Draft

SHORELINE RESTORATION PLAN

Tacoma Shoreline Master Program Update

Prepared for: City of Tacoma

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1.0 OVERVIEW OF SHORELINE RESTORATION GOALS

Tacoma's shoreline restoration goals and objectives are aimed at restoring identified degraded areas. The following overarching goals will guide restoration efforts along the Tacoma shoreline:

- Improve shoreline water quality;
- Re-establish and restore natural shoreline processes, restore degraded and lost habitat, and wildlife corridors;
- Improve connectivity of the shoreline environments to one another and to adjacent habitat corridors that support priority species and species of local significance; and
- Promote shoreline stewardship.

2.0 INTRODUCTION

The Shoreline Restoration Plan is designed to meet the requirements for restoration planning outlined in the Department of Ecology Guidelines; WAC 173-26-201(2)(f) or, Guidelines, as well as the goals and aspirations of the people of the City of Tacoma. A restoration plan is not a regulatory document or a set of regulatory requirements. The Guidelines, however, point to restoration plans as guides for improving shoreline ecological function. The Shoreline Master Program should include restoration goals and policies, and regulations that facilitate implementation of restoration projects. The purpose of Tacoma's Shoreline Restoration Plan is to identify restoration goals and objectives, identify existing programs, plans and policies that contribute to shoreline restoration, to prioritize degraded areas with potential for ecological restoration, and provide a strategy for implementation of this plan. Additionally, this document is intended as a basis for partnership between the City of Tacoma, and its citizens, businesses, property owners, and non-governmental organizations.

The Shoreline Restoration Plan describes and relies heavily on the significant past and ongoing shoreline analyses and restoration programs in the city of Tacoma. This plan also builds on the assessment of shoreline functions and opportunity areas that was compiled in the Tacoma Shoreline Inventory and Characterization (July 2007).

Project proponents seeking mitigation sites can consider potential opportunities identified in this Shoreline Restoration Plan. Other conservation and restoration groups or agencies with restoration funding could also use the identified goals, policies and opportunities to guide their actions.

Specifically, this Shoreline Restoration Plan includes:

- A discussion of the purpose and regulatory background of this Shoreline Restoration Plan and the definition of restoration in the context of shoreline planning (Section 3);

- Proposed shoreline restoration goals and objectives (Section 4.0).
- Restoration opportunities and prioritization criteria (Section 5.0);
- A summary of existing restoration plans, programs and policies (Section 6.0); and
- A discussion about how this Shoreline Restoration Plan will be implemented, including funding and partnerships, timelines and benchmarks, strategies for measuring effectiveness and adaptive management (Section 7.0).

3.0 PURPOSE AND INTENDED USE OF THE SHORELINE RESTORATION PLAN

The governing principles of the Guidelines (WAC 173-26-186) clarify that restoration of shoreline ecological functions is accomplished through the following

- Goals and policies for restoring ecologically impaired shorelines;
- Meaningful understanding of the current shoreline ecological conditions;
- Regulations and mitigation standards that ensure that permitted developments do not cause a net loss of ecological functions;
- Regulations that ensure developments exempt from permitting do not result in net loss of ecological functions when evaluated in the aggregate;
- Regulations and programs that fairly allocate the burden of mitigating cumulative impacts among development opportunities; and
- Incentives or voluntary measures designed to restore and protect ecological functions.

Restoration planning relies on voluntary mechanisms (rather than regulatory provisions), economic incentives and varied funding sources that can contribute to the improvement of ecological functions. The Guidelines do not state that local programs should or could require individual permit applicants to restore past damages to an ecosystem as a condition of a permit for new development. However, this Shoreline Restoration Plan can be used to guide compensatory mitigation projects to shoreline areas where they may have the most effect. The City and project proponents may use Shoreline Restoration Plan information to prioritize the types and locations for restoration and mitigation actions. Other conservation and restoration groups or agencies, such as those identified in this plan, could also use the identified goals, objectives and opportunities to guide their actions.

