PIERCE COUNTY SHORELINE MASTER PROGRAM UPDATE

Shoreline Restoration Report

Prepared for:

Pierce County Planning and Land Services

June 2009; revised June 2011

Ecology Grants #G0700001 and G1000552

Pierce County
Planning and Land Services

ESA

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

This plan was prepared as part of Pierce County's Shoreline Master Program (SMP) Comprehensive Update project. The County is currently in the process of updating the SMP (SMP Policies enacted by Pierce County Resolution No. 15388; Shoreline Use Regulations known as Title 20 of the Pierce County Code) to comply with the Washington State Shoreline Management Act [1] (SMA or the Act) requirements, enacted in 1972 and the state's shoreline guidelines[2], (the guidelines) which were adopted in 2003.

The County's SMP contains policies and regulations that govern the use and development of the County's freshwater rivers, lakes and marine shorelines[3]. The SMP is designed to protect shoreline ecological functions, provide for public access to public shorelines, and accommodate reasonable and appropriate uses of the shoreline. The SMP also must include a "real and meaningful" strategy to restore shoreline ecological functions where such functions are impaired. This restoration plan is a key element of the County's shoreline restoration strategy. It supplements the County's Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2007a, revised 2009), which documents general shoreline conditions throughout the County.

This Restoration Plan was prepared by ESA Adolfson with assistance from Parametrix and Coastal Geologic Services and in cooperation with Pierce County Planning and Land Services. This Restoration Plan was funded by a grant from Washington State Department of Ecology (Grant No. G0700001). This Restoration Plan has been reviewed by Pierce County Special Projects, Ecology technical staff and the Shoreline Technical Advisory Committee. ESA revised this plan in June 2011 to incorporate additional comments from Ecology and Pierce County under Ecology Grant No. G1000552.

1.1 PLAN PURPOSE AND SCOPE

This plan, in conjunction with the SMP policies and regulations, is designed to satisfy the shoreline guideline requirements for shoreline restoration planning. It provides a planning-level framework for understanding how and where shoreline ecological functions can be restored in Pierce County. The plan also describes how future restoration activities can be integrated with existing and ongoing restoration efforts including: the region-wide effort to restore Puget Sound (which the Puget Sound Partnership is spearheading); the work of the Pierce County Public Works and Utilities Surface Water Management - Environmental Services; Pierce Conservation District; South Puget Sound Salmon Enhancement Group; the regional recovery efforts for Puget Sound Chinook, bull trout, steelhead, and endangered southern resident killer whales (orca); and

[1] Revised Code of Washington (RCW) 90.58

[2] Washington Administrative Code (WAC) 173-26, Part III

[3] In this document, the term 'shoreline' is synonymous with 'shorelines of the state.' These are defined in RCW 90.58 and generally include all streams with a mean annual flow of 20 cubic feet per second or more, all marine shores, and lakes greater than 20 acres as well as the adjacent 'shorelands' that accompany these waters. Shorelands means the lands extending 200 feet from the ordinary high water mark, floodways and contiguous floodplains 200 feet from the floodway, and all associated wetlands. For a list of all of the shorelines of the state in Pierce County, refer to the Draft Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2007a).

the diversity of other restoration efforts being implemented by federal and state agencies, Tribes, towns and cities in Pierce County, non-governmental organizations, and private citizens.

1.1.1 Format and Content – How to Use this Plan

The format and content of this plan are designed to:

- Describe an overarching **vision** that guides future restoration efforts;
- Summarize the County's shoreline restoration **goals and objectives**;
- Identify the freshwater and nearshore areas that are high **priorities** for restoration;
- Describe specific restoration **opportunities and recommended actions** for each watershed and waterbody;
- Identify potential **partners** and existing/ongoing restoration activities and describe opportunities to **integrate** this plan with those existing efforts; and
- Explain how future restoration efforts can be **implemented** in a way that maximizes effectiveness and achieves the greatest overall benefits.

To understand and effectively implement this plan, restoration planners and practitioners are encouraged to review the vision, goals, and objectives in Chapter 2 to understand the desired restoration outcomes. Planners and practitioners should then consider the information in Chapter 3 identifying general areas of the County that have been identified as top priorities for restoration. Specific opportunities and actions in those areas and elsewhere in Pierce County can be found in Chapter 5. Restoration projects can then be fully developed in cooperation with the partners and programs identified in Chapter 6 to maximize restoration benefits.

The projects and actions described herein represent voluntary actions taken to restore marine and freshwater shorelines in Pierce County. It is not the County's intention to require restoration on private property or to commit privately owned land for restoration purposes without the willing cooperation and participation of the affected landowners. However, the County is eager to support and foster restoration actions on both public and private lands and encourages private landowners to help implement this plan. In addition, private landowners who are required to provide mitigation for development related impacts may wish to implement actions noted in this plan to meet their mitigation obligations.

Numerous restoration projects and programs are already underway within the shorelines of Pierce County. These are discussed by waterbody in the Shoreline Inventory and Characterization report (ESA Adolfson et al., 2007a; revised 2009). This Restoration Plan is focused on future shoreline restoration opportunities that will build on existing restoration efforts.

1.2 DEFINING RESTORATION

Restoration can be defined generally as returning an area to a previous condition by improving ecological structure and function. Restoration creates a net increase in the amount, size, and/or functions of an ecosystem or components of an ecosystem compared to a baseline condition (Thom et al. 2005a). The shoreline guidelines define restoration more specifically as follows:

> "*The reestablishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including but not limited to re-vegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions.*" [4]

The guidelines require that restoration goals, policies and actions "be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program."[5] Inherent in these definitions is the concept of repairing past damage to natural resources and habitats, but not necessarily recreating historic conditions.

Many researchers have cautioned that simply recreating the form or structure of a particular habitat without also addressing the ecosystem processes and their interaction with ecological functions may not fully achieve restoration goals or objectives (Stanley et al., 2005, Montgomery et al. 2003; Gersib 2001). As a result, this plan emphasizes the need to restore ecosystem processes so that restoration strategies are sustainable and successful in the long-term.

1.2.1 Restoration versus Protection

Restoration is different from protection. For shorelines, the latter is achieved primarily through the SMP policies and regulations (as well as other County, state, and federal regulations) that safeguard resources from damage caused by use and development. Protection requires that development be prohibited in some areas and that when allowed, development occur in a way that mitigates adverse effects on the natural environment such that the net result of the development activity is no worse than the pre-development condition. Protection also requires that deliberate measures be taken to ensure that natural ecosystem processes (such as net shore-drift, channel migration, large woody debris recruitment, for example) continue with minimal impairment.

Restoration, on the other hand, involves more than simply following and enforcing existing rules or maintaining existing conditions. It requires taking active steps to improve the condition of existing resources and replace resources that have been lost. Restoration measures are intended to supplement shoreline protection efforts such that environmental conditions improve over time.

[4] WAC 173-26-020

[5] WAC 173-26-201(2)(f)

Table 1-1 identifies and differentiates typical shoreline protection and restoration actions. The protection measures are addressed in the SMP (and/or required by other regulatory programs such as critical areas regulations and stormwater regulations). The restoration actions reflect a range of activities that are applicable to Pierce County. This plan is built around this list or menu of common restoration actions as indicated in the subsequent chapters.

Table 1-1. Examples of Typical Protection and Restoration Actions

Examples of Protection Actions	Examples of Restoration Actions
• Treating stormwater runoff using best management or low impact development • Protecting associated wetlands • Minimizing development on coastal feeder bluffs • Maintaining/repairing on-site septic systems • Protecting vegetation in buffers and setbacks • Protecting/preserving existing trees/vegetation • Protecting water quality by limiting pesticide/fertilizer use • Regulating groundwater withdrawals • Limiting construction of new docks, bulkheads, and staircases • Clustering residential development • Preserving property through easement or acquisition	• Removing dikes and setting levees back • Removing bulkheads • Replacing bulkheads with soft shore stabilization (bio-stabilization) • Replanting/enhancing riparian/nearshore vegetation • Planting/transplanting eelgrass, kelps and other aquatic macrophytes • Replacing or enlarging blocked or undersized culverts • Removing fill from wetlands, intertidal habitats and floodplains • Removing invasive species • Reconnecting intertidal wetlands • Replacing existing dock/pier decking with open grating material to allow light penetration • Replacing treated wood docks/piers with concrete, steel and other materials • Retrofitting existing impervious surfaces to include stormwater treatment and flow control • Removing derelict vessels, fishing gear, creosote pilings and other in-water apparatus • Decommissioning underused forest roads • Adding large woody debris or engineered log jams to streams • Replacing pavement with pervious pavement (such as parks/ boat launches) • Relocating public infrastructure outside of floodplains and other sensitive habitats

Restoration typically occurs in phases with each phase composed of one or more actions (Table 1-2). The progression from planning to reporting can take weeks, months, or even years depending on the complexity and scope of the restoration effort. In general, the phases and tasks build on and inform one another. Yet in some cases, the progression of phases and actions is not linear but iterative, meaning that it may be necessary to go back and revisit goals or priorities during the implementation phase or do more construction in response to performance monitoring information. This is an adaptive management approach.

This plan addresses and accomplishes most of the actions required in the restoration planning phase. Additional effort will be required to implement, monitor, manage, and report on the outcomes of this planning effort.

Table 1-2. Typical Restoration Phases and Actions

Phase	Actions	Timeline
		Beginning → →→ Completion
Planning	Visioning Collecting background data Setting goals Defining objectives Identifying priority areas Identifying potential restoration measures in priority areas Identifying partners and collaborators Identifying funding sources	
Implementation	Selecting projects/sites Developing conceptual designs/ plans Preparing detailed design plans Constructing project/site	
Performance Assessment / Monitoring	Defining success criteria Comparing to reference sites Designing monitoring program Collecting performance monitoring data	
Adaptive Management	Adjusting design Correcting problems (barriers to success) Implementing contingency measures	
Reporting	Publishing reports documenting project effectiveness	

1.2.2 No Net Loss and Shoreline Restoration

The concept of no net loss of shoreline ecological functions is rooted in the Shoreline Management Act and in the goals, policies, and governing principles of the state's shoreline guidelines. The Act states: "permitted uses in the shoreline shall be designed and conducted in a manner that minimizes insofar as practical, any resultant damage to the ecology and environment of the shoreline area." The guidelines suggest that no net loss is achieved primarily through regulatory mechanisms including mitigation requirements but that restoration incentives and voluntary actions are also critical to achieving no net loss. The distinction between "no net loss" of shoreline function during shoreline development and shoreline restoration is illustrated in Figure 1-1 below.

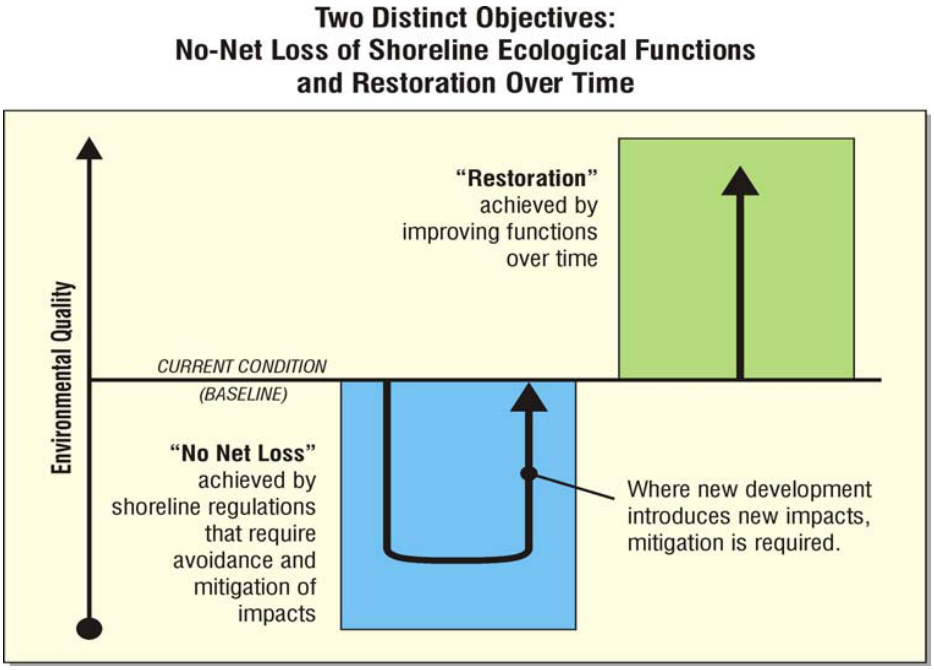


Figure 1-1. Mitigation versus Restoration in Shoreline Master Programs (Source: Department of Ecology)

The SMP requires that proponents of shoreline development fully mitigate impacts caused by their proposed development and although they are not required to improve conditions over and above the impacts of their development action, they may elect to implement elements of this plan as mitigation for shoreline development if appropriate. Citizens, agencies, and other groups may also elect to implement portions of this plan irrespective of any proposed development activity or requirement to mitigate impacts. Components of this plan can also be implemented as part of future capital or resource management endeavors. As an example, a park improvement project could be designed to include removal of intertidal fill and restoration of nearshore habitat. All of these actions would have the effect of improving conditions over time, which is necessary for achieving no net loss.

1.3 ADDITIONAL STUDIES

Preparing a detailed plan for restoring shoreline resources throughout Pierce County is a difficult undertaking that cannot be easily summarized in one document. All of the restoration opportunities mentioned herein will require further investigation and analysis to fully assess feasibility and determine actual benefits and costs. In some cases, restoration actions are recommended that involve private properties. This plan makes no claims as to the ownership or availability of any parcel of land for restoration purposes and does not recommend takings of any private land. Considerable additional study, collaboration, and public discourse will be required to ensure consensus on the restoration priorities; acquire permission, easements or ownership of private property; and develop detailed implementation plans, budgets, schedules, and monitoring programs.

1.3.1 Data Gaps

Due to data limitations (including data that were not available, not adaptable to a database, or of poor quality) many important ecological processes, features, and conditions could not be fully described in this plan. Specifically, surface water quantity and quality are critical components of the riparian ecosystem largely missing from existing watershed and riparian analyses. These components are typically measured as in-stream flow and surface water chemistry. Although surface water studies have been conducted in Pierce County, available data were focused on specific conditions at a few locations. For example, in-stream flows are a primary controlling factor for salmon spawning, egg incubation, juvenile rearing, and migration; however, this restoration plan did not include a full analysis of in-stream flows or trend data in relationship to in-stream habitat.

Water quality characterization is also limited in the marine environment to periodic seasonal measurement of fecal coliform concentrations at shellfish harvesting areas, but the tests are not designed to identify year-round trends or sources. Water quality data for the freshwater shoreline lakes in Pierce County is also very limited and only periodically taken. These data gaps should be considered when evaluating the restoration priorities discussed in this report. Efforts to address these gaps through acquisition of new/additional pertinent data are encouraged.

Important habitat features or processes that were not fully assessed due to a lack of applicable quantitative data include:

- Peak in-stream flow
- Low summer flow
- Dissolved oxygen concentrations, nutrient and fecal coliform loading
- Lake water quality data (i.e., clarity, nutrients, phosphorus)
- Channel complexity (i.e., length and area of side channels; numbers, size, and ratios of in-stream features such as pools, riffles, logjams, etc.)
- Channel stability (e.g., shifts in substrate, scouring, sedimentation)
- Nearshore assessment for WRIA 11 and 12 (pending)

2.0 RESTORATION VISION AND GOALS

This plan seeks to establish a basic framework for improving the quality and sustainability of Pierce County's shoreline resources over time in a collaborative and cohesive manner. This overarching goal is consistent with the Shoreline Management Act and with the newly developing regional strategy for restoring Puget Sound, which is embodied in Engrossed Substitute Senate Bill (ESSB) 5372 signed by the State Legislature in May 2007. In ESSB 5372, the Legislature declared that:

> *"Puget Sound, including Hood Canal and the waters that flow to it are a national treasure and a unique resource. Residents enjoy a way of life centered around these waters that depends upon clean and healthy marine and freshwater resources. Puget Sound is in serious decline…. This decline is indicated by loss of and damage to critical habit, rapid decline in species populations, increases in aquatic nuisance species, numerous toxics contaminated sites, urbanization and attendant storm water drainage, closure of beaches to shellfish harvest due to disease risks, low-dissolved oxygen levels causing death of marine life, and other phenomena. If left unchecked, these conditions will worsen. Puget Sound must be restored and protected in a more coherent and effective manner. The current system is highly fragmented. Immediate and concerted action is necessary by all levels of government working with the public, nongovernmental organizations, and the private sector to ensure a thriving natural system that exists in harmony with a vibrant economy."*

The Legislature directed the Puget Sound Partnership (the Partnership) to coordinate and lead the regional restoration effort. The Partnership has developed an 'Action Agenda' that describes the steps needed to restore the Sound by 2020. The Action Agenda is being updated in 2011. In identifying specific restoration goals and objectives that the Action Agenda must achieve, the Legislature described the characteristics of a healthy and restored Puget Sound as follows:

- A healthy human population supported by a healthy Puget Sound that is not threatened by changes in the ecosystem;
- A quality of human life that is sustained by a functioning Puget Sound ecosystem;
- Healthy and sustaining populations of native species in Puget Sound, including a robust food web;
- A healthy Puget Sound where freshwater, estuary, nearshore, marine, and upland habitats are protected, restored, and sustained;
- An ecosystem that is supported by ground water levels as well as river and stream flow levels sufficient to sustain people, fish, and wildlife, and the natural functions of the environment; and
- Fresh and marine waters and sediments of a sufficient quality so that the waters in the region are safe for drinking, swimming, shellfish harvest and consumption, and other

human uses and enjoyment, and are not harmful to the native marine mammals, fish, birds, and shellfish of the region.

This plan seeks to achieve those same goals by contributing to the Puget Sound restoration effort and to the specific strategies being developed by the Partnership as part of the 2020 Action Agenda (Puget Sound Partnership, 2008). This plan is also intended to be compatible with and incorporate the restoration goals already developed by other restoration planning entities in the region including, but not limited to: the Salmon Recovery Planning Lead Entities, the South Puget Sound Salmon Recovery Group, the Nisqually Tribe, the Muckleshoot Tribe, the WRIA Action Plans, and many others.

2.1 RESTORATION VISION

The restoration vision for Pierce County can be described as follows:

> *The County will strive to restore, protect and enhance the shoreline resources and ecological processes that contribute to those resources through a combination of public actions and voluntary private actions. Restoration efforts, combined with protection of existing shoreline resources, will be targeted to create a net improvement in the shoreline ecosystem over time so as to benefit native fish and wildlife, and maintain public amenities for the people of Pierce County, Washington.*

2.2 RESTORATION GOALS

Pierce County has the following restoration goals (Table 2-1):

1. To improve shoreline processes, functions, and values over time through regulatory and voluntary and incentive-based public and private programs and actions that are consistent with the SMP and other agency/ locally adopted restoration plans.

2. To increase the availability, viability and sustainability of shoreline habitats for salmon, shellfish, forage fish, shorebirds and marine seabirds, and other species; improve habitat quality for sensitive and/or locally important species; and support the biological recovery goals for federally protected species[6].

3. To integrate restoration efforts with capital projects and other resource management efforts including, but not limited to, shellfish closure response plans and water cleanup plans.

[6] Federal sensitive species include endangered, threatened, candidate, and species of concern. Definitions of the federal designations can be found in the USFWS Glossary at http://www.fws.gov/endangered/glossary.html.

The State of Washington designates priority species which require protective measures for their survival due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority species include State Endangered, Threatened, Sensitive, and Candidate species; animal aggregations considered vulnerable; and species of recreational, commercial, or tribal importance that are vulnerable. The state also designates priority habitats. Definitions of these designations are provided at http://wdfw.wa.gov/hab/phslist.htm.

4. To encourage cooperative restoration actions involving local, state, and federal public agencies, tribes, non-government organizations, and private landowners.

5. To participate in the Puget Sound Partnership and commit energy and resources to implementation of the Puget Sound Action Agenda.

Table 2-1. Pierce County Restoration Goals, Objectives, Actions, and Success Measures

Goal	Objective	Potential Restoration[7] Actions	Potential Measures of Success
1. To improve ecosystem processes, functions and values over time.	Restore natural sediment transport and littoral drift. Restore native riparian and nearshore vegetation. Improve natural hydrologic pathways.	Remove dikes Levee setbacks Remove/replace bulkheads Replant riparian vegetation Decommission roads Restore wetlands	Acres of riparian enhancement. Linear feet of bulkhead removed. Acres of reconnected floodplain. Linear feet of road decommissioned. Acres of wetland restored. Acres of native vegetation planted.
2. To increase habitat quality and availability for salmon, shellfish, forage fish, and other sensitive and/or locally important species, and support biological recovery goals for federally listed species.	Reduce nearshore shading of kelp/eelgrass. Restore stream channels, channel migration zones, side channels, and floodplains. Enhance disturbed tidelands and riparian zones and support the essential ecological functions those areas provide. Restore wetland and salt marsh habitats. Improve water quality to provide safe water for drinking, swimming, and producing/consuming fish and shellfish.	Replace decking on overwater structures with open grating. Design overwater structures to accommodate juvenile salmon migration along the shoreline by using narrow walkways in the intertidal and nearshore. Protect grated areas from being covered up during subsequent development and structure occupation activities. Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris. Replace or enlarge blocked or undersized culverts. Replant/enhance riparian/nearshore	Number of culverts replaced or number of miles of stream open to migration. Number of creosote structures/ pilings removed. Acres of riparian/nearshore enhancement Water quality measurements. Area of retrofit. Reduced shellfish closures.

[7] These actions would supplement existing regulatory requirements and other protection actions related to stormwater management/low impact development, critical areas, septic system maintenance, etc. See Table 1-1.

Table 2-1 continued.

Goal	Objective	Potential Restoration[7] Actions	Potential Measures of Success
		vegetation. Remove invasive species. Add large woody debris to stream channels. Remove abandoned overwater and in-water structures. Replace treated wood docks/piers with concrete, steel and other materials. Retrofit existing impervious surfaces to include stormwater treatment and flow control.	
3. To integrate restoration efforts with capital projects and resource management efforts.	Evaluate restoration opportunities when planning for parks, transportation, and other capital projects.	Replace paved parking areas with pervious pavement at parks/ boat launches. Relocate public infrastructure outside of floodplains, migration zones and other sensitive areas. Retrofit existing impervious surfaces to include stormwater treatment and flow control.	Number of restoration actions implemented in conjunction with other projects.
4. To encourage cooperative restoration actions involving local, state, and federal public agencies, tribes, NGOs, and landowners.	Engage in coordinated planning to identify and scope restoration projects. Provide incentive to landowners to restore private properties. Establish local improvement districts to facilitate and fund restoration	Provide bonus points to landowners who restore shorelines through an open space taxation program. Sponsor an annual restoration planning workshop with other partners. Work with restoration partners to establish a database and tracking program for restoration projects. Fund or otherwise facilitate a restoration demonstration project such as a soft shore armoring project. Create stewardship programs and/or work with	Number of collaborative projects implemented. Number of projects tracked via database. Number of landowners participating in stewardship workshops. Number of partners participating in joint efforts.

Table 2-1 continued.

Goal	Objective	Potential Restoration[7] Actions	Potential Measures of Success
		existing stewardship programs to educate private landowners on appropriate restoration actions.	
5. To participate in the Puget Sound Partnership and commit energy and resources to implementation of the Puget Sound Action Agenda.	Support restoration projects in the County identified as priorities by the Partnership	Provide technical assistance or other forms of support in implementing nearshore restoration projects	Number of priority projects implemented along the Puget Sound shoreline

The above table provides general measures that could be used to determine project success. However, detailed measures of success must be determined for each project through the establishment of project-specific performance criteria and long-term monitoring. Similarly, the potential for restoration projects to improve specific ecological functions can only be accurately determined on a case-by-case basis. Ideally, each project will be designed to ensure a high likelihood of success in restoring the functions that are targeted for that project. This Restoration Plan summarizes restoration opportunities with moderate to high potential for successfully improving ecosystem-wide processes and shoreline functions. Other projects with lower potential for success have not been included in this countywide plan.

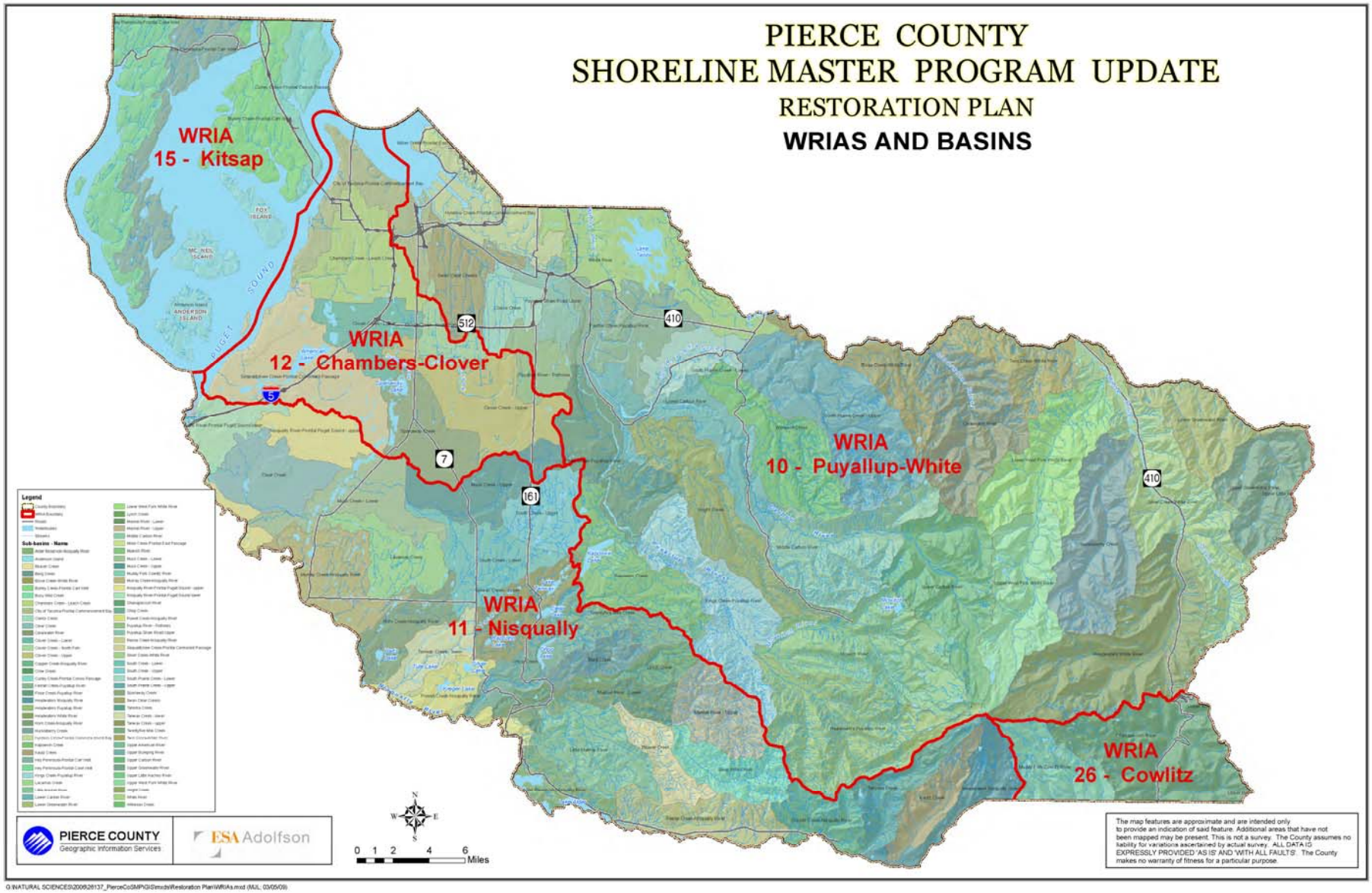
3.0 WATERSHED OVERVIEW

This section provides an overview of watersheds that comprise Pierce County. This is background information that helps set the context for the discussion in the subsequent chapters of this plan.

3.1 WATERSHED DESCRIPTIONS

Pierce County includes portions of five Water Resource Inventory Areas (WRIAs): the White/Puyallup, Chambers/Clover, Nisqually, Cowlitz, and Kitsap Peninsula (Figure 3-1). A brief description of each of these WRIAs and their respective shorelines follows.

Figure 3-1. WRIA Overview



3.1.1 WRIA 10 – Puyallup-White Rivers

WRIA 10 includes both the Puyallup River and its major tributary, the White River, which drain into Commencement Bay within the City of Tacoma (Figure 3-2). WRIA 10 encompasses approximately 673,100 acres of area in both Pierce and King Counties, Washington (Department of Ecology, http://www.ecy.wa.gov/pubs/0610039/10.pdf). Approximately 87 percent of the WRIA 10 watershed lies within Pierce County. Major population centers include the Cities of Tacoma, Sumner, Puyallup, and Orting. The eastern portion of WRIA 10 is sparsely populated, with the exception of limited development along Highway 410 around the town of Greenwater.

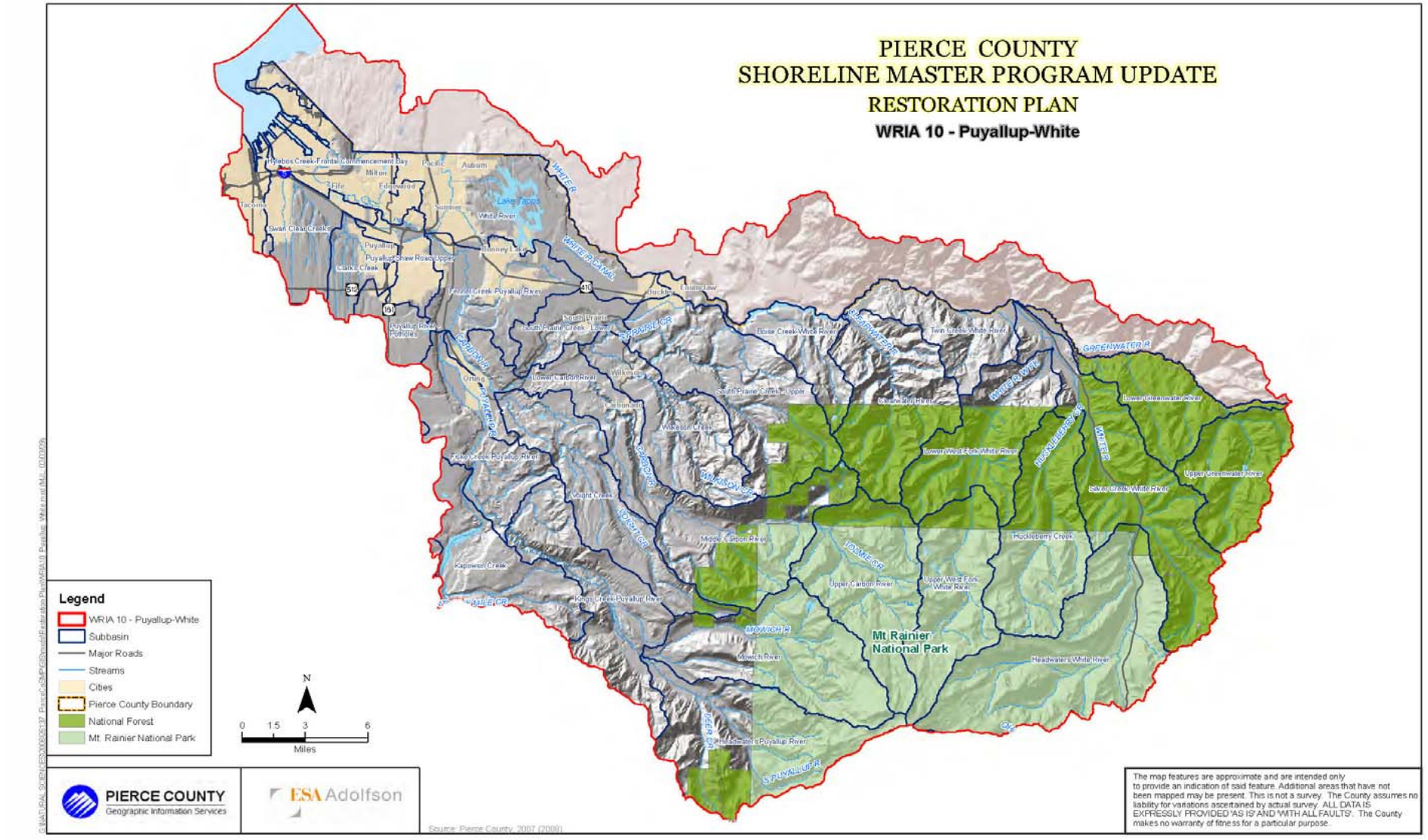
Surface water runoff from the western, northern, and northeastern slopes of Mt. Rainier shapes a number of significant sub-basins in the WRIA's eastern reaches, including the Upper Puyallup River, the Upper and Lower Carbon Rivers, South Prairie Creek, and the Upper White River. Generally, these are medium gradient river systems in "U"-shaped, glacially carved valleys. Lakes in this area include Mowich, Kapowsin, and Mud Mountain lakes.

