores Marina**		
Location	**Ocean Shores**		
		Project Sponsor	City or Quinault Indian Nation
		Project Status	Conceptual
		Target Habitat	Salmonid spawning and rearing habitat
		Current Ownership	Quinault Indian Nation
		Zoning	Commercial
		Hydrogeomorphic Classification	Estuarine shoreline
		Project Size	2000 feet of shoreline
		Strategy	Debris removal
Existing Conditions	The Ocean Shores Marina is protected by two 500-foot-long riprap jetties, which shelter more than 17 acres of Grays Harbor. The active marina is confined to a single set of piers at the southern end of the marina. The rest of the marina has no formal existing use, with the exception of a decaying boardwalk (see picture). The boardwalk is missing in places, and the remainder of the boards are in various stages of rot. Invasive species (predominantly) on the adjacent shoreline are common. The shoreline itself is steep and completely covered by the boardwalk.		
Project Description	2,000 feet of decaying decking would be removed, and the shoreline slope would be made more gradual. Nourishment (sand) would be placed where appropriate. Invasive species would be removed and replanted with native plants that would grade from emergent wetland species in the upper intertidal, scrub-shrub near and above mean higher high water (MHHW), to upland species near the top of the slope.		
Future Threats	Further decay of remnant infrastructure, continued presence of overwater structures impairing nearshore habitat.		
Project Rationale	The overwater decking that surrounds the marina is harmful to salmonid migration, useless in its current state, a public safety hazard, and prevents access to the water. The decking could be easily removed and shoreline access improved, while improving salmonid migration along the shoreline and potentially opening up new rearing areas in this crucial location.		
Functions Restored	Improved salmonid migration, juvenile salmonid rearing.		

Table 2. Protection Island Road Removal and RV Park Relocation.

Project Name	**Protection Island Road Removal and RV Park Relocation**
Location	**Ocean Shores**

Project Sponsor	Unknown
Project Status	Conceptual
Target Activity	Water quality
Current Ownership	Quinault Indian Tribe
Zoning	Recreational
Hydrogeomorphic Classification	Marine shoreline
Project Size	6 acres
Strategy	Debris removal, revegetation

Existing Conditions	The project site has been subject to significant erosion, as Damon Point has migrated eastwards. The shoreline migration has caused roadway asphalt to be transported along the beach and out to Damon Point. Eventually the shoreline will likely migrate to Marine Drive, possibly requiring shoreline protection. At the RV Park next door, there are sites that are developed that are immediately adjacent to marine inundated areas with no vegetative buffer. Finally, there is a portion of Protection Island Road that remains on Damon Point (outside city limits), but the road is now isolated from the mainland.
Project Description	The roadway would be removed and disposed of at an upland disposal site. The RV Park would be relocated on other tribal land in the area. The site would be revegetated with a suite of vegetation that will buffer the existing shoreline from Marine View Drive Southeast. Substantial woody vegetation (e.g., shore pine and other shrubs) would be included in this vegetation mix to retard shoreline migration. If possible, removal of Protection Island Road on Damon Point would be included in this project, though logistically it would be more difficult than the mainland road removal and would likely require a barge.
Future Threats	Sea level rise and wave energy increases eroding more pollutant generating surfaces, wave-induced erosion of Marine View Drive Southeast.
Project Rationale	More than 100 feet of unused roadway remains exposed to the erosive conditions at the former connection point to Damon Point. As can be seen in the photo, the pavement is in contact with marine waters during high water events and has eroded progressively into the sea over the last 20 years. In addition, immediately adjacent to the road is an RV Park, with some sites having no buffer between them and the intertidal. Both the roadway and the RV Park likely contribute hydrocarbons (via leaking oil lines and gas tanks, exhaust, etc.) to the marine environment and potentially interrupt high tide migration of juvenile salmonids.
Functions Restored	Improved water quality, human safety (by slowing and preventing migration of the shoreline into Marine View Drive Southeast), and improved salmonid migration.

Habitat Benefits

The habitat benefits from these site-specific actions will improve physical conditions for rearing and migrating salmonids using the Grays Harbor nearshore. Further revegetation of the shorelines will also provide a food source (macroinvertebrates) to both juvenile and adult salmonids. Finally, the vegetation will also provide shade that is currently lacking in many locations, though water temperature is generally not a concern in the area due to its geographic location.

Westport

Overview

Westport's shoreline is marine in character and consists of 7.1 miles of Pacific Ocean waterfront, of 8 miles of waterfront within the Grays Harbor navigation channel and 10 miles of Grays Harbor shoreline. Westport is an active maritime community, with moorage available to over 600 charter, commercial, and sport fishing vessels, plus a wide range of pleasure craft at Westhaven Marina. The city also has extensive seafood processing facilities at the marina, and considers seafood processing an important contributor to the city's economy. The city also contains a small estuarine creek, called Winter Creek, which drains to Grays Harbor. The creek itself is not within the shoreline jurisdiction, though it is within the (marine) 100-year floodplain for most of its length.

Restoration Priorities and Opportunities

The main site-specific restoration opportunities in Westport relate to the improvement of the greater Winter Creek and the entirety of Grays Harbor estuary as a nursery for salmonids (Tables 3 and 4). Salmonid rearing has been identified as a key limiting factor in the restoration feasibility analyses performed by others (Sandell et al. 2011). Juvenile salmonids rear in estuarine wetlands and small stre ams that fringe the city's eastern edge, but these areas have been impaired and reduced due to past development.

In addition to improving juvenile salmonid rearing success, a couple of the opportunities (Winter Creek and Montesano Street: Tables 3 and 4) will also have water quality benefits. This is important for the City because of its dependence on the shellfish industry. Although western Grays Harbor remains open for shellfish harvest, there is a risk over time that accumulated contamination, possibly from stormwater and other anthropogenic sources would close these shellfish harvest grounds. In particular, Table 4 illustrates the Montesano Street project that would treat stormwater runoff to the harbor. It is likely that there are other low-lying sites where low-impact development techniques could be implemented that would buffer development and improve water quality.

Currently, Winter Creek is regulated by a tide gate, which is at least a partial fish barrier. Improving fish access at this location is a recommended restoration project (Table 5), but other opportunities could have indirect benefits to rearing juvenile salmonids that modify existing physical and hydrologic constraints, including some programmatic actions discussed in the *Programmatic Restoration Opportunities* section below.