3.1 Regulatory Background

Shorelines are a major feature in the City of Tacoma, providing both a valuable setting for land use and recreation and performing important ecological functions. The Shoreline Management

Act (SMA or the Act; RCW 90.58) is charged with balancing how shorelines should be developed, protected, and restored. The Act has three broad policies or mandates; it strives to: 1) encourage water-dependent uses, 2) protect shoreline natural resources, and 3) promote public access. Restoration planning is an important component of the environmental protection policy of the Act. This Shoreline Restoration Plan supplements the City of Tacoma's Shoreline Master Program (SMP).

Tacoma's Shoreline Master Program (SMP) is being updated to comply with the Shoreline Management Act (SMA) requirements (RCW 90.58), and the state's SMP Guidelines (Washington Administrative Code [WAC] 173-26, Part III), which went into effect in 2003. The SMP Guidelines require that local governments develop SMP goals that promote "restoration" of impaired shoreline ecological functions and a "real and meaningful" strategy to implement restoration objectives. Local governments are also encouraged to contribute to restoration by planning for and supporting restoration of shoreline functions through the SMP and other regulatory and non-regulatory programs. The City's Shoreline Inventory and Characterization (ESA Adolfson, July 2007) describes how natural shoreline processes have been modified and identifies the restoration potential and opportunities within each shoreline reach. This Shoreline Restoration Plan builds on that analysis. See Section 3.0 for a discussion of how this plan meets the State's 2003 Guidelines.

Table 1 summarizes the key elements for shoreline restoration planning required by the Guidelines, and identifies which section of this Shoreline Restoration Plan addresses each element.

Table 1. WAC Requirements and Tacoma's Shoreline Restoration Plan

Key elements for the shoreline restoration planning process WAC 173-26-201(2)(f)	Location in Tacoma Shoreline Master Program and Supporting Information
Identify degraded areas, impaired ecological functions, and sites with potential for ecological restoration.	Shoreline Inventory and Characterization, Section 8.0
Establish overall goals and priorities for restoration of degraded areas and impaired ecological functions.	Shoreline Restoration Plan, Section 4.3
Identify existing and ongoing projects and programs that are currently being implemented which are designed to contribute to local restoration goals (such as capital improvement programs (CIPs) and watershed planning efforts (WRIA habitat/recovery plans).	Shoreline Restoration Plan, Section 6.0
Identify timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals.	Shoreline Restoration Plan, Section 7.0
Provide for mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans and to appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals (e.g., monitoring of restoration project sites).	Shoreline Restoration Plan, Section 7.0
Identify additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs.	Shoreline Restoration Plan, Sections 5.0 and 7.0

3.2 Defining Restoration

The state has directed local governments to develop SMP provisions "…to achieve overall improvements in shoreline ecological functions over time when compared to the status upon adoption of the master program." This overarching goal is accomplished primarily through two distinct objectives:

Protection of existing shoreline functions through regulations and mitigation requirements to ensure "no net loss" of ecological functions from baseline environmental conditions; and Restoration of shoreline ecological functions that have been impaired from past development practices or alterations.

This distinction is illustrated in Figure 1 below.