Rivers and tributaries within the mountainous reaches of WRIA 10 drain primarily to the White, Carbon, and Upper Puyallup rivers. The Carbon and White rivers both drain into the Puyallup River – northwest of Orting and at Sumner, respectively – and the Puyallup River flows into Puget Sound at Commencement Bay. Sub-basins within the western (lowland) portion of WRIA 10 include Browns/Dash Point, Tacoma, Hylebos Creek, Clear/Clark's Creek, Mid Puyallup River, Mud Mountain, and Lower White River. Floodplains and terraces characterize much of this area, with meandering rivers and oxbow scars. Lake Tapps is a major lake within the western reach of WRIA 10.

The WRIA 10 nearshore extends from Browns/Dash Point to the north, along Commencement Bay, to near the Thea Foss water way. Only a small section of Browns/Dash Point lies within Pierce County shoreline jurisdiction. Most of the WRIA 10 nearshore lies within the greater Tacoma metropolitan area and has been highly altered by shoreline development, urbanization, and filling of the Puyallup estuary and Commencement Bay. Some areas with unarmored bluff shorelines and riparian vegetation occur along Dash Point and Point Defiance, but otherwise the shoreline is highly altered by armoring, fill below MHHW, presence of contaminated sediments, impervious surfaces, and high rates of stormwater runoff. Significant loss of estuarine wetlands within the Puyallup River estuary has historically occurred.

Despite the high level of alteration at the mouth of the Puyallup River, the nearshore waters still provide habitat and biotic support. Juvenile salmonids move through and use areas of Commencement Bay for physiological transition and feeding, and a variety of shellfish, marine mammals and waterfowl are found in Commencement Bay (Simenstad 2003). Surf smelt spawning occurs at a few locations along Dash Point. Pocket estuaries along the shoreline south of Point Defiance provide feeding, physiological transition, migration, and predator refuges for juvenile salmon (Redman et al. 2005).

Figure 3-2. WRIA 10



3.1.2 WRIA 11 – Nisqually River

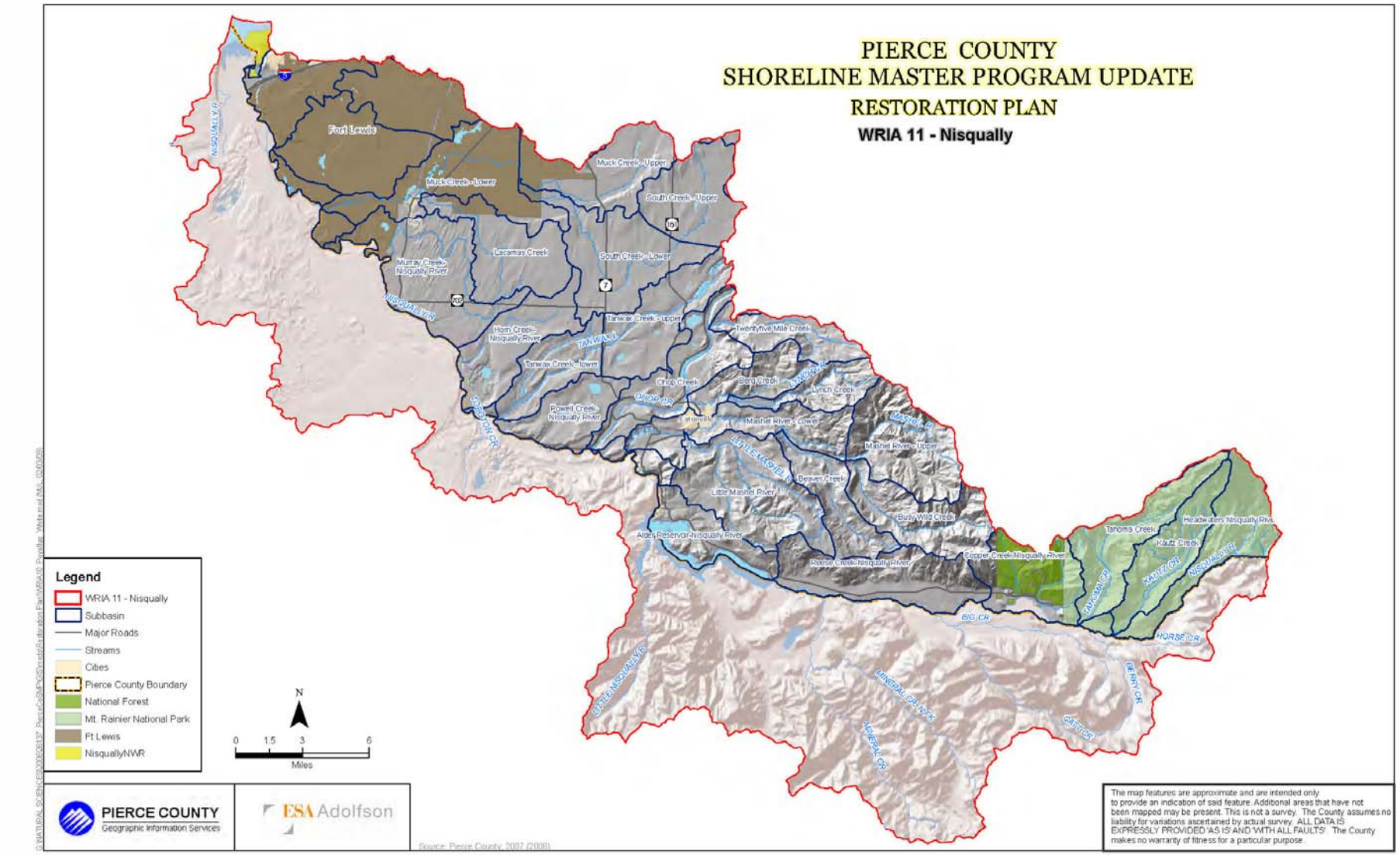
WRIA 11 encompasses approximately 491,300 acres within Pierce, Thurston and Lewis Counties, Washington (Department of Ecology, http://www.ecy.wa.gov/pubs/0610039/11.pdf). Approximately 58 percent of the watershed lies within Pierce County (Figure 3-3). The basin's headwaters originate at Mt. Rainier's Nisqually Glacier, and eventually empty into Puget Sound at the Nisqually National Wildlife Refuge. Medium gradient rivers in the upper watershed give way to very low-gradient systems in the lowlands. Elevations range from over 14,000 feet above sea level at the summit of Mt. Rainier to sea level at the Nisqually River's mouth. Population is relatively sparse in WRIA 11, with the highest densities occurring around the Cities of Yelm, Eatonville, and Roy. The predominant land use within WRIA 11 – Nisqually River is forest resource and timber harvest.

The upper portion of WRIA 11 includes the Upper Nisqually River, Mashel River, and Ohop Creek sub-basins. Sub-basins within the lowland portion of WRIA 11 include the Mid and Lower Nisqually rivers and Muck Creek. As in WRIA 10, these are medium gradient river systems in "u"-shaped, glacier-carved valleys. Alder Lake is the only major lake within the upper watershed and this is a reservoir within the Nisqually River behind Alder Dam.

Major tributaries to the Nisqually River include: Muck Creek, Ohop Creek, Tanwax Creek, and the Mashel River. Shoreline lakes within WRIA 11 include: Harts, Tule, Kreger, Silver, RapJohn, Ohop, Clear and Tanwax Lakes.

Only a small portion of the WRIA 11 nearshore exists within Pierce County. This section is located within the Nisqually delta, and includes a portion of county lands near the Nisqually National Wildlife Refuge. Alterations to the nearshore include the presence of a rail line along the shore and partial constrictions from roads, bridges, and fill in tidal wetlands (Redman et al. 2005).

Figure 3-3. WRIA 11



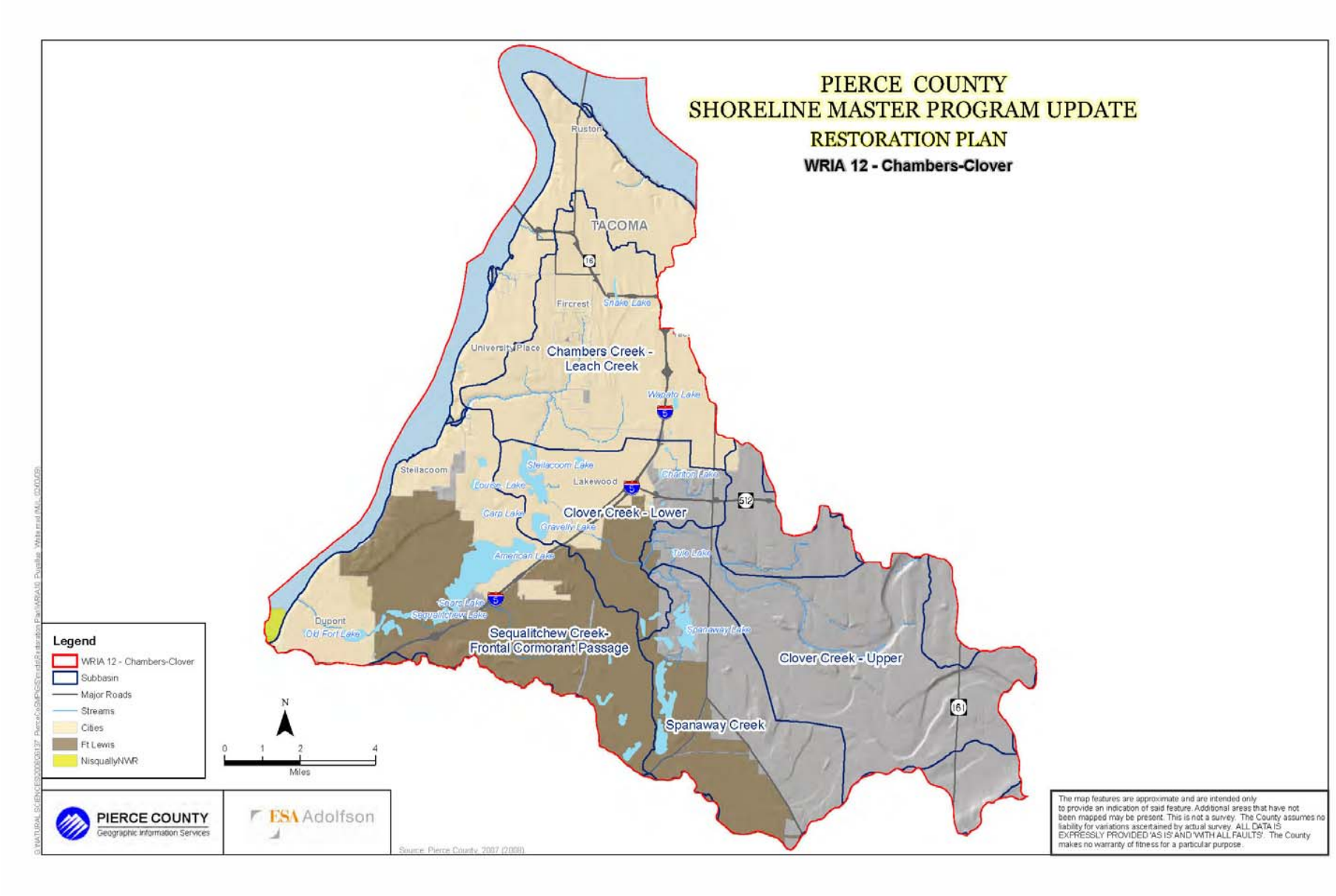
3.1.3 WRIA 12 – Chambers-Clover Creek

WRIA 12 encompasses approximately 115,000 acres within the Puget Lowland ecoregion of Pierce County, Washington (http://www.ecy.wa.gov/pubs/06100039/12.pdf). Elevations throughout the basin are at or just above sea level. Streams in WRIA 12 are low gradient, with underlying topography consisting of rolling glacial outwash and till plains. Sub-basins within WRIA 12 include Clover Creek/Steilacoom, American Lake, Chambers Bay, Tacoma West, and portions of Tacoma (Figure 3-4). Spanaway and American Lakes are the major lakes within the basin.

The nearshore portion of WRIA 12 extends from approximately Point Defiance, south to the edge of the Nisqually Delta. This region is characterized by high energy currents through the relatively deep and narrow passes and is somewhat distinct from the rest of the Pierce County nearshore as this area is part of the Central Puget Sound Basin. No nearshore shoreline lies within Pierce County jurisdiction within WRIA 12. However, the County does own shoreline properties at Chambers Bay at the mouth of Chambers Creek, which are located within the cities of University Place and Lakewood.

Although the shoreline reach from the Point Defiance to the Nisqually delta is highly urbanized and constrained by the presence of the rail line along much of the shore, this area does contain several small pocket estuaries. These estuaries provide some juvenile salmonid support and water quality functions. Partial constrictions from roads, bridges, and fill in tidal wetlands all affect these pocket estuaries to some extent (Redman et al. 2005).

Figure 3-4. WRIA 12



3.1.4 WRIA 15 – Kitsap Peninsula and Islands

WRIA 15 includes Key Peninsula, the southern tip of the Gig Harbor Peninsula, Fox Island, McNeil Island, Anderson Island, Ketron and other smaller islands (Figure 3-5). WRIA 15 encompasses approximately 631,100 acres, although only 22 percent of the watershed lies within Pierce County (Ecology, http://www.ecy.wa.gov/pubs/0610039/15.pdf). The large majority of the watershed is located in Kitsap County, Washington.

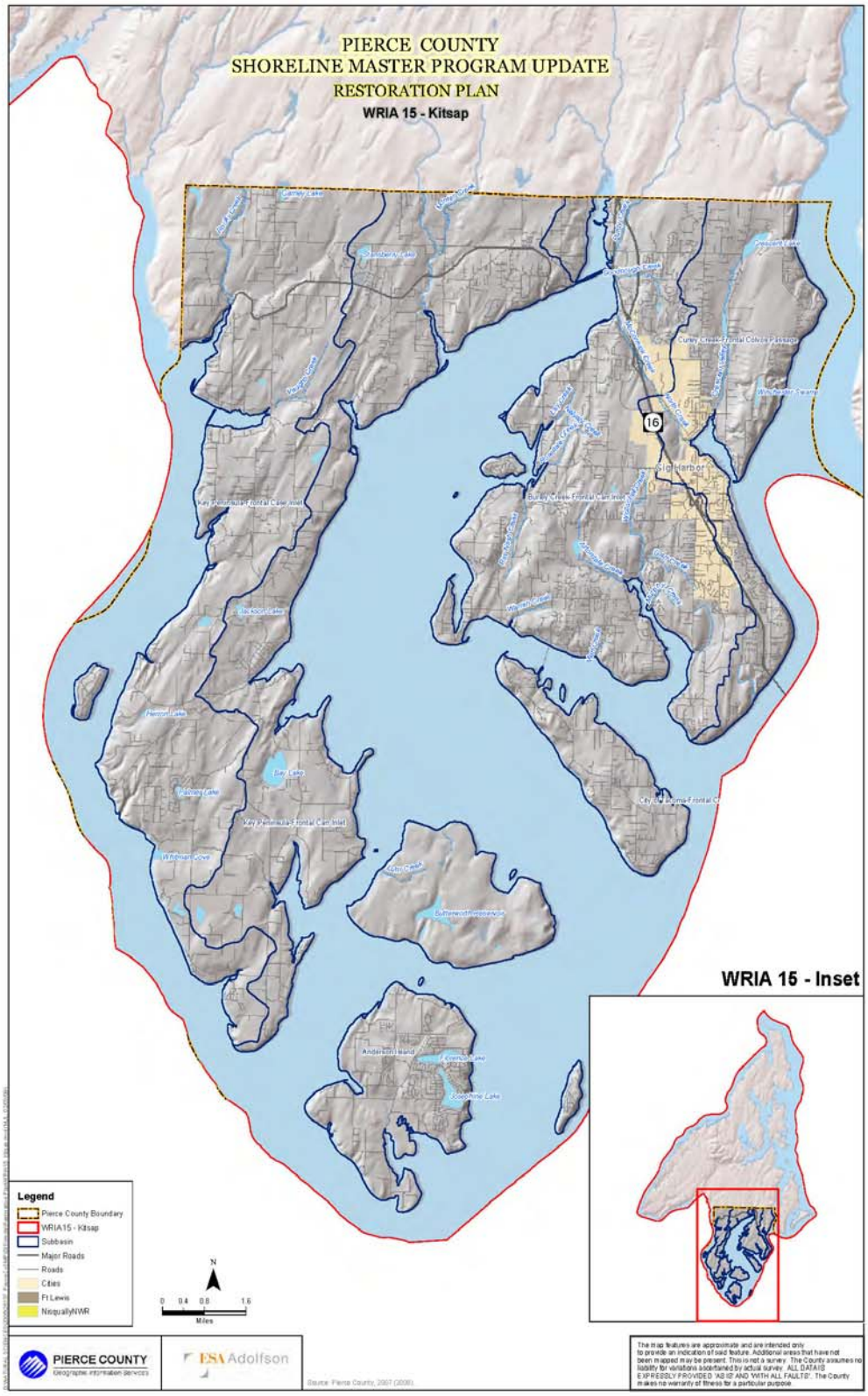
The entire basin is located within the central Puget Sound ecoregion. Elevations throughout the basin are at or just above sea level. Sub-basins within WRIA 15 in Pierce County include Gig Harbor, Key Peninsula, and Islands. Major lakes in these sub-basins include Bay Lake, Crescent Lake, Lake Minterwood, Carney Lake, Lake Florence and Lake Josephine. Major land uses in WRIA 15 are forest resources, agriculture, and urban uses.

The nearshore portion of WRIA 15 includes the eastern portion of Case Inlet, Carr Inlet, the western portions of Colvos Passage and the Tacoma Narrows, both sides of the Key Peninsula and Gig Harbor Peninsula, Fox Island, McNeil Island, Anderson Island, and several smaller bays, inlets and islands. Although the degree of shoreline development is high in some areas, the upland watersheds have relatively low impervious surface areas, and predominantly forest or mixed forest/pasture land cover. This area lacks the large urban/industrial developments that have altered the Puyallup estuary and Commencement Bay.

Water quality impairments exist in Gig Harbor, Carr Inlet, Henderson Bay, Wollochet Bay, and in the area between the Nisqually Delta and Anderson Island and in isolated spots off Anderson and McNeil Islands. Water quality impairments are associated with areas of greater impervious surfaces, overwater structures, urban areas, agricultural land uses, wastewater treatment plants, and lack of riparian vegetation. Several prohibited or restricted shellfish growing areas occur in Wollochet Bay, Oro Bay, Burley Lagoon, and at scattered locations on the Key Peninsula (e.g., Filucy Bay). Sources of water quality impairments are exacerbated in this area by the long, narrow and shallow inlets, the lack of flushing, and the long residence times (Albertson et al. 2002). All of these factors increase this area's susceptibility to water quality impairments. Excess inputs of nutrients, pathogens, or toxins in this region of Pierce County are more likely to result in algal blooms and low DO levels, build up of pathogens in the water, sediments, and ultimately in shellfish, and accumulation of toxins in sediments.

Shoreline modification through armoring and overwater structures and lack of riparian vegetation occurs locally within Hale Passage, Wollochet Bay, portions of Henderson Bay, Gig Harbor Bay and a small area in Case Inlet around Vaughn Bay. Forage fish spawning, eelgrass, marine invertebrates and shellfish beds are relatively abundant, especially around Wollochet Bay, and in Carr Inlet/Henderson Bay and Case Inlets. Numerous marine mammal haulouts, primarily for harbor seal, occur scattered around the islands. Waterfowl concentration areas are associated with most small bays which contain mud or sand flats.

Figure 3-5. WRIA 15



3.1.5 WRIA 26 – Cowlitz River

WRIA 26 encompasses approximately 1,594,800 acres in Pierce, Lewis, and Cowlitz counties (Ecology, http://www.ecy.wa.gov/pubs/0610039/26.pdf). Only a small area of the upper watershed of WRIA 26 lies within Pierce County, to the southeast of Mt. Rainier. This portion of the basin includes the headwaters of the Cowlitz River and associated tributaries. Elevations are well above sea level, including the summit of Mt. Rainier. The portion of WRIA 26 in Pierce County lies entirely within Mount Rainier National Park. No river, streams or lakes meeting the definition of shorelines of the state lie within WRIA 26 in Pierce County jurisdiction; therefore, restoration opportunities will not be provided in this document for WRIA 26.

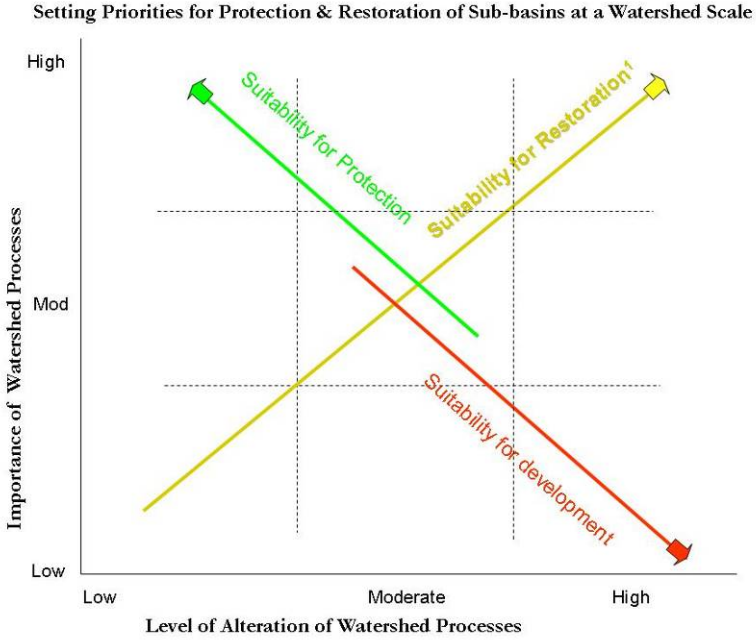
4.0 OVERVIEW OF RESTORATION PRIORITIES

This section provides a broad overview of the individual watersheds and sub-basins that are considered high priority for restoration or protection. The following chapter (Chapter 5) provides information on specific restoration opportunities within these watersheds/reaches. The Pierce County Shoreline Inventory and Characterization report (ESA Adolfson et al., 2007; revised 2009) identified important freshwater and nearshore processes and discussed threats and alterations within the four watershed inventory areas to access the potential for shoreline restoration based upon the condition of the watershed and important landscape scale functions.

4.1 FRESHWATER RESTORATION POTENTIAL

The Ecology Watershed Characterization method (Stanley et. al 2005) was applied to sub-basins in Pierce County to determine relative restoration potential and priority. Each sub-basin was rated in terms of its level of *importance* (High, Medium, and Low) in performing freshwater water flow processes and evaluated the extent to which each watershed is *altered*. The "importance rating" was then compared to the "alteration rating" so that each watershed could be assigned to a category based on its relative suitability for restoration, protection, or development (Figure 4-1).

Figure 4-1. Determining restoration, protection and development categories for hydrologic processes
(Ecology 2007)



1) Applies to areas where restoration is feasible. If the site proposed for restoration is in an existing developed urban area, or where processes are so altered (either within a sub-basin or in the upper watershed) that they cannot be adequately restored, then the site is more suitable for development and restoration should be shifted to other locations in the sub-basin that are rated high for both level of importance and level of alteration.

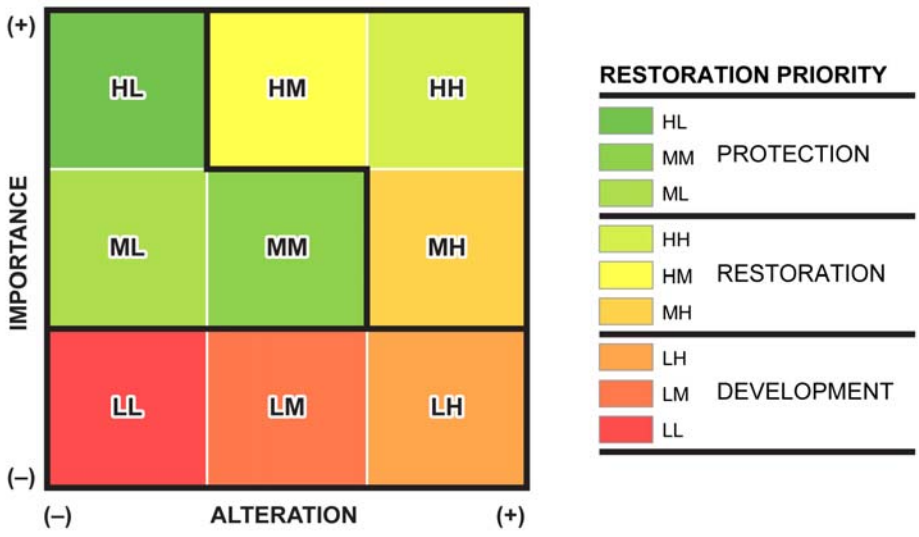
This approach assumes that, in general:

- Areas of High (H) importance (for water processes) are higher priorities for restoration than areas of low importance, and
- Areas of Low (L) alteration are higher priorities for preservation than highly altered areas, and
- Highly altered (i.e., urbanized or developed) areas should generally not be high priorities for restoration.

The importance and alteration scores were then taken together to provide a combined score (High-High [HH], High-Medium [HM], etc) that can be used to suggest future management priorities (Figure 4-2). For example, a sub-basin with high importance and high level of alteration would be given a score of HH and would be a candidate for activities that focus on restoration. Similarly, a sub-basin with high importance and a low level of alteration would score a HL and be a candidate for activities that focus on preservation. Maps of the restoration priorities by watershed and sub-basin are included in Appendix A of this document.

This method was intended to provide a first-order ranking of sub-basin for restoration and preservation priority. This method does not incorporate site-specific data on potential fish habitat priorities in stream channels (such as the data supporting the Ecosystem Diagnostic and Treatment [EDT] approach). However, the EDT Model results for freshwater rivers and streams are shown as a separate layer on the restoration priority maps in Appendix A. The EDT Model data was then considered as part of the restoration priority ranking per sub-basin in Chapter 5.

Figure 4-2. Rankings and groupings for restoration, protection and development categories for hydrologic processes used for Pierce County



When using Ecology's watershed characterization for ecosystem restoration planning, it is important to note that the goal of the basin analysis is to describe hydrologic processes and alterations. It does not characterize all ecosystem processes and it does not directly assess biological functions. The watershed characterization focuses on groundwater and surface water movement because the way that water flows through a watershed has a major impact on other key ecosystem processes (related to water quality, sediment generation and transport, and the movement of organic materials such as large woody debris) and therefore influences habitat structure and biological function. Hydrologic processes drive other important functions; therefore the former can serve as an indicator of the latter. Other assumptions should be considered when evaluating this model:

- The ratings are coarse-scale. Analysis was at the watershed and sub-basin scale, not at the reach scale. As an example, there are some restoration opportunities in watersheds categorized as "development" and some development opportunities in areas categorized as "restoration".

- Rating categories are not absolute. A rating of "development" or "restoration" applies generally to the sub-basin as a whole. It does not exclude or devalue the need to protect existing resources in those watersheds. All areas in the watershed are protected under existing regulations and management policies.

- Categories suggest types of policies that should be emphasized. For areas in the "protection" category, strengthening regulations and policies is emphasized. For areas in the "restoration" category, strengthening restoration efforts, programs and projects is emphasized.

The results of this analysis should be evaluated again in light of community goals and information on locally significant habitats so that site-specific priorities for restoration and protection within each area of the watershed are fully understood.

4.2 NEARSHORE RESTORATION POTENTIAL

Conditions in the nearshore environment of Pierce County were assessed using aerial photographs, satellite images (Google Earth), and existing inventories (e.g., salmon recovery plans). The Key Peninsula, Gig Harbor and Islands Nearshore Assessment Report (Pentec 2003) was used specifically to identify restoration opportunities in WRIA 15 (Kitsap Peninsula). The strategic change analysis being undertaken by the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) is mapping general levels of degradation along Puget Sound shorelines; this information was also used to help identify potential restoration areas (see Map 8; Schlenger et al., in prep). Through an intensive site screening process, PSNERP has identified 36 potential nearshore restoration sites throughout Puget Sound, including two sites in Pierce County (ESA et al., 2011). Several other information sources were used to identify and prioritize restoration projects, including:

- DNR Shorezone data,

- WDFW PHS data including forage fish spawning maps,

- Ecology 2006 aerial shoreline photos,
- South Puget Sound Salmon Enhancement Group data,
- Pierce County lead entity salmon recovery plans and work plans,
- Tribal information,
- Pierce County basin plans and watershed council plans, and
- Data from environmental stewardship organizations.

The Pierce County Shoreline Inventory and Characterization Report (ESA Adolfson, 2007a; revised 2009) provides additional detail on information sources used.

For this restoration plan, the restoration potential of reaches was evaluated qualitatively, by considering the importance of the area to ecosystem function and the level of process or function alteration in that reach.

Reaches that are important for ecosystem function are assumed to be higher priorities for restoration, particularly areas with low levels of alteration. Highly altered areas, especially those with alterations than tend to be largely irreversible – i.e., urban developments – are not generally suitable for restoration but are areas where development is more suitable. This is a coarse-scale ranking of potential, given the qualitative evaluation and the large areas encompassed within reaches.