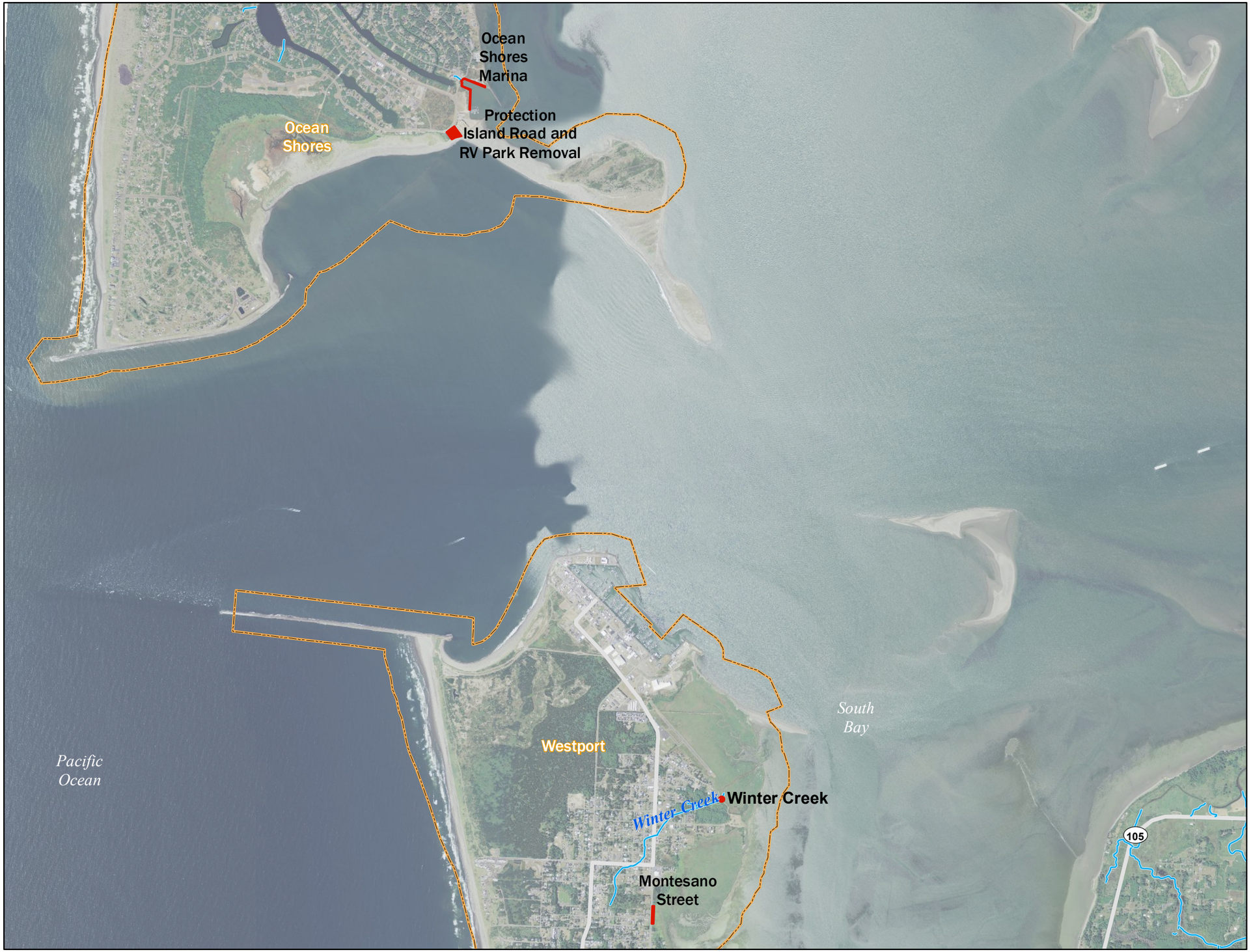
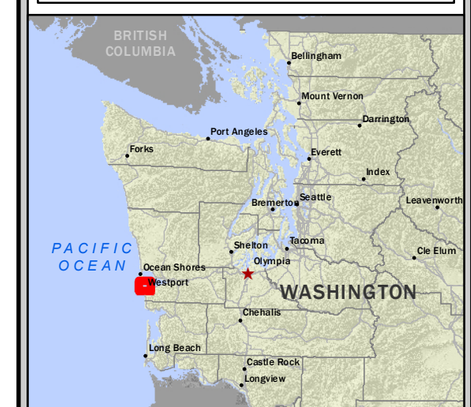


Figure 1.
Map of Proposed Site-Specific Restoration Opportunities within the Cities.

Legend

- Restoration opportunity site
- Stream
- Highway
- City limit



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USDA, Aerial (2013)

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Table 3. Montesano Street.			
Project Name	**Montesano Street**		
Location	**Westport**		
		Project Sponsor	City of Westport
		Project Status	Conceptual
		Target Habitat	Shellfish
		Current Ownership	City of Westport
		Zoning	Transportation
		Hydrogeomorphic Classification	Estuarine wetlands
		Project Size	1000 feet roadway and shoreline
		Strategy	Stormwater management
Existing Conditions	Montesano Street borders estuarine wetlands for approximately 1,000 feet near its junction with Veterans Avenue. A number of stormwater outfalls discharge directly to Grays Harbor along the road. Inlets exist on both sides of the street, and water is discharged from the system to the east, into the estuary. The road also lacks a sizeable curb to prevent direct runoff to the harbor. The area is within 500 feet of approved shellfish harvest areas and only 1,500 feet from a common harvest site.		
Project Description	The installation of roadside bioretention along the west edge of Montesano Street would effectively reduce stormwater volume and treat runoff from the west side of the street. Because the street is located directly adjacent to the estuarine wetland, there is no room for bioretention on the east side of the street. Instead, Filterra systems or similar water quality treatment systems should be installed to treat surface runoff from the east side of the street. Both bioretention and Filterras (or similar) would be effective at treating harmful bacteria, nutrients, and organic chemicals that could harm shellfish beds. In addition, the maintenance requirements for these best management practices are very low; and thus, the maintenance burden would be minimal. Care should be taken to use an advanced bioretention media that will not export nutrients. Research has indicated that some specifications for bioretention soil media may result in nutrient and copper export.		
Future Threats	Degraded water quality, adjacent shellfish harvest closures.		
Project Rationale	Untreated stormwater discharging into shellfish beds could lead to bacterial contamination and the subsequent closing of shellfish harvesting. The waters around Westport are listed for organic chemicals (some carcinogenic) and fecal coliform. By treating the stormwater from Montesano Street, human health will be improved by reducing direct exposure and reducing contamination of shellfish beds.		
Functions Restored	Improved water quality, human health, and shellfish habitat.		