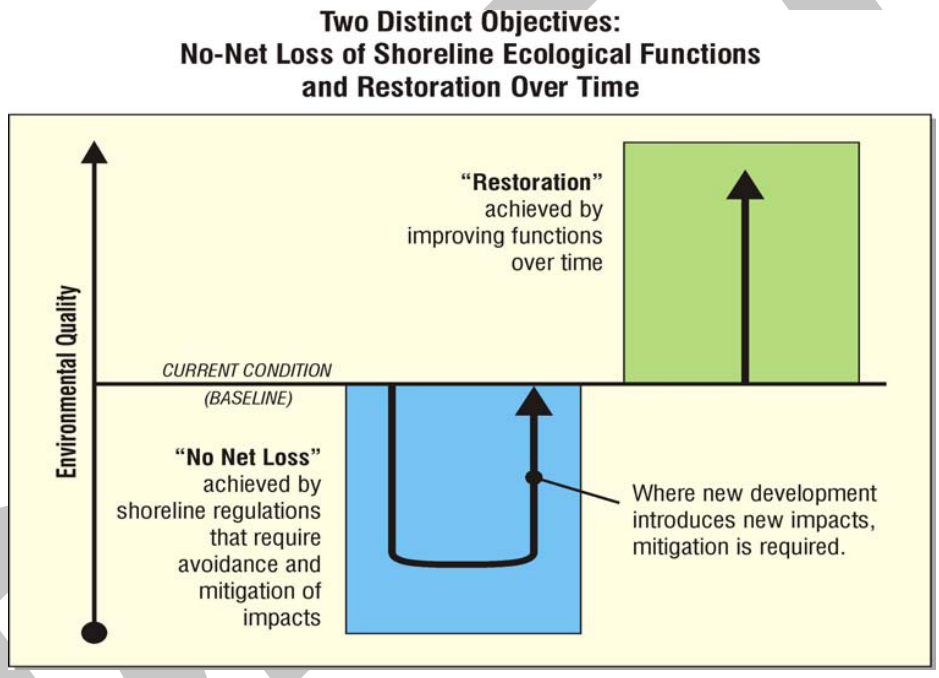

Figure 1. Mitigation Versus Restoration in Shoreline Master Programs (Source: Department of Ecology)

The concept of no net loss of shoreline ecological function is embedded in the Act and in the goals, policies and governing principles of shoreline Guidelines and other federal and state environmental protections (e.g., the Clean Water Act). Washington's general policy goals for shorelines of the state include the "protection and restoration of ecological functions of shoreline natural resources." This goal derives from the Act, which 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."

There are numerous definitions for "restoration" in scientific and regulatory publications. Specific elements of these definitions often differ, but the core element of repairing damage to an

existing, degraded ecosystem remains consistent. In the SMP context, the WAC defines "restoration" or "ecological restoration" as:

> …the reestablishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including, but not limited to, revegetation, 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" (WAC 173-26-020(27)).

Using the WAC definition of restoration with regard to state shorelines, it is clear the effort should be focused on specific shoreline areas where natural shoreline functions have been modified or degraded. The emphasis in the WAC is to achieve overall improvement in existing shoreline processes or functions, where functions are impaired. Therefore, the goal is not to restore the shoreline to historically natural conditions, but rather to improve on existing, degraded conditions. In this context, restoration can be broadly implemented through a combination of programmatic measures (such as surface water management or public education) and site-specific projects (such as riparian plantings or habitat creation).

The Guidelines focus on an understanding and analysis of ecosystem-wide processes, or landscape scale processes that form and maintain shoreline ecological functions. The challenges with implementing restoration in highly urbanized settings have been characterized by Borde et al (2004), below. Shoreline restoration in Tacoma presents similar challenges and benefits.

> More than 50% of the U.S. Population lives on the coast, with a higher growth rate in coastal counties than in the country as a whole. The result of this development has been the loss of a high percentage of coastal habitats that were once present in urban areas. Restoration in highly urbanized settings represents perhaps the most critical and challenging situation to use the principles of landscape ecology for choosing a restoration site. While the challenges of urban restoration are many, the importance of habitat restoration in these settings is monumental from an ecological and societal perspective. The ecological importance of projects in urban areas can be disproportional to the size of the project because of the lack of ecological habitat in the surrounding areas. In other words, urban restoration can be more important, even in small areas, than in other rural restoration.
>
> Restoration in urban areas presents the following challenges:
>
> - Multiple inputs watershed-wide that are outside of a restoration site.
> - Limited sites available for restoration
> - Limited reference sites
> - Confounding factors, such as poor water quality, chemical contamination, and altered hydrology
> - Fragmented habitat

- High costs due to land acquisition expenses and the amount of work required to reverse habitat modifications
- Differing needs for coastal resources (e.g., economic, cultural, social, recreational, environmental)
- Differing values of local citizens and government decision-makers

However, these challenges are often offset by the following benefits:

- The restored habitat provides pockets of habitat where otherwise there would be none
- Restored habitat can provide a connectivity to adjacent, more functional habitats
- Additional natural landscapes for urban residents
- A heightened public awareness of coastal ecosystems
- Educational opportunities
- Public involvement in the restoration process of highly visible projects, resulting in community project stewardship

4.0 SHORELINE RESTORATION PLAN GOALS AND OBJECTIVES

This section discusses existing shoreline restoration goals in the Tacoma Comprehensive Plan (2007) and Draft Open Space Habitat and Recreation Plan (2008), and proposes additional goals and polices considering issues identified in the Shoreline Inventory and Characterization (2007).