In evaluating the level of alteration for the nearshore reaches, the focus was on the major threats or stressors that have been identified for the Puget Sound region (Pentec 2003, McClure and Ruckelshaus 2007, Puget Sound Partnership 2008, ESA et al., 2011, Schlenger et al., in prep.). These include loss or simplification of river delta/estuary habitats, loss of salt marsh habitat, contamination of sediments, modification of shorelines by armoring and overwater/in-water structures, loss of riparian vegetation, and water quality impairments from increased inputs of nutrients, pathogens, and/or toxins.

Based on this qualitative evaluation, the following are nearshore areas where restoration should be emphasized:

- Nisqually River Estuary
- Pocket Estuaries on Anderson and McNeil Islands and the Key Peninsula
- Case Inlet
- Carr Inlet/Henderson Bay including river and stream mouths

These areas are priorities for restoration because of high importance for shoreline sediment or hydrologic (tidal flows) processes and/or biological resources and generally moderate to high levels of alteration.

5.0 RESTORATION ACTIONS

The restoration opportunities and recommended actions presented here were derived from technical studies prepared in support of the Pierce County SMP update or other published reports, or they are based on input provided by County staff, the Shoreline Citizens Advisory Committee, state and federal agencies, Tribes, environmental organizations, and the general public. In compiling the lists of recommended actions for each watershed, the County identified some of the most apparent and significant causes of shoreline degradation and impairment and matched them with the restoration actions (from the menu of restoration actions in Tables 1-1 and 2-1) that would have the greatest opportunity for achieving the goals in Chapter 2.

Additional shoreline restoration opportunities may be present in Pierce County that have not been identified in the tables. Some of the actions identified here may prove to be infeasible or impractical based on further analysis. This list should be used as a starting point for future collaboration and planning.

Programmatic restoration/conservation actions that are applicable to all areas of the County are also identified in this chapter. Implementing the programmatic actions will also help to improve ecological conditions over time.

5.1 PROGRAMMATIC ACTIONS

Certain restoration actions should be broadly and comprehensively implemented on a programmatic basis to help achieve restoration goals. The following programmatic actions are recommended for shorelines within Pierce County. Which County departments or other entities will take the lead on these actions will be determined in the future. Pierce County will continue to coordinate with neighboring jurisdictions on restoration activities. For example, King County and Pierce County have coordinated past restoration and planning efforts, and such coordination is expected to continue. Opportunities to partner with towns and cities in Pierce County on programmatic efforts will also be explored.

Education and Incentives:

- Educate property owners about proper vegetation/landscape maintenance (including preservation of native vegetation along stream/nearshore riparian corridors) to promote shore stabilization and protect water quality.

- Encourage low impact development practices for shoreline property owners.

- Educate private property owners about the negative impacts of shore armoring and over-water structures and encouraging soft shore protection where shore protection is unavoidable.

- Educate boaters about proper waste disposal methods, anchoring techniques, and other best boating practices to minimize habitat damage and prevent water quality contamination.

- Encourage incentive programs for shoreline property owners, such as transfer or purchase of development rights and tax incentives for shoreline restoration and protection.

- Where shorelines have been modified, provide incentives to encourage redevelopment activities to include salmonid habitat restoration.

Marine Nearshore:

- Remove armoring and bulkheads from publicly owned marine sites including parks, wherever feasible.

- Design overwater structures to allow light penetration for protection of aquatic habitat.

- Encourage removal of creosote pilings, docks or other contaminants or derelict structures from the nearshore environment.

- Remove derelict vessels from nearshore areas.

- Work with the shellfish aquaculture industry, Tribes, and non-government organizations to develop and implement BMPs for environmentally sustainable aquaculture.

- Encourage dike and tide gate removal.

- Remove blockages to small tributaries to the nearshore such as culverts, fill and structures.

- Encourage the construction of joint-use versus single-use docks to minimize the need for new dock construction.

Freshwater Shorelines (Lakes and Rivers):

- Remove armoring and bulkheads from publicly-owned freshwater sites including parks, wherever feasible.

- Design docks and piers to allow light penetration for protection of aquatic habitats.

- Encourage the construction of joint-use versus single-use docks to minimize the need for new dock construction.

- Encourage lake associations or stewardship organizations to act for the protection of water quality and control of invasive aquatic weeds in freshwater lakes.

- Encourage levee setback projects to allow for channel migration on rivers and provide off-channel habitat for salmonids.

- Remove culverts and blockages from smaller tributaries and replace with bridges to allow for fish passage and channel migration.

- Restrict new development in the floodplain and channel migration zone.

Infrastructure:

- Manage water withdrawals to address in-stream flows, especially in water-limited basins.
- Implement best management practices to control runoff from agricultural lands.
- Inspect, maintain, and repair leaking or unauthorized septic systems to prevent nutrient and bacteria loading in streams and bays. Where possible, public sewer systems should be installed to replace on-site septic systems.
- Reforest commercial forest lands and repair or abandon forest roads.
- Retrofit stormwater systems using Low Impact Development (LID) strategies.

Planning and Coordination:

- Match mitigation, including off-site and compensatory mitigation, to appropriate restoration and enhancement activities as identified in salmon recovery, watershed management plans and the SMP restoration plan.
- Coordinate SMP restoration with salmonid recovery and watershed management plans to align with projects prioritized in salmon recovery plans.
- Develop a marine resource committee to achieve the protection and restoration of the marine resources of Pierce County (as provided in Chapter 36.125 RCW).
- Continue to survey and monitor invasive species, including noxious weeds and nonnative invertebrates (e.g., tunicates), and initiate eradication programs as needed.

5.2 RESTORATION OPPORTUNITIES - WRIA 10

Restoration opportunities for nearshore areas and freshwater shorelines of the Puyallup-White Rivers (WRIA 10) are summarized in this section. The recommendations are described relative to the benefits they would help to achieve. Implementing these recommendations would complement the protection efforts encompassed in the SMP. Both protection and restoration efforts are necessary to offset impacts of existing and future development, repair past damages, and improve the ecological baseline.

5.2.1 Nearshore Restoration

The nearshore areas of the Puyallup-White Rivers (WRIA 10) are located in Commencement Bay within the urban growth boundary of the City of Tacoma. Tacoma is currently identifying nearshore restoration opportunities within Commencement Bay along with partners, Citizens for a Healthy Bay, Tahoma Audubon Society, Port of Tacoma, the Puyallup Tribe, and others. Tacoma has summarized restoration opportunities for the bay in its City of Tacoma Shoreline Restoration Plan (ESA, April 2011). Partnering with the City of Tacoma and other stakeholders will be important for restoration opportunities within the Brown's Point/Dash Point shorelines in Pierce County jurisdiction.

Restoration in the nearshore marine environment of Commencement Bay has occurred over the past 15 to 20 years through the remediation efforts under the Commencement Bay Natural Resource Damage Assessment (CB/NRDA) program. These efforts are part of the implementation of the Commencement Bay Conceptual Restoration Plan (June 1997), which details the restoration components outlined in the preferred alternative – the Integrated Approach – as described in the programmatic Environmental Impact Statement (EIS) prepared for the Commencement Bay cleanup plan.

Restoration opportunities for Browns Point/Dash Point nearshore shoreline include: 1) removal of intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris; 2) bulkhead removal or softening; 3) restoration of stream estuaries; and 4) riparian enhancement to improve large woody debris (LWD) recruitment and habitat conditions.

Washington State Parks has recently completed a planning process for Dash Point State Park. Part of the management approach for the park includes restoration measures, such as removing marine debris, addressing permitted surface runoff, restoring stream and intertidal habitat for juvenile salmon, removing facilities to allow natural stream processes to occur, and protecting and monitoring wetlands (WSPRC, 2009).

5.2.2 Freshwater Restoration

The freshwater shoreline restoration opportunities include both programmatic and project-specific actions that have been identified by various government and non-government entities. These are summarized in Table 5-1. Restoration of freshwater shorelines in the Pierce County portion of WRIA 10 will involve coordination with several adjacent jurisdictions that share the shorelines of larger water bodies. Opportunities for partnerships with other local jurisdictions are described by water body in Table 5-1.

Some rivers and lakes do not have site-specific identified restoration opportunities. For example, data are lacking for rivers and streams in the upper watershed in the Mt. Baker-Snoqualmie National Forest or on private forest resource lands.

Restoration opportunities in Table 5-1 are presented first for major streams and rivers, followed by smaller tributaries grouped by drainage basin. All of the projects listed in the table are considered to have a high potential for success in improving the functions of shorelines in the WRIA. However, the success of each restoration project depends on the ultimate project design and implementation.

Table 5-1 lists the recommended timing for each restoration opportunity as "short-term" or "long-term." **Short-term** (approximately 1-5 years) restoration projects include those that could be implemented by local landowners and volunteers and that would benefit the areas that are most in need. Short-term restoration efforts include habitat restoration and enhancement efforts in publicly owned areas of the County's shorelines. These projects could be implemented in the near term, depending on grant cycles and coordination with volunteer and community organizations. **Long-term** (approximately 5-10 years) restoration projects could be those that require coordination with other jurisdictions or that cover larger land areas. These projects may be more difficult to implement and would likely require more planning and permitting.

Table 5-1. Freshwater Restoration Opportunities in Puyallup-White River Drainage (WRIA 10)

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Hylebos Creek	High fecal coliform levels; loss of riparian vegetation; loss of estuarine marsh at the mouth. Coordination with Port of Tacoma, City of Tacoma and NRDA plan.	Numerous potential sites along stream. Determine project locations through coordination with other groups that are working on the stream.	<u>Programmatic opportunities:</u> • Restore stream channel and floodplain to benefit salmon habitat. • Improve flood storage and capacity. • Improve water quality (Hylebos Browns-Dash Point Basin Plan CIP04-LH1-RST01). • Coordinate restoration with Cities of Tacoma and Milton. <u>Site-specific opportunities:</u> • Restoration of NRDA alternative site. Construct 2 acres of new restoration area in the intertidal zone (Port of Tacoma). Included in WRIA 10/12 Lead Entity 2011 Three-year Work Plan. • Restore property owned by WSDOT at the mouth of the Hylebos. Revegetation of tidal area to encourage marsh habitat development (Friends of the Hylebos). Included in WRIA 10/12 Lead Entity 2011 Three-year Work Plan. • Revegetation of the Hauff Property at mouth of Hylebos (Friends of the Hylebos). Included in WRIA 10/12 Lead Entity 2011 Three-year Work Plan.	High for all opportunities	Water quality Shading and organic input Estuarine habitat Flood storage	Long-term for programmatic opportunities Short-term for site specific opportunities and those listed in basin plan; property acquisition may be long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Clarks Creek	Non-point source pollution from stormwater runoff, invasive species. Brazilian elodea infestations result in lowered dissolved oxygen, restricted stream flow, retention of sediment, and destruction of fish spawning beds. Infestations are removed annually. Portions of the stream that are well-shaded and free of sediment do not have elodea.	Entire stream where riparian vegetation is lacking. Lower Clarks Creek (CLAR_CR_01)	<u>Programmatic opportunities:</u> • Develop a detailed riparian planting plan for Clarks Creek to increase shading and reduce sedimentation. • Coordinate with City of Puyallup. <u>Site-specific opportunities:</u> • Enhance floodplain between Pioneer Way and Clear Creek confluence by removing invasive vegetation and planting native vegetation (Clear/Clarks Creek Basin Plan CIP03-CK-RST-01). This is also identified as an opportunity in the Puyallup draft SMP restoration plan (ESA Adolfson, 2007). • Implement stormwater retrofit projects funded through Ecology grant (construction anticipated in 2012-2013). • Acquire properties that are repeatedly flooded by backflows from Puyallup River at RM 5.8. Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011).	High for all opportunities	Water quality Fish habitat Shading and organic input	Long-term for programmatic opportunities Short-term for site specific opportunities and those listed in basin plan; property acquisition may be long-term
Clear Creek	See Puyallup River.	Lower Clear Creek (within PUYA_RV_01)	<u>Site-specific opportunities:</u> • Restore 3,000 feet of Clear Creek near Pioneer Way by removing invasive vegetation, planting native conifers, installing LWD within channel (Clear/Clarks Creek Basin Plan CIP03-CL-RST-01). Clear Creek restoration planned for scoping in 2011, construction in 2013 (Puyallup River Watershed Council). • Acquire floodprone properties at Puyallup River confluence (RM 2.9). Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011).	High for all opportunities	Shading and organic input Fish habitat	Short-term for site specific opportunities and those listed in basin plan; property acquisition may be long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Puyallup River	Conversion of forest land cover to pasture or urban land uses; confinement of the channel and disconnection of floodplain by extensive levees and revetments; channel avulsion of the White River into the Puyallup, potentially doubling the sediment load in the lower Puyallup; relocation of the main channel and reduction in channel length; historical dredging of the channel to remove sediment; discharges from wastewater treatment plans; alterations of natural flow regime from upstream dams; loss of riparian forests and sources of LWD; blockage of fish passage by culverts; water quality impairments; road and utility crossings.	All reaches	<u>Programmatic opportunities:</u> • Implement streamside and riparian plantings including reforestation of riparian areas behind the levees. • Preserve and restore aquatic and terrestrial habitat. • Fix culverts that are barriers to salmon. • Set back levees and reconnect floodplain habitats. • Restore off-channel habitats. • Coordinate restoration efforts with Cities of Puyallup, Tacoma, Fife, Sumner, and Orting.	High for all opportunities	Channel migration and floodplain connection Aquifer recharge Flood flow retention Upland sediment generation Water quality Fish and wildlife habitat Fish passage Shading and organic input	Long-term for programmatic opportunities
		Two priority sites from the WRIA 10/12 priority projects list: South Fork site RM 17.8 – 18.4; Union Pacific Site in estuary RM 2.6-3.0.	<u>Site-specific opportunities:</u> • Construction of levee setbacks for floodplain reconnection and habitat restoration between RMs 6 and 22; feasibility study evaluated 20 potential projects on the Puyallup River (Geoengineers 2008).	High for all opportunities	See programmatic opportunities	Short-term for site specific opportunities and those listed in basin plans and WRIA project lists; property acquisition may be long-term
		RM 0 to RM 6	• Restore off-channel estuarine habitat on lower Puyallup. • Revegetate wetlands in riparian zone. • Work with City of Tacoma to implement projects identified in their draft SMP restoration plan (ESA Adolfson, 2011).			

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Puyallup River, (continued)		Lower Puyallup River near SR 512.	• Revegetate riparian areas and reconnect floodplain wetlands to provide off-channel fish habitat. Coordinate with City of Puyallup to implement projects identified in its draft restoration plan (ESA Adolfson 2007).	High for all opportunities	See programmatic opportunities	Short-term for site specific opportunities and those listed in basin plans and WRIA project lists; property acquisition may be long-term
		Lower Puyallup	• North Levee Road setback: Set back levee on right bank from RM 2.4 – 8.1 and purchase affected properties. Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011). • Breach, remove, and/or set back levee at Linden Golf Course (RM 9.8 – 10.3). Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011).			
		Middle Puyallup	• Calistoga Oxbow Culvert Replacement: Replace undersized and damaged culvert along Puyallup at RM 18 and Calistoga Bridge near Orting to increase backwater rearing habitat and reconnect floodplain (Pierce Co. and Puyallup Tribe). • Puyallup River Setback Levee at South Fork (RM 17.8 to 18.4): Complete project to remove existing levee and construct setback levee along 0.6 miles of Puyallup River on the left bank. Will reconnect 45 acres of floodplain and reestablish natural riverine processes. Included in WRIA 10/12 Lead Entity 2011 Three-year Work Plan. • Levee setback at McCutcheon Rd/128th Street East: Set back levee at RM 16.7-17.3 and acquire floodprone properties. Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011).	High for all opportunities		

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Puyallup River, (continued)		Upper Puyallup	• Complete acquisition and restoration of riparian property along Horsehaven Creek (Puyallup River floodplain). Pierce County has already purchased 30 acres of riparian corridor in this area (Mid-Puyallup Basin Plan CIP-23-HH1-AC02, CIP-23-HH1-RST01). • Coordinate with City of Orting on riparian revegetation projects identified in City's 2009 restoration plan. • Electron diversion canal (PUY_RV_11): Improve efficiency of the screen on the Electron hydroelectric diversion canal for juvenile salmonids migrating downstream (included in the 2011 WRIA 10/12 three-year work plan). • Upper Puyallup River Land Acquisition: Acquire up to 800 acres along the north bank of the Puyallup in Section 29 including the river and floodplain. Includes one mile of river frontage from the City of Orting to the entrance of Mt. Rainier Nat. Park. Land provides pristine riparian and wetland habitats (Lead Entity WRIA 10/12). • Calistoga Levee setback (RM 20.0 – 21.3): Set back 1.3 miles of levee to reconnect 46 acres of floodplain; acquire floodprone properties. Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011). Listed in WRIA 10/12 Lead Entity 2011 Three-year work plan. • Orville Road relocation and levee setback (RM 26.3 – 28.8): Relocate 2.7 miles of Orville Road, construct setback levee, install engineered log jams. Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011). • Needham Road (RM 25.5 – 27.0): Abandon Needham Road and purchase floodprone properties. Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011).	Moderate to High for all opportunities High priority (for salmon) Moderate to High	See programmatic opportunities	Short-term for site specific opportunities and those listed in basin plans and WRIA project lists; property acquisition may be long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
White River **Mud Mountain Lake**	Alteration of the natural flow regime by Mud Mountain dam and diversion of surface flows to Lake Tapps (PSE diversion); conversion of forests to harvested forest, pasture, or urban lands; loss of riparian forests; increased demands on groundwater which have increased low flows; land use that have increased fine sediment loads; extensive levees on lower reaches; water quality impairments.	All reaches	<u>Programmatic opportunities:</u> • Decommission roads in Upper White-Greenwater River floodplain (included in WRIA 10/12 2011 priority projects list). • Install engineered logjams. • Plant riparian vegetation. • Set back levees to allow more channel migration and reconnect floodplain habitat. • Coordinate restoration efforts on the White River with those of the Cities of Sumner, Pacific, and Buckley and King County.	High for all opportunities	Water quality Fish habitat Shading and organic input Channel migration and floodplain connection	Long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
White River **Mud Mountain Lake (continued)**			<u>Site-specific opportunities:</u> • Construction of levee setbacks for floodplain reconnection and habitat restoration. Feasibility study evaluated six potential projects on the White River (Geoengineers 2008). • Sumner Levee Setback: Set back levee between RM 3.2 and RM 3.5 to restore 9 acres of floodplain habitat. Listed in WRIA 10/12 Lead Entity 2011 Three-year work plan. • Transcanada Setback Levee (RM 8.4 – 8.8). Modify existing breaches and remove portions of levee on King County owned property to improve potential for overbank flow into existing side-channels. Listed in WRIA 10/12 Lead Entity 2011 Three-year work plan. • Acquire properties, set back levees, restore riparian vegetation on parcels in Pacific. Listed in WRIA 10/12 Lead Entity 2011 Three-year work plan. • White River Land Acquisition: Acquire up to 300 acres along White River in the vicinity of Buckley. Lands currently owned by PSE and contain important riverine riparian habitats (Pierce County Water Programs, Cascade Land Conservancy and King County). • Levee setbacks (RM 1.8 – 4.4): Acquire properties and set back levees to increase channel capacity and flood storage. Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011). • Acquire property and set back levees at RM 5.2 to restore 47 acres of floodplain habitat. Parcels are located in King and Pierce Counties. • Raise SR 410 and install engineered log jams (RM 43.5 – 43.8). Identified as an option during flood hazard management plan update (Pierce County Public Works, 2011).	High	See programmatic opportunities	Short-term for site specific opportunities and those listed in basin plans and WRIA project lists; property acquisition may be long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Carbon River	Conversion of forest to agriculture or development; construction of roads and levees; lack of LWD; water quality impairment.	All reaches Upper Carbon	<u>Programmatic opportunities:</u> • Set back levees and reconnect floodplain habitat. • Plant forested riparian vegetation. • Add LWD to channel. • Coordinate restoration activities with City of Orting. <u>Site-specific opportunities:</u> • Construction of levee setbacks for floodplain reconnection and habitat restoration. Feasibility study evaluated six potential projects on the Carbon River (Geoengineers 2008). • Complete acquisition of conservation easement on 60-acre West Farm between Orting and South Prairie; Pierce County has applied for funding to WWRP.	High for all opportunities	Channel migration and floodplain connection Aquifer recharge Flood flow retention Upland sediment generation Water quality Fish and wildlife habitat Shading and organic input	Long-term for programmatic opportunities Short-term for site specific opportunities; property acquisition may be long-term
Lake Tapps **Printz Basin**	Loss of natural vegetation, shoreline armoring, overwater structures, dense road network in the watershed, heavy recreational boat use; water quality impairments.	All reaches Lake Tapps North Park	<u>Programmatic opportunities:</u> • Protect and preserve the lake's water quality from impacts from stormwater or other non-point pollution sources. <u>Site-specific opportunities:</u> • Revegetate and restore shoreline riparian habitat in park.	Moderate for all opportunities	Water quality Shading and organic input Fish and wildlife habitat	Long-term for programmatic opportunities Short-term for site specific opportunities
South Prairie Creek	Lost of forest cover and riparian vegetation; Buckley diversion dam; levee construction; road crossings; gravel mining; floodplain development; water quality impairment.	All reaches	<u>Programmatic opportunities:</u> • Revegetate riparian areas. • Support ongoing restoration programs (e.g., South Prairie Creek Preserve). • Restore wetland and floodplain connectivity to the channel. • Add LWD, channel structure, sinuosity. • Coordinate restoration efforts with Town of South Prairie.	High for all opportunities (important salmonid habitat)	Channel migration and floodplain connection Aquifer recharge Flood flow retention Upland sediment generation Water quality Fish and wildlife habitat Shading and organic input	Long-term for programmatic opportunities

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
South Prairie Creek (continued)		Lower South Prairie Creek	<u>Site-specific opportunities:</u> • Acquire 60 – 120 acres of instream and riparian habitat along lower south Prairie Creek to protect important salmonid spawning area (included in WRIA 10/12 2011 priority projects list). Acquisition of floodprone properties along lower South Prairie Creek was identified as an option during flood hazard management plan update (Pierce County Public Works, 2011). • Instream and riparian restoration (LWD placement, removal of riprap, revegetation) on 300 acres from RM 2 – RM 4.6. Included in WRIA 10/12 Lead Entity 2011 Three-year Work Plan. • Survey and control Japanese knotweed in riparian and floodplain areas from RM 0 – RM 10. Included in WRIA 10/12 Lead Entity 2011 Three-year Work Plan.	High	See programmatic opportunities	Short-term for site specific opportunities and those on WRIA project lists; property acquisition may be long-term
Greenwater River	Timber harvest, logging roads and potential associated sedimentation; water quality impairment.	All reaches	<u>Programmatic opportunities:</u> • Place LWD in stream. • Remove roads and restore floodplain habitat. • Decommission roads in Upper White-Greenwater River floodplain (included in WRIA 10/12 2011 priority projects list).	High for all opportunities (important fish habitat)	Water quality Fish and wildlife habitat Channel migration and floodplain connection Shading and organic input	Long-term for programmatic opportunities
Clearwater River	Timber harvest, logging roads and potential associated sedimentation; water quality impairment.	All reaches	<u>Programmatic opportunities:</u> • Place LWD in stream (included in WRIA 10/12 Lead Entity 2011 Three-year work plan). • Remove roads and restore floodplain habitat. • Revegetate riparian areas.	High for all opportunities	Water quality Fish and wildlife habitat Channel migration and floodplain connection Shading and organic input	Long-term
Mid Puyallup River Basin Tributaries						
Fennel Creek	Upper reaches degraded by historic land uses, lack of riparian vegetation and LWD. Riparian area south of Sumner-Buckley Hwy is still relatively intact.	All reaches	<u>Programmatic opportunities:</u> • Revegetate riparian areas, particularly in upper portions of SMP planning area. • Coordinate restoration efforts with City of Buckley.	High for all opportunities	Water quality Shading and organic input Fish and wildlife habitat Wetland restoration	Long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Rhodes Lake	Shoreline armoring, docks, removal of shoreline vegetation.	All reaches	Programmatic opportunities: • Restore native shoreline vegetation. • Remove failing bulkheads. • Replace failing bulkheads with softer alternatives.	High for all opportunities	Water quality Shading and organic input Fish and wildlife habitat Wetland restoration	Long-term
Upper Puyallup River Basin Tributaries						
Kapowsin Creek	Livestock access to stream; lack of riparian vegetation in some areas.	All reaches	Programmatic opportunities: • Fence livestock areas to prevent access to stream. • Revegetate riparian areas.	Moderate for all opportunities	Water quality Shading and organic input Fish and wildlife habitat	Long-term
Kapowsin Lake	High phosphorus levels, timber harvest, limited residential docks and bulkheads.	All reaches	Programmatic opportunities: • Protect existing shoreline vegetation and replant where vegetation is lacking.	Moderate for all opportunities	Water quality Shading and organic input Fish and wildlife habitat	Long-term
Morgan Lake	Removal of vegetation for agriculture and low-density residential development.	All reaches	Programmatic opportunities: • Revegetate degraded wetland areas. • Enhance shoreline riparian vegetation.	Moderate to High for all opportunities	Water quality Shading and organic input Fish and wildlife habitat	Long-term
Tributaries in Forest Resource Areas: Ohop Creek Kings Creek Neisson Creek Mowich River Rushingwater Creek Meadow Creek Deer Creek North Puyallup River South Puyallup River Saint Andrews Creek Unnamed Tributary to Puyallup River Unnamed Tributary to South Puyallup	Timber harvest, logging roads and potential associated sedimentation.	All reaches	Programmatic opportunities: • Decommission or repair logging roads to prevent sedimentation into water bodies. • Replant riparian zones with native trees. • Remove failing culverts. • Add LWD to stream channels where appropriate.	High for all opportunities (sediment transport)	Water quality & Sediment Transport Shading and organic input Fish and wildlife habitat	Long-term
Lower White River Basin Tributaries						
Leaky Lake	Residential bulkheads, docks.	All reaches	Programmatic opportunities: • Restore native shoreline vegetation. • Replace failing bulkheads with softer alternatives.	Moderate for all opportunities	Water quality Shading and organic input Fish and wildlife habitat	Long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Upper White River Basin Tributaries						
Tributaries in Forest Resource Areas: Canyon Creek Two Milky Creek West Fork White River Pinochle Creek Viola Creek Huckleberry Creek Eleanor Creek Lost Creek (Huckleberry) Silver Creek Goat Creek Twenty-eight Mile Creek George Creek Lost Creek (Greenwater) Maggie Creek Echo Lake	Timber harvest, logging roads and potential associated sedimentation.	All reaches	Programmatic opportunities: • Decommission or repair logging roads to prevent sedimentation. • Replant riparian zones with native trees • Road decommissioning in floodplains specifically for Huckleberry and West Fork White River (including re-contouring of slope, installation of water barrs, removal of culverts or drainage structures, and revegetation). (USFS, SPSSEG, Puyallup Tribe; Lead Entity WRIA 10/12 Priority project). • Add LWD to stream channels where appropriate.	High for all opportunities	Water quality Shading and organic input Fish and wildlife habitat Channel migration and floodplain connection	Long-term for programmatic opportunities Short-term for site specific opportunities and those on WRIA project lists
South Prairie Creek Basin Tributaries						
Wilkeson Creek	Water quality impairment; loss of riparian vegetation.	All reaches	Programmatic opportunities: • Revegetate riparian areas.	High for all opportunities	Water quality Shading and organic input Fish and wildlife habitat	Long-term
Tributaries in Forest Resource Areas: Gale Creek Page Creek East Fork South Prairie Creek South Fork South Prairie Creek	Timber harvest, logging roads and potential associated sedimentation; water quality impairment.	All reaches	Programmatic opportunities: • Decommission or repair logging roads to prevent sedimentation.	High for all opportunities	Water quality	Long-term
Lower Carbon River Basin Tributaries						
Voight Creek	Removal of riparian vegetation; water quality impairment.	All reaches	Programmatic opportunities: • Revegetate riparian areas.	High for all opportunities	Water quality Shading and organic input Fish and wildlife habitat	Long-term

Table 5-1 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Bear Creek	Timber harvest, logging roads and potential associated sedimentation; water quality impairment.	All reaches	Programmatic opportunities: • Decommission or repair logging roads to prevent sedimentation.	High for all opportunities	Water quality Fish habitat	Long-term
Upper Carbon River Basin Tributaries						
Tributaries in Forest Resource Areas: Evans Creek Tolmie Creek Chenuis Creek Cayada Creek	Timber harvest, logging roads and potential associated sedimentation; water quality impairment.	All reaches	Programmatic opportunities: • Decommission or repair logging roads to prevent sedimentation. • Revegetate riparian areas.	Moderate for all opportunities (sediment transport)	Water quality Shading and organic input Fish and wildlife habitat	Long-term

Sources: Pierce County Lead Entity WRIA 10/12; Puyallup River Watershed Council; Pierce County Public Works Puyallup River Basin CIP program

5.3 RESTORATION OPPORTUNITIES - WRIA 11

Restoration opportunities for nearshore areas and freshwater shorelines of the Nisqually River (WRIA 11) are summarized in this section. Implementing these recommendations would complement the protection efforts encompassed in the SMP. Both protection and restoration efforts are necessary to offset impacts of existing and future development, repair past damages, and improve the ecological baseline.

5.3.1 Nearshore Restoration

The single most important salmonid habitat restoration project in the Nisqually River Salmon Recovery Plan is currently underway in the Nisqually delta in the Nisqually National Wildlife Refuge area. In a phased approach that began in 2008, the estuary restoration project funded by the U.S. Fish and Wildlife Service has removed much of the outer dike to allow the natural regeneration of estuarine wetland and tidal channels within a 760-acre area on the refuge (http://www.fws.gov/Nisqually/wildlife/restoration.html). This project combined with adjacent restoration efforts by the Nisqually Tribe'on tribal lands is anticipated to significantly restore habitat for Nisqually Chinook and other salmonids in the Nisqually estuary.

A comprehensive nearshore habitat assessment and restoration design project is currently underway for the WRIA 11 and 12 shoreline areas of the southern Puget Sound region. This project is being led by SPSSEG in cooperation with Nisqually Tribe, Pierce County, People for Puget Sound and the BNSF Railroad Company. In 2006, SPSSEG inventoried habitat from the Nisqually Delta north to Point Defiance to characterize habitats and assess forage fish use. A study is currently underway to identify restoration opportunities and develop a restoration plan specific to this nearshore reach. In addition to identifying restoration projects that will have the greatest benefit to salmon, the WRIA 11/12 Nearshore Assessment fills in data gaps between previously assessed areas adjacent to the project reach. Thurston County conducted a nearshore assessment in the Nisqually River and the Key Peninsula, Gig Harbor and Islands Assessment (KGI Study; Pentec, 2003) covered Anderson and Fox Islands, as well as the Gig Harbor area. The WRIA 11 and 12 nearshore assessment was designed consistent with these adjacent assessments, and gained consistency with other assessments in Puget Sound by following the Puget Sound Nearshore Partnership's guidance (PSNERP 2002). The nearshore restoration project is not yet complete and the summary report is not yet available to the public http://www.spsseg.org/index.php/projects/habitat-assessment/wria-1112-nearshore-assessment/.