Table 4. Winter Creek.			
Project Name	**Winter Creek**		
Location	**Westport**		
		Project Sponsor	City of Westport
		Project Status	Conceptual
		Target Habitat	Salmonid rearing and cover habitat
		Current Ownership	City of Westport
		Zoning	Commercial
		Hydrogeomorphic Classification	Estuarine stream
		Project Size	0.3 miles of stream
		Strategy	Fish passage
Existing Conditions	Currently there are two 48-inch vertical-hinge tide gates at the mouth of Winter Creek. The tide gates were installed in 1988. In the summer of 2014, these gates were propped open temporarily to allow seawater to control (invasive) vegetative encroachment on the channel upstream of the tide gates. This suppressed the growth of reed canarygrass and provided access to intact juvenile salmonid rearing habitat.		
Project Description	The project would replace the existing tide gates and replace them with fish-passable tide gates, such as side-hinge gates. The gates could be expanded to provide even better flood protection than under existing conditions and further reduce velocity migration barriers. The project could be further improved if the adjacent parcels were acquired by the City and the stream was returned to a more natural (meandering) alignment. Due to concerns about fish intrusion into the stormwater system, a fish barrier must be installed somewhere near the 2nd Street crossing to prevent fish accessing City stormwater infrastructure, which could be detrimental to those fish.		
Future Threats	Sea level rise and increased flooding from runoff backing up behind closed or malfunctioning gates. Continued intrusion of freshwater invasives into the Winter Creek channel.		
Project Rationale	There is about 0.3 miles of intact riparian habitat, (see photo) that is restricted to juvenile salmonids. Although the creek is channelized and privately owned through this area, habitat conditions are excellent; and given the extensive wetlands adjacent to the stream, unlikely to be developed. Updating the gates would improve fish passage and flood conveyance. The upstream fish barrier would prevent fish from migrating into the City's stormwater system.		
Functions Restored	Juvenile salmonid rearing habitat, improved vegetative management of streamside areas, improved drainage of upper basin areas.		

Habitat Benefits

The primary benefits of two of the site-specific projects described above would be to improve juvenile salmonid rearing success, enhance overall salmonid migration and improve water quality. However, these projects would also potentially provide a buffer between human development and harbor waters. This would benefit the marine ecosystem as a whole, including shellfish, which can bioaccumulate anthropogenic toxins. This would ultimately have human benefits, as these actions would prevent shellfish closures of this vital economic sector and reduce contamination of shellfish that could also harm the consuming public.

Programmatic Restoration Opportunities

In addition to the site-specific actions mentioned and summarized in the previous sections, several broad-scale programs are being implemented, or are suggested to be implemented to assist with the Cities' restoration efforts. They are described below.

Expansion of the US Army Corps of Engineers Beach Nourishment Program

Erosion of private residences and public infrastructure is a critical environmental issue in the Cities. US Army Corps of Engineers guidance is clear that beach nourishment should be encouraged wherever possible. The US Army Corps of Engineers currently dredges on average (between 2000 and 2012) 887,600 cubic yards annually from the Grays Harbor Navigation Channel near the Cities (US Army Corps of Engineers 2014). Beginning more than twenty years ago after erosion destroyed the access to Westhaven State Park and threatened the City of Westport Waste Treatment Plant. After the isthmus at the South Jetty was breached, the US Army Corps of Engineers began using a small subset of dredged material as beach nourishment, near the Westhaven State Park parking lot and at the east end of Half Moon Bay. This was made a quasi-regular practice in 2002, with placed volumes typically being between 10 to 20 percent of the total volume of dredged material (US Army Corps of Engineers 2014). Although the material placed here has eroded because of wave and wind energy conditions, regular nourishment has more or less arrested the dramatic erosion that precipitated the original beach nourishment program.

Currently the most acute erosion problem throughout the Cities is near the North Jetty in Ocean Shores. Here erosion has been a chronic problem (as recently as the winter of 2014: KOMO News 2014) and has been accelerating in recent years, possibly due to sea level rise and increased wave energy due to climate change (discussed at length below). Although the North Jetty is further from current dredge operations, the placement of even a fraction of the currently wasted spoils could be beneficial to the community to slow erosion and prevent emergency actions, such as the placement of rock and other permanent shoreline structures.

Even though the existing beach nourishment program has already addressed the worst erosion problems in the city of Westport, other areas in Westport remain at risk to erosion. For instance, the shoreline south of Ocean Avenue has eroded approximately 30 feet between 2006 and 2011. The City of Westport is encouraged to identify those areas that may eventually require shoreline protection and proactively expand the nourishment program to incorporate these areas. Proactive measures now will avoid difficult and complex decisions later when the danger to development is too great to avoid constructing ecologically harmful hard structures.

Consider Limiting Vehicular Access to Pacific Beaches (Ocean Shores)

In 1989, the communities of the outer coast entered into a planning process to be compliant with the Seashore Conservation Act and to regulate vehicular access to Pacific beaches. There were three planning areas: North Beach, of which Ocean Shores is a part; South Beach, of which Westport is a part; and Long Beach. It was agreed that in each of the planning areas, at most 40 percent of the shoreline would be used by vehicles between April 15 and Labor Day. It was decided that some areas would be off-limits to vehicles entirely, except during clamming season. As part of the South Beach Recreation Management Plan, the City of Westport agreed to restrict vehicular access to all of its Pacific Ocean beaches (City of Westport et al. 1989). Meanwhile the City of Ocean Shores elected to maintain vehicular access to its beaches, with some restrictions placed between Chance A La Mer Boulevard and Pacific Boulevard as well as south of Marine View Drive (City of Ocean Shores and Grays Harbor County 1989). Although a very traditional and accepted approach to access the beach, elimination of public vehicular access in the City of Westport has decreased anthropogenic nearshore disturbance and likely reduced contaminant loading to adjacent coastal areas. The pedestrian-only access points are also generally popular with the local citizens.