4.1 Comprehensive Plan

The general goal in the Environmental Policy Element of the City of Tacoma's Comprehensive Plan (last amended 12/11/2007) is to "ensure conservation, protection, enhancement and proper management of natural resources and shoreline, while providing for a balanced pattern of development and the needs of the citizens of the City of Tacoma." There is a strong environmental policy basis in the Comprehensive Plan for the restoration of shoreline resources.

4.2 Open Space Habitat and Recreation Plan

The City of Tacoma, Green Tacoma Partnership and the Metropolitan Park District recently developed an Open Space Habitat and Recreation Plan. This plan and action program includes strategies for open space acquisition, management and restoration as well as city-wide green strategies. The Open Space Habitat Plan was drafted to meet goals nine and ten of the GMA. Goal Nine encourages cities and counties to retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and

water and develop parks and recreation facilities. Goal Ten encourages cities and counties to protect the environment and enhance Washington's high quality of life, including air and water quality, and the availability of water.

4.3 Shoreline Restoration Goals and Objectives.

Tacoma's restoration goals and objectives must be consistent with WAC Guidelines (described in Section 3.1). As such, goals are to be aimed at restoring identified degraded areas and impaired ecological functions. The City's primary goal is to achieve an overall net gain in shoreline ecological function through the Shoreline Master Program, including restoration planning and implementation, policies and development regulations. As discussed in Section 1 of this Plan, restoration actions are meant to achieve the following four priorities for restoration citywide:

- Improve shoreline water quality
- Re-establish and restore natural shoreline processes, restore degraded and lost habitat, and wildlife corridors
- Improve connectivity of the shoreline environments to one another and to adjacent habitat corridors that support priority species and species of local significance
- Promote shoreline stewardship

The following restoration goals and objectives specifically address the altered shoreline processes and functions identified in the Shoreline Inventory and Characterization (see Attachment 2 to this Plan). Objectives identify specific measurable actions that can be taken to achieve the stated goals. For example, to meet the goal of improving water quality, an objective might be to remove creosote pilings.

4.3.1 Hydrology

Goal: Improve wave energy attenuation within the City's nearshore.

Objective: Restore estuarine and freshwater wetlands.

Objective: Encourage removal of bulkheads and use of soft armoring.

Goal: Increase the area over which the fresh to salt water transition occurs.

Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.

Goal: Reconnect the Puyallup River and Hylebos Creek channels to the floodplain, and generally increase flood storage along the Puyallup River.

Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.

Objective: Partner with watershed entities and Pierce County to improve flood storage along the Puyallup River.

Goal: Increase summer flows in the Puyallup River and Hylebos Creek.

Objective: Partner with regional and upstream entities to address minimum instream flows in the Puyallup River and Hylebos Creek.

Goal: Improve hydrological functions in the fresh to salt water transition area.

Objective: Restore estuarine and freshwater wetlands.

Objective: Connect freshwater seeps and wetlands to the shoreline.

Goal: Maintain the important water storage function of Wapato Lake.

Objective: Prepare and implement a basin plan to manage the hydrology of Wapato Lake.

4.3.2 Sediment Generation and Transport

Goal: Improve sediment delivery to support nearshore processes.

Objective: Reconnect feeder bluff functions.

Goal: Reduce sediment loading in the Puyallup River, Hylebos Creek and Wapato Lake.

Objective: Require water quality BMPs in urban and industrial areas.

Objective: Implement stormwater quality measures in the Hylebos Creek Basin Plan.

4.3.3 Water Quality

Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants.

Objective: Restore estuarine and freshwater wetlands.

Goal: Remove and avoid pollutant discharges to the shoreline.

Objective: Prevent further loss of wetland area.

Objective: Restore estuarine and freshwater wetlands.

Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.

Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.

Goal: Restore the water quality of Wapato Lake.

Objective: Restore wetlands.

Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.

4.3.4 Habitat

Goal: Improve aquatic habitat conditions.

Objective: Restore and protect salt marsh habitat.

Objective: Remove fish passage barriers.

Goal: Preserve and restore existing shoreline forests, and reconnect forests and the nearshore.

Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.

Goal: Establish native riparian vegetation communities along the shoreline.

Objective: Plant native vegetation along Puyallup River levees whenever possible as consistent with levee management standards.

Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.

Objective: Re-establish native riparian plant and forest communities around Wapato Lake.