5.3.2 Freshwater Restoration

The freshwater shoreline restoration opportunities include both programmatic and project-specific actions that have been identified by various government and non-government entities. These are summarized in Table 5-2. Restoration of freshwater shorelines in the Pierce County portion of WRIA 11 will involve coordination with several adjacent jurisdictions that share the shorelines of larger water bodies. Opportunities for partnerships with other local jurisdictions are described by water body in Table 5-2.

Some rivers and lakes do not have site-specific identified restoration opportunities. For example, data are lacking for many of the small lakes in the basin. Restoration opportunities in Table 5-2 are presented first for major streams and rivers, followed by smaller tributaries grouped by

drainage basin. All of the projects listed in the table are considered to have a high potential for success in improving the functions of shorelines in the WRIA. However, the success of each restoration project depends on the ultimate project design and implementation.

Table 5-2 lists the recommended timing for each restoration opportunity as "short-term" or "long-term." **Short-term** (approximately 1-5 years) restoration projects include those that could be implemented by local landowners and volunteers and that would benefit the areas that are most in need. Short-term restoration efforts include habitat restoration and enhancement efforts in publicly owned areas of the County's shorelines. These projects could be implemented in the near term, depending on grant cycles and coordination with volunteer and community organizations. **Long-term** (approximately 5-10 years) restoration projects could be those that require coordination with other jurisdictions or that cover larger land areas. These projects may be more difficult to implement and would likely require more planning and permitting.

Table 5-2. Freshwater Restoration Opportunities in Nisqually River Drainage (WRIA 11)

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Nisqually River	Conversion of forests to military reservation, harvested forest, and agriculture; confinement of the channel and disconnection of the floodplain with levees or revetments; sediment reduction downstream of two hydroelectric projects; gravel mining activities; water diversion; and water quality impairment, largely from agricultural activities.	All reaches	<u>Programmatic opportunities:</u> • Remove culverts blocking salmon passage and altering sediment processes in tributaries to the Nisqually. • Restore forested conditions in degraded areas of the riparian zone. • Protect feeder tributaries from sedimentation due to timber harvest, gravel mining, and other development. • Control knotweed in riparian buffers and floodplains of salmon-bearing streams. • Support ongoing tribal, government, and non-profit organization restoration programs throughout watershed. • Coordinate restoration efforts with Thurston County; for example, removal of invasive vegetation and replanting of native species in riparian areas.	High for all opportunities (important salmonid habitat)	Fish and wildlife habitat Water quality Shade and organic input Floodplain connection and channel migration	Long-term for programmatic opportunities Short-term for site specific opportunities and those in basin plans and WRIA project lists; property acquisition may be long-term
		Lower mainstem areas (NISQ_RV_01, 02, 03)	<u>Site-specific opportunities:</u> • Acquire shoreline properties that are important to protecting riparian functions and channel migration zones (Nisqually River Basin Plan CIP11-NIS-AC02, AC03).			
		Wilcox area (NISQ_RV_01 and 02)	• Create side channel fish habitat, reconnect existing off-channel habitats by restoring the channel migration zone, enhance riparian vegetation on Wilcox Flats (Nisqually River Basin Plan CIP11-NIS-RST01, CIP11-NIS-RST02, CIP11-NIS-RST03).			
		NISQ_RV_02	• Numerous property acquisition and restoration projects planned in Wilcox flats area; included in WRIA 11 Lead Entity 2011 Three-year work plan.			

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Nisqually River (continued)		McKenna area (RM 21.6 – 22.0) Nisqually Park Subdivision (RM 65.0)	• Acquire floodprone properties (Pierce County Public Works, 2011). • McKenna protection project – acquire 250+ acres including Nisqually mainstem riparian areas and McKenna Creek headwater wetlands (included in WRIA 11 Lead Entity 2011 Three-year work plan). • Acquire property and install engineered log jams (Pierce County Public Works, 2011).	High	See programmatic opportunities	
Mashel River	Channelization of river; removal of riparian vegetation; lack of LWD.	All reaches Mashel River in and near Eatonville (MASH_RV_02, 03)	<u>Programmatic opportunities:</u> • Restore forested riparian areas. • Restore LWD to stream • Decommission/resurface timber roads, replace culverts. • Coordinate restoration efforts with Town of Eatonville. <u>Site-specific opportunities:</u> • Acquire river shoreline and adjacent upland properties that are a priority for restoration (Nisqually River Basin Plan CIP20-MAL-AC01 and AC02). • Middle Mashel Riparian Enhancement – restore degraded riparian areas currently in timber production (included in WRIA 11 Lead Entity 2011 Three-year work plan).	High (important fish habitat)	Fish and wildlife habitat Water quality Shade and organic input	Long-term for programmatic opportunities Short-term for site specific opportunities and those in basin plans and on WRIA project lists; property acquisition may be long-term

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Mashel River (continued)		Mashel River near Eatonville	• Acquire 105 acres to support and expand the Mashel River Eatonville Reach Instream Restoration Project, including 70 acres at the confluence with the Little Mashel River (included in WRIA 11 Lead Entity 2011 Three-year work plan). • Acquire and protect 313 acres on Mashel River near Boxcar Canyon (included in WRIA 11 Lead Entity 2011 Three-year work plan).	High	See programmatic opportunities	
Little Mashel River	Channelization of river; removal of riparian vegetation.		<u>Programmatic opportunities:</u> • Restore forested riparian areas. • Protect and restore associated wetlands. • Restore natural channel configuration. • Coordinate restoration efforts with Town of Eatonville. <u>Site-specific opportunities:</u> • Acquire 45 acres of riparian and floodplain habitat near the Little Mashel confluence with the Mashel River (Nisqually Land Trust/Pierce County project listed in 2008 South Puget Sound 3-Year Project List).	Moderate	Fish and wildlife habitat Water quality Shade and organic input Floodplain connection and channel migration	Long-term for programmatic opportunities Short-term for site specific opportunities and those on WRIA project lists; property acquisition may be long-term

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Tanwax Creek	Increased erosion and inputs of fine sediment associated with agricultural activities; areas of stream channelization and loss of habitat complexity; loss of riparian forests above RM 6.5; and degraded wetlands dominated by reed canarygrass below RM 6.5. Water quality impairments include fecal coliform, temperature, and dissolved oxygen.	Tanwax Creek (TANW_CR_01)	<u>Programmatic opportunities:</u> • Protect and restore wetlands that maintain flow in Tanwax Creek. • Control invasive reed canarygrass • Remove existing ditches and drains in wetlands to restore hydrology. • Plant native trees and shrubs. • Plant native trees and shrubs along Tanwax Creek above RM 6.5. • Restore original channel morphology in channelized sections. (Nisqually River Basin Plan CIP11-TWL-RST01, CIP11-TWU-AC01 and AC02). • Support Nisqually Tribe restoration projects. <u>Site-specific opportunities:</u> • Acquire and restore riparian habitat along lower Tanwax Creek and confluence with Nisqually River (included in WRIA 11 Lead Entity 2011 Three-year work plan).	Moderate to High	Fish and wildlife habitat Shading and organic input Stream base flows Wetland hydrology Water quality	Long-term for programmatic opportunities Short-term for site specific opportunities and those in basin plans; property acquisition may be long-term
Muck Creek	Loss of riparian forest cover, with resulting increase in temperatures and lack of LWD; increasing intermittent/low flows result in significant impact on fish passage; sedimentation due to livestock access; channelization with a loss of channel complexity and disconnection from floodplain; non-native species (reed canarygrass) dominance and filling of some smaller channels. Water quality impairments are primarily temperature and fecal coliforms.	All reaches, especially areas with perennial flow; e.g., North Fork between 8th Ave. East and SR 7 (Muck Creek Basin Plan CIP 12NF-STR-01, 02).	<u>Programmatic opportunities:</u> • Establish a functional riparian corridor along the stream system through large-scale plantings of riparian vegetation. • Exclude cattle and horses from the stream corridor. • Replace existing culverts where possible to enhance passage. • Remove and manage reed canarygrass where channels are blocked. • Restore forested riparian areas. • Restore degraded wetlands to reestablish forest cover.	Moderate to High	Fish and wildlife habitat Shading and organic input Water quality	Long-term for programmatic opportunities

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Ohop Creek	Loss of riparian forest in some reaches with a lack of LWD and high temperatures; downstream of Ohop Lake, channelization and reduced habitat complexity and disconnected the stream from the floodplain. Water quality impairments include fecal coliform, temperature, dissolved oxygen, and pH. The EDT model ranked the lower 6.3 miles of Ohop Creek as among the highest priority tributary reaches for salmonid habitat restoration.	All reaches	<u>Programmatic opportunities:</u> • Restore meanders to the stream, which was historically channelized for agriculture. • Restore riparian forests. • Replace existing culverts where possible to enhance fish passage. • Control invasive reed canarygrass. • Restore floodplain wetlands (Nisqually Indian Tribe, 2008; Nisqually Land Trust, 2006). • Coordinate restoration efforts with Town of Eatonville.	High for all opportunities (important salmonid habitat)	Channel migration and floodplain connection Shading and organic input Fish and wildlife habitat Water quality	Long-term for programmatic opportunities Short-term for site specific opportunities and those in basin plans and on WRIA project lists; property acquisition may be long-term
		Upper part of stream (OHOP_NIS_CR_03)	<u>Site-specific opportunities:</u> • Acquire upper Ohop Creek shoreline reaches that are accessible to anadromous fish and are a priority for restoration (Nisqually River Basin Plan CIP14-OHU-AC01 and AC02).			
		Lower Ohop Valley (OHOP_NIS_CR_01, 02)	• Continue implementation of the Lower Ohop Creek Restoration Project to restore 4 miles of meandering stream channel and connection to floodplain, and revegetate 400 acres of wetlands (Nisqually River Basin Plan CIP14-OHL-RST01, RST02, RST03; also included in WRIA 11 Lead Entity 2011 Three-year work plan). • Acquire 100 acres along one mile of lower Ohop Creek for permanent protection (included in WRIA 11 Lead Entity 2011 Three-year work plan).			
		Middle Ohop (RM 4 to Ohop Lake)	• Revegetate over two miles of riparian area with native trees and shrubs (included in WRIA 11 Lead Entity 2011 Three-year work plan). • Acquire conservation easement on 38+ acres in Eatonville UGA to protect Chinook spawning reach (included in WRIA 11 Lead Entity 2011 Three-year work plan).			

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Mid Nisqually River Tributaries						
Horn Creek	Lack of forested riparian zone, nutrient inputs from agriculture.	All reaches	<u>Programmatic opportunities:</u> • Restore riparian areas. • Protect and restore associated wetlands. • Fish passage improvements (CIP11-HRN-FP01, 02). Horn Creek fish passage project is also included in the 2008 South Puget Sound 3-Year Project List.	Moderate	Shading and organic input Fish and wildlife habitat	Long-term for programmatic opportunities Short-term for site specific opportunities in CIP list.
Harts Lake	Nutrient inputs from lawn fertilizers, septic systems, and agricultural operations along the shoreline.	All reaches HART_LK_01	<u>Programmatic opportunities:</u> • Restore forested riparian areas. • Restore degraded wetlands. • Repair septic systems. <u>Site-specific opportunities:</u> • Restore historic connection between Nisqually mainstem and Harts Lake Creek (listed in 2008 South Puget Sound 3-Year Project List).	Moderate to High	Water quality Fish and wildlife habitat Shading and organic input	Long-term for programmatic opportunities Short-term for site specific opportunities and those on WRIA project lists

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Other Lakes: Unnamed Lake near Roy Little Lake Benbow Lake Tanwax Lake Whitman Lake Tule Lake Rapjohn Lake Twin Lakes Kreger Lake Unnamed Lake near Tanwax Silver Lake Cranberry Lake Mud Lake Clear Lake Twenty-seven Lake	Issues common to most of the lakes in this drainage basin include high phosphorus levels; removal of riparian vegetation for residences, agriculture, or other uses; shoreline armoring with docks and bulkheads; alteration of associated wetlands; possible livestock access to shoreline (Cranberry Lake in particular); invasive species.	All reaches	Programmatic opportunities: • Restore forested riparian areas along lake shores and inlet or outlet streams. • Restore associated wetlands. • Replace/consolidate existing docks to reduce shade impacts. • Remove abandoned docks. • Replace failing bulkheads with soft alternatives. • Protect existing natural shorelines. • Prevent livestock access to sensitive shoreline areas. • Repair septic systems.	Moderate to High	Water quality Fish and wildlife habitat Shading and organic input	Long-term
Upper Nisqually River Tributaries						
La Grande Reservoir	Construction of dam; high phosphorous levels.	All reaches	Programmatic opportunities: • Restore riparian vegetation.	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Long-term
Alder Lake	Construction of Alder Dam; small number of docks and SR 706 running along some of the north shore of the lake; water quality (phosphorus and sediment) due to stormwater runoff from roads, rural residential, forestry, and agricultural areas.	All reaches	Programmatic opportunities: • Restore native riparian vegetation (shrubs and trees) in areas with no or sparse forested riparian buffer and near park/boat launch facilities.	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Long-term
Copper Creek	Timber harvest, road crossings, sedimentation.	All reaches	Programmatic opportunities: • Restore forested riparian areas. • Decommission/resurface timber roads, replace culverts.	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Long-term

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Muck Creek Tributaries						
Muck Lake	Removal of riparian vegetation for residences and pasture.	All reaches	<u>Programmatic opportunities:</u> • Restore forested riparian areas and associated wetlands.	Moderate to High	Water quality Fish and wildlife habitat Shading and organic input	Long-term
South Creek	Removal of riparian vegetation; lack of LWD; ditching and draining of wetlands.	All reaches, especially areas with perennial flow; e.g., South Fork between 8th Ave. East and SR 7 (Muck Creek Basin Plan CIP 12SF-STR-01, 02).	<u>Programmatic opportunities:</u> • Restore forested riparian areas. • Replace culverts to improve fish passage. • Control invasive vegetation.	Moderate to High	Water quality Fish and wildlife habitat Shading and organic input	Long-term
Ohop Creek Tributaries						
Ohop Lake	High phosphorous levels; invasive species; residential docks and bulkheads.	All reaches	<u>Programmatic opportunities:</u> • Restore forested riparian buffers. • Revegetate disturbed areas near boat launch and recreation area. • Repair failing bulkheads. • Replace/consolidate docks to reduce shade impacts. • Replace failing bulkheads with soft alternatives.	Moderate to High	Water quality Fish and wildlife habitat Shading and organic input	Long-term
Lynch Creek Twenty-file Mile Creek	Elevated sediments; removal of riparian vegetation for residences, agriculture, mining.	All reaches	<u>Programmatic opportunities:</u> • Restore forested riparian vegetation and degraded wetlands. • Decommission forest roads. • Stabilize slopes. • Restore mine areas.	Moderate to High	Water quality Fish and wildlife habitat Shading and organic input	Long-term

Table 5-2 continued.

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Mashel River Tributaries						
Midway Creek South Fork Little Mashel River	Removal of riparian vegetation.	All reaches	Programmatic opportunities: • Restore forested riparian vegetation.	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Long-term
Tributaries in Forest Resource Areas: Beaver Creek Busy Wild Creek Unnamed Tributary Mashel River	Timber harvest, road crossings, sedimentation.	All reaches	Programmatic opportunities: • Restore forested riparian vegetation. • Decommission or repair forest roads and replace culverts.	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Long-term

Sources: Nisqually Indian Tribe, Nisqually Land Trust, Pierce County Muck Creek Basin Plan, Pierce County Nisqually River Basin Plan, South Puget Sound Salmon Enhancement Group

5.4 RESTORATION OPPORTUNITIES - WRIA 12

Restoration opportunities for freshwater shorelines of the Chambers/Clover Creek Watershed (WRIA 12) are summarized here. No nearshore shoreline areas within Pierce County jurisdiction lie within WRIA 12; however, the County owns Puget Sound shoreline properties located within the jurisdiction of University Place. Implementing these recommendations would complement the protection efforts encompassed in the SMP. Both protection and restoration efforts are necessary to offset impacts of existing and future development, repair past damages, and improve the ecological baseline.

5.4.1 Freshwater Restoration

The freshwater shoreline restoration opportunities for the Chambers/Clover Creek watershed include both programmatic and project-specific actions that have been identified by primarily Pierce County. These are summarized below in Table 5-3. Restoration of freshwater shorelines in the Pierce County portion of WRIA 12 will involve coordination with several adjacent jurisdictions that share the shorelines of larger water bodies. Opportunities for partnerships with other local jurisdictions are described by water body in Table 5-3.

The Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) has identified a project to restore the mouth of Chambers Creek and Chambers Bay. This project would involve properties both within Pierce County shoreline jurisdiction (lower Chambers Creek) and outside of Pierce County jurisdiction (Chambers Bay estuary). The railroad causeway and Chambers Creek dam inhibit the free flow of tidal and fluvial waters. These features, along with shoreline armoring and private development in the estuary, are impacting the natural geomorphic processes that are responsible for creating and maintaining nearshore habitat. Removal of these features will allow for tidal hydrology, the natural transport of sediment, and freshwater inputs across the current and historic Chambers Bay estuary (ESA et al., 2011). This restoration project will involve coordination among PSNERP, Pierce County, University Place, and the Town of Steilacoom. Both Steilacoom and University Place are developing SMP restoration plans for their respective shorelines in this area (ESA and CGS, 2011).

Restoration within this watershed focuses on improvements to water quality, surface water quantities, and recovery of habitats in an urbanized setting. All of the projects listed in the table are considered to have a high potential for success in improving the functions of shorelines in the WRIA. However, the success of each restoration project depends on the ultimate project design and implementation.

Table 5-3 lists the recommended timing for each restoration opportunity as “short-term” or “long-term.” **Short-term** (approximately 1-5 years) restoration projects include those that could be implemented by local landowners and volunteers and that would benefit the areas that are most in need. Short-term restoration efforts include habitat restoration and enhancement efforts in publicly owned areas of the County’s shorelines. These projects could be implemented in the near term, depending on grant cycles and coordination with volunteer and community organizations. **Long-term** (approximately 5-10 years)

restoration projects could be those that require coordination with other jurisdictions or that cover larger land areas. These projects may be more difficult to implement and would likely require more planning and permitting.

Table 5-3. Freshwater Restoration Opportunities in Chambers-Clover Creek Drainage (WRIA 12)

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Chambers Creek	Conversion of forested cover to impervious surfaces, pastures, and residential lawns; bank armoring; numerous physical barriers and crossings, including a fish weir associated with the hatchery at the mouth of Chambers Creek; groundwater extraction which has affected summer time low flows; alterations to flow regime from stormwater runoff; water quality impairments.	All reaches CHAM_CK_01	<u>Programmatic opportunities:</u> • The Chambers-Clover Creek Watershed Council's (CCCWC) action plan for 2007 through 2011 includes restoring streams, wetlands, and riparian areas, restoring beneficial uses of lakes, and supporting salmon recovery efforts (CCCWC, 2007). • Coordinate restoration on lower Chambers Creek with adjacent jurisdictions (Lakewood, University Place, and Steilacoom). <u>Site-specific opportunities:</u> • Continue Pierce County project to identify and control knotweed infestations in Chambers Creek Canyon. • Participate in PSNERP project to restore tidal hydrology, sediment transport, and freshwater inputs between Chambers Creek and the estuary. Remove Chambers Creek dam, support buildings, abutment fill material, and impounded sediments behind dam. Replace Chambers Creek Road bridge with full span (ESA et al., 2011).	High	Water quality Fish and wildlife habitat	Short-term
Clover Creek	Conversion of forest cover to impervious surface, pasture or lawn; bank armoring; physical barriers and crossings; piping large sections of stream through McChord Air Force Base and diversion into asphalt ditch around Pacific Lutheran University; groundwater extraction that has reduced water available for summer flows; large regional detention facilities as well as numerous in-line and off-line private ponds; removal of LWD; invasion by non-native plants; water quality impairments.	All reaches CLOV_CR_01	<u>Programmatic opportunities:</u> • Restore terrestrial and aquatic habitat. • Restore riparian forested buffers. • Restoring floodplain habitat and reconnect channel and floodplain. • Coordinate restoration efforts with City of Lakewood. <u>Site-specific opportunities:</u> • Remove asphalt lining from streambed and replace it with a clay liner or other measure to reduce flow loss through the channel. • Remove invasive vegetation, replant native species, install in-stream habitat features (Clover Creek Basin Plan CIP-WQH-5A, 5B).	High	Water quality Fish and wildlife habitat Channel migration and floodplain connectivity Stream hydrology Shading and organic input	Long-term for programmatic opportunities Short-term for site specific opportunities and those in basin plans
Spanaway Creek	Conversion of forest cover to impervious surface, pasture or lawn; bank armoring; physical barriers and crossings; groundwater extraction that has reduced water available for summer flows; numerous in-line and off-line private ponds; removal of LWD; invasion by non-native plants; water quality impairments.	SPAN_CR_01; downstream from the Bresemann Dam passage barrier removal project	<u>Site-specific opportunities:</u> • Remove invasive vegetation and accumulated sediments; install native vegetation; replace hardened embankment with bioengineered bank stabilization measures; install woody debris in the channel (Clover Creek Basin Plan, CIP-WQH-4A, 4B, 4C).	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Short-term
Spanaway Lake	Loss of forest cover and conversion to impervious surface, residential lawns, and pasture; shoreline armoring; docks and overwater structures; water quality impairments.	All reaches	<u>Programmatic opportunities:</u> • Replace bulkheads with softer alternatives where possible. • Consolidate/replace docks with alternate decking to reduce shade impacts. • Restore forested riparian buffers where possible.	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Long-term

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
American Lake	Water quality degradation from urban stormwater runoff; loss of riparian habitat along the shoreline; docks/overwater structures and shoreline armoring that reduce shallow littoral and riparian habitats; water quality impairments.	All reaches	Programmatic opportunities: • Replace bulkheads with softer alternatives where possible. • Consolidate/replace docks with alternate decking to reduce shade impacts. • Restore forested riparian buffers where possible. • Coordinate restoration efforts with City of Lakewood.	Moderate	Water quality Fish and wildlife habitat Shading and organic input	Long-term

Sources: Chambers-Clover Creek Watershed Council

5.5 RESTORATION OPPORTUNITIES - WRIA 15

Restoration opportunities for nearshore areas and freshwater shorelines of the Kitsap Peninsula and Islands Watershed (WRIA 15) are summarized in this section. Implementing these recommendations would complement the protection efforts encompassed in the SMP. Both protection and restoration efforts are necessary to offset impacts of existing and future development, repair past damages, and improve the ecological baseline.

5.5.1 Nearshore Restoration

Nearshore restoration opportunities have been identified for WRIA 15 through a variety of planning and study efforts. These include the Key Peninsula, Gig Harbor, and Islands Watershed Nearshore Salmon Habitat Assessment (Pentec, 2003), the Draft Chinook and Bull Trout Recovery Approach for the South Puget Sound Nearshore (SPSSRG, 2004), the additional work by the SPSSRG to determine restoration opportunities specifically in Carr Inlet (Kantz, pers. Comm., 2009), and salmon restoration planning efforts for WRIA 15 (West Sound Watersheds Council, 2011). Table 5-4 provides a summary of these restoration opportunity types by nearshore shoreline reach. Table 5-5 provides a detailed list of restoration projects based upon the KGI study and WRIA 15 priorities. Table 5-6 provides management recommendations for Carr Inlet only.

Intact nearshore habitats have also been identified within Pierce County's portion of WRIA 15 (SPSSRG, 2004; Pentec, 2003). These nearshore habitats provide natural shoreline functions and should be protected as important aquatic resources. Intact habitats that should be considered for protection include but are not limited to:

- Carr Inlet – Cutts Island;
- Case Inlet - Head of Rocky Bay;
- WDFW Marine Protected Areas – Colvos Passage;
- Cove between Devil's Head and Taylor Bay;
- Head of Dutcher's Cove;
- Pocket estuaries; sand spits and estuarine marshes; and
- Active coastal feeder bluffs.

The nearshore projects listed in Table 5-5 are likely to be long-term, requiring more than five years to implement. This is due to the permitting complexity and high costs typically associated with nearshore projects.

5.5.2 Freshwater Restoration

The freshwater shoreline restoration opportunities for the Kitsap Peninsula and Islands watershed include both programmatic and project-specific actions that have been identified primarily by

Pierce County through its basin planning process. The freshwater restoration opportunities are summarized below in Table 5-7. Restoration of freshwater shorelines in the Pierce County portion of WRIA 15 will involve coordination with several adjacent jurisdictions that share the shorelines of larger water bodies. Opportunities for partnerships with other local jurisdictions are described by water body in Table 5-7.

Restoration within this watershed focuses on improvements to water quality, surface water quantities, and recovery of habitats. All of the projects listed in the table are considered to have a high potential for success in improving the functions of shorelines in the WRIA. However, the success of each restoration project depends on the ultimate project design and implementation.

Table 5-7 lists the recommended timing for each restoration opportunity as "short-term" or "long-term." **Short-term** (approximately 1-5 years) restoration projects include those that could be implemented by local landowners and volunteers and that would benefit the areas that are most in need. Short-term restoration efforts include habitat restoration and enhancement efforts in publicly owned areas of the County's shorelines. These projects could be implemented in the near term, depending on grant cycles and coordination with volunteer and community organizations. **Long-term** (approximately 5-10 years) restoration projects could be those that require coordination with other jurisdictions or that cover larger land areas. These projects may be more difficult to implement and would likely require more planning and permitting.

Table 5-4. Summary of Nearshore Restoration and Protection Opportunities (WRIA 15)

Management Units	Reach Name	Restoration Opportunities					Protection		Source
		Structure/Bulkhead Removal	Stream/Marsh Restoration	Culvert Maintenance/ Replacement	Dam Breach	Riparian Enhancement	Portion Proposed Natural SED	High Protection Value	
South Key Peninsula + Islands Anderson Island	AND IS 1	X					X		*DNR; WSWC 2011*
	AND IS 2	X		X	X		X		*KGI Study; WSWC 2011*
	AND IS 3		X			X	X		*KGI Study*
	AND IS 4	X					X		*KGI Study; EXISTING SED*
	AND IS 5	X					X		*EXISTING SED; WSWC 2011*
Carr Inlet - Henderson Bay	CI-HB 1	X					X		*KGI Study*
	CI-HB 10	X				X	X	X	*KGI Study; SPSSRG*
	CI-HB 11	X				X	X	X	*KGI Study; SPSSRG*
	CI-HB 12	X				X	X	X	*KGI Study; SPSSRG*
	CI-HB 13	X	X			X	X	X	*KGI Study; SPSSRG; WSWC 2011*
	CI-HB 2	X					X	X	*KGI Study; SPSSRG*
	CI-HB 3	X	X			X	X		*KGI Study; SPSSRG*
	CI-HB 4	X					X		*KGI Study; SPSSRG*
	CI-HB 5	X	X	X		X	X	X	*KGI Study; SPSSRG; WSWC 2011*
	CI-HB 6	X	X			X	X	X	*KGI Study; SPSSRG*
	CI-HB 7	X	X	X		X	X	X	*KGI Study; SPSSRG*
	CI-HB 8	X					X	X	*KGI Study; SPSSRG*
	CI-HB 9	X		X			X	X	*KGI Study; SPSSRG*

Management Units	Reach Name	Restoration Opportunities					Protection		Source
		Structure/Bulkhead Removal	Stream/Marsh Restoration	Culvert Maintenance/ Replacement	Dam Breach	Riparian Enhancement	Portion Proposed Natural SED	High Protection Value	
Case Inlet	CI-1						X		
	CI-10	X	X				X		*KGI Study*
	CI-11						X		*KGI Study*
	CI-2	X					X		*KGI Study*
	CI-3						X		
	CI-4				X		X		*KGI Study*
	CI-5	X		X	X		X		*KGI Study*
	CI-6	X					X		*KGI Study*
	CI-7						X		*KGI Study*
	CI-8	X			X		X		*KGI Study*
	CI-9						X		
Colvos Pass-Tacoma Narrows	CP-TN 1	X					X		*KGI Study*
	CP-TN 2	X	X				X		*KGI Study*
	CP-TN 3	X	X			X	X		*KGI Study*
	CP-TN 4	X				X	X		*KGI Study*
Dash Point	DP	X	X	X		X			*KGI Study*
Hale Passage - Wollochet Bay	HP-WB 1	X					X		*KGI Study*
	HP-WB 2		X			X	X		*KGI Study*
	HP-WB 3	X					X		*KGI Study; Regional Salmon Recovery*
S.Key Peninsula + Islands Ketron Island	KTRN IS						X		*KGI Study*
McNeil Island	MCN IS 1	X					X		*KGI Study*
	MCN IS 2	X		X			X		*KGI Study; EXISTING SED; WSWC 2011*
	MCN IS 3	X		X			X		*KGI Study; EXISTING SED; WSWC 2011*
	MCN IS 4	X		X			X		*KGI Study; EXISTING SED; WSWC 2011*

Management Units	Reach Name	Restoration Opportunities					Protection		Source
		Structure/Bulkhead Removal	Stream/Marsh Restoration	Culvert Maintenance/ Replacement	Dam Breach	Riparian Enhancement	Portion Proposed Natural SED	High Protection Value	
South Key Peninsula	SKEY 1	X					X		*KGI Study*
	SKEY 2	X					X		*WSWC 2011*
	SKEY 3	X					X		*KGI Study*
Nisqually Delta	NISQ01		X					X	*Regional Salmon Recovery Plan*

Table 5-5. Nearshore Restoration Opportunities (WRIA 15)

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
All Marine reaches – WRIA 15	1. Hardened shoreline interrupts natural net shore drift. 2. Solid decking on docks and over-water structures creates shade and impacts aquatic vegetation and in-water habitats. 3. Failing septic systems negatively affect water quality. 4. Stormwater runoff contributes to pollutant loading, especially heavy metals, sediment and oils/grease. 5. Trees and native vegetation are lacking within the shoreline jurisdiction in urbanized and residential areas.	All reaches	<u>Programmatic opportunities:</u> • Replace hard armoring with alternatives methods for bank stabilization – throughout management area • Replace non-functioning bulkheads • Replace solid decks with grating where possible to enhance light penetration • Water quality improvement through septic upgrades • Stormwater management of urban runoff • Restore and revegetate residential shorelines
Colvos Passage – Tacoma Narrows	Modifications in this management unit include fill and structures within the beach/intertidal area; concrete bulkheads and other hard armoring; removal of riparian vegetation; numerous overwater structures; filling and/or restriction of tidal flows in shoreline wetlands	CP TN 1 – Relict structure removal, Bulkhead removal, Artificial fill removal	• North of Point Richmond, area of concrete bulkheads, former industrial/commercial buildings, jetties and fill in the upper beach area – removal of concrete walls, vaults, stone jetties, docks/piers and fill; • Regrade to natural contours and replant native vegetation in the backshore/riparian area
		CP TN 1 – Riparian enhancement; replace hard armoring with bioengineering	• Point Richmond, encourage owners of residences on the beach to remove hard armoring and replace with bioengineering; • Plant native vegetation adjacent to the shoreline

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Colvos Passage – Tacoma Narrows (continued)		CP TN 2 – Bulkhead removal, Marsh restoration	• South of Pt. Richmond, scattered residential structures on beach or just upland from beach could be encouraged to remove unnecessary armoring and/or replace with soft engineering • Investigate potential to remove some structures that do not appear to be actively used • Two of the larger structures occur where very small drainages or seeps enter the water – both areas appear to have remnant salt marsh that could be enhanced or restored (AU 1.08 and 1.09 in KGI)
		CP TN 3 – Riparian enhancement, Relict structure removal	• Although heavily developed, some opportunities for enhancement of riparian vegetation on residential/commercial properties and removal of relict structures
		CP TN 3 – Replace solid decking with grated to allow light penetration	• Look for willing owners to replace existing solid decking
		CP TN 3 – Marsh/estuary restoration at Crescent Creek mouth	• Widen road crossing; look for opportunities to purchase and remove buildings that are in the estuary • Coordinate restoration efforts with City of Gig Harbor (ESA Adolfson, 2008).