Automobiles are a known vector for contamination of water, including, but not limited to, bioaccumulating heavy metals. Such pollutants bioaccumulate in shellfish (e.g., razor clams) that are harvested commercially and recreationally in the City of Ocean Shores, rendering them detrimental for human consumption. One way to ease the implementation of disallowing vehicle access via the City's road grid to the ocean beaches might be to construct a single restricted beach entrance. Although driving would still be allowed on the beach from other access points, it would produce a situation locally (at the restricted access point) that would enable the public to evaluate whether they prefer that access change. The City may need to update or revise the North Beach Recreation Management Plan in collaboration with Grays Harbor County and Washington State Parks to implement this change.

The City of Ocean Shores would then monitor the use of the restricted access point, assess related disturbance compared to other Pacific beach areas to determine whether the policy should be applied to all City-owned Pacific beach access points, and determine whether complete vehicular access prohibition, similar to what currently occurs in the City of Westport, is feasible and preferred.

Encourage Soft Shore Armoring of Grays Harbor Shorelines (Ocean Shores)

In Ocean Shores, there are a large number of residential properties along the Grays Harbor shoreline. Some of these properties have armor to protect past fill placed during the construction of the city. A program to encourage alternative means of protecting vulnerable property and residences in this area may be an effective way to improve shoreline functions while also protecting property and residences.

The need for armoring along the Grays Harbor shoreline is related to protection of past fill only. Natural shorelines in this area do not typically require structural protection. Because the shoreline over geologic time is accreting due to the net influx and entrapment of both Columbia River and Chehalis River sediment (Gelfenbaum and Kaminsky 2010), protection is limited to storm events and slope stability issues related to past fill slopes. These are ideal

conditions for soft shore armoring approaches, such as beach nourishment and secured wood placement. These approaches could replace existing riprap revetments (the most common type of armoring currently) or could be employed on currently unarmored shorelines that are vulnerable from high water induced (sea level rise induced) erosion.

Consider the Removal of European Beachgrass

Although the Cities are near the northern limit of the nesting range of the western snowy plover, it has been well documented that European beachgrass (*Ammophila arenaria*) impairs the formation of western snowy plover nesting habitat. Invasion of European beachgrass also degrades overall species richness, cutting plant diversity in half as compared to areas where native dune grasses are dominant (Barbour and Major 1990). European beachgrass does bind the loose, mobile sand and provides some measure of erosion protection. In the areas where erosion is a problem (e.g., just north of the North Jetty in Ocean Shores), removal should not be considered because, even if the site is planted with native dunegrass, these plants do not resist erosion to the same degree as the invasive grasses and might initiate landward migration of the shoreline. However, there are areas in the Cities, most particularly the northern half of Ocean Shores and in the state parks in Westport, where accretion is significant and there is a substantial buffer between those areas that would be a target for European beachgrass removal and existing development. In these areas, habitat for Western snowy plover could be expanded by replanting native grasses and restoring the physical processes that lead snowy plover habitat formation (i.e., gaps in grass clumps, interspersed with sand). These changes might also accommodate any northern shift in western snowy plover populations due to climate change.

Removal of Abandoned Creosote-Treated Pilings

Recently WDNR completed a survey of abandoned creosote-treated piles in Grays Harbor (WDNR 2014). Puget Sound has had a program to remove abandon creosote-treated pilings since 2004. This program has removed more than 14,000 tons of creosote-treated timber from Puget Sound since its inception (WDNR 2015). Removal of these pilings not only has ecological benefits, but also has human health benefits, particularly in Grays Harbor where recreational shellfish is a key shoreline activity.

Removal of Blockages in Intertidal Channels in Grays Harbor (Westport)

Due to the interaction of historical alterations and natural processes, a number of blockages have been identified in the intertidal channels between Westhaven and the southern City limits along the Grays Harbor in Westport. None of this area is developed or is likely to be developed in the future. Therefore to improve and expand access to relatively rearing areas, investigation should be undertaken to identify potential fish barriers in these channels and remove them, where they can expand habitat to rearing juvenile salmonids.

Removal of Abandoned Homes

There are a number of abandoned homes within the shoreline jurisdiction, particularly in Westport along Pacific Avenue. Eventual removal of these homes would benefit nearby shorelines through the reduction of impervious surface and reduction in contaminant loading.

It would also benefit human health, as abandoned homes are a known vector for human diseases and vermin (Shane 2012). They can also attract illegal dumping, leading to further contamination of nearby water bodies. This program could also improve property values and benefit public safety, as abandoned homes typically depress property values and increase local crime rates (Shane 2012). Cataloging these homes throughout the shoreline jurisdiction is the first step in the removal process, similar to the effort to catalog creosote-treated piles performed recently by WDNR (WDNR 2015, see previous opportunity). After cataloging, the Cities should prioritize those abandoned homes that would provide the greatest ecological benefit if removed and begin negotiations with property owners. Where possible, properties with abandoned homes should be acquired, the properties revegetated, and any placed fill removed to provide further habitat benefits, since many of these abandoned homes are immediately adjacent to water bodies that contain salmonids. Because Pacific Avenue was one of the first sites for development in the City, the homes would need to be reviewed to determine if they are historic structures.

Monitor Success of Restoration Projects

One of the primary means to ensure success of restoration projects in meeting the goal of restoring no net loss of ecological functions is to monitor existing and future restoration projects to determine if they are performing as designed, and to evaluate the efficacy of different approaches. Whenever possible, monitoring of future restoration projects should include baseline monitoring prior to project construction, as that is critical to understanding and demonstrating the effects of restoration.

Determining a physical and ecological baseline is crucial for documenting the ecological lift of restoration projects. As such, it is recommended that all of the proposed and potential restoration projects be monitored both prior to and following their construction and that such monitoring be included as part of the project implementation and funding.

Develop Public Outreach and Educational Programs

Public outreach and education is a key restoration plan strategy. As property owners become increasingly aware of the important roles of shoreline vegetation and natural geomorphic processes, it is expected that more property owners will initiate private restoration projects.

One of the largest stressors on the ecological health of the Cities is the cumulative impact of private development that alters important shoreline ecological functions. Thus, homeowner education on activities that would improve shoreline conditions is viewed as an essential strategy for maintaining and improving ecological conditions along the shoreline. Reduction and removal of such impacts will be more common and effective with an educated shoreline populace. Landowner education on the effect of their land use activities on shoreline functions can help to ensure those functions are maintain or improved.

Educational programs could also include stormwater education, which would help residents become more aware that their storm drains contribute to the water used by aquatic species, similar to a program set up by the Puget Sound Partnership for Puget Sound (Puget Sound Starts Here 2014: <http://www.pugetsoundstartshere.org/>). Such education could also help minimize illicit discharges to the Cities' important water bodies.