Goal: Establish long term sources of large woody debris (LWD) to support shoreline habitat.

Objective: Reintroduce LWD along the Puyallup River through plantings and wood placement as consistent with levee management standards.

Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.

Objective: Re-establish native riparian plant and forest communities around Wapato Lake while preventing conflicts with recreational uses.

Goal: Create high quality habitat connections between Wapato Lake and surrounding uplands.

Objective: Preserve existing and establish new habitat corridors around Wapato Lake.

5.0 RESTORATION OPPORTUNITIES

This section describes restoration opportunities within each shoreline district and criteria for use in prioritizing specific projects over time.

5.1 Opportunities

Restoration opportunities were identified based on the findings of the Shoreline Inventory and Characterization (2007).

Table 2 identifies specific restoration actions associated with the types and levels of shoreline alterations and the potential for restoration within each shoreline district. Further, the specific goals and objectives that Tacoma aims to achieve are associated with each action. Potential metrics for measuring the success of and monitoring restoration actions are suggested. Table 1 is not meant to be an exhaustive list of restoration actions and does not prohibit other meaningful objectives from being pursued.

As the City implements restoration actions, sea level rise and its potential effect on shoreline habitat will be considered (see Attachment 2 for a discussion of climate change and potential sea level rise in Tacoma). The size, elevation and overall resiliency of restoration projects will need to be planned according to expected changes in sea level.

Map 1 in Attachment 1 shows restoration opportunities conceptually as they occur across Tacoma's shoreline.

Table 2. Ecological Processes, Restoration Goals and Objectives, and Associated Actions

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
S-2 WESTERN SLOPE CENTRAL					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Acres of reconnected bluffs Feet of feeder bluff along shoreline
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators

[1] *See Shoreline Inventory and Characterization, Section 8.0, for a discussion of the level of alteration of shoreline ecological processes and functions.*

[2] *See Attachment 3 to this Plan for a summary of the criteria used to rate restoration potential. See Shoreline Inventory and Characterization, Section 8.0, for further discussion.*

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA
Habitat: Maintenance of typical native plant community	**Moderate**	**Low**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Improve aquatic habitat conditions. Objective: Restore and protect salt marsh habitat.	Restore salt marsh and tidal wetlands	Acres of wetland restored
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	# of connections between upland forest and nearshore. Acres of forest enhanced.
S-3 WESTERN SLOPE NORTH					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Acres of reconnected bluffs Feet of feeder bluff along shoreline
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest enhanced.

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
S-5 POINT DEFIANCE CONSERVATION					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Acres of reconnected bluffs Feet of feeder bluff along shoreline
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest enhanced.
S-6 RUSTON WAY					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Acres of reconnected bluffs Feet of feeder bluff along shoreline
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest enhanced.
S-7 SCHUSTER PARKWAY					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Acres of reconnected bluffs Feet of feeder bluff along shoreline
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA
S-8 THEA FOSS WATERWAY					
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA
S-9 PUYALLUP RIVER					
Hydrology: Fresh to Salt Water Transition	**High**	**Low**	Goal: Increase the area over which the fresh to salt water transition occurs. Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.	Hydrology: Fresh to Salt Water Transition	High
Hydrology: Channel and floodplain connection	**High**	**Low**	Goal: Reconnect the Puyallup River and Hylebos Creek channels to the floodplain and generally increase flood storage. Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.	Restore existing wetlands Setback levees	Acres of restored wetland Acres of floodplain expansion
Hydrology: Summer low flows	**High**	**Moderate**	Goal: Increase summer flows in the Puyallup River and Hylebos Creek. Objective: Partner with regional and upstream entities to address minimum instream flows in the Puyallup River.		

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Hydrology: Flood flow retention	**Moderate**	**Low**	Goal: Reconnect the Puyallup River and Hylebos Creek channels to the floodplain and generally increase flood storage. Objective: Partner with watershed entities and Pierce County to improve flood storage along the Puyallup River.		
Sediment Generation and Transport: Upland sediment generation	**Moderate**	**Moderate**	Goal: Reduce sediment loading in the Puyallup River, Hylebos Creek and Wapato Lake. Objective: Require water quality BMPs in urban and industrial areas.	Use water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Water contact time with soil	**High**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Encourage the restoration of estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.		
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Restore estuarine and freshwater wetlands.		