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Colvos Passage – Tacoma Narrows (continued)		CP TN 4 – Bulkhead removal, Riparian enhancement	• Although most of this reach is relatively undeveloped, with active feeder bluffs, several small concentrations of houses/structures on the beach at the northern end of the reach present opportunities for removal of bulkheads and/or replacement with soft armoring, • Potentially removal of derelict structures, and riparian enhancement on residential lawns. • Coordinate with City of Gig Harbor to protect feeder bluffs along Tacoma Narrows (ESA Adolfson, 2008).
Hale Passage – Wollochet Bay	There are areas of high quality habitat with relatively intact processes and functions in this management unit, but alterations are also significant. Modifications include large areas of shoreline armoring; overwater structures; a lack of marine riparian vegetation; restrictions to tidal flow and fill in salt marshes/estuaries; stormwater runoff from impervious surfaces; and structures and debris within the beach/intertidal area. Water quality impairments include fecal coliform and dissolved oxygen, with areas within Wollochet Bay designated as a prohibited shellfish growing area.	HP WB 1 – Relict structure removal	• Old pilings at the mouth of Wollochet Bay (east end); • Small pocket estuary on east side of WB; salt marsh/pocket estuary enhancement at the head of WB; • Remove any barriers at road crossing (Artondale Creek), look for opportunities to remove structures from estuary (Wollochet Creek)
		HP WB 1 – Riparian enhancement	• Numerous opportunities to enhance native riparian vegetation where there are existing lawns adjacent to shoreline

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Hale Passage – Wollochet Bay (continued)		HP WB 2 – Marsh restoration	• East of Shaw's Cove, small pocket estuary with some fill encroaching into the estuary and low bulkheads that could be removed to restore more marsh area
		HP WB 2 – Riparian enhancement	• Numerous opportunities to enhance riparian vegetation along the heavily developed residential shoreline areas
		HP WB 2 – Bulkhead removal/alternative bank stabilization	• Numerous areas appear to be suitable for either removal of existing armoring or replacement with bioengineered/soft bank stabilization alternatives (see marsh restoration above)
		HP WB 3 – Dilapidated dock/pier removal	• Abandoned ferry dock and pilings
		HP WB 3 – Bulkhead removal	• Multiple sites that contain bulkheads that could be removed and/or replaced with bioengineered alternatives

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Carr Inlet – Henderson Bay	This management unit contains numerous large and small embayments, extensive mudflats, eelgrass, estuaries and salt marshes and productive shellfish areas. Alterations to processes are significant in some areas and relatively intact in other. Major modifications include areas that lack marine riparian vegetation; concentrated areas of heavily armored shoreline and overwater structures; and fill and restrictions of tidal flows in estuaries and salt marshes. Water quality impairments are exacerbated in this management unit due to the naturally low flushing rates of the long, shallow embayments. Water quality issues include fecal coliform, dissolved oxygen, nitrite, and PCBs and areas of concern include Mayo Cove, Horsehead Bay, Geldern Cove, and Burley Lagoon. Sources of water quality impairment failing septic systems, and stormwater runoff from roads and residential lawns.	CI HB 1 - Bulkhead Removal	• Multiple sites that contain bulkheads that could be removed and/or replaced with bioengineered alternatives
		CI HB 2 – Relict Structure Removal	• Derelict structure on Shaw's Cove spit
		CI HB 3 – Dilapidated dock/pier removal	• Remnants of wooden dock in Horsehead Bay
		CI HB 3 – Marsh restoration	• Moorelands Estuary Restoration – removal of tide gate and restoration of tidal flows

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Carr Inlet – Henderson Bay (continued)		CI HB 4 – Bulkhead removal	• Multiple locations where bulkheads appear to have little value and could be removed and/or replaced with alternative bank stabilization and enhance riparian vegetation adjacent to the shoreline
		CI HB 5 – Bulkhead removal; dilapidated dock/pier removal; Marsh restoration; Riparian enhancement	• Marsh restoration opportunities at Lay Creek (fill and armoring in former estuary associated with scattered structures) • Multiple locations where bulkheads appear to have little value and could be removed and/or replaced with alternative bank stabilization and enhance riparian vegetation adjacent to the shoreline • Ray Nash Creek – resize culverts and control invasive vegetation
		CI HB 6 – Bulkhead removal; Marsh restoration	• Lagoon at south end of reach has accumulated a large amount of woody debris which may be encroaching on marsh habitat; • Multiple locations where bulkheads appear to have little value and could be removed and/or replaced with alternative bank stabilization and enhance riparian vegetation adjacent to the shoreline • Coordinate restoration efforts with City of Gig Harbor (ESA Adolfson, 2008).

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Carr Inlet – Henderson Bay (continued)		CI HB 7 – Culvert maintenance, Relict structure removal, Riparian enhancement, Stream mouth restoration;	• Mouth of Purdy Creek riprap armoring, debris, dilapidated structures and fill – removal of debris, riparian enhancement, and restoration of shoreline here would increase estuarine and mudflat habitat • Culvert beneath Hwy 16 may be barrier to fish passage; culvert improvements may improve access, although habitat quality upstream may be questionable • Restoration of riparian vegetation along the lower section of Purdy Creek would enhance temperatures and habitat quality for juvenile salmonids • Coordinate restoration efforts with City of Gig Harbor (ESA Adolfson, 2008).
		CI HB 8 – Relict structure removal	• Derelict structure (wood raft?) on beach north of Minter Creek mouth
		CI HB 9 – Relict structure removal	• Pilings on west side of Minter Creek estuary
		CI HB 9 – Marsh restoration	• Some potential for removal of fill, setback of armoring/removal of armoring, and culvert improvements to expand area of estuarine and marsh habitat at mouth of Minter Creek
		CI HB 10 - Bulkhead Removal	• Several failing bulkheads and/or bulkheads that do not provide significant protection could be removed to restore more natural shoreline

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Carr Inlet – Henderson Bay (continued)		CI HB 11 - Bulkhead Removal, Riparian Enhancement	• Glen Cove – along the west side of the cove debris bulkheads could be removed with shoreline restoration and riparian enhancement
		CI HB 12 - Bulkhead Removal, Riparian Enhancement	• Multiple locations where bulkheads appear to have little value and could be removed and/or replaced with alternative bank stabilization and enhance riparian vegetation adjacent to the shoreline
		CI HB 12 – Silver Bow Farms Estuary Restoration (SPSSEG)	• Complete scoping and landowner negotiations • Complete final design and permitting • Construction project
		CI HB 13 - Bulkhead Removal, Dilapidated Dock/pier Removal, Relict Structure Removal	• Mayo Cove – opportunities for removing debris, dilapidated docks/floats, dilapidated structures/piles, and failing bulkheads in intertidal/marsh areas • Von Geldern Cove – Remove bulkheads • Entire reach – numerous opportunities to evaluate removal or replacement of existing vertical hard armoring with bioengineering alternatives

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
South Key Peninsula and Islands	This management unit contains large areas of relatively intact feeder bluffs, marine riparian vegetation, and active LWD recruitment. There are few major streams, but several large bays (Filucy, Amsterdam, and Oro Bays, and Still Harbor) and numerous smaller bays and pocket estuaries. Shellfish concentrations, eelgrass, and potential forage fish habitat occur throughout the management unit. Although this management unit has relatively high quality habitat and relatively intact processes, important modifications include concentrated areas of shoreline armoring, fill in intertidal areas, and overwater structures; localized water quality impairments from failing septic systems and stormwater runoff; and loss of riparian vegetation.	CI-1 to CI - 6 (SS); Taylor Bay AR	• Restore pocket estuaries on southern Key Peninsula
		Reaches on western side of Key Peninsula	• Protect functioning drift cells on western side of Key Peninsula and associated depositional areas
		AND 2	• East Oro Bay Dam Removal/Estuary Restoration (SPSSEG: KGI) Finalize scoping and landowner negotiations, complete final designs and permitting; and construct project • Dilapidated dock removal, culvert maintenance, relict structure removal • Protect pocket estuary
		AND 4	• Relict Structure Removal
		AND 1, 3 and 5	• Protect and maintain or restore small pocket estuaries and feeder bluffs

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
South Key Peninsula and Islands (continued)		AND 1 and 5	• Remove bulkheads
		All reaches, Anderson Island	• Restore pocket estuaries on Anderson Island (Thompson Cove PF/AR; East Oro Bay AR; Johnson Landing AR; Amsterdam Bay) • Acquire and protect ecologically intact shoreline at Jacobs Point
		McNeil Island	• Wastewater reclamation and reuse retrofits to improve water quality
		Restore pocket estuaries on the north shore of McNeil Island	• Culvert maintenance/restore tidal connection and remove passage barriers currently resulting from roadway
		MCN IS 1	• Relict structure removal; bulkhead removal
		McNeil Island, Reaches 2, 3 and 4	• Culvert maintenance • Remove bulkheads and tidegates
		Ketron Island	• Protect small pocket estuary
		SKEY 1 – Bulkhead removal	• Entire reach – numerous opportunities to evaluate removal or replacement of existing vertical hard armoring with bioengineering alternatives
		SKEY 1 – Dilapidated dock/pier removal	• Southern stretch of reach wooden dock could be removed

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
South Key Peninsula and Islands (continued)		SKEY 2	• Filucy Bay – failing septic; sources of nutrients • Filucy Bay – remove bulkheads, docks and piers; protect pocket estuary
		SKEY 3 – Bulkhead removal	• Several opportunities to evaluate removal or replacement of existing vertical hard armoring with bioengineering alternatives
Case Inlet	This management unit contains large areas of relatively intact feeder bluffs, marine riparian vegetation, and active LWD recruitment. There are moderately sized streams and bays (Rocky Creek, Vaughn Creek, Purdy Creek, Whiteman Cove, Dutcher Cove, and Taylor Bay) and numerous smaller bays and pocket estuaries. Although this management unit has relatively high quality habitat and relatively intact processes, important modifications include concentrated areas of shoreline armoring, fill in intertidal areas, and overwater structures. Localized water quality impairments from failing septic systems and stormwater runoff; and loss of riparian vegetation. Water quality impairments are exacerbated in this management unit due to the naturally low flushing rates of the long, shallow embayments. Water quality issues include fecal coliform, dissolved oxygen, ammonium and nitrite nitrogen.	CI 2 - Relict Structure Removal; Bulkhead removal	• Opportunities to remove relict structures and/or remove/replace bulkheads along Taylor Bay

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Case Inlet (continued)		CI 4 - Dam/dike Breach	• Restore tidal action and salt marsh to Whiteman Cove by removing/modifying tide gates and/or breaching the spit in one or more places
		CI 5 - Bulkhead removal, Culvert Maintenance, Dam/dike Removal	• Former lagoon behind spit at Camp Gallagher could be restored to salt marsh habitat by restoring tidal connections to lagoon – currently restricted by construction of road and filling of portion of spit and former marsh – breaching roadway and installing larger culverts
		CI 5 – Bulkhead removal	• Entire reach – numerous opportunities to evaluate removal or replacement of existing vertical hard armoring with bioengineering alternatives
		CI 6 – Marsh/pocket estuary restoration	• Small estuary on peninsula just north of Herron Island – removal of fill and reconstruction of bridge would open more habitat to tidal influence and additional marsh habitat could be restored
		CI 6 – Bulkhead removal	• Entire reach – some opportunities to evaluate removal or replacement of existing vertical hard armoring with bioengineering alternatives to restore intertidal and beach habitat
		CI 6 - Relict Structure Removal	• Dutcher Cove opportunities for derelict structure/debris removal
		CI 7 - Bulkhead removal	• Just south of Vaughn Bay – some opportunities for removing bulkheads and/or replacing with soft alternatives – esp. where bulkheads extend into deeper water

Table 5-5 continued.

Water Body /Management Unit	Problems and Issues	Reach or Location	Restoration Opportunities
Case Inlet (continued)		CI 8 - Dam/dike Breach	• North shore of Vaughn Bay, wooden bulkhead/weir blocks small stream mouth; this could be removed to restore small estuary; protect adjacent structures with bioengineering
		CI 8 - Bulkhead Removal	• A number of concrete bulkheads do not appear to protect any structures but lawns or fields – these could be removed, shoreline gradients and riparian vegetation restored
		CI 10 - Dilapidated Dock/Pier Removal	• Southern shore of Rocky Bay, opportunities for removing debris, dilapidated docks from intertidal
		CI 10 - Bulkhead Removal	• Multiple sites with vertical bulkheads, extensive riprap do not appear necessary for protection of structures; evaluate removal and/or replacement with soft alternatives

Data Sources: Key Peninsula Gig Harbor and Islands Nearshore Assessment (Pentec, 2003), Key Peninsula Basin Plan (Pierce County 2006); East WRIA 15 Three-Year Work Plan (West Sound Watersheds Council, 2011)

Table 5-6. Nearshore Restoration Opportunities (WRIA 15) Identified by the South Puget Sound Salmon Recovery Group (SPSSRG) - Carr Inlet – Henderson Bay

Reach Name	Management Recommendation[8]
CI-HB 2	High protection value. Prevent future armoring.
	Potentially very high benefit of restoration for forage fish and salmonids. Pursue opportunities for soft armoring, riparian restoration and community docks.
	Some eelgrass.
	High protection areas.
CI-HB 3	Good eelgrass and forage fish habitat. Shoreline has opportunities for both protection and restoration. Potential to address over-water structures, community docks, riparian conditions, and stormwater control.
	Potentially very high benefit of restoration for forage fish and salmonids. Pursue opportunities for soft armoring, riparian restoration and community docks.
CI-HB 4	Kopachuck State Park. Cutts Island. Eelgrass present and high protection benefit.
	Eelgrass present. Restoration: bulkhead removal, riparian planting, retro-fit grounding dock.
	Kopachuck State Park. Protection benefits include shellfish beds, diverse intertidal habitat, feeder bluffs, and riparian vegetation. Restoration opportunities include bulkhead removal and soft armoring.
CI-HB 5	Restoration: bulkhead removal, riparian planting, retrofit grounding dock.
	Address sediment transport issues associated with dock and shoreline armoring.
	Low gradient protected area with mud flats. Drains at low tides. Restoration: soft bank armoring, riparian planting, retrofit grounded docks, and open road.
	Raft Island: feeder bluff. Eelgrass. Low energy shallow protected waters for salmon feeding. Restoration: bulkhead removals, riparian planting. Protect small area on east point.
	Restoration: bulkhead removal, riparian planting, retro-fit grounding dock, piling removal.
	Some trees located at the south end. Restoration: riparian planting.
	Low gradient protected area with mud flats. Drains at low tides. Restoration: soft bank armoring, riparian planting, retrofit grounded docks.

Table 5-6 continued.

Reach Name	Management Recommendation[8]
CI-HB 5	Eelgrass present. Restoration: bulkhead removal, riaparian planting, retro-fit grounding dock. Site visit to evaluate lagoon connectivity, stressors, and restoration opportunities.
	Protect riparian zone.
	High protection benefits riparian vegetation and shoreline. Opportunities may include improving road that cut-off marsh.
CI-HB 6	Restoration potential for creek mouth
	Freshwater input. Protect riparian zone. Restoration: bulkhead removal.
	Eelgrass beds offshore. Education: value of shoreline vegetation for slope stability.
	Address shoreline modification caused by residential development. Education: value of shoreline vegetation for slope stability.
	Eelgrass beds offshore. Protect: high value riparian zone, old landslide feeding eelgrass beds
	Riparian enhancement
	Feeder bluff. High protection value as it feeds forage fish spawning beaches and eelgrass beds.
	Address shoreline development issues.
	Pocket estuary. High protection, especially riparian zone and feeder bluff that is providing sediment.
	Remove bulkheads and improve riparian conditions
	Extensive eelgrass offshore
	Address shoreline armoring of feeder bluff to this spit. Assess status of opening.
	Assess restoration opportunities with field visit.
CI-HB 7	Protect riparian, marsh, and mudflat
	Restoration: debris and relic structure removal, riparian enhancement, culvert maintenance, marsh restoration.
CI-HB 8	Feeder bluff to eelgrass beds and spit. Protect feeder bluff, riparian zone

Table 5-6 continued.

Reach Name	Management Recommendation[8]
CI-HB 9	High protection benefit Restoration: culvert and road
	Restoration: relic piling removal.
CI-HB 10	Feeder bluffs to eelgrass and spit. High protection value. Remove derelict pilings. Remove non-functioning bulkhead
	Remove fill from back shore. Forage fish spawning beach and eelgrass beds. Protection: feeder bluff. Restoration: remove bulkheads in backshore, riparian enhancement.
	Eelgrass beds. Protection: feeder bluff. Restoration: remove bulkheads in backshore; riparian enhancement.
	Feeder bluff. High protection value as it feeds forage fish spawning beaches and eelgrass beds. Good riparian.
CI-HB 11	Forage fish spawning. Pocket estuary. High value protection. High restoration value.
	Restore riparian removed around house.
CI-HB 12	High protection value. Restoration: restore riparian, remove bridge to spit.
	Restoration: remove swimming pool in backshore.
	Feeder bluffs to eelgrass beds and forage fish spawning beach. High protection value. Restoration: remove bulkheads and riparian enhancement.
	Restoration: remove derelict pilings
	Eelgrass beds. Forage fish. Feeder bluff supplying sediment to both habitats. High protection value. Good riparian condition.
	Moderate protection value for high quality open shoreline in parts.
CI-HB 13	Restoration: some bulkhead in backshore.
	Restoration: would need to be extensive and restore sediment processes, extensive revegetation would be valuable.
	Forage fish spawning. Eelgrass. High protection value. Good habitat. Restoration: bulkhead removal, derelict structure removal, riparian enhancement. Restore lost salt marsh in Penrose State Park. Possible diked farmland. Derelict groin removal.

[8] Management recommendations provided by T. Kantz; Access database from SPSSRG.

Table 5-7. Freshwater Restoration Opportunities in Kitsap Peninsula and Islands Watershed (WRIA 15)

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Crescent Lake	Invasive species; high phosphorous levels; dock and bulkhead construction.	All reaches	Programmatic opportunities: • Enhance native riparian vegetation to restore buffers around the lake. • Evaluate non-native species control in lake. • Support actions of Crescent Valley Alliance. • Implement Crescent Valley Biodiversity Management Area stewardship plan.	Moderate to High	Shading and organic input Fish and wildlife habitat Water quality	Long-term
Minter Creek	Fish passage barriers (culverts, diversion/intake structures at the hatchery); altered instream and riparian habitat conditions in the lower reaches; removal of riparian vegetation; bank armoring; channel alterations; water quality impairments.	All reaches	Programmatic opportunities: • Remove invasive vegetation and restore riparian habitat. • Coordinate with the hatchery to improve water quality and enhance instream habitat (Key Peninsula-Islands Basin Plan). Site-specific opportunities: • Complete design, permitting, and construction of Little Minter Creek culvert/passage barrier (SPSSEG) to provide access to additional two miles of habitat.	Moderate to High	Shading and organic input Fish and wildlife habitat Water quality	Long-term for programmatic opportunities Short-term for site-specific opportunities
Carney Lake	Some residential bulkheads and docks.	All reaches	Programmatic opportunities: • Restore native riparian vegetation where lacking. • Remove derelict overwater structures where present. • Replace failing bulkheads with soft alternatives for shoreline restoration.	Moderate to High	Shading and organic input Fish and wildlife habitat	Long-term
Stansberry Lake	Residential bulkheads; removal of shoreline vegetation.	All reaches	Programmatic opportunities: • Restore shoreline areas with native forested vegetation.	Moderate to High	Shading and organic input Fish and wildlife habitat	Long-term
Rocky Creek	Barriers to fish passage (144th Street pipe culvert); and water quality impairments for dissolved oxygen and temperature.	All reaches	Programmatic opportunities: • Remove historic pilings from nearshore areas. • Remove invasive vegetation and restore riparian habitat. • Coordinate with the hatchery to improve water quality and enhance instream habitat. Site-specific opportunities: • Construct Rocky Creek Fish Passage Project (SPSSEG) to provide access to additional five miles of habitat.	Moderate to High	Shading and organic input Fish and wildlife habitat Water quality	Long-term for programmatic opportunities Short-term for site-specific opportunities

Table 5-7 continued

Basin and Water Body	Problems and Issues	Reach or Location	Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timing
Lake Minterwood	Residential development, docks and bulkheads.	All reaches	Programmatic opportunities: • Work with private property owners to revegetate shoreline areas with native plant species. • Remove derelict overwater structures where present. • Replace failing bulkheads with soft alternatives for shoreline restoration.	Moderate	Shading and organic input Fish and wildlife habitat	Long-term
Jackson Lake	Some residential bulkheads and docks, especially at south end of lake.	All reaches	Programmatic opportunities: • Revegetate shoreline areas where native vegetation is lacking. • Remove derelict overwater structures where present. • Replace failing bulkheads with soft alternatives for shoreline restoration.	Moderate to High	Shading and organic input Fish and wildlife habitat	Long-term
Bay Lake	Few developed properties; much of shoreline is forested.	All reaches	Programmatic opportunities: • Preserve existing forested shoreline.	Moderate	Shading and organic input Fish and wildlife habitat	Long-term
Butterworth Reservoir	Limited docks, roads along shoreline; reservoir is the drinking water supply for McNeil Island.	All reaches	Restoration is likely not feasible for this shoreline due to its use in a water supply system.	Not applicable	Not applicable	Not applicable
Florence Lake	Invasive milfoil; residential development, bulkheads, docks.	All reaches	Programmatic opportunities: • Restore degraded shoreline areas with native vegetation. • Remove derelict overwater structures where these exist. • Replace failing bulkheads with softer alternatives. • Continue milfoil control efforts.	Moderate	Shading and organic input Fish and wildlife habitat Water quality	Long-term
Josephine Lake	High phosphorous levels; residential bulkheads and docks.	All reaches	Programmatic opportunities: • Restore degraded shoreline areas with native vegetation. • Remove derelict overwater structures where these exist. • Replace failing bulkheads with softer alternatives.	Moderate	Shading and organic input Fish and wildlife habitat	Long-term

Sources: Crescent Valley Alliance, KGI Watershed Council, Pierce County Key Peninsula-Islands Basin Plan (Pierce County, 2006)

6.0 EXISTING RESTORATION PROGRAMS AND PARTNERS

Numerous agencies and organizations are planning and implementing restoration efforts in Pierce County (see Appendix B for a summary description of these organizations/programs). Most restoration efforts are implemented because citizens, tribes, non-government entities and local, state and federal resource agencies collaborate to solve problems and achieve shared goals. Continued collaboration at all levels is needed if the goals of this plan are to be achieved.

The Pierce County SMP inventory and characterization report (ESA Adolfson, 2007a) provides additional details about restoration projects and programs that are already underway. The focus of this restoration plan is on future shoreline restoration opportunities that will build on the existing restoration efforts.

Puget Sound Partnership

The Puget Sound Partnership (Partnership) is likely to play a major role in future restoration efforts in Pierce County. This new state agency, proposed by Governor Christine Gregoire and formed by the Washington State Legislature in 2007, is unique in state government in that it is a community effort of citizens, governments, tribes, scientists and businesses working together to restore and protect Puget Sound (see Engrossed Substitute Senate Bill 5372 and 90.71 RCW).

One of the most important responsibilities given to the Partnership by the Governor and the Legislature is to create an Action Agenda that will be a living, adaptable roadmap to health for Puget Sound. The Action Agenda prioritizes cleanup, restoration and protection efforts; coordinates federal, state, local, tribal and private resources; and encourages a cooperative working environment through the year 2020 (PSP, 2008). The Partnership, through the 2020 Action Agenda, will base decisions on science, focus on actions that have the biggest impact, and hold people, governments and organizations accountable for results.

As enacted by the Legislature, the goals of the 2020 Action Agenda are:

- A healthy human population supported by a healthy Puget Sound that is not threatened by changes in the ecosystem;
- A quality of human life that is sustained by a functioning Puget Sound ecosystem;
- Healthy and sustaining populations of native species in Puget Sound, including a robust food web;
- A healthy Puget Sound where freshwater, estuary, near shore, marine, and upland habitats are protected, restored, and sustained;

- An ecosystem that is supported by ground water levels as well as river and stream flow levels sufficient to sustain people, fish, and wildlife, and the natural functions of the environment;

- Fresh and marine waters and sediments of a sufficient quality so that the waters in the region are safe for drinking, swimming, shellfish harvest and consumption, and other human uses and enjoyment, and are not harmful to the native marine mammals, fish, birds, and shellfish of the region.

- Given that this plan embraces these same goals and seeks to achieve them, it is anticipated that the Partnership, through the Action Agenda, will help to implement this restoration plan and the SMP as a whole.

Pierce County

Several County-led programs and plans address restoration opportunities and projects within the shoreline areas of Pierce County. Each of these programs and plans involves community stakeholders, the Tribes, non-governmental organizations, and other partners. The major Pierce County restoration programs underway are: the Pierce County Lead Entity for Salmonid Recovery in WRIA 10/12, the County's Basin Planning efforts through Public Works and Utilities, the South Puget Sound Salmon Recovery Group, Pierce Conservation District, an update to the Pierce County Rivers Flood Hazard Management Plan, and the Capital Improvement Program through the Public Works and Utilities, Surface Water Management Division. Public Works and Utilities is now offering information and assistance to property owners wishing to implement low impact development projects to reduce stormwater runoff.

Basin planning is an important component of shoreline restoration in Pierce County. Pierce County Public Works and Utilities – Surface Water Management has developed basin plans for 10 areas within the County. The plans identify and prioritize projects to improve flood management, water quality, and riparian habitat. The first phase of developing a basin plan is to study the existing characteristics of the basin, such as flooding, water quality, and fisheries. This information is used to develop a prioritized list of projects and actions to reduce flood damage and improve water quality and floodplain habitat in the basin. Basin plans for the Clover Creek, Gig Harbor, and Muck Creek basins were issued in 2003. In 2005, basin plans for the Mid-Puyallup, Clear/Clarks Creek, Browns Point/Hylebos, and Key Peninsula/Islands were issued. Basin plans for the Nisqually River, White River/Lake Tapps, and Upper Puyallup/Carbon River basins are currently being developed.

Appendix C provides supplemental information related to shoreline restoration programs and details about the County's basin planning process, flood hazard management program, and the salmon recovery/lead entity process.

Other Organizations

Other organizations that are likely to play a major role in carrying out the restoration efforts including those described in this plan are listed alphabetically in Table 6-1. These are some of the key organizations with a primary focus on ecological restoration that are actively involved in restoration and stewardship of the County's marine and freshwater resources. The list, which is not exhaustive, describes the key partners, their mission or area of focus, the role they can likely play in future restoration activities, and some of their past projects.

Other local jurisdictions, including adjacent counties as well as towns and cities within Pierce County, will also be important partners in shoreline restoration projects. Many of these adjacent jurisdictions are currently working on or have recently completed their own SMP restoration plans. These jurisdictions are listed where appropriate in Chapter 5.

Table 6-1. Potential Restoration Partner Organizations and their Roles in Future Restoration

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Cascade Land Conservancy	Non-profit organization working to conserve land in Pierce, King, Mason, Kittitas, and Snohomish Counties	• Protection of land through purchase, donation, easement, or other means • Community and landowner involvement and education	• Partner in acquisition of South Prairie Creek Preserve • Led the conservation of more than 150,000 acres over the last decade including approximately 20 properties in Pierce County.
Citizens for a Healthy Bay	Non-profit environmental and community involvement group committed to cleaning-up, restoring and protecting South and South Central Puget Sound as well as the entire Puyallup River Watershed, including Commencement Bay.	• Partner with community to achieve habitat restoration along tributaries and stream in the Puyallup River watershed, and nearshore areas in Commencement Bay.	• Monitoring of NRDA restoration sites within Commencement Bay nearshore environment. • Planting of native plants in the Tahoma Salt Marsh • Planting of high marsh at Squally Beach along Marine View Drive • Education of boaters through the Clean Boating program to avoid pollution in the Bay
Coastal Habitats in Puget Sound (CHIPS)	Coordinate, integrate, and link USGS studies with PSNERP goals and objectives.	• Provide scientific information for use in making decisions about nearshore restoration efforts.	
Crescent Valley Alliance	Habitat restoration on Crescent Lake, Crescent Creek and its estuary.	• Implementing restoration projects.	• Registering backyard wildlife habitats, organizing volunteers, maintaining wildlife corridors, establishing native vegetation, providing public education, encouraging low impact development, and collecting monitoring data.
Friends of Pierce County	To educate and empower the people of Pierce County to preserve and restore the natural environment, and promotes more livable communities.	• Public involvement in restoration.	• Published a booklet for citizens, “Pierce County Land Use Process and strategies for Hearing Examiner public hearings” • Works with students to restore riparian vegetation.

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Great Peninsula Conservancy	Non-profit organization working to protect lands in Mason, Kitsap, and western Pierce Counties.	• Protection of land through purchase, donation, easement, or other means • Community and landowner involvement and education	• Has protected more than 1,900 acres through acquisition, conservation easements, and project partnerships. • Projects include the South Sound Preserve on the Key Peninsula and Homestead Park on the Gig Harbor Peninsula
KGI Watershed Council	Implement the Key Peninsula-Gig Harbor-Islands Watershed Action Plan, which details the activities necessary to reduce nonpoint source pollution throughout the watershed.	• Restoration planning, public education and involvement, funding.	• Local watershed planning, educational workshops, coordinate grants to community organizations.
Muckleshoot Tribe	Defend the economic and cultural integrity of the Muckleshoot Tribe and maintain salmon fishing treaty rights	• Coordinate with County and other partners to ensure salmonid recovery on the White River	• Coordination with King and Pierce Counties to improve habitat conditions on the White River
Nisqually Glacier to Sound Conservation Corridor	Creation of a conservation corridor that links Mount Rainier National Park to the Nisqually National Wildlife Refuge.	• Assistance to landowners and jurisdictions in protecting habitat and views.	
Nisqually Land Trust	Protect habitat and wildlife threatened by urban sprawl.	• Acquire properties through grants, mitigation funds, donation funds, and annual auction.	• Ongoing restoration at Mt. Rainier National Park • Mashel River restoration currently underway • Ohop Valley stream restoration • Powell Creek riparian restoration • Wilcox Flats floodplain restoration and management plan • Red Salmon Creek restoration

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Nisqually River Council	Implements the Nisqually River Management Plan.	• Partner with other organizations to obtain funding and coordinate restoration projects.	• Published "Low Impact Development Design and Architectural Guidelines for the Nisqually Watershed"
Nisqually River Education Project	Watershed based education and environmental action projects which engage students and teachers in protecting and enhancing the water quality and salmon habitat of the Nisqually River watershed.	• Environmental education.	• Involves hundreds of students in annual water quality monitoring program and restoration projects.
Nisqually River Interpretive Center Foundation	Fostering a stewardship ethic by providing interpretive and educational opportunities that emphasize the system of natural, cultural, historic and economic resources of the Nisqually River basin.	• Public education	• Published "Nisqually Watershed: Glacier to Sea - A River's Legacy." • Acquired property for new interpretive center.
Nisqually Stream Stewards	Protect and improve the health of streams in the Nisqually watershed.	• Stream monitoring and restoration.	
Nisqually Tribe	Plan for the recovery of Nisqually salmon and restore salmon habitat in WRIA 11	• Work with government and other agencies to acquire property and restore habitat	• Nisqually Delta floodplain and estuarine restoration • Red Salmon Creek restoration • Mashel River stream restoration
Pacific Northwest Recovery Implementation Science Team (RIST)	Coordinating scientific analyses in support of recovery plan implementation across the Pacific Northwest and other locations along the west coast.	• Provide scientific information in support of salmon recovery planning.	