Community Resources and Partners for Restoration

The following programs, organizations, and agencies support the types of restoration projects described in this plan. There are local organizations described that could lead the work or serve as partners to accomplish restoration goals as well as organizations that will fund restoration projects that meet their mission.

Salmon Recovery Funding Board

In 1999, the Washington State legislature created the Salmon Recovery Funding Board (SRFB), which is now administered by the Puget Sound Partnership. The SRFB provides grants to protect or restore salmon habitat. Composed of five citizens appointed by the governor and five state agency directors, the SRFB brings together the experiences and viewpoints of citizens and the major state natural resource agencies.

Aquatic Lands Enhancement Account

In 1984, the Washington State legislature created the Aquatic Lands Enhancement Account (ALEA) to ensure that money generated from aquatic lands was used to protect and enhance those lands. Aquatic lands are all tidelands, shore lands, harbor areas, and the beds of navigable waters. ALEA grants may be used for the acquisition, improvement, or protection of aquatic lands for public purposes. They also may be used to provide or improve public access to the waterfront. The ALEA program is targeted at re-establishing the natural, self-sustaining ecological functions of the waterfront, providing or restoring public access to the water, and increasing public awareness of aquatic lands as a finite natural resource and irreplaceable public heritage. It is administered by the Recreation and Conservation Office and is funded almost entirely by revenue generated by WDNR's management of state-owned aquatic lands (WSRCO 2014).

Washington Wildlife and Recreation Program

The Washington Wildlife and Recreation Program (WWRP) is a state grant program that provides a variety of funding programs to protect habitat, restore habitat and species, and acquire properties with valuable natural resources. It is administered by the Washington State Recreation and Conservation Office and is funded by the legislature in the state's capital construction budget (WWRP 2014).

- The Critical Habitat Category fund program provides funding to protect habitat for wildlife including habitat for endangered, threatened, or sensitive species. Project sites may include high-quality habitat or degraded habitat that once restored will support the target species.

- The Natural Areas Category fund provides funding to protect high quality, representative native ecosystems or unique plant or animal communities, endangered, threatened, or sensitive species, rare geological features, or similar features of scientific or educational value. Project sites must have, to a major degree, retained their natural character and be managed primarily for resource preservation, protection, and study.
- The Riparian Protection Category fund provides funding to protect riparian areas. Projects may include a wide variety of site conditions on either fresh or saltwater riparian areas. Projects must include property acquisition. Projects to extend riparian protection for a minimum of 25 years on lands enrolled in the federal Conservation Enhancement Reserve Program are allowed.
- State Lands Restoration and Enhancement fund provides funding to two state agencies (WDNR and WDFW) to repair damaged plant and animal habitat. Restoration projects must bring a site back to its original function through activities that will help the site be self-sustaining. Enhancement projects must improve the ecological functionality of a site.
- Urban Wildlife Habitat Category fund provides funding to conserve wildlife habitat in cities. Projects must be within 5 miles or inside a city or town (or its adopted urban growth area boundary) with a population of at least 5,000, which would apply to the entire shoreline jurisdiction of Westport and Ocean Shores.

NOAA Fisheries

NOAA Fisheries funds land conservation and restoration projects through multiple programs. The particular goals of these programs and level of available funding can vary from year to year. Examples of these programs include the Coastal and Estuarine Land Conservation Program (CELCP) and the Pacific Coastal Salmon Recovery Fund.

Coastal and Estuarine Land Conservation Program (CELCP)

CELCP provides matching funds to state and local governments to purchase threatened coastal and estuarine lands or obtain conservation easements. To be considered, the land must be important ecologically or possess other coastal conservation values, such as historical features, scenic views, or recreational opportunities.

Pacific Coastal Salmon Recovery Fund

Congress established the Pacific Coastal Salmon Recovery Fund (PCSRF) in 2000 to reverse the declines of Pacific salmon and steelhead, supporting conservation efforts in California, Oregon, Washington, Idaho, and Alaska. The program, administered by NOAA, is essential to preventing the extinction of the 28 listed salmon and steelhead species on the West Coast and, in many cases, has stabilized the populations and contributed to their recovery course (NOAA Fisheries West Coast Region 2014). The Pacific Coastal Salmon Recovery Fund has funded most of the work performed by the Wild Fish Conservancy described herein (Sandell et al. 2011, 2013, and 2014; Sandell and McAninch 2013).

US Fish and Wildlife Service

The US Fish and Wildlife Service has grant programs that fund restoration-oriented projects. These programs are often tailored to particular goals of the agency and, as with NOAA, can vary from year to year. However, it is likely that there are programs that would apply to the restoration goals described herein, particularly projects that support protection of endangered species and critical habitats. A few of those programs are described in separate subsections below.

Chehalis Fisheries Restoration Program

The Chehalis Fisheries Restoration Program provides funding for habitat restoration in the Chehalis River and Grays Harbor Basins (USFWS 2014). Private landowners; nonprofit organizations; and local, tribal, state, or federal agencies are eligible to apply for funding through this program. The Chehalis Fisheries Restoration Program funds a variety of projects, including fish passage barrier corrections, removal of invasive species, native plant revegetation, riparian and off-channel fish habitat restoration, agricultural wetland restoration for fish use, and monitoring of fish use of these habitats.

National Fish Passage Program

The National Fish Passage Program provides funding to restore native fish and other aquatic species to self-sustaining levels by reconnecting habitat that has been fragmented by human-made barriers (USFWS 2014). Private landowners; nonprofit organizations; and local, tribal, state, or federal agencies are eligible to apply for funding through this program.

North American Wetlands Conservation Act (NAWCA) Small Grants

The NAWCA Small Grants is a competitive, matching grants program created in 1996 to promote public-private partnerships and encourage smaller-scale, long-term wetland conservation projects that may otherwise not be able to compete in the US Standard Grants Program (USFWS 2014). Projects must involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefit of all wetland-associated migratory birds. Grants requests may not exceed $75,000 and funding priority is given to new grantees or partners.

Western Native Trout Initiative

The mission of the Western Native Trout Initiative is to serve as a catalyst for the implementation of conservation or management actions, through partnerships and cooperative efforts that result in improved trout species status, improved aquatic habitats, and improved recreational opportunities (WNTI 2007). The Western Native Trout Initiative funds a variety of projects, including riparian restoration, invasive species removal, fish passage barrier correction, and wetland and estuary restoration. Private landowners, nonprofit organizations, and local, tribal, state, or federal agencies are eligible to apply for funding through this program (USFWS 2014).