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Maintenance of typical native plant community	**High**	**Low**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Plant native vegetation along Puyallup River levees whenever possible as consistent with levee management standards.		
Habitat: Maintenance of typical native plant community	**High**	**Low**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Plant native vegetation along Puyallup River levees whenever possible as consistent with levee management standards.		
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Reintroduce LWD along the Puyallup River through plantings and wood placement as consistent with levee management standards.		
Habitat	**NA**	**NA**	Goal: Improve aquatic habitat conditions. Objective: Remove fish passage barriers.		
S-10 PORT INDUSTRIAL – NEARSHORE					
Hydrology: Fresh to Salt Water Transition	**High**	**Low**	Goal: Improve hydrological functions in the fresh to salt water transition area. Objective: Connect freshwater seeps and wetlands to the shoreline.	Excavate and revegetate connections between seeps/wetlands and shorelines	Number of connections Acres of wetland connection

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Maintenance of typical native plant community	**Moderate**	**Low**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Improve aquatic habitat conditions. Objective: Restore and protect salt marsh habitat.	Restore salt marsh and tidal wetlands	Acres of wetland restored
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest enhanced.
S-10 PORT INDUSTRIAL – HYLEBOS CREEK					
Hydrology: Fresh to Salt Water Transition	**High**	**Moderate**	Goal: Improve hydrological functions in the fresh to salt water transition area. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Hydrology: Channel and floodplain connection	**High**	**Moderate**	Objective: Reconnect the Puyallup River and Hylebos Creek channels to the floodplain. Objective: Restore wetlands and setback levees wherever feasible in the fresh to salt water transition area and where reconnection to the floodplain could be accomplished.	Restore existing wetlands Setback levees	Acres of restored wetland Acres of floodplain expansion
Hydrology: Summer low flows	**Moderate**	**Moderate**	Goal: Increase summer flows in the Puyallup River and Hylebos Creek. Objective: Partner with regional and upstream entities to address minimum instream flows in the Puyallup River.	NA	Flow monitoring
Sediment Generation and Transport: Upland sediment generation	**Moderate**	**Moderate**	Goal: Reduce sediment loading in the Puyallup River, Hylebos Creek and Wapato Lake. Objective: Require water quality BMPs in urban and industrial areas. Objective: Implement stormwater quality measures in the Hylebos Creek Basin Plan.	Use water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Water contact time with soil	**High**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Habitat: Maintenance of typical plant community	**Moderate**	**High**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.	Establish native plant s and trees along creek.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Source and delivery of LWD	**High**	**High**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Re-establish native riparian plant and forest communities along Hylebos Creek.	Establish native plant s and trees along creek.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat	**NA**	**NA**	Goal: Improve aquatic habitat conditions. Objective: Remove fish passage barriers.	Remove barriers between shoreline and upstream habitat	Number of barriers removed Fish population in upstream habitat Miles of newly accessible habitat
S-11 MARINE VIEW DRIVE SOUTH					
Hydrology: Fresh to Salt Water Transition	**High**	**Low**	Goal: Improve hydrological functions in the fresh to salt water transition area. Objective: Connect freshwater seeps and wetlands to the shoreline.	Excavate and revegetate connections between seeps/wetlands and shorelines	Number of connections Acres of wetland connection