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
People for Puget Sound	Non-profit organization founded in 1991 to protect the health of Puget Sound. Key programs address community-based restoration, oil spill prevention, stormwater management, toxics, septic systems, public involvement and education.	• Community and volunteer support for shoreline restoration and education projects.	• Key supporter of permanent year-round rescue tug at Neah Bay for oil spill prevention • 1,200 miles of Puget Sound shoreline protected • 46 miles of shoreline restored, working with 2,000 volunteers • 20 salt marshes, beaches and estuaries restored • Partnered with The Nature Conservancy and the Trust for Public Land to form the Alliance for Puget Sound.
Pierce Conservation District	Provide local landowners with technical assistance in managing natural resources and improving water quality	• Work directly with landowners and in conjunction with USFWS, WDFW, Ecology, DNR, and other agencies for funding	• Conservation plans for private landowners, stream restoration projects through StreamTeam program. • Developed BMPs for agricultural uses and active farmlands in the County.
Pierce County Biodiversity Alliance	Cross-section of conservation agencies and organizations that share an interest in conserving the biodiversity of Pierce County.	• Collection of biological information (e.g., through BioBlitz, NatureMapping) • Community planning to protect diversity of species	• Partner with other agencies to establish Biodiversity Network of 16 biologically rich areas connecting corridors that cover nearly 268,000 acres. • Lower White River Biodiversity Management Area pilot project
Pierce County Conservation Futures Fund	Protect threatened open space, timber lands, wetland, habitat areas, agricultural and farm lands within Pierce County through land purchase and acquisition of development rights. Funding comes from a state authorized County property tax.	• Work with other organizations to protect shoreline lands.	• Acquisition and management of numerous open space areas in the county.

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Pierce County Noxious Weed Control Board	Enforces the state noxious weed control regulations and refines the state noxious weed list to include species present in Pierce County.	• Provide guidance on methods of weed control; enforce weed control requirements.	
Pierce County (WRIA 10/12) Lead Entity	Support the recovery of self-sustaining, harvestable salmon populations in Puget Sound by restoring and protecting the habitat in WRIA 10, Puyallup River Watershed and 12, Chambers/Clover Creek Watershed.	• Prioritization of salmon habitat protection and restoration projects; submittal of project lists to the State Salmon Recovery Board for funding decisions.	• 45 individual projects funded since 1999
Pierce County Surface Water Management Division	To be a responsive service organization that efficiently addresses flood control, water quality, and the preservation of natural drainage systems.	• Basin planning, salmon recovery, capital improvement projects, maintenance of drainage systems, preserving and restoring natural habitat.	• Publication of basin plans, support of watershed councils, biological expertise on in-water projects and mitigation plans, sponsorship of salmon habitat restoration projects for funding by the state's Salmon Recovery Funding Board for WRIAs 10 and 12, technical assistance to the Kitsap Lead Entity in WRIA 15.
Puget Sound Nearshore Ecosystem Restoration Project (PSNERP)	Identify significant ecosystem problems in Washington State's Puget Sound basin, evaluate potential solutions, and restore and preserve critical nearshore habitat.	• Make recommendations for restoration actions.	• Identified and developed conceptual restoration designs for two nearshore sites in Pierce County (Chambers Bay and Sequalitchew Creek). • Currently undertaking mapping of general levels of degradation along Puget Sound shorelines.

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Puget Sound Partnership	Restore and protect Puget Sound by implementing the Puget Sound Action Agenda.	• Secure funding, develop detailed implementation plans, adopt benchmarks to measure progress, prepare Integrated Ecosystem Assessment for Puget Sound, work with watershed groups to incorporate salmon recovery planning, etc.	• Published Puget Sound Action Agenda in December 2008. Updates to Action Agenda planned during 2011.
Puyallup River Watershed Council	Provide a forum that gives those in the watershed an opportunity to promote and implement programs that restore, maintain, and enhance the watershed.	• Foster communication and collaboration among stakeholders, citizen outreach, reports on state of the watershed.	• Published a Watershed Action Agenda for 2007 – 2011 that presents ten action items that PRWC believes should be a high priority for the watershed.
Puyallup Tribe	Protect existing fishing treaty rights and encourage salmonid recovery in WRIA 10	• Partner with City of Tacoma in restoration planning	• Riparian enhancement projects along the Puyallup River
Shared Strategy for Puget Sound	Collaborative effort to protect and restore salmon runs for Puget Sound Chinook across Puget Sound.	• On January 1, 2008, the regional salmon recovery functions of the Shared Strategy became the responsibility of the Puget Sound Partnership.	• Coordinated regional watershed groups to create a salmon recovery plan.

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
South Puget Sound Salmon Enhancement Group (SPSSEG)	Involve communities, volunteers, and landowners in salmon recovery	• Sponsor and co-sponsor projects funded by grants, membership dues, donations, and other sources	• 2004 placed engineered log jams on the Mashel River with the Nisqually Indian Tribe • 2008 removed three fish barrier culverts and one overflow culvert on Powell Creek, together with the Nisqually Land Trust • Bulkhead removal at two Puget Sound locations • Started WRIA 11/12 Nearshore Assessment in 2006 in cooperation with the Nisqually Tribe, People for Puget Sound, Pierce County, and BNSF Railway Company
Squaxin Island Tribe	Plan for the recovery of salmon and nearshore habitat within the South Puget Sound	• Partner in the South Puget Sound Salmon Recovery Group.	• Acoustic monitoring in Tacoma Narrows • Nearshore assessment and restoration planning for WRIA 12 nearshore areas • Various nearshore restoration projects to enhance salmonid habitat
Tahoma Audubon Society	The Tahoma Audubon Society's mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and Earth's biological diversity.	• Participates in the Green Tacoma Partnership and partners with other stakeholders for restoration of habitats in the South Puget Sound region	• Preserving habitat in Nisqually Wildlife Refuge • Partnering with Pierce County to conserve habitat at Breseman Forest • Restoration of nearshore habitat in Commencement Bay

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
The Nature Conservancy	Conservation organization working around the world to protect ecologically important lands and waters for nature and people.	• Land acquisition and protection • Public involvement and education	• Protected more than 119 million acres of land, 5,000 miles of rivers, more than 100 marine conservation projects globally • Partnered with People for Puget Sound and the Trust for Public Land to form the Alliance for Puget Sound.
Washington Department of Fish and Wildlife	State agency with a dual mandate from the Washington Legislature to: (1) Protect and enhance fish and wildlife and their habitats; (2) Provide sustainable, fish- and wildlife-related recreational and commercial opportunities.	• Technical assistance, grant funding for shoreline restoration projects • Permitting for in-water restoration work	• Maintains list and maps of Priority Habitats and Species throughout the state and provides management recommendations • Screens forest practices applications, hydraulic project approvals, and provides SEPA review • Operates 15 public water access sites in Pierce County • Stocks fish in Pierce County lakes
West Sound Watersheds Council	Lead entity for salmon recovery in east WRIA 15. Participants include Pierce County, Kitsap County, cities, the Suquamish Tribe, and the Squaxin Island Tribe.	• Prioritizes and awards funding for local salmon recovery projects.	• Publishes three-year work plans that list and prioritize salmon recovery projects.

Table 6-1 continued

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
WRIA 10 - Upper and Lower Puyallup Watershed Committees	Upper Puyallup Watershed Committee: "To Protect and Enhance Water Quality and Beneficial Uses of Water by Reducing Water Pollution from Non-Point Sources." Lower Puyallup Watershed Committee: "…to develop an Action Plan to improve water quality in the Lower Puyallup Watershed and Puget Sound by reducing nonpoint pollution."	• Collaborate with the Puyallup River Watershed Council to develop watershed action plans and coordinate projects to carry out those plans.	• Upper Puyallup Watershed Action Plan • Lower Puyallup Watershed Action Plan
WRIA 11 - Nisqually Watershed	"To maximize the ability of the Nisqually Watershed to produce high quality ground and surface water, while protecting and managing the related resources to support environmental, social, economic, and cultural values."	• Foster communication and collaboration among stakeholders, citizen outreach, reports on state of the watershed.	• Cascade Land Trust, Port of Tacoma, City of Tacoma, other municipalities, many others

7.0 IMPLEMENTATION AND MONITORING

As a long-range planning effort without dedicated funding, it is difficult to articulate a firm strategy for accomplishing the goals of this plan. Under the Shoreline Management Act, the County is required to review, and amend if necessary, its SMP once every seven years (RCW 90.58.080(4)). At the time of the update, the County is required to report progress toward meeting its restoration goals, but there is no requirement or timeframe for specifically *implementing* the Restoration Plan. That said, the County has developed a process to help ensure that this plan is implemented over time.

7.1 IMPLEMENTATION PROCESS

Pierce County Planning and Land Services intends to meet annually with federal, state, and local resource agencies, tribes, non-government organizations and other restoration partners to review and discuss options for implementing the shoreline restoration actions in this plan.

The goal of this annual meeting will be to match and align priority restoration actions with available resources and funding, ongoing capital improvement projects, and community needs and interests in a systematic and objective way. Projects and actions that are in sub-basins noted as having the best potential for restoration (highest priority) would be emphasized. Progress toward fulfilling this plan would be tracked and recorded on an annual basis and Pierce County would provide a written status report to Ecology by December of each year. The status report would document progress made based on the benchmarks offered in Section 7.2.

7.2 TIMELINES AND BENCHMARKS

Specific timelines should be developed according to the general priorities described herein and emphasis should be given to areas with the greatest restoration potential. A suggested timeline for initiating implementation of this plan is as follows:

Within 2 years of adoption of this plan:

- Identify at least 2 potential bulkhead removal/ bio-stabilization projects on high priority shorelines, establish a schedule for obtaining and assigning staff, applying for funding, and initiating steps toward implementation.

- Identify at least 2 potential riparian enhancements or levee setback projects on high priority shorelines; establish a schedule for obtaining and assigning staff, applying for funding, and initiating steps toward implementation.

- Initiate conversations with at least one public agency regarding an intertidal fill removal or culvert removal project on a high priority shoreline.

Within 5 years of adoption of this plan (assuming funding is available):

- Complete at least 2 bulkhead removal/ bio-stabilization projects.

- Complete at least 2 riparian enhancement or levee setback projects.
- Initiate technical work to support at least 1 large-scale intertidal fill removal or culvert removal on a high priority shoreline on public lands.

Within 7 years of adoption of this plan:

- Identify and complete at least 1 new bulkhead removal/ bio-stabilization project.
- Identify and complete at least 1 new riparian enhancement or levee setback project.
- Complete technical work to support at least 1 potential large-scale intertidal fill removal or culvert removal on a high priority shoreline on public lands.

Over time restoration efforts must be evaluated against a set of benchmarks to determine if adequate progress is being made. One way to assess progress will be to track and report the following general benchmarks:

- Acres of riparian enhancement
- Linear feet of bulkhead removed
- Acres of reconnected floodplain
- Linear feet of road decommissioned
- Acres of wetland restored in the shoreline jurisdiction
- Acres of native vegetation planted
- Number of culverts replaced or number of miles of stream open to migration
- Number of creosote structures/ pilings removed in the nearshore environment
- Acres of riparian/nearshore enhancement
- Performance in meeting water quality criteria as measured in the state water quality assessment
- Shellfish closures and downgrades
- Number of restoration actions implemented in conjunction with other project partners

More specific benchmarks should be developed for specific projects. For example, a project that involves fill removal and salt marsh restoration might be evaluated based on the number of acres of upper intertidal habitat, the number of different plant species present or the degree of use by shorebirds. Restoration of estuarine habitat might be evaluated based on the number of fish present or the development of habitat conditions over time.

7.3 POTENTIAL FUNDING

Implementing restoration activities identified in this plan will be a challenge given the economic conditions in the County and the current lack of dedicated funding sources. At present, shoreline restoration is almost entirely dependent on grant funding, which depends upon state and federal monies. The County is not anticipated to be able to devote resources from the general fund to the implementation of this plan, but potential internal funding sources do exist. One potential funding mechanism would be the establishment of a shoreline restoration program organized like or integrated with a capital improvement program (CIP). Similar to an infrastructure CIP, a shoreline restoration CIP would be evaluated and updated regularly. A restoration CIP could be focused on site-specific projects and could be funded through grants or County general funds. For example, funds could be dedicated to support bulkhead removal, beach cleanup and riparian enhancements in the shoreline jurisdiction. Further, existing CIP projects, such as stormwater facility and road improvements, could be evaluated to determine if their design could advance shoreline restoration goals.

Special districts or local improvement districts (LIDs) could also be established to help fund and/or implement restoration projects. A special district is a local unit of government authorized by law to perform a single function or a limited number of functions, including but not limited to, water-sewer districts, irrigation districts, and transportation districts. LIDs are primarily a means of financing needed capital improvements over a period of time through assessments on the benefitting properties. They require the approval of the local government and affected property owners. LIDs involve the sale of bonds to investors and the retirement of those bonds via annual payments by the property owners within a district. Both of the models would provide a potential mechanism for achieving some of the goals of this plan.

A variety of outside funding sources are available for restoration projects in Puget Sound. Funding opportunities have generally increased since the implementation of Governor Gregoire's Puget Sound Initiative in 2005, though the process by which organizations are able to obtain funds is typically quite competitive. Sources listed here do not represent an exhaustive list of potential funding opportunities, but are meant to provide an overview of the types of opportunities available.

Interagency Committee for Outdoor Recreation
Washington Wildlife Recreation Program
1111 Washington St. SE
PO Box 40917
Olympia, WA 98504
360-902-3000, info@iac.wa.gov

The WWRP provides funds for the acquisition and development of recreation and conservation lands. WWRP funds are administered by account and category. The Habitat Conservation Account includes critical habitat, natural areas, and urban wildlife categories. The Outdoor Recreation Account includes local parks, state parks, trails, and water access categories. Letters of intent are usually due March 1. Applications are usually due May 1.

Washington State Department of Ecology
Post Office Box 47600
Olympia, Washington 98504-7600
jrus461@ecy.wa.gov
www.ecy.wa.gov/programs/wq/plants/grants/index.html

Grant programs administered by Washington State Department of Ecology are described below.

- *Aquatic Weeds Financial Assistance Program*: This program provides funding for technical assistance, public education and grants to help control aquatic weeds. Grant projects must address prevention and/or control of freshwater, invasive, non-native aquatic plants. The types of activities funded include: Planning, education, monitoring, implementation, pilot/demonstration projects, surveillance and mapping projects. Grant applications are accepted from October 1 through November 1 of each year during a formal application process.
- *Water Quality Program*: The Department of Ecology's Water Quality Program administers three major funding programs that provide low-interest loans and grants for projects that protect and improve water quality in Washington State. Ecology acts in partnership with state agencies, local governments, and Indian tribes by providing financial and administrative support for their water quality efforts. As much as possible, Ecology manages the three programs as one; there is one funding cycle, application form, and offer list. The three programs are: The Centennial Clean Water Fund, The State Revolving Loan Fund (SRF), and The Section 319 Nonpoint Source Grants Program (Section 319).
- Local governments, Native American tribes, special purpose districts, and non-profit groups are eligible for funding. Grants and loans are available for point source and nonpoint source projects. This includes, but is not limited to, treatment facilities, stream and salmon habitat restoration, and water quality monitoring.
- *Coastal Protection Fund*: This account is funded primarily by oil spill penalties levied against responsible parties. Restoration efforts undertaken with these funds are diverse and include land acquisition, fish barrier removal, and environmental education projects.
- *Coastal Zone Management Administration/Implementation Awards*: This program assists states in implementing and enhancing Coastal Zone Management (CZM) programs that have been approved by the Secretary of Commerce. Funds are available for projects in areas such as coastal wetlands management and protection, natural hazards management, public access improvements, reduction of marine debris, assessment of impacts of coastal growth and development, special area management planning, regional management issues, and demonstration projects with potential to improve coastal zone management.

Washington Department of Fish & Wildlife
600 Capitol Way North
Olympia, WA 98501-1091
360-902-2806.
http://wdfw.wa.gov/volunter/vol-7.htm

- *Aquatic Lands Enhancement Account (ALEA) Volunteer Cooperative Projects Program*: The Washington Department of Fish and Wildlife (WDFW) accepts grant applications from individuals and volunteer groups conducting local projects to benefit fish and wildlife. Grants have ranged from $300 to $75,000 in past years to help volunteers pay for materials necessary for projects approved by the agency. Funding cannot be used for wages or benefits. Examples of past projects include habitat restoration, improving access to fish and wildlife areas for disabled people, fish and wildlife research, public education and fish-rearing projects that can benefit the public.
- *Landowner Incentive Program*: The Landowner Incentive Program (LIP) is a competitive grant program designed to provide financial assistance to private landowners for the protection, enhancement or restoration of habitat to benefit species at risk on privately owned lands. At risk species depend on specific ecosystems for survival. These ecosystems include riparian areas, wetlands, oak woodlands, prairies and grasslands, shrub steppe and nearshore environments. Through Washington's LIP, individual landowners are eligible to apply for up to $50,000 in assistance. In addition, $50,000 is typically set aside for small grants. Any individual applying for these small grant funds may apply for up to $5,000. A 25% non-federal contribution is required, which may include cash and/or in-kind (labor, machinery, materials) contribution.

National Fish and Wildlife Foundation
1120 Connecticut Avenue, NW, #900
Washington, DC 20036
Kathleen Pickering 202-857-0166
www.nfwf.org

Non-profit organizations, local, state or federal government agencies are eligible to apply for funds for community-based projects that improve and restore native salmon habitat, remove barriers to fish passage, or for the acquisition of land/ conservation easements on private lands where the habitat is critical to salmon species. Specific grant programs are listed below.

- *Bring Back the Natives: A Public-Private Partnership for Restoring Populations of Native Aquatic Species*: The Bring Back the Natives initiative (BBN) funds on-the-ground efforts to restore native aquatic species to their historic range. Projects should involve partnerships between communities, agencies, private landowners, and organizations that seek to rehabilitate streamside and watershed habitats. Projects should focus on habitat needs of species such as fish, invertebrates, and amphibians that originally inhabited the waterways across the country. Twelve to fifteen grants averaging $60,000 are awarded annually.
- *Five-Star Restoration Matching Grants Program*: The Five-Star Restoration Program provides modest financial assistance on a competitive basis to support community-based wetland, riparian and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities.

- *Marine Debris Prevention and Removal Program*: The NOAA Marine Debris Program (NOAA MDP), codified by the Marine Debris Research, Prevention, and Reduction Act (33 U.S.C. 1951 et seq.) coordinates, strengthens, and enhances the awareness of marine debris efforts within the agency and works with external partners to support research, prevention, and reduction activities related to the issue of marine debris. The NOAA MDP mission is to support a national and international effort focused on preventing, identifying and removing the occurrence of marine debris and to protect and conserve our nation's natural resources, oceans, and coastal waterways from the impacts of marine debris.
- *Puget Sound Marine Conservation Fund*: In spring 2005, the United States charged an international shipping company with violating numerous federal pollution laws after inspections and actions taken by the Washington Department of Ecology and the Coast Guard identified the violations. As part of the settlement, the courts ordered $2,000,000 in community service payments to be made to the National Fish and Wildlife Foundation (Foundation) to be invested in conservation projects in the area of environmental impact.
- *The Migratory Bird Conservancy*: The MBC will fund projects that directly address conservation of priority bird habitats in the Western Hemisphere. Acquisition, restoration, and improved management of habitats are program priorities. Education, research, and monitoring will be considered only as components of actual habitat conservation projects.

- *Community Salmon Fund:* NFWF has established local partnerships throughout Washington State through the Community Salmon Fund program to engage landowners, community groups, tribes, and businesses in stimulating smaller-scale, community-oriented habitat restoration and protection projects to aid in salmon recovery. Grants made under this program are administered by NFWF. There are currently three Community Salmon Fund partnership programs. NFWF has partnered with the Washington State Salmon Recovery Funding Board (SRFB) to administer a statewide Community Salmon Fund program that is coordinated with the individual Lead Entity groups. In addition to this SRFB Community Salmon Fund program, NFWF has partnered with both King and Pierce Counties to administer county-specific Community Salmon Fund programs in those counties.

Salmon Recovery Funding Board (SRFB)
Tara Galuska (Nisqually River Salmon Recovery, WRIA 15)
(360) 902-2953
Barb McIntosh (Pierce County)
(360) 902-3001
http://www.rco.wa.gov/srfb/board/board.htm

The Salmon Recovery Funding Board supports salmon recovery by funding habitat protection and restoration projects. It also supports related programs and activities that produce sustainable and measurable benefits for fish and their habitat. SRFB distributes funds through two grant programs: SRFB grants, and Family Forest Fish Passage Program grants. The grants from SRFB range from $10,000 to nearly $900,000. They were awarded to organizations in 28 counties for work ranging from planting trees along streams to cool the water for salmon, to replacing culverts that prevent salmon from migrating to spawning habitat, to restoring entire floodplains.

Depending on the grant program, eligible applicants may include municipal subdivisions (cities, towns, counties, and special districts such as port, conservation, utility, park and recreation, and

school), tribal governments, state agencies, nonprofit organizations, regional fisheries enhancement groups, and private landowners. To be considered for funding, projects must be operated and maintained in perpetuity for the purposes for which funding is sought. All projects require lead entity approval and must be a high priority in the lead entity strategy or regional recovery plan.

Grants are awarded by the Salmon Recovery Funding Board based on a public, competitive process that weighs the merits of proposed projects against established program criteria.

NOAA Restoration Center
Community-based Restoration Program
Northwest Region
Jennifer Steger, Director
Jennifer.Steger@noaa.gov
http://www.nmfs.noaa.gov/

The NOAA Community-based Restoration Program (CRP) is a financial and technical assistance program that helps communities implement restoration projects. Specific opportunities are listed below.

- *NOAA CRP 3-Year Partnership Grants*: These grants fund national and regional habitat restoration partnerships for up to 3 years that provide sub awards for individual grass-roots restoration projects. Typical awards range from $100,000 to $2,000,000.
- *NOAA CRP Project Grants*: These grants fund grass-roots marine and coastal habitat restoration projects that will benefit anadromous fish species, commercial and recreational resources, and endangered and threatened species. Typical awards range from $30,000 to $250,000.
- *American Sportfishing Association's FishAmerica Foundation Grants*: Since 1998, NOAA CRP has partnered with the FishAmerica Foundation to provide funding for fisheries habitat restoration projects nationwide. Grants will fund marine and anadromous fish habitat restoration projects that benefit recreationally fished species. Typical awards range from $5,000 to $50,000.
- *National Fish & Wildlife Foundation/National Association of Counties Coastal Counties Restoration Initiative*: In partnership with NOAA CRP, this grant program funds innovative, high quality county-led or supported projects that support wetland, riparian and coastal habitat restoration projects. Typical awards range from $25,000 to $100,000.

Washington State Department of Natural Resources
Aquatic Lands Restoration Funding
Aquatic Resources Division
360-902-1100
Fax 360-902-1786
ard@dnr.wa.gov

DNR is encouraged that revitalizing the health of Puget Sound and other aquatic lands has become a high priority for the Governor and the people of the state. DNR provides funding for removal of creosote piles, removal of derelict vessels and other clean up in the nearshore environment.

Funding is typically awarded to restoration projects between 2004 and 2007 ranged from $8,000 to $35,000. http://www.dnr.wa.gov/ResearchScience/Topics/AquaticClean-UpRestoration/Pages/aqr_aquatic_clean_restoration.aspx.

Puget Sound Nearshore Partnership
Estuary and Salmon Restoration Program
Washington Department of Fish and Wildlife
600 Capital Way N.
Olympia, WA 98501
ESRP@dfw.wa.gov

The Estuary and Salmon Restoration Program (ESRP) is a protection and restoration funding opportunity being developed by the Puget Sound Nearshore Partnership to support the transition from opportunistic project funding to strategic and sustained nearshore ecosystem restoration in Puget Sound. The ESRP uses state capital funds and NOAA Restoration Center resources to fund restoration and protection projects that benefit salmon and the nearshore environment in Puget Sound. Projects are selected for their ability to provide long-term protection of restoration of ecosystem processes. ESRP provides phased funding to incrementally support large and complex projects. Projects that rank well through a regional competition are considered for annual funding.

Environmental Protection Agency
Region 10: Pacific Northwest
Grants Administration Unit
Bob Phillips
phillips.bob@epa.gov
(206) 553-6367

The Environmental Protection Agency funds a variety of projects that aim to safeguard the natural environment and protect human health. Potential opportunities specific to watershed protection and restoration are listed below.

- *The Clean Water State Revolving Fund Program*: Under this program, EPA provides grants or "seed money" to all 50 states plus Puerto Rico to capitalize state loan funds. The states, in turn, make loans to communities, individuals, and others for high-priority water-quality activities. Projects funded by the low-interest loans may include wetlands protection and restoration, estuary management efforts and development of riparian buffer zones.
- *Nonpoint Source Implementation Grant (319) Program*: Clean Water Act Section 319(h) funds are provided only to designated state and tribal agencies to implement their approved nonpoint source management programs. State and tribal nonpoint source programs include a variety of components, including technical assistance, financial assistance, education, training, demonstration projects, and regulatory programs. Each year, EPA awards Section 319(h) funds to states in accordance with an allocation formula that EPA has developed.
- *Wetland Protection, Restoration, and Stewardship Discretionary Funding*: This program provides support for studies and activities related to implementation of Section 404 of the Clean Water Act for both wetlands and sediment management. Projects can support regulatory, planning, restoration or outreach issues. Typical grant awards range from $5,000 to $20,000.

U.S. Fish & Wildlife Service
Nell Fuller
911 NE 11th Avenue
Portland, OR 97232-4181
(503) 231-2014
Nell_Fuller@fws.gov

- *Partners for Fish and Wildlife Program*: This program provides technical and financial assistance to private landowners and Tribes who are willing to work with USFWS and other partners on a voluntary basis to help meet the habitat needs of Federal Trust Species. The Partners Program can assist with projects in all habitat types which conserve or restore native vegetation, hydrology, and soils associated with imperiled ecosystems such as longleaf pine, bottomland hardwoods, tropical forests, native prairies, marshes, rivers and streams, or ecosystems that otherwise provide an important habitat requisite for a rare, declining or protected species. The typical grant award is approximately $25,000.
- *Puget Sound Program*: The Puget Sound Program was established to protect, restore, and enhance the natural resources of Washington's coastal ecosystems. USFWS works closely with the U.S. Environmental Protection Agency's National Estuary Program, and their State partner, the Puget Sound Water Quality Action Team to conserve fish and wildlife and their habitats in Puget Sound, an "estuary of national significance". Partnerships with other agencies, Native American Tribes, citizens, and organizations are emphasized.
- *National Fish Passage Program*: Each year the Service solicits and inputs select fish passage projects into the Fisheries Operational Needs System database. Projects are prioritized and selected based upon the benefits to species and the geographical area. Typical projects include barrier culvert removal or replacement with a fish passable culvert or bridge, and re-opening oxbow and off channel habitats. Typical funding amounts range from $30,000 to $110,000 with a minimum 25% cost share requested.
- *Cooperative Endangered Species Conservation Fund*: Grants offered through the Cooperative Endangered Species Conservation Fund support participation in a wide array of voluntary conservation projects for candidate, proposed and listed species. These funds may in turn be awarded to private landowners and groups for conservation projects.
- *North American Wetlands Conservation Act Grants Program*: The North American Wetlands Conservation Act of 1989 provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects in the United States, Canada, and Mexico for the benefit of wetlands-associated migratory birds and other wildlife. The Standard Grants Program supports projects in Canada, the United States, and Mexico that involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats. The Small Grants Program operates only in the United States; it supports the same type of projects and adheres to the same selection criteria and administrative guidelines as the U.S. Standard Grants Program. However, project activities are usually smaller in scope and involve fewer project dollars. Grant requests may not exceed $75,000, and funding priority is given to grantees or partners new to the Act's Grants Program.

U.S. Army Corps of Engineers
Section 206 Aquatic Ecosystem Restoration Projects
Mr. John R. Kennelly, Chief
Planning Branch
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742-2751

Under the authority provided by Section 206 of the Water Resources Development Act of 1996, the Corps may plan, design and build projects to restore aquatic ecosystems for fish and wildlife. The process for Section 206 projects begins after a non-federal sponsor requests Corps of Engineers assistance under the program. When funding is available, the Corps of Engineers prepares a Preliminary Restoration Plan (PRP) paid for by the federal government. The PRP is a 3 to 5 page document used to determine whether federal involvement is appropriate. It describes the project benefits and contains an initial schedule and budget. The Final PRP contains a letter from the non-federal sponsor indicating that they understand their obligations for cost sharing and obtaining any necessary real estate. If the sponsor agrees to move forward with the project, the Corps prepares a feasibility study, then plans and specifications. The Corps then manages construction of the project.

U.S. Army Corps of Engineers
Basinwide Restoration New Starts General Investigation
Bruce Sexauer
P.O. Box 3755
Seattle, WA 98134
(206) 764-6959

Funding for projects related to coastal ecosystems, fish and wildlife, flood management, land management and planning, outdoor recreation, general restoration, riparian areas, water quality, and wetlands is provided through this program at a 65:35 cost share. Studies on the same topics are funded at a 50:50 cost share.

Washington Department of Transportation
City Fish Passage Grant Program
Cliff Hall
(360) 705-7499
hallcli@wsdot.wa.gov

The City Fish Passage Barrier Removal and Habitat Restoration Grant Program provides $2 million to be used towards city fish passage barrier removal projects, with complementing habitat restoration and stormwater components. The intent of the City Fish Passage Barrier Removal and Habitat Restoration Grant program is to integrate clean water with salmon restoration efforts and complements the WSDOT ESA response. Grant funding may vary from year to year; check with the Program Manager at WSDOT for more detailed information.