Aquatic Restoration Program

The Aquatic Restoration Program is run by WDNR to establish partnerships with agencies and organizations to restore, enhance, create, and protect healthy ecological conditions in freshwater, saltwater, and estuarine aquatic systems (WSDNRARP 2014). Matching funds in this program require a 1:1 ratio with the goal to provide seed money for projects that leverage existing funds to increase the restoration benefits. Funding provided by the Aquatic Restoration Program is restricted to on-the-ground portions of restoration projects, including on-site preparation and implementation of restoration related activities.

Wild Fish Conservancy

A nonprofit conservation organization headquartered in Duvall, Washington, Wild Fish Conservancy is dedicated to the recovery and conservation of the region's wild fish ecosystems. Through science, education, and advocacy, Wild Fish Conservancy promotes technically and socially responsible habitat, hatchery, and harvest management to better sustain the region's wild fish heritage (Wild Fish Conservancy 2014). Wild Fish Conservancy has been active in supporting ecological restoration in Grays Harbor through a series of recent studies looking at the most effective ways of improving wild fish numbers in Grays Harbor (Sandell et al. 2011, 2013, and 2014; Sandell and McAninch 2013).

The Nature Conservancy

The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. The Nature Conservancy achieves this mission through the dedicated efforts of a diverse staff, including more than 600 scientists, located in all 50 US states and more than 35 countries, and with the help of many partners, from individuals and governments to local nonprofits and corporations (The Nature Conservancy 2014). The Nature Conservancy has most recently worked in Grays Harbor in collaboration with the Quinault Indian Nation and WDNR to remove derelict fishing gear from throughout the harbor (Pacific Marine and Estuarine Fish Habitat Partnership 2014).

Friends of Grays Harbor

Friends of Grays Harbor (FOGH) is a nonprofit citizen's group consisting of crabbers, fishers, oyster growers, and other concerned citizens that advocate for a healthy Grays Harbor estuary. The goal of FOGH is to protect the natural environment and human health in Grays Harbor and surrounding areas via science, advocacy, law, activism, and empowerment (FOGH 2014).

Implementation and Monitoring

Effective implementation of restoration projects and programs may require both regulatory and nonregulatory approaches to be effective. While technically feasible, many of the suggested restoration strategies are extremely challenging from a socio-political perspective and will require consensus on what needs to be accomplished and how.

Timelines and Benchmarks

Many aspects of restoration can be highly opportunistic, for example, where one finds a willing landowner; or where an event, such as a road failure due to flood-induced erosion that requires immediate repair, creates an opportunity for a more ecologically beneficial solution. Establishing timelines is further complicated by the fact that shoreline restoration may largely depend on grant funding, which is unpredictable at best. That said, it is important to set specific timelines and benchmarks to ensure progress. A suggested timeline for initiating implementation of this plan is as follows:

Within 0 to 7 years of adoption of this plan:

- Each city identify at least one site-specific shoreline project that provides a high level of ecological function. Establish a schedule for obtaining and assigning staff, applying for funding, and initiating steps toward implementation.
- Each city identify and complete design work on at least one stormwater quality treatment project such as a bioretention swale, rain garden, or other water quality treatment option to improve stormwater quality.
- Develop and implement at least one restoration directed program using public outreach and education to engage private landowners in restoration activities.

Within 7 to 14 years of adoption of this plan (assuming funding is available):

- Each city complete at least one additional site-specific restoration project.
- Each city identify and complete one riparian enhancement/invasive vegetation removal project.
- Each city complete construction of at least two stormwater quality treatment projects that will improve water quality.

Every 10 years thereafter:

- Each city identify and complete at least one new site-specific shoreline restoration project that provides a high level of ecological function.
- Each city identify and complete at least one new riparian enhancement/invasive vegetation removal project.

- Each city identify and complete at least one stormwater quality treatment project that will improve water quality.
- Each city develop and implement at least one restoration directed program using public outreach and education to engage private landowners in restoration activities.

Over time, restoration efforts must be evaluated against a set of benchmarks to determine if adequate progress is being made. Progress can be tracked by reporting benchmarks such as the examples below:

- Acres of riparian enhancement
- Acres of reconnected floodplain
- Acres of wetland restored in the shoreline jurisdiction
- Acres of noxious weed removal and native vegetation planted
- Number of fish barriers removed or number of stream miles open to fish passage
- Number of exceedances of water quality criteria as measured in the state water quality assessment
- Number of restoration actions implemented in conjunction with other project partners

In the context of the SMP update, restoration planning is a long-term effort. The SMP guidelines include the general goal that local master programs "… include planning elements that, when implemented, serve to improve the overall condition of habitat and resources within the shoreline area" (WAC 173-26-201(c)). The legislature has provided an overall timeframe for future amendments to the SMPs. A jurisdiction is required to review its SMP once every 8 years (beginning on or before June 30, 2022), and amend if necessary, (RCW 90.58.080(4)). During this review period, the Cities should document progress toward achieving shoreline restoration goals. The review could include:

- Re-evaluating adopted restoration goals, objectives, and policies.
- Summarizing both planning efforts (including application for and securing grant funds) and on-the-ground actions undertaken in the interim to meet those goals.
- Revising the SMP restoration plan to reflect changes in priorities or objectives.

Funding

Potential funding sources for restoration projects and programs are identified in the report section *Community Resources and Partners for Restoration*. In addition to outside funding sources, it may benefit the Cities' restoration efforts to incorporate projects with restoration elements into their Capital Improvements Program to ensure that shoreline restoration is considered during the budget process. Another option would be to develop a tax-based fund specifically for restoration projects. It is expected that restoration funding will be derived from a variety of sources selected for their appropriateness to the project or program goals.

Monitoring Strategies

The Cities are required to monitor the effectiveness of their SMPs, including this restoration plan, over time to assess whether net loss of ecological functions and processes is occurring. This will require tracking shoreline development activities to ensure permit compliance, periodically reassessing the ecological health and status of shoreline resources, and charting the timelines and benchmarks recommended in the previous section. The latter should include identifying which restoration activities have occurred compared to the stated goals, objectives, and priorities of this plan. Should restoration projects fall short of being implemented within the general periods recommended in this plan (see *Timelines and Benchmarks* section), the Cities' should take specific steps to remedy that situation in order to remain compliant with the SMP. An annual review of restoration efforts, including projects and programs, is recommended.