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Acres of reconnected bluffs Feet of feeder bluff along shoreline
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest enhanced.
S-12 MARINE VIEW DRIVE NORTH					
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Hydrology: Attenuation of wave energy	**High**	**Moderate**	Goal: Improve wave energy attenuation within the City's nearshore. Objective: Encourage removal of bulkheads and use of soft armoring.	Replace existing bulkheads with soft shoreline armoring	Feet of bulkhead removed Feet of new soft armoring
Sediment Generation and Transport: Sediment delivery from coastal bluffs	**Moderate**	**Moderate**	Goal: Improve sediment delivery to support nearshore processes. Objective: Reconnect feeder bluff functions.	Remove barriers to sediment delivery from bluffs	Acres of reconnected bluffs Feet of feeder bluff along shoreline
Water Quality: Water contact time with soil	**Moderate**	**Moderate**	Goal: Improve water contact time with soil in wetlands to improve the filtering and cycling of pollutants. Objective: Restore estuarine and freshwater wetlands.	Restore existing wetlands	Acres of restored wetland
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Remove intertidal fill, contaminated sediments, creosote contaminated logs, pilings and debris.	Number of pilings and contaminated logs removed Tons of debris removed Cubic yards of fill/contaminated sediments removed
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Long-term storage of excess nutrients, pathogens, and toxins	**High**	**Moderate**	Goal: Remove and avoid pollutant discharges to the shoreline. Objective: Prevent further loss of wetland area.	Do not allow wetland fill in or adjacent to shoreline districts.	NA
Habitat: Source and delivery of LWD	**High**	**Moderate**	Goal: Preserve and restore existing shoreline forests, and reconnect forests to the nearshore. Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Remove barriers between shoreline forest and nearshore habitats and enhance existing forests.	Remove structural barriers between shoreline forests and nearshore habitats. Enhance existing forests with native plants and trees.	Number of connections between upland forest and nearshore. Acres of forest enhanced.
S-14 WAPATO LAKE					
Hydrology: Water storage	**Moderate**	**Moderate**	Goal: Maintain the important water storage function of Wapato Lake. Objective: Prepare and implement a basin plan to manage the hydrology of Wapato Lake.	NA	Plan completed
Sediment Generation and Transport: Sediment Sink	**Low**	**Moderate**	Goal: Reduce sediment loading in the Puyallup River, Hylebos Creek and Wapato Lake. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Water Quality: Maintain trophic level	**High**	**Moderate**	Goal: Restore the water quality of Wapato Lake. Objective: Restore wetlands.	Restore existing wetlands	Acres of restored wetland
Water Quality: Maintain trophic level	**High**	**Moderate**	Goal: Restore the water quality of Wapato Lake. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indica-tors
Habitat: Maintenance of native plant community	**High**	**Moderate**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plant s and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Source and delivery of LWD	**High**	**High**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plant s and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Connection between upland and aquatic habitats	**Moderate**	**Low**	Goal: Create high quality habitat connections between Wapato Lake and surrounding uplands. Objective: Preserve existing and establish new habitat corridors around Wapato Lake.	Remove barriers between Wapato Lake and upland habitat	Number of corridors created barriers removed Acres of habitat corridor
Hydrology: Water storage	**Moderate**	**Moderate**	Goal: Maintain the important water storage function of Wapato Lake. Objective: Prepare and implement a basin plan to manage the hydrology of Wapato Lake.	NA	Plan completed
Sediment Generation and Transport: Sediment Sink	**Low**	**Moderate**	Goal: Reduce sediment loading in the Puyallup River, Hylebos Creek and Wapato Lake. Objective: Decrease pollutant loading through low impact development and water quality improvement techniques.	Use LID and water quality improvement measures in and adjacent to shoreline.	Water quality sampling/indicators
Water Quality: Maintain trophic level	**High**	**Moderate**	Goal: Restore the water quality of Wapato Lake. Objective: Restore wetlands.	Restore existing wetlands	Acres of restored wetland

Ecological Process and Function	Level of Alteration[1]	Restoration Potential[2]	Restoration Goals and Objectives	Restoration Actions	Metrics and Monitoring
Habitat: Maintenance of native plant community	**High**	**Moderate**	Goal: Establish native riparian vegetation communities along the shoreline. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plant s and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Source and delivery of LWD	**High**	**High**	Goal: Establish long term sources of LWD to support shoreline habitat. Objective: Re-establish native riparian plant and forest communities around Wapato Lake.	Establish native plant s and trees in passive recreation areas in park.	Number of trees and plants surviving 2 years after planting Acres planted
Habitat: Connection between upland and aquatic habitats	**Moderate**	**Low**	Goal: Create high quality habitat connections between Wapato Lake and surrounding uplands. Objective: Preserve existing and establish new habitat corridors around Wapato Lake.	Remove barriers between Wapato Lake and upland habitat	Number of corridors created barriers removed Acres of habitat corridor

5.2 Criteria for Prioritizing Restoration Projects

The State's 2003 Guidelines do not include specific criteria for local jurisdictions to use in prioritizing restoration actions. Ecology has encouraged jurisdictions to use Stanley et al (2005) as a guide in prioritizing actions. In general, Stanley et al (2005) proposes that ecological processes and functions be evaluated at the reach and watershed scale. Functions should be protected where there is low alteration and enhanced in the urban environment where there is high alteration at the reach and watershed scale. Where there is low alteration of a reach within the context of a highly altered watershed (such as S-4, Point Defiance in the lower Chambers-Clover Watershed), Stanley et al (2005) recommends that the focus be on the restoration of broad ecological processes.

Collaborating with adjacent jurisdictions to restore ecological processes operating at the landscape level will help to protect existing functions and set the stage for reach- or site-specific actions. It is generally accepted that controlling factors or ecological processes must be restored to provide the basis for ecological functions. Once processes are intact, restoration of functions can be successful in the long term (Thom et al. 2005). High level guidance on appropriate shoreline enhancement actions from the Commencement Bay Aquatic Ecosystem Assessment (2000) can help guide restoration decisions. See Attachment 3 for further discussion of the foundation for restoration priorities in this Plan.

The following criteria will be used to prioritize restoration actions and fill the needs identified in Table 2 and Map 1.

If a project's priority was identified in previous plans/programs, that ranking is incorporated into this Shoreline Restoration Plan. If a project was not previously ranked and as new projects are proposed, the following criteria can be applied to determine their level of priority. A project may be rated as a low, medium or high priority once it is reviewed according to these criteria. The criteria are not listed in order of importance or priority.

Screening criteria:

- Site can be made available for restoration; sites do not have substantial structures or pavement.
- Site has limited potential for contamination/recontamination.

Prioritization criteria:

- The project meets the goals and objectives for shoreline restoration.
- The project is directly associated with a moderate or high restoration potential/opportunity, according to the Shoreline Inventory and Characterization.
- The project is sustainable and there is a high likelihood of success given the status of ecological processes and functions and larger watershed controls (such as sea level rise associated with climate change, or erosion associated with river/creek flows affected by land uses in the greater watershed).

- The project would increase functional connectivity or link existing habitats.
- The project is cost-effective. For example, enhancement of existing habitat is more cost-effective than creating new habitat (enhancement generally requires less engineering, less earth-moving, less cost).
- Size of area to be protected or restored; greater than 2 acres is preferred.
- Ownership and management does not present access challenges.
- Adjacent land uses are compatible with the site to be protected or restored.
- There is public support for the project.

6.0 EXISTING RESTORATION EFFORTS

Much effort has been dedicated to protecting natural areas and restoring Tacoma's shoreline. Although the Shoreline Inventory and Characterization demonstrated that there is currently a significant degree of alteration to ecological processes, it also illustrated that there are many areas of opportunity for improvement. This section provides an overview of organizations, plans, programs and policies that currently address shoreline restoration. The efforts of both public and private organizations are included. Attachment 1, Map 2a and 2b, show existing restoration sites associated with the existing efforts described in this section.

6.1 Local

Shoreline Master Program (1976) The City of Tacoma first adopted its SMP in 1976 as an element of the City's long-range comprehensive Land Use Management Plan (Comprehensive Plan, see below). The SMP is organized into two major parts. Part I is the Shoreline Plan, providing long-range goals and policies adopted by resolution. Part II establishes shoreline districts, shoreline environment designations, use regulations, and permitting procedures to govern development and other activities in the City's shorelines. The environment designations are to be based on biological and physical capabilities and limitations of the shoreline, existing and planned development patterns, and a community's vision or objectives for its future development. The City's SMP establishes three environment designations: Natural, Conservancy, and Urban. The City's SMP further establishes 14 distinct shoreline districts. Each district has shoreline environment designations, management policies, and use regulations applicable to properties in that district. The Shoreline Master Program is currently implemented by the City of Tacoma Building and Land Use Services (BLUS) division.

Comprehensive Plan (1993) The City of Tacoma's Comprehensive Plan is the official statement adopted by the City that establishes the long-range vision for the city. The Comprehensive Plan anticipates change for the coming 20 years and establishes direction for the future physical growth, development, and improvement of the city. The plan also fulfills the City's responsibilities to manage growth as mandated by the Washington State Growth Management Act (GMA). There are five primary elements mandated by the GMA: land use, transportation, housing, capital facilities, and utilities. These five general elements were initially adopted in

1993. The Shoreline