Washington Department of Natural Resources Small Forest Landowner Office (SFLO)
PO Box 47000
1111 Washington Street SE
Olympia, WA 98504-7000
(360) 902-1000

The Family Forest Fish Passage Program will pay qualified landowners up to 100% for replacing blocked culverts. The Forest Riparian Easement Program also pays qualified landowners 50 to 100% of the value of timber they leave in riparian zones in exchange for a 50-year easement.

Ducks Unlimited
Matching Aid to Restore State Habitat (MARSH)
(916) 852-2000
conserve@ducks.org

The MARSH program was instituted in 1985 to develop and protect waterfowl habitat in the United States. This reimbursement program provides matching funds for wetland acquisition and habitat restoration and enhancement in each state based on Ducks Unlimited (DU's) income within that state. Projects submitted for MARSH funding must significantly benefit waterfowl. Normally, all projects must be on land under the control of a public agency or private cooperator with which DU has an approved memorandum of understanding. Control must be through ownership, lease, easement, or management agreement. Control must be adequate for protection, maintenance, and use of the project throughout its projected life.

Trout Unlimited
Embrace-A-Stream
406-543-1192
www.tu.org

Embrace-A-Stream (EAS) is the flagship grant program for funding Trout Unlimited's conservation efforts to conserve, protect, and restore coldwater fisheries and their watersheds. Trout Unlimited annually raises money from TU members, corporate and agency partners, and foundations to distribute as small grants to local TU projects. The goal of EAS is to conserve coldwater fisheries through innovative grassroots conservation projects. Successful projects are based on sound science, benefit the resource, strengthen the local TU chapter and council, and help build the constituency for protecting trout and salmon. TU volunteers are actively involved in project work and are expected to provide matching funds. An Embrace-A-Stream Committee comprised of TU volunteer representatives and scientific advisors evaluates all proposed projects.

Other Potential Sources

A number of private foundations, businesses, and other organizations administer grant programs with the intent of restoring habitat and ecosystems. Organizations with focal areas including Puget Sound, watershed protection, and habitat conservation include:

- The Russell Family Foundation (www.trff.org/home.asp);
- Northwest Fund for the Environment (www.nwfund.org/);
- The Bullitt Foundation (www.bullitt.org);
- The Compton Foundation (www.comptonfoundation.org);
- The Acorn Foundation (www.commoncounsel.org); and
- The Hugh and Jane Ferguson Foundation (http://www.foundationcenter.org/grantmaker/ferguson/).

7.4 OBSTACLES AND CHALLENGES

There are a number of potential complicating factors between the development of a county-wide shoreline restoration plan and on-the-ground implementation of its programs and projects. Some of these challenges are briefly summarized below:

- Lack of funding: Designing, carrying out, and monitoring the success of restoration efforts can be an expensive undertaking, particularly at larger (e.g., watershed or reach) scales. In general, funding for restoration is limited and competition for funds extensive.
- Landowner participation: Ownership of Pierce County's shorelines is highly variable. Landowners in areas identified as priorities for restoration efforts may be unwilling or unable to participate in those efforts, while others may be willing to participate in future projects.
- Project permitting: Obtaining necessary permits from local, state, and federal regulatory agencies can require substantial time and effort. Although encouraged and allowed by the SMP, complicated restoration projects may take a year or more to permit.
- Climate change: Rising temperatures and sea levels have the potential to dramatically alter Pierce County's shoreline jurisdiction, processes, and functions over time. Depending on the scale of change and time period over which changes occur, restoration priorities could shift substantially within a relatively short period of time. For example, restoration and levee setback projects currently underway at the Nisqually National Wildlife Refuge at the mouth of the Nisqually River are designed to accommodate for rising sea levels on Puget Sound and to provide for additional nearshore habitat as water elevations rise and saltwater intrusion occurs. Future restoration should be designed to consider sea level rise and future water elevations in shoreline areas of Pierce County.

7.5 MONITORING AND ADAPTIVE MANAGEMENT STRATEGIES

The SMP guidelines for restoration planning state that local programs should "…appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals" (WAC 173-26-201(2)(f)). Monitoring of the progress of any restoration plan is an important step in documenting progress and managing change in the shoreline environment. Phase 3 of the SMP guidelines restoration framework (based on Palmer et al, 2005) provides a general roadmap for assessing restoration actions and revising the approach to meeting restoration goals. It includes the following objectives:

- Adaptively manage restoration projects;
- Monitor post-restoration conditions; and
- Use monitoring and maintenance results to inform future restoration activities.

As defined by Salafsky et al. (2001), adaptive management is "the integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn." Testing assumptions involves first thinking about the situation at a specific location and developing a specific set of assumptions about what is occurring at that site and what actions one might be able to use to affect these events. For example, if a bulkhead has been placed in the marine nearshore environment in such a fashion as to block shore-drift behind it, then restoration may include removal of the bulkhead and long-term sediment monitoring to determine whether natural net shore drift is restored. Restoration practitioners can then implement these actions and monitor the actual results to see how they compare to the ones predicted by the set of assumptions.

Adaptation, in turn, is about taking action to improve a project based on the results of monitoring (Salafsky et al., 2001). Adaptation involves changing assumptions and interventions to respond to new information obtained through monitoring efforts. As in our previous example, if a catastrophic landslide occurs within the reach formerly deprived of sediment, it may no longer be necessary to perform beach nourishment on a recurring basis within that reach. Ongoing monitoring would make clear the necessity of adapting to changed circumstances; namely, the unexpected addition of a new sediment source within the drift cell feeding the scoured beach.

Learning is an additional important component of adaptive management (Salafsky et al., 2001). Learning is about systematically documenting the process of restoration and the results achieved, in order to prevent the repetition of mistakes in the future. Others in the conservation community can benefit from this information, as they can design and manage better projects and avoid some of the hazards and perils of previous efforts that were well documented by practitioners.

Pierce County plans to review shoreline processes and functions at the time of periodic SMP updates to, at a minimum, validate the effectiveness of the SMP. This review will consider what restoration activities actually occurred compared to stated goals, objectives and priorities, and whether restoration projects resulted in a net improvement of shoreline resources.

Under the Shoreline Management Act, the SMP must result in "no net loss" of shoreline ecological resources. If reviews demonstrate that this standard has not been met, Pierce County will be

required to take corrective actions. The goal for restoration is to achieve a net improvement of shoreline resources. The cumulative effect of restoration over the time between reviews will be evaluated, along with an assessment of impacts of development that is not fully mitigated to determine effectiveness at achieving a net improvement to shoreline ecological resources.

To conduct a valid reassessment of the shoreline conditions, it is necessary to monitor, record and maintain key environmental metrics to allow a comparison with baseline conditions. No comprehensive monitoring of ongoing restoration efforts has been undertaken by the County to date. Therefore, the effectiveness of current restoration efforts on a County-wide scale is unknown. In the context of project and site-specific monitoring and adaptive management, Pierce County will consider conducting system-wide monitoring of shoreline conditions and development activity, to the degree practical, recognizing that individual project monitoring does not provide an assessment of overall shoreline ecological health.

Pierce County will consider tracking information using the County's GIS and permit system as activities occur (development, conservation, restoration, and mitigation), such as:

a. New shoreline development
b. Shoreline variances and the nature of the variance
c. Compliance issues
d. New impervious surface areas
e. Number of pilings
f. Removal of fill
g. Vegetation retention/loss
h. Bulkheads/armoring

The County will require project proponents to monitor as part of project mitigation, which may be incorporated into this process. Regardless, as development and restoration activities occur in the shoreline area, the County will seek to monitor shoreline conditions to determine whether both project specific and SMP overall goals are being achieved. Mitigation plans, including those for restoration activities, shall be based on site-specific conditions and shall include a monitoring proposal intended to capture development of habitat conditions and features within the mitigation area. Mitigation plans shall be submitted to Pierce County for County review and approval.

As monitoring occurs, Pierce County will reassess environmental conditions and restoration objectives. Those ecological processes and functions that are found to be worsening may need to become elevated in priority to prevent loss of critical resources. Alternatively, successful restoration may reduce the importance of some restoration objectives in the future.

Evaluation of shoreline conditions, permit activity, GIS data, and policy and regulatory effectiveness will occur at varying levels of detail consistent with the Comprehensive Plan update cycle. A complete reassessment of conditions, policies and regulations will be considered every seven years. Through an adaptive management approach, the County will improve the effectiveness of restoration efforts through better coordination of projects, monitoring of restoration success, and expenditure of funds and effort. The County anticipates that needs for additional information about shoreline processes and restoration opportunities will continue to arise as part of this process. Identifying these data gaps and implementing measures to collect the information will be key to the success of restoration in the County.

8.0 REFERENCES

Albertson et al. 2002. South Puget Sound Water Quality Study. Washington State Department of Ecology Environmental Assessment Program, Olympia, Washington, Publication #02-03-021. Available: http://www.ecy.wa.gov/biblio/0203021.html

Bargmann, G. 1998. Forage Fish Management Plan. Washington Department of Fish and Wildlife.

Booth, D.B. 2000. Forest Cover, Impervious-Surface Area, and the Mitigation of Urbanization Impacts in King County, Washington. Prepared for King County Water and Land Resources Division. Seattle, Washington. 18 pp.

Cairns, J. Jr. 1988. Increasing Diversity by Restoring Damaged Ecosystems. In: National Research Council. 1992. Restoration of Aquatic Ecosystems: Science, Technology and Public Policy. Washington, DC: National Academy Press.

Cascade Land Conservancy. Undated. South Prairie Creek. Available: http://www.cascadeland.org/conservation-program/gallery/south-prarie-creek. Accessed January 2009.

Chambers-Clover Creek Watershed Council (CCCWC). 2007. Watershed Action Agenda: Priorities for Focus within the Chambers-Clover Creek Watershed, 2007 through 2011. July 2007.

City of Orting. 2009. City of Orting Shoreline Master Program, Adopted April 2009. Available: http://www.ecy.wa.gov/programs/sea/sma/download/pdf/orting_smp.pdf.

Coffin, B.A. and R.D. Harr. 1992. Effects of forest cover on volume of water delivery to soil during rain-on-snow. Final Report, Project SH-1. Sediment, Hydrology, and Mass Wasting Steering Committee, Timber/Fish/Wildlife program, Olympia, Washington.

Collins, B.D., and Sheikh A.J. 2005. Historical reconstruction, classification, and change analysis of Puget Sound tidal marshes. Project Completion Report to: Washington Dept. Natural Resources, Aquatic Resources Division. Olympia, Washington 98504-7027. Puget Sound River History Project, Dept. of Earth and Space Sciences, Seattle, Washington 98195.

Collins, B.D., D.R. Montomery, and A.J. Sheikh. 2003. Chapter 4: Reconstructing the historic riverine landscape of the Puget lowland. In: Montgomery, D.R., S. Bolton, D.B. Booth, and L. Wall (eds.). Restoration of Puget Sound Rivers. University of Washington Press.p. 79-128.

Commencement Bay Natural Resource Trustees (CBNRT). 1997. Commencement Bay Natural Resource Restoration Plan.

Crescent Valley Alliance (CVA). 2007. Crescent Valley Biodiversity Management Area (BMA) Stewardship Plan. July 2007. Available: http://www.crescentvalleyalliance.org/. Accessed January 2009.

Crescent Valley Alliance (CVA). Undated. Crescent Valley Alliance brochure. Available: http://www.crescentvalleyalliance.org/. Accessed January 2009.

ESA and Coastal Geologic Services. 2011. Draft Town of Steilacoom Shoreline Restoration Plan Element. June 2011.

ESA, ESA PWA, Anchor QEA, Coastal Geologic Services, KPFF, and Pacific Survey & Engineering. 2011. Puget Sound Nearshore Ecosystem Restoration Project Strategic Restoration Conceptual Engineering Final Design Report. March 2011. Prepared for Puget Sound Nearshore Ecosystem Restoration Project. Available: http://www.pugetsoundnearshore.org/conceptual_design.htm.

ESA Adolfson. 2007a. Draft Shoreline Inventory and Characterization for Pierce County, Washington. October 2007. Prepared by ESA Adolfson, Coastal Geological Services, Parametrix and Shannon and Wilson for Pierce County Planning and Land Services, Seattle, Washington.

ESA Adolfson. 2007b. City of Puyallup Draft Shoreline Restoration Plan. November 2007. Prepared for City of Puyallup.

ESA Adolfson. 2008. Draft City of Gig Harbor Shoreline Restoration Plan Element. October 2008. Available: http://www.cityofgigharbor.net/page.php?id=1151.

ESA Adolfson. 2011. Draft City of Tacoma Shoreline Restoration Plan. Prepared for Tacoma Public Works Division. April 2011.

Friends of Hylebos Wetlands. Undated. Completed Restoration Projects. Available: http://www.hylebos.org/projects/completed-restoration-projects. Accessed January 2009.

Friends of Pierce County. 2008. Friends' Focus newsletter, May – June 2008. Available: http://www.friendsofpiercecounty.org/updates/FPC-Newsletter-May-June-2008.pdf. Accessed January 2009.

GeoEngineers. 2008. Levee Setback Feasibility Analysis, Puyallup River Watershed, Pierce County, Washington. June 19, 2008. Prepared for Pierce County Public Works & Utilities.

Gersib, R. 2001. The Need for Process-Driven, Watershed-based Wetland Restoration in Washington State. Proceedings of the Puget Sound Research Conference 2001.

Intergovernmental Panel on Climate Change. 2007. Climate Change 2007: The Physical Science Basis – Summary for Policy Makers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. February 2007. Available at: http://www.ipcc.ch/

KGI Watershed Council. Undated. KGI Watershed Council brochure. Available: http://www.co.pierce.wa.us/xml/services/home/environ/water/ps/kgi/KGIWCBrochure-WEB.pdf. Accessed January 2009.

KGI Watershed Interim Council (KGI-WIC). 2001. Key Peninsula-Gig Harbor-Islands Watershed, State of the Watershed Report 2001. Available: http://www.co.pierce.wa.us/xml/services/home/environ/water/general/KGIAnnualReport2001.pdf. Accessed January 2009.

Magnuson, J.J., H.A. Regier, W.J. Christies, and W.C. Sonzogni. 1980. To Reinhabit and Restore Great Lakes Ecosystems. In: National Research Council. 1992. Restoration of Aquatic Ecosystems: Science, Technology and Public Policy. Washington, DC: National Academy Press.

McBride, M., and D. B. Booth. 2005. Urban Impacts on Physical Stream Conditions: Effects of Spatial Scale, Connectivity, and Longitudinal Trends: Journal of the American Water Resources Association, Vol. 41, No. 3, pp. 565-580.

Menashe, E. 2001. "Bio-structural" Erosion Control: Incorporating Vegetation in Engineering Designs to protect Puget Sound Shorelines. In: Puget Sound Research 2001, Conference Proceedings, Puget Sound Action Team. Bellevue, WA, 2001.

Menashe, E., 1993, Vegetation Management: A guide for Puget Sound bank property owners, Shorelands and Coastal Zone Management Program, Washington Department of Ecology, Olympia, WA.

Montgomery, D. R., S. Bolton, D. B. Booth, and L. Wall, editors. 2003. Restoration of Puget Sound rivers. University of Washington Press, Seattle.

Morgan, D.S. and J.L. Jones. 1999. Numerical Model Analysis of the Effects of Ground-Water Withdrawals on Discharge to Streams and Springs in Small Basins Typical of the Puget Sound Lowland, Washington. U.S. Geological Survey Water-Supply Paper 2492. 73 pp.

Murray, M and L. Ferguson. 1998. The Status of Marine Protected Areas in Puget Sound, Volume II: MPA Site Profiles & Appendices. March 1998. Prepared for the Puget Sound/Georgia Basin International Task Force Work Group on Marine Protected Areas with support from Puget Sound Action Team U.S. Environmental Protection Agency, Region 10.

Newton, J.A., S.L. Albertson, K. Nakata, and C. Cishe. 1998. Washington State Marine Water Quality in 1996 and 1997, No. 98-338. Department of Ecology, Olympia, WA.

Nisqually Indian Tribe. 2008. Yil-me-hu, The Nisqually Watershed Salmon Recovery Newsletter, Fall/Winter 2008. Available: http://www.nisquallyriver.org/stewards/Yil_Me_Hu_Fall_Winter_08.pdf. Accessed January 2009.

Nisqually Land Trust. 2006. Nisqually Land Trust - Protected Lands, Ohop Creek. Available: www.nisquallylandtrust.org/ohop_creek.php. Accessed January 2009.

Nisqually River Watershed Lead Entity. 2011. Nisqually Watershed Chinook Salmon Recovery Plan 3 year work program, 2011-2013. Provided to ESA by Tom Kantz, Pierce County biologist.

Nisqually Tribe Natural Resources Department. 2008.Yil-me-Ho, The Nisqually Watershed Salmon Recovery Newsletter, Nisqually Tribe, Olympia, WA.

Palmer, M.A., E.S. Bernhardt, J.D. Allan, P.S. Lake, G. Alexander, S. Brooks, J. Carr, S, Clayton, C.N. Dahm, J. Follstad Shah, D.L. Galat, S.G. Loss, P. Goodwin, D.D. Hart, B. Hassett, R. Jenkinson, G.M. Kondolf, R. Lave, J.L. Meyer, T.K. O'Donnell, L. Pagano, And E. Sudduth. 2005. Standards for ecologically successful river restoration. Journal of Applied Ecology. 42, 208-217.

Pentec Environmental. 2003. Key Peninsula, Gig Harbor, and Islands Watershed Nearshore Salmon Habitat Assessment. Prepared for Pierce County Public Works and Utilities.

Penttila, D.E. 1978. Studies of the surf smelt (*Hypomesus pretiosus*) in Puget Sound. Wash. Dept. Fisheries Technical Report 42. 47pp.

Penttila, D.E. 1995. Investigations of the spawning habitat of the Pacific sand lance (*Ammodytes hexapterus*) in Puget Sound. Puget Sound Research '95 Proceedings, Bellevue, WA.

Pierce Conservation District (PCD). 2008. The Tahoma View. Volume 5, Issue 4, Winter 2008-09. Available: http://www.piercecountycd.org/images/tahomaViewPDFs/thm_vw_wint0809.pdf. Accessed January 2009.

Pierce County. 2010. Chambers Creek Properties web page. Available: http://www.co.pierce.wa.us/pc/abtus/ourorg/ccp/index.htm.

Pierce County (WRIA 10/12) Lead Entity. 2008a. 2008 Three-year Watershed Implementation Priorities. April 21, 2008.

Pierce County (WRIA 10/12) Lead Entity. 2008b. Salmon Habitat Protection and Restoration Strategy, WRIA 10 Puyallup Watershed, WRIA 12 Chambers/Clover Creek Watershed. March 2008.

Pierce County Lead Entity. 2011. Puyallup-White and Chambers-Clover Creek Watersheds (WRIAs 10 & 12) 2011 Three Year Work Program Update. Provided to ESA by Tom Kantz, Pierce County biologist.

Pierce County Public Works. 2006a. Clear/Clarks Creek Basin Plan. Pierce County Public Works and Utilities, Water Programs Division. Available: http://www.co.pierce.wa.us/pc/services/home/environ/water/ps/basinplans/bpmain.htm

Pierce County Public Works. 2006b. Hylebos Browns-Dash Point Basin Plan. Pierce County Public Works and Utilities, Water Programs Division. Available: http://www.co.pierce.wa.us/pc/services/home/environ/water/ps/basinplans/bpmain.htm

Pierce County Public Works and Utilities. 2011. Flood Hazard Management Plan web page. Available: http://www.co.pierce.wa.us/pc/services/home/environ/water/wqws/floodhazmgmtplan2.htm.

Pierce County. 2003. Muck Creek Basin Plan. Available: http://www.co.pierce.wa.us/pc/services/home/environ/water/ps/basinplans/muck.htm. Accessed January 2009.

Pierce County. 2006. Clover Creek Habitat/Floodplain Restoration Fact Sheets. Pierce County Public Works and Utilities. Available: http://www.co.pierce.wa.us/pc/services/home/environ/water/cip/cloverrest.htm. Accessed January 2009.

Pierce County. 2006. Key Peninsula-Islands Basin Plan. Pierce County Public Works and Utilities. Available: http://www.piercecountywa.org/pc/services/home/environ/water/ps/basinplans/keypenisld.htm. Accessed January 2009.

Pierce County. 2007. Mid-Puyallup Basin Plan 2007 Update. Available: http://www.co.pierce.wa.us/pc/services/home/environ/water/ps/basinplans/midpuy.htm. Accessed February 2009.

Pierce County. 2007. Spanaway Creek Fish Passage Project Background. Pierce County Public Works and Utilities.

Pierce County. 2007. White River Basin Plan – Characterization Report. September 2007. Pierce County Public Works and Utilities.

Pierce County. 2008. Nisqually River Basin Plan Volume 1 – Public Review Draft. June 2008. Pierce County Public Works and Utilities. Available: http://www.co.pierce.wa.us/pc/services/home/environ/water/ps/basinplans/nisqually.htm. Accessed January 2009.

Puget Sound Action team (PSAT). 2001. Sound Facts: Eelgrass. Available at: http://www.psat.wa.gov/Publications/Fact_sheets/eelgrass.pdf

Puget Sound Action Team (PSAT). 2005. Regional Nearshore and Marine Aspects of Salmon Recovery in Puget Sound. Prepared for Shared Strategy for Puget Sound. June 28, 2005.

Puget Sound Action Team (PSAT). 2006. Aquatic Nuisance Species News. October 6, 2006. http://www.psat.wa.gov/Programs/ANS/tunicate_update_100606.htm (accessed 10/31/06).

Puget Sound Partnership (PSP). 2008. Puget Sound Action Agenda: Protecting and Restoring the Puget Sound Ecosystem by 2020. December 1, 2008. Available: http://www.psp.wa.gov/downloads/ACTION_AGENDA_2008/Action_Agenda.pdf. Accessed February 2009.

Puget Sound Partnership (PSP). 2009. Puget Sound 2009 Economic Stimulus Projects. Updated February 3, 2009.

Puget Sound Technical Recovery Team. 2002. Planning Ranges and Preliminary Guidelines for the Delisting and Recovery of the Puget Sound Chinook Salmon Evolutionarily Significant Unit.

http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Puget-Sound/upload/trtpopesu.pdf

Puget Sound Water Quality Action Team. 2002. 2002 Puget Sound Update: Eighth Report of the Puget Sound Ambient Monitoring Program. Puget Sound Water Quality Action Team. Olympia, Washington

Puyallup River Watershed Council (PRWC). 2007a. Forum Meeting Notes, May 23, 2007.

Puyallup River Watershed Council (PRWC). 2007b. Watershed Action Agenda: Priorities for Focus Within the Puyallup River Watershed - 2007 through 2011.

Puyallup River Watershed Council (PRWC). 2008. Clear/Clarks Creek Basin Plan, 2008 Update.

Puyallup River Watershed Council. 2011. Puyallup River Watershed Council Forum Notes, April 27, 2011.

Puyallup Tribe of Indians. Undated. Fisheries. Available: http://www.puyallup-tribe.com/index.php?nav=programs&id=21. Accessed January 2009.

Redman, S., D. Myers, and D. Averill, eds. (2005). Regional Nearshore and Marine Aspects of Salmon Recovery in Puget Sound. Shared Strategy for Puget Sound. June 28, 2005.

Reinelt, Lorin. 2011. Clark Creek Projects and Activities by Pierce County. April 27, 2011.

Ruckelshaus, M. H. and M. M. McClure. 2007. Sound Science: Synthesizing ecological and socioeconomic information about the Puget Sound ecosystem. prepared in cooperation with the Sound Science collaborative team. U.S. Dept. of Commerce, National Oceanic & Atmospheric Administration (NMFS), Northwest Fisheries Science Center. Seattle, Washington.93 p.

Salafsky, N., R. Margoluis, K. Redford. 2001. Adaptive Management: A Tool for Conservation Practitioners. World Wildlife Fund, Inc. Washington, DC.

Schlenger, P., A. McLennan, E. Iverson, K Fresh, C. Tanner, B. Lyons, S. Todd, R. Carman, D. Myers, S. Campell, and A. Wick. In prep. Strategic Needs Assessment Report. Puget Sound Nearshore Ecosystem Restoration Project.

Schwartz, M.L., B.D. Harp, B.E. Taggart, and M. Chrzastowski. 1991. Net shore-drift in Washington state: Shorelands and Coastal Zone Management Program. WA Dept. of Ecology, Olympia, WA.

Shared Strategy Development Committee. 2007. Puget Sound Salmon Recovery Plan. Seattle, Washington. (http://www.sharedsalmonstrategy.org/plan/toc.htm)

Shared Strategy for Puget Sound (SSPS). Undated. Salmon and the Puyallup/White and Chambers/Clover Creek Watersheds. Available: http://www.sharedsalmonstrategy.org/watersheds/watershed-puyallup.htm#Changes. Accessed January 2009.

Shared Strategy for Puget Sound. Undated. Watershed Profile: Salmon and the Nisqually Watershed. Available: http://www.sharedsalmonstrategy.org/watersheds/watershed-nisqually.htm. Accessed January 2009.

Simenstad, C.A. 2000. Commencement Bay aquatic ecosystem assessment: ecosystem-scale restoration for juvenile salmon recovery. University of Washington, School of Fisheries, Sof-UW-2003. 25pp.

South Puget Sound Salmon Enhancement Group (SPSSEG). 2006. SalmonGram, The South Puget Sound Salmon Enhancement Group Newsletter Fall 2006.

South Puget Sound Salmon Enhancement Group (SPSSEG). 2007. SalmonGram, The South Puget Sound Salmon Enhancement Group Newsletter Spring 2007.

South Puget Sound Salmon Enhancement Group (SPSSEG). 2008. SalmonGram, The South Puget Sound Salmon Enhancement Group Newsletter. Winter 2008.

South Puget Sound Salmon Enhancement Group (SPSSEG). 2008. SalmonGram, The South Puget Sound Salmon Enhancement Group Newsletter. Winter 2008.

South Puget Sound Salmon Enhancement Group (SPSSEG). 2009a. Mashel River ELGs. Available: http://www.spsseg.org/?page_id=423. Accessed January 2009

Stanley, S., J. Brown, and S. Grigsby. 2005. Protecting Aquatic Ecosystems: A Guide for Puget Sound Planners to Understand Watershed Processes. Washington State Department of Ecology. Publication #05-06-027. Olympia, Washington.

Tacoma News Tribune. 2006. Carbon River Critters Get More Room. July 27, 2006.

Tahoma Aubudon Society. 2007. Annual Report 2007. University Place, Washington (http://www.tahomaaudubon.org/Default.aspx?pageId=30300).

Thom RM, GD Williams, and HL Diefenderfer. 2005. "Balancing the Need to Develop Coastal Areas with the Desire for an Ecologically Functioning Coastal Environment: Is Net Ecosystem Improvement Possible?" Restoration Ecology 13(1):193-203. doi:10.1111/j.1526-100X.2005.00024.x

Thom, R. M., A. B. Borde, G. D. Williams, J. A. Southard, S. L. Blanto and D. L. Woodruff,. 2001. Effects of Multiple Stressors on Eelgrass Restoration Projects. Battelle Marine Sciences Laboratory, Pacific Northwest National Laboratory. In Puget Sound Research.

Thom, R., L. Antrim, A. Borde, W. Gardiner, D. Schreffler, P. Farley, J. Norris, S.Willey-Echeverria, and T. McKenzie. 1998. Puget Sound's eelgrass meadows: Depth distribution and spatial patchiness. Puget Sound '98,Conference Proceedings, March 12-13, 1998, Seattle, WA.

Thom RM, GD Williams, AB Borde, JA Southard, SL Sargeant, DL Woodruff, JC Laufle, and S Glasoe. 2005. "Adaptively Addressing Uncertainty in Estuarine and Near Coastal Restoration Projects." Journal of Coastal Research. JCR 40(sp. iss.):94-108.

United States Environmental Protection Agency (EPA). 2006. Puget Sound Georgia Basin Ecosystem: Species at Risk. Available at: http://epa.gov/region10/psgb/indicators/species_at_risk/

United States Geological Survey (USGS). 1998. Determination of Upstream Boundaries on Western Washington Streams and Rivers Under the Requirements of the Shoreline Management Act of 1971. By David L. Kresch, Water-Resources Investigations Report 96-4208. Prepared in cooperation with Washington State Department of Ecology.

Washington Conservation Commission. 1999. Habitat Factors Limiting Salmon Success in Washington State. Washington Conservation Commission.

Washington Department of Ecology (Ecology). Puget Sound Shorelines. Available at: http://www.ecy.wa.gov/programs/sea/pugetsound/species/shorebird.html

Washington Department of Ecology (Ecology). 2001 Shoreline Photos Shorelands and Environmental Assistance Program

Washington Department of Ecology (Ecology). 2005. Stormwater Management Manual for Western Washington. Publication Numbers 05-10-029 through 05-10-032. February 2005.

Washington Department of Ecology (Ecology). 2006. Cleanup sites.

Washington State Department of Ecology (Ecology). 2006. South Prairie Creek Bacteria and Temperature Total Maximum Daily Load (Water Cleanup Plan) - Detailed Implementation Plan - Draft. March 2006. Publication Number 06-10-018. Available: http://www.co.pierce.wa.us/xml/services/home/environ/water/ps/prwc/2006/SouthPrairieCreekDIP-finalDraft.pdf. Accessed January 2009.

Washington Department of Fish and Wildlife (WDFW). 2000. 1999 Warmwater Fish Survey of Harts Lake, Pierce County. May 2000. WDFW Warmwater Enhancement Program.

Washington Department of Fish and Wildlife (WDFW). 2000. Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual. Accessed at: http://wdfw.wa.gov/hab/engineer/mnl2000.pdf

Washington Department of Fish and Wildlife (WDFW). 2000a. Critical spawning habitat for herring, surf smelt, sand lance, and rock sole in Puget Sound Washington. Washington Department of Fish and Wildlife, Fish Program. Olympia, Washington.

Washington Department of Fish and Wildlife (WDFW), Salmonid Screening, Habitat Enhancement and Restoration Section (SSHEAR). 2001. 2000 Annual Report. Environmental Restoration Division, Habitat Program. Accessed at: http://wdfw.wa.gov/hab/tapps/reports/2000sshear.pdf

Washington Department Of Health (WDOH). 2005. Report to the Puget Sound Action Team. Nitrogen Reducing Technologies for Onsite Wastewater Treatment Systems. Office Of Environmental Health & Safety. Wastewater Management Program Division. June 2005.

Washington Department of Natural Resources (WDNR). 2001. Washington State ShoreZone Inventory, Nearshore Habitat Program, Olympia, WA.

Washington Department of Natural Resources (WDNR). 2005. Draft Environmental Impact Statement on the Policy for Sustainable Forests. April 2005.

Washington Sea Grant. 2000. Draft Northwest Straits Overview, A Science Gap Report. Seattle, Washington. April 2000. Prepared for the Northwest Straits Commission.

Washington State Parks and Recreation Commission (WSPRC). 2009. SeaTac Area State Parks Management Plan. Adopted January 13, 2009. Available at: http://www.parks.wa.gov/plans/dash-saltwater/SeaTac%20Management%20Plan.pdf.

Washington Water Trust (WWT). 2009. South Prairie Creek information. Available: www.thewatertrust.org.