DATA GAPS

Monitoring Results

One of the largest data gaps found during the preparation of this plan was the lack of information on the effectiveness of past and current restoration activities in the Cities. Monitoring of sites has been limited, though that may improve with the establishment of an operating mitigation bank at the Weatherwax property in Ocean Shores. Such monitoring data should then be used to educate the public, gauge cost effectiveness and determine effectiveness at different approaches. The Weatherwax bank may serve as an excellent opportunity to experiment with restorative approaches, particularly for improving the freshwater shorelines within Ocean Shores.

Climate Change

The Wild Fish Conservancy recently completed an analysis of climate change for Grays Harbor for the specific purposes of identifying climate-adaptable restoration projects in the Grays Harbor estuary (Sandell and McAninch 2013). Sea level rise and wave energy changes, discussed separately below, will each have their own impact on restoration success and viability. Despite the recent progress in these areas, understanding how these processes will change over time and interact remains a crucial data gap for the Cities.

Sea Level Rise

Sandell and McAninch (2013) summarized sea level rise estimates in the estuary as being produced by the combined effects of global sea level rise and local factors, such as vertical land deformation (e.g., tectonic movements) and seasonal water surface elevation changes due to atmospheric circulation effects. Within the Cities, there is little if any tectonic motion (Verdonck 2006; Central Washington University 2014), so sea levels reflect eustatic (globally averaged) changes (Canning 2005; Mote et al. 2008). This explains the relatively modest sea level rise observed at Toke Point, the nearest sea level NOAA gage, in the twentieth century (1.60 mm per year) (NOAA 2014). With that said, recent (within the last 30 years) sea level rise has been suppressed by large-scale oceanographic processes, the reversal of which may trigger acceleration of sea level rise in the near future (Bromirski et al. 2011). It is also important to couch these predicted changes in known interannual sea level variability associated with El Niño. Mojfeld (1992) has shown that during El Niño years the average water level can be up to 1 foot higher than in ordinary winters, with deviations during storms of up to 3 feet.

Therefore it is expected that lower areas will convert from upland to marsh areas over the next fifty years (e.g., low lying areas on the east edge of Westport: Sandell and McAninch [2013]). This conversion will decrease the viability of these extremely low-lying lands to be anything other than intertidal marshes. However, it is unclear how these processes will interact, since they are dependent on the nature of the sea level rise (i.e., episodic events versus gradual conversion to intertidal area, see below) and future development. Even though

the Sandell and McAninch (2013) model is capable of producing estimates of conversion time scales for different habitat types, the approximations inherent in the model likely limit its applicability at the site scale. Therefore, continued review of sea level rise research will be important to ensuring restoration projects are designed and sited appropriately to be sustainable given expected sea level changes.

Wave Energy Changes

There are well-documented historical increases in wave energy in the North Pacific Ocean (Allan and Komar 2006; Ruggiero et al. 2010; Bromirski et al. 2013). Allan and Komar (2006) found that between 1975 and 2000, peak wave heights offshore of the Cities increased by 2.7 meters (9 feet). They speculated, and later work confirmed (Bromirski et al. 2013), that these increases were due to climate change and are expected to continue to an unknown degree in the future. These changes are related to the same basin-scale dynamics that drive regional changes in sea level rise, though they do have their own internal patterns, which can often dominate the larger overall trend (Bromirski et al. 2013). It is unclear how these changes will interact with sea level, but it is likely that they will exacerbate erosion at both jetties, unless proactive actions are taken such as placement of dredge spoils as nourishment. These changes will no doubt affect restoration projects planned on the exposed coast, but the extent to which this will occur is largely unknown and therefore a data gap.

REFERENCES

Allan, J. and P.D. Komar. 2006. Climate controls on US West Coast erosion processes. Journal of Coastal Research 22(3):511–529.

Barbour, M.G. and J. Major. 1990. Terrestrial vegetation of California. California Native Plant Society. Special Publication Number 9, University of Davis, California.

Bridges, A. 2010. Prospectus for the City of Ocean Shores wetland mitigation bank: Weatherwax Property, Ocean Shores, Washington. Prepared for Interagency Review Team. February 23, 2010.

Bromirski, P.D., D.R. Cayan, J. Helly, and P. Wittmann. 2013. Wave power variability and trends across the North Pacific. Journal of Geophysical Research 118:6329–6348: doi:10.1002/2013JC009189.

Bromirski, P.D., A.J. Miller, R.E. Flick and G. Auad. 2011. Dynamical suppression of sea level rise along the Pacific coast of North America: Indications for imminent acceleration. Journal of Geophysical Research 116:C07005, doi: 10.1029/2010JC006759.

Canning, D.J. 2005. Sea Level Rise and Coastal Hazards in Washington State. Washington State Department of Ecology. Presented at The Future Ain't What it Used to Be: Planning for Climate Disruption, 2005 Regional Climate Change Conference, Seattle, Washington. October 27, 2005.

CBPHWG. 2008. The Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIA 22 and 23. Prepared by the Chehalis Basin Partnership Habitat Work Group with Assistance by Lee Napier, Lead Entity Coordinator, Grays Harbor County; Chad Stussy, Washington Department of Fish and Wildlife; Brett Demond, Streamworks, LLP.; John Kliem, Creative Community Solutions. Updated September 2008.

Central Washington University. 2014. Pacific Northwest Geodetic Array (PANGA) website. Available at: <http://www.panga.cwu.edu/demo_vms/velo_map.html>.

City of Ocean Shores and Grays Harbor County. 1989. North Beach Recreation Management Plan for the Ocean Beaches.

City of Westport, Grays Harbor County and Pacific County. 1989. South Beach Recreation Management Plan for the Ocean Beaches. August 1989.

Ecology. 2011. Shoreline Master Program Guidelines (Chapter 173-26 WAC, Part III). Available at: <http://apps.leg.wa.gov/wac/default.aspx?cite=173-26>.

FHWA. 2014. In-Lieu Fee and Mitigation Banking FAQs website. Federal Highways Administration. Accessed December 10, 2014: <https://www.fhwa.dot.gov/everydaycounts/pdfs/spd/banking_faq.pdf>.

FOGH. 2014. Friends of Grays Harbor, Westport, Washington. Accessed November 20, 2014): <http://www.fogh.org/about.php>.

Gelfenbaum, G. and G. Kaminsky. 2010. Large-scale coastal change in the Columbia River littoral cell: An overview. Marine Geology 273:1–10.

Herrera and AHBL. 2015. Shoreline Inventory and Characterization Report for the Cities of Ocean Shores and Westport. Prepared for the City of Ocean Shores and the City of Westport. Herrera Environmental Consultants, Inc., Seattle, Washington. February 2015.

King County. 2012. Wetland, River and Shoreline Mitigation in King County Factsheet (December 2012). Accessed December 10, 2014: <http://www.govlink.org/watersheds/8/committees/1305/9_KC_in_lieu_fee_mitigation_factsheet.pdf>.

KOMO News. 2014. Beach erosion forces emergency declaration in Ocean Shores. Accessed April 8, 2014: <http://www.komonews.com/news/local/Geotubes-failing-Ocean-Shores-causing-emergency-287069821.html>.

Mojfeld, H.O. 1992. Subtidal sea level fluctuations in a large fjord system. Journal of Geophysical Research, 97(C12):20,191–20,199.

Mote, P., A. Petersen, S. Reeder, H. Shipman, and L.W. Binder. 2008. Sea Level Rise in the Coastal Waters of Washington State. UW Climate Impacts Group and Washington State Department of Ecology. January 2008.

NOAA. 2014. Toke Point, WA – Station ID: 9440910 webpage. National Oceanographic and Atmospheric Administration. Accessed December 10, 2014: <http://tidesandcurrents.noaa.gov/stationhome.html?id=9440910>.

NOAA Fisheries West Coast Region. 2014. Pacific Coastal Salmon Recovery Fund website. National Oceanographic and Atmospheric Administration. Accessed December 9, 2014: <http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/pacific_coastal_salmon_recovery_fund.html>.

Pacific Marine and Estuarine Fish Habitat Partnership. 2014. Grays Harbor County Derelict Gear Removal Project Annual Report. Accessed December 9, 2014: <http://www.pacificfishhabitat.org/media/Grays_Harbor_Derelict_Gear_2013_Annual_Report_12_16_13.pdf>.

Ruggiero, P., P.D. Komar, and J.C. Allan. 2010. Increasing wave heights and extreme value projections: The wave climate of the US Pacific Northwest. Coastal Engineering 57:539–552.

Sandell, T. and A. McAninch. 2013. Climate Change in the Chehalis River and Grays Harbor Estuary. Wild Fish Conservancy. Prepared for Chehalis Basin Habitat Work Group. February 10, 2013.

Sandell, T., J. Fletcher, A. McAninch, and M. Wait. 2011. Grays Harbor Juvenile Fish Use Assessment, RCO #10-1412P: Literature Review, Habitat Inventory, and Study Plan. Prepared for: Chehalis Basin Habitat Work Group and the Salmon Recovery Funding Board Technical Review Panel. January 2011.

Sandell, T., J. Fletcher, A. McAninch, and M. Wait. 2013. Grays Harbor Juvenile Fish Use Assessment: 2012 Annual Report. Prepared for: Chehalis Basin Habitat Work Group and the Washington State Recreation and Conservation Office. Prepared by: Wild Fish Conservancy.

Sandell, T., J. Fletcher, A. McAninch, and M. Wait. 2014. Grays Harbor Juvenile Fish Use Assessment: 2013 Annual Report. Prepared for: Chehalis Basin Habitat Work Group and the Washington State Recreation and Conservation Office. Prepared by: Wild Fish Conservancy.

Shane, J.M. 2012. Abandoned Buildings and Lots. Center for Problem-Oriented Policing. US Department of Justice. Problem-Specific Guides Series No. 64.

The Nature Conservancy. 2014. The Nature Conservancy Vision and Mission website. Accessed December 10, 2014: <http://www.nature.org/about-us/vision-mission/index.htm>.

US Army Corps of Engineers. 2014. Grays Harbor, Washington Navigation Improvement Project: General Investigation Feasibility Study: Appendix B: Engineering Analysis. Seattle District. Seattle, Washington. June 2014.

USFWS. 2007. Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (*Charadrius alexandrines nivosus*). United States Fish and Wildlife Service California/Nevada Operations Office. Sacramento, California. August 13, 2017.

USFWS. 2014. Washington Fish and Wildlife Office, Funding – Fisheries and Fish Passage. United States Fish and Wildlife Service. Accessed November 17, 2014: <http://www.fws.gov/wafwo/funding_fisheries.html>.

Verdonck, D. 2006. Contemporary vertical crustal deformation in Cascadia. Tectonophysics 417:221–230.

Wild Fish Conservancy. 2014. Wild Fish Conservancy Northwest: About Us website. Accessed December 9, 2014: <http://wildfishconservancy.org/about>.

WSRCO (Washington State Recreation and Conservation Office). 2014. Washington State Recreation and Conservation Office, Olympia, Washington – Aquatic Lands Enhancement Account. Accessed November 17, 2014: <http://www.rco.wa.gov/grants/alea.shtml>.

WNTI. 2007. Western Native Trout Initiative, A Plan for Strategic Actions. Western Native Trout Initiative, Lakewood, Colorado. January 2007.

WSCC. 2001. Salmonid habitat limiting factory analysis. Chehalis Basin and nearby drainages: Water Resources Inventory Areas 22 and 23. Washington State Conservation Commission, Olympia, Washington.

WDNR. 2014. Removing creosote-treated materials from Puget Sound and its beaches factsheet. Washington Department of Natural Resources. Accessed December 10, 2014: <http://www.dnr.wa.gov/Publications/em_fs07_210.pdf>.

WNDR. 2015. Aquatic Restoration Spotlight Project Grays Harbor. Washington Department of Natural Resources. Accessed April 2, 2015: <http://www.dnr.wa.gov/ResearchScience/Topics/AquaticClean-UpRestoration/Pages/aqr_rest_spotlight_grays_harbor.aspx>.

WSDNRARP (Washington State Department of Natural Resources Aquatic Restoration Program). 2014. Washington State Department of Natural Resources, Aquatic Restoration Program, Olympia, Washington. Accessed November 17, 2014: <http://www.dnr.wa.gov/ResearchScience/Topics/AquaticClean-UpRestoration/Pages/aqr_restoration_program.aspx>.

WWRP. 2014. Washington Wildlife Recreation Program, Washington State Recreation and Conservation Office, Olympia, Washington. Accessed November 17, 2014: <http://www.rco.wa.gov/grants/wwrp.shtml>.