West Sound Watersheds Council. 2011. Three-year Work Plan for WRIA 15, updated spring 2011. Provided to ESA by Tom Kantz, Pierce County biologist.

APPENDIX A – WRIA RESTORATION PRIORITY MAPS

APPENDIX B - SUMMARY OF EXISTING RESTORATION PROGRAMS AND PARTNERS

SUMMARY OF EXISTING RESTORATION PROGRAMS AND PARTNERS

This section supplements the information in Chapter 6 on restoration partners. These additional restoration planning efforts in Pierce County may help to inform and implement future restoration actions. Partners are presented below in alphabetical order.

Cascade Land Conservancy

Cascade Land Conservancy is a non-profit organization working to conserve land in Pierce, King, Mason, Kittitas, and Snohomish Counties. The Conservancy has led the conservation of more than 150,000 acres over the last decade including approximately 20 properties in Pierce County. The Conservancy works with landowners using tools such as land purchase or donation, conservation easements, and stewardship endowments to preserve high-quality ecosystems. (http://www.cascadeland.org/).

Citizens for a Healthy Bay

Citizens for a Healthy Bay (CHB) is an non-profit environmental group that was founded in 1990 to represent the people of Tacoma in the Superfund cleanup of Commencement Bay. CHB took on the mission of representing and giving a voice to the citizens of Tacoma at meetings, forums and planning sessions for Commencement Bay to bring all the stakeholders to find the most effective methods for cleaning up the polluted bay (http://www.healthybay.org/). Citizens for a Healthy Bay also became a leader in the restoration of contaminated parcels of land along both sides of the Bay. CHB's Adopt-A-Wildlife-Area (AAWA) program was established as the organizational hub for a diverse band of volunteers dedicated to enhancing the expanding corridor of restored sites that provide valuable wildlife habitat but are too small to be self-sustaining. CHB and its volunteers remove invasive weeds, plant native trees and shrubs, clean up litter and debris and monitor the ongoing recovery and health of the land.

Coastal Habitats in Puget Sound (CHIPS)

The Coastal Habitats in Puget Sound (CHIPS) group is an interdisciplinary collaboration to coordinate, integrate, and link USGS studies with the goals and objectives of the Puget Sound Nearshore Ecosystem Restoration Project (described below). Current studies have three themes effects of urbanization on nearshore ecosystems; restoration of large river deltas; and recovery of nearshore ecosystems. The primary focus is developing information on the physical, chemical, and biological processes and human dimensions associated with the restoration or rehabilitation of the nearshore environment. USGS study results are distributed through databases, geospatial models and analyses, technical reports, and formal publications to provide the necessary scientific foundation for decision-makers.

Crescent Valley Alliance

The Crescent Valley Alliance was formed by Gig Harbor and Crescent Valley residents in the fall of 2006 as a result of a wildlife survey by landowners, governmental and environmental agencies. This study confirmed that the Crescent Valley riparian system (Crescent Lake, Creek

and Estuary) comprises one of the most pristine, biologically rich watersheds in Pierce County and is worthy of protection. A Conservation Action Plan was written identifying potential threats to the quality of this environment and establishing measures to ensure its preservation. The Crescent Valley Alliance is a community wide effort that depends on volunteers for a variety of activities (http://www.crescentvalleyalliance.org/).

Friends of Pierce County

Friends of Pierce County is a nonprofit organization that involves the people of Pierce County in preserving and restoring the natural environment and promotes more livable communities. The organization seeks to serve as an interactive link coordinating communities, business, government, and other entities; educate and empower communities through public outreach; direct growth of community attributes that promote a sensible and sustainable balance of environment, equity, and economics; preserve and restore the natural ecosystem; promote livable communities; and advocate for responsible and adaptive land use and transportation planning, watershed planning and natural resource management, and environmentally friendly planning, techniques, and policies. (http://www.friendsofpiercecounty.org/about.htm)

Great Peninsula Conservancy

The Great Peninsula Conservancy is a non-profit organization working in Mason, Kitsap, and western Pierce Counties. As of 2007 the Conservancy had protected more than 1,900 acres through acquisition, conservation easements, and project partnerships. Projects include the South Sound Preserve on the Key Peninsula and Homestead Park on the Gig Harbor Peninsula. (http://www.greatpeninsula.org/)

KGI Watershed Council

The purpose of the Key Peninsula-Gig Harbor-Islands (KGI) Watershed Council is to preserve, protect and restore the watershed by implementing the KGI Watershed Action Plan through activities that foster collaboration and involvement. The Council participates in local watershed planning processes, provides educational workshops, facilitates restoration and preservation activities with local community members and regional stakeholders, and coordinates the Lu Winsor Environmental Grant Program, which has provided over $8,000 in grants annually to community organizations since 2003.
(http://www.piercecountywa.org/pc/services/home/environ/water/ps/kgi/main.htm)

Muckleshoot Tribe

The Muckleshoot Indian tribe is a descendant of the Coastal Salish tribes that have inhabited the region surrounding the White and Green Rivers. The Tribe adopted its constitution in 1936 through the Indian Reorganization Act and is a federally recognized self-governing tribal government. In the 1960s and 70s, the Tribe was involved in a fight over tribal rights to take salmon at all of the "usual and accustomed" fishing sites. Following the Bolt Decision, which reaffirmed the Tribe's treaty fishing rights, the tribe's Natural Resources Department has focused primarily on salmon preservation and restoration of salmon habitat.
(http://www.muckleshoot.nsn.us/).

The Muckleshoot Tribe operates a fish hatchery on the White River. Working in cooperation with the Puyallup Tribe, the Corps of Engineers, the US. Fish and Wildlife Service and NMFS, and WDFW, the Muckleshoot Tribe has helped to build the White River Chinook salmon population – listed as "threatened" under the ESA in 1999. Prospects for recovery of this stock are now considered good and the project has become a model for successful stock restoration (http://wdfw.wa.gov/hat/overview.htm).

Nisqually Glacier to Sound Conservation Corridor

The Nisqually River Council, the Nisqually River Basin Land Trust, the Nisqually River Interpretive Center Foundation, the Nisqually Indian Tribe, the National Park Service Rivers and Trails Conservation Assistance Program and Stewardship Partners have joined forces to develop a conservation corridor that links Mount Rainier National Park to the Nisqually National Wildlife Refuge. The Stewardship Corridor will provide a Habitat Management Plan for terrestrial and aquatic species and help landowners voluntarily implement the plan on their property; work with landowners to conserve water quality and habitat; conserve working forests and agricultural lands; provide landowners with incentives to protect designated view/landscape areas; help counties, towns, and landowners develop voluntary community development standards, and develop incentives for those who adopt these standards.

The Stewardship Corridor is intended as a model for how landowners and communities can link habitat areas and conserve watersheds through community developed voluntary initiatives, rather than through regulations. The Stewardship Corridor will not impose standards or new regulation on landowners. (http://www.nisquallyriver.org/corridor.html)

Nisqually Land Trust

In 1989, the Nisqually Land Trust was established to protect habitat and wildlife threatened by the effects of urbanization. Currently, the Land Trust is responsible for conserving and restoring approximately 1,700 acres of old-growth forest and salmon habitat in the Nisqually watershed. These properties have been acquired through grants, mitigation funds, donations, and special events including the Trust's annual auction.

The Nisqually Land Trust owns six land complexes in the watershed. The Mount Rainier Gateway Initiative is located near the main entrance to Mount Rainier National Park. Phase one of five has been completed, with a goal of acquiring 4,500 acres of threatened forest in the upper watershed that provide habitat for threatened wildlife species, including spotted owl and marbled murrelet. The Land Trust owns two properties on the Mashel River, the primary salmon-producing tributary along the Nisqually River, totaling approximately 109 acres. Chinook, steelhead, coho, and pink salmon spawn in the Mashel River. The Nisqually Land Trust is collaborating with the Nisqually Tribe to restore salmon habitat along a portion of the river located near the Nisqually-Mashel State Park.

The Land Trust also owns approximately 200 acres in the Ohop Valley, where restoration efforts include removal of old buildings and invasive plants and replanting of a large floodplain. The Land Trust is restoring approximately 360 acres of floodplain habitat at the confluence of Powell Creek and the Nisqually River. Restoration efforts include culvert removal and replanting and

enhancement of habitat for spotted owls. The Wilcox Flats complex comprises 150 acres along the Nisqually River located south of Wilcox Farms in Pierce County. The Land Trust has removed debris deposited during flood events, planted native trees, and is now completing a wildlife inventory and long-term restoration and management plan. Finally, Red Salmon and Washburn Creeks represent the most significant of the Land Trust's restoration efforts. The Land Trust combined efforts with the Nisqually Tribe, USFWS, and Washington Conservation Corps to remove invasive vegetation and plant 2,000 native trees and shrubs along the two streams. (http://www.nisquallylandtrust.org/)

Nisqually River Council

The Nisqually River Council implements the Nisqually River Management Plan and is comprised of representatives from Pierce, Thurston and Lewis Counties, WDFW, WDNR, Washington State Parks, the Nisqually Tribe and various citizen stakeholders (http://www.nisquallyriver.org/nrc.html).

Nisqually River Education Project

The Nisqually River Project (NREP) is a watershed education program with the principal mission of implementing key elements of the Nisqually River Management Plan. The Nisqually River Education Project implements watershed based education and environmental action projects which engage students and teachers in protecting and enhancing the water quality and salmon habitat of the Nisqually River watershed. By making the involvement of schools possible, the NREP directly supports the efforts of the Nisqually River Council and the Nisqually Tribe in creating a healthier Nisqually River and the preservation of its fisheries and shellfish resources.

Each year, the NREP actively involves hundreds of student participants in an on-going water quality monitoring program. These students then engage in problem-solving and action education projects. For example, some students strive to enhance depressed salmon habitat by working on stream restoration projects at key sites in the Nisqually watershed. Other students create educational outreach presentations and materials about non-point pollution prevention. (http://www.nisquallyriver.org/edu/edu.html)

Nisqually River Interpretive Center Foundation

The Nisqually River Interpretive Center Foundation was established in the early 1990s to plan, develop and operate the Nisqually River Interpretive Center, a state and regional watershed interpretive facility. Educational programming at this facility will use the Nisqually River Management Program as a prototypical example of a new way of managing natural resources through stakeholder cooperation and collaboration. The Foundation has acquired property to house the main interpretive center facilities. The Foundation also published *Nisqually Watershed: Glacier to Sea - A River's Legacy.* (http://www.nisquallyriver.org/center/index.html)

Nisqually Stream Stewards

The Nisqually Stream Stewards are people living in the Nisqually watershed who want to help protect and improve the health of streams. Nisqually Stream Stewards monitor the health of their local streams and help with projects that improve stream health, such as removing invasive grass from stream channels or planting trees along stream banks. (http://www.nisquallyriver.org/stewards/index.html)

Nisqually Tribe

The Nisqually Tribe is located on both sides of the Nisqually River in Pierce County, Washington. The Natural Resources Department consists of several programs, including a Salmon Recovery Program, which is charged with planning for the recovery of Nisqually salmon and restoring salmon habitat (http://www.nisqually-nsn.gov/naturalresources.html). Tribal biologists are responsible for studying and monitoring salmon. Stream stewards educate the public about salmon habitat, protection, and restoration. Tribal biologists also operate two hatcheries and a shellfish program.

One of the hallmark projects of the Salmon Recovery Program is the Nisqually Tribe's collaborative effort in the Nisqually Delta restoration. The Nisqually Tribe has restored over 140 acres of the estuary on the east side of the river since 1996. The Tribe has embarked on a three-year large-scale restoration in the Nisqually Wildlife Refuge to help increase salmon habitat in the Nisqually delta (http://www.nisquallyriver.org/stewards/Yil_Me_Hu_Fall_Winter_08.pdf). The dikes along the pastures are being removed or breached in phases to restore 760 acres of estuary and salmonid habitat in the delta. The Tribe has worked with the Nisqually Land Trust on the Red Salmon Creek restoration project and is currently collaboration with the Land Trust to restore salmon habitat along the Mashel River.

Pacific Northwest Recovery Implementation Science Team (RIST)

After listing 27 Pacific salmon Evolutionarily Significant Units (ESUs) as threatened or endangered under the Endangered Species Act, NMFS initiated a west coast-wide process to develop recovery plans for these species. An important part of this process was the creation of geographically based multi-disciplinary science teams Technical Recovery Teams (TRTs). The TRTs were tasked with providing science support to recovery planners by developing biologically based viability criteria, analyzing alternative recovery strategies, and providing scientific review of draft plans.

With the imminent publication of recovery plans for most Pacific Northwest recovery domains, the Pacific Northwest TRTs either have completed or are close to completing their initial task of developing viability criteria and providing science support for recovery plan development. NMFS therefore has phased out most of the existing Pacific Northwest TRTs.

As the recovery plans are completed, there is a continuing need for broad-based scientific support for recovery plan implementation. There are two active technical recovery teams in the Puget Sound domain: the Puget Sound Steelhead Technical Recovery Team (PSSTRT), and the Puget Sound Recovery Implementation Technical Team (PSRITT). Both teams work in

coordination with the Pacific Northwest Recovery Implementation Science Team (RIST). The PSSTRT is tasked with identifying population structure and developing biological viability criteria for Puget Sound steelhead. The PSRITT is providing recovery implementation technical support for Puget Sound Chinook and steelhead, Eastern Strait of Juan de Fuca / Hood Canal summer chum, and Lake Ozette sockeye. The PSRITT also works closely with the Puget Sound Partnership. The original Puget Sound salmon TRT was formed in April of 2000, and was phased out in early 2008 with the formation of the PSRITT.

Pierce Conservation District

The Pierce Conservation District (PCD) is a non-regulatory branch of state government that works with Pierce County landowners to protect water quality, improve fish and wildlife habitat, and conserve natural resources while maintaining a sustainable agricultural community (http://www.piercecountycd.org/).

The PCD works with interested landowners to develop conservation plans that identify current conditions and economically viable alternative and best management practices (BMPs) to improve productivity while protecting soil and water quality. Some of the BMPs incorporated into conservation plans include composting, roof runoff management, pasture planting, sacrifice areas, and filter strips. In addition, the PCD collaborates with the U.S. Fish and Wildlife Service (USFWS), Washington State Department of Fish and Wildlife (WDFW), WSU Cooperative Extension, Washington State Department of Ecology (Ecology), Department of Natural Resources, and Pierce County government to provide technical assistance for landowners in the County. Major projects include animal waste management, stream bank fencing, replanting stream bank areas, pasture management, improving fish and wildlife habitat, and installation of fish ladders and road culverts. The PCD's StreamTeam program specifically educates residents about water quality monitoring and stream restoration plantings in the area.

Pierce County Biodiversity Alliance

The Pierce County Biodiversity Alliance includes a cross-section of conservation agencies and organizations that share an interest in conserving the biodiversity of Pierce County. The Alliance includes Pierce County Planning and Land Services, Washington Department of Fish and Wildlife, University of Washington, Cooperative Fish & Wildlife Unit, Metro Parks Tacoma, National Wildlife Federation, Puyallup River Watershed Council, Pierce County Conservation District, Crescent Valley Alliance (CVA), and Friends of the Lower White River (FLWR).

The Alliance has identified a Biodiversity Network of 16 biologically rich areas known as "biodiversity management areas" and connecting corridors that cover nearly 268,000 acres of land. The lower White River corridor is a Biodiversity Management Area (BMA) in Pierce County. Landowners in Pierce County BMAs are eligible for reduced property taxes. The Alliance has involved landowners and citizens in learning and stewardship through rapid biological inventory (BioBlitz), data collection (NatureMapping), and community planning. (http://www.biodiversity.wa.gov/ourbiodiversity/updatewhite_river.html)

Pierce County Conservation Futures Fund

Conservation Futures is a land preservation program for protection of threatened open space, timber lands, wetland, habitat areas, agricultural and farm lands within Pierce County. Conservation Futures funds are used to acquire the land or the rights to future development of the land. The funding comes from a state authorized County property tax. The Pierce County Council enacted the tax and all property taxpayers pay up to six and one-quarter cents per thousand dollars of assessed value of each Pierce County owned parcel. These monies, identified in the budget as Conservation Futures, are budgeted annually by the Pierce County Council. Any individual who does not have an interest in the land, non-profit group, city, town, or Pierce County agency who wishes to preserve an eligible property can become a project sponsor and nominate a property for purchase. Property can be the land itself or certain rights associated with the property. The rights may also be given as a gift, grant, bequest, devise (will), or be leased. The seller of the property may retain limited use of the property rights as part of the sale.

Pierce County Noxious Weed Control Board

Washington State requires the control of noxious weeds through the Revised Code of Washington (RCW) Title 17, and Title 16 of the Washington Administrative Code (WAC). State law requires all landowners (private or agency) to manage weeds on their properties (RCW 17.10.140). To implement these requirements, the State established the Washington State Noxious Weed Control Board or WSNWCB (Chapter 16-750 WAC). The WSNWCB oversees the statewide management of noxious weeds in an effort to ultimately prevent establishment of invasive vegetation and preserve native species and habitat. The WSNWCB identifies and classifies weeds that are of concern in the state and maintains the state noxious weed list. The WSNWCB has determined that noxious weed control is best implemented at a local level due to the variation in ecosystems across the state. Therefore Chapter 17.10 RCW establishes Noxious Weed Control Boards for counties in the state.

Pierce County Code Chapter 8.24 specifically activates the Pierce County Noxious Weed Control Board (PCNWCB). The PCNWCB enforces the state noxious weed control regulations and refines the state noxious weed list to include species present in Pierce County. The PCNWCB provides guidance on methods of control, and has the authority to cite property owners for failing to comply with weed control requirements.

Pierce County (WRIA 10/12) Lead Entity

The 1999 Washington Legislature created and authorized the Salmon Recovery Funding Board (SRFB) to guide spending of funds targeted for salmon recovery activities and projects. The legislation also included a ranking process that provides an opportunity for local organizations to prioritize projects from their watersheds before they are submitted to the SRFB.

Pierce County serves as the "Lead Entity" for the Puyallup/White and Chambers/Clover watersheds ranking process. Projects from both watersheds are ranked together and only one list is submitted to the SRFB for consideration. Project ranking is performed by a "Citizens' Advisory Committee" (CAC) of stakeholders from both watersheds. A Technical Advisory Group (TAG) supplies the most up to date scientific data to the CAC. The CAC then prioritizes

proposed salmon habitat protection and restoration projects. Once prioritized, the Lead Entity Coordinator submits the list to the State Salmon Recovery Board for funding decisions. (http://www.co.pierce.wa.us/pc/services/home/environ/water/ps/leadentity.htm)

Pierce County Surface Water Management Division

The mission of the Pierce County Surface Water Management Division is to be a responsive service organization that efficiently addresses flood control, water quality, and the preservation of natural drainage systems. Sections within Surface Water Management include:

- Capital Improvement Program and Projects
- Watershed Services: Environmental, Natural Resources, Watershed and Basin Planning
- Maintenance Operations: Public Ponds, Rivers, Creeks, Small Works Projects, Rock Quarry Facility and Service Response System (SRS)
- Water Quality, NPDES, West Nile Virus & Mosquitoes, and Private Facility Inspection

County staff conduct comprehensive, integrated surface water management plans for each of Pierce County's 26 basins. The plans are updates to Pierce County's 1991 Surface Water Management Plan. They direct the capital projects and programmatic activities of the Surface Water Management Division. SWM also assists and track implementation of Watershed Action Plans developed under the state's WAC 400-12 process.

Pierce County serves as a Lead Entity under the state's Salmon Recovery Act (2496) process. County staff coordinates and support local sponsors developing salmon habitat restoration projects for funding by the state's Salmon Recovery Funding Board for WRIAs 10 and 12 and provide technical assistance to the Kitsap Lead Entity in WRIA 15. Staff also provides biological expertise on in-water projects and mitigation plans. Other services provided by the Surface Water Management Division are described on the web page: http://www.co.pierce.wa.us/pc/abtus/ourorg/pwu/about/water.htm.

Puget Sound Nearshore Ecosystem Restoration Project (PSNERP)

The Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) was formally initiated as a General Investigation (GI) Feasibility Study in September 2001, through a cost-share agreement between the U.S. Army Corps of Engineers and the State of Washington, represented by the Washington Department of Fish and Wildlife. This agreement describes our joint interests and responsibilities to complete a feasibility study to: "…evaluate significant ecosystem degradation in the Puget Sound Basin; to formulate, evaluate, and screen potential solutions to these problems; and to recommend a series of actions and projects that have a federal interest and are supported by a local entity willing to provide the necessary items of local cooperation." Collaborating with the Puget Sound Action Team (PSAT), the Nearshore Partnership seeks to implement portions of PSAT's Work Plan pertaining to nearshore habitat restoration issues.

The purpose of the project is to identify significant ecosystem problems in Washington State's Puget Sound basin, evaluate potential solutions, and restore and preserve critical nearshore

habitat. The project is a cooperative effort among government organizations, tribes, industries, and environmental organizations to preserve and restore the health of the Sound's nearshore.

PSNERP's goal is to evaluate the factors that are causing the habitat to decline and pollution to occur in the Puget Sound basin; to formulate, evaluate, and screen potential solutions to these problems; and to recommend a series of actions and projects. Restoration strategies for the Sound include:

- River deltas: Protect and restore freshwater input and tidal processes where major river floodplains meet marine waters.
- Beaches: Protect and restore sediment input and transport processes to littoral drift cells where bluff erosion sustains beach structure.
- Barrier embayments: Protect and restore sediment input and transport processes to littoral drift cells where bluff erosion sustains barrier beaches that form barrier embayments and restore the tidal flow processes within these partially closed systems.
- Coastal inlets: Protect and restore tidal flow processes in coastal inlets, and protect and restore freshwater input and detritus transport processes within these open embayment systems.

PSNERP has identified and developed conceptual designs for 36 potential restoration actions throughout Puget Sound. These actions were drawn from PSNERP's analysis of process-based nearshore restoration needs, and from a list of existing restoration opportunities identified by restoration proponents from various governmental and non-governmental organizations throughout the Puget Sound Basin. Each action represents a location where one or more restoration measures can be applied to improve the integrity and resilience of the nearshore ecosystem (ESA et al., 2011). The conceptual design report is available at: http://www.pugetsoundnearshore.org/conceptual_design.htm.

Puget Sound Partnership

The Puget Sound Partnership is a community effort of citizens, governments, tribes, scientists and businesses working together to restore and protect Puget Sound (http://www.psp.wa.gov/). When the Puget Sound Partnership was created in 2007, the Washington State Legislature assigned it three basic tasks: (1) Define a 2020 Action Agenda that identifies work needed to protect and restore Puget Sound, based on science and with clear and measurable goals for recovery; (2) determine accountability for achieving results including performance, effectiveness, and the efficient use of money spent on Puget Sound; and (3) promote public awareness and communication to build support for a long-term strategy. The Partnership published the Puget Sound Action Agenda in December 2008. The Action Agenda includes strategies to protect and restore the intact ecosystem processes, structures, and functions that sustain Puget Sound; prevent water pollution at its source; create a coordinated system to ensure that activities and funding are focused on the most urgent and important problems facing the region; and build an implementation, monitoring, and accountability management system (PSP, 2008).

Puyallup River Watershed Council

The Puyallup River Watershed Council (PRWC) formed in 1996 and includes representatives of local governments, businesses, elected officials, environmental agencies, non-profit groups and private citizens. The PRWC provides stakeholders in the watershed a forum in which to promote and implement projects that protect the environmental, economic, and cultural health of the watershed. PRWC has ten broad goals related to clean water, healthy native fish and wildlife, sustainable land use, viable agriculture and forestry, quality outdoor recreation, natural flow patterns and groundwater recharge, vegetated corridors, management of solid waste, resident education, and sustainable communities. Pierce County Public Works and Utilities provides support to the PRWC.
(http://www.piercecountywa.org/pc/services/home/environ/water/ps/prwc/main.htm)

Puyallup Tribe

The Puyallup Tribe was one of the tribes that signed the Treaty of Medicine Creek in 1854 with Territorial Governor Isaac Stevens. This treaty established the boundaries of the Puyallup Reservation and spelled out specific rights for tribal members such as access to traditional hunting and fishing grounds. In 1990 the Tribe formally accepted a settlement of $162 million in cash, real estate and economic development programs in exchange for giving up claims to about 18,000 acres along Commencement Bay. This resolved disputes over property titles and allowed Port of Tacoma to develop land for shipping terminals and other industrial uses. Tribal departments such as Environmental and Natural Resources, Fisheries and Shellfish are committed to improving water quality and habitat for fish and wildlife. The Tribe operates hatcheries and monitors fish runs and an elk herd, and works closely with local governments on a host of environmental issues. (http://www.puyallup-tribe.com/)

Shared Strategy for Puget Sound

The Shared Strategy for Puget Sound (Shared Strategy) began as a collaborative effort to protect and restore salmon runs for Puget Sound Chinook across Puget Sound. Shared Strategy engaged local citizens, tribes, technical experts and policy makers to build a practical, cost-effective recovery plan endorsed by the people living and working in the watersheds of Puget Sound.

The Shared Strategy operated through a five-step process:

1) Identify what should be in a recovery plan and assess how efforts can support the plan.

2) Set recovery targets and ranges for each watershed.

3) Identify actions needed at the watershed level to meet targets.

4) Determine if identified actions add up to recovery. If not, identify needed adjustments.

5) Finalize the plan and actions and commitment necessary for successful implementation.

Fourteen watershed areas participated in the Shared Strategy to recover Puget Sound Chinook salmon and obtain the commitments needed to achieve them. These individual watershed groups developed the technical content and implementation structure of their local recovery chapter. Watersheds, in turn, worked with stakeholders in the Puget Sound to integrate science and social

policy into the regional recovery plan. In addition to the work within the fourteen watershed areas, work by the Puget Sound Action Team, the predecessor agency to the Puget Sound Partnership, led the development of a nearshore chapter as part of Shared Strategy's salmon recovery plan for Puget Sound. The regional consensus process ensured the plan ultimately reflected local needs and priorities while meeting ESA requirements (http://www.sharedsalmonstrategy.org/about.htm).

On January 1, 2008, the regional salmon recovery functions of the Shared Strategy became the responsibility of the Puget Sound Partnership.

South Puget Sound Salmon Enhancement Group

The South Puget Sound Salmon Enhancement Group (SPSSEG) is a 501(c)(3) non-profit organization formed by the Washington State Legislature in 1990 to involve communities, volunteers, and landowners in salmon recovery. Primary sources of funding include $1 and $100 surcharges on sport and commercial fishing licenses, respectively. Other sources of funding include revenue from the sale of eggs and carcasses from state hatcheries; grants, membership dues, private donations, and in kind contributions; and cooperative funding from agencies and private companies.

Restoration projects sponsored or co-sponsored by SPSSEG since 1990 have focused on restoring salmonid spawning/rearing habitat; riparian restoration; nearshore restoration and monitoring; and culvert/dam replacements or modifications. (http://www.spsseg.org/)

Squaxin Island Tribe

The Squaxin Island Tribe is located on Squaxin Island in the South Puget Sound area, south of Shelton, in Mason County, Washington. Tribal headquarters are located in Kamilche at Little Skookum Inlet. The tribe officially occupied the reservation on Squaxin Island in 1855. Known as the "People of the Water", the Squaxin Tribe has lived along the shoreline of the Salish Sea (Puget Sound) for centuries (www.squaxinisland.org/). The Squaxin Island Tribe participates in the South Puget Sound Salmon Recovery Group and tribal biologists conduct research related to salmonid habitats and nearshore restoration in the South Sound and Hood Canal. Squaxin Island Tribe's Natural Resources Department has undertaken extensive marine shoreline habitat inventories and assessments in southern Puget Sound. For example, the Tribe is participation in a nearshore assessment with SPSSEG for the WRIA 12 shoreline. Other nearshore work undertaken by the Tribe includes placement of acoustic sensors in the Tacoma Narrows to monitor the effects of noise on salmonids.

Tahoma Audubon Society

The Tahoma Audubon Society is the Pierce County chapter of the National Aubudon Society that works to conserve, restore, and steward irreplaceable natural resources throughout the Pierce County area (http://www.tahomaaudubon.org/). Tahoma Audubon organizes community volunteers, provides public education regarding the environment, and participates in planning to protect habitats in the Pierce County and Tacoma area. Habitats important to local birds and wildlife are the focus of 2009, including: 1) urban habitats, marine shorelines, riparian shorelines

and forests, and oak woodlands and prairies. In 2007, Tahoma Aububon worked with the State legislature to protect shorelines from unregulated geoduck farming and worked with Pierce County to pass the interim regulations on geoduck aquaculture.

West Sound Watersheds Council

The West Sound Watersheds Council is the lead entity organization for salmon recovery in East WRIA 15. The organization was formed in 2007, replacing the East Kitsap Salmon Habitat Restoration Committee. The participants include: Kitsap County, Pierce County, City of Gig Harbor, City of Port Orchard, City of Bremerton, City of Poulsbo, City of Bainbridge Island, Suquamish Tribe, and Squaxin Island Tribe. (http://www.westsoundwatersheds.org/)

WRIA 10 Watershed Action Committee

The Puyallup River watershed and part of the White River watershed are located in Water Resource Inventory Area (WRIA) 10 in Pierce County. Water quality issues in these watersheds stem from forest practices, storm water and erosion, agriculture, recreation, and on-site sewage systems. Watershed committees that formed within these basins have focuses on improving water quality and reducing nonpoint pollution.

The Upper Puyallup and Lower Puyallup Watershed Committees each produced an Action Plan for their respective watershed. The Upper Puyallup Action Plan cites three action items related to habitat restoration. These involve identification of potential restoration sites, purchasing of conservation easements of development rights, and development of a water quality and habitat corridor plan for properties adjacent to Mt. Rainier National Park. The Lower Puyallup Action Plan identifies a need for public involvement in replanting efforts along riparian zones. To achieve this and other priority restoration goal, this Action Plan calls for the establishment of a Puyallup River Basin Council. This council would provide recommendations for priority restoration projects and consult with coordinating agencies for project implementation.

In 2007, Pierce County Public Works and Utilities, Surface Water Programs (Water Programs) published a White River Basin Characterization Report. This report identified several restoration opportunities within the basin. These include installation of pullback levees to increase recruitment of large woody debris (LWD); installation of engineered logjams on the White River; installation of riparian vegetation; increased detention and new approaches to treatments for pollutants to reduce impacts to fish and wildlife from storm water runoff; and restoration of connectivity with side channel habitat for anadromous salmonid habitat.

WRIA 11 Watershed Action Committee

The Nisqually Indian Tribe is the lead agency in watershed planning under the Watershed Planning Process in the Nisqually Watershed (WRIA 11), which was initiated in 1998 by the "Expanded Initiated Governments". The Tribe is responsible for facilitating the Planning Unit, which is …"the committee formed by the Expanded Initiating Governments to gather and analyze water data and to develop and present water resource management policies to the Expanded Initiating Governments".

APPENDIX C – SUPPLEMENTAL INFORMATION ON PIERCE COUNTY PROGRAMS

The enclosed CD provides supplemental information on the Pierce County salmon recovery/lead entity process, the basin planning process, and the flood hazard management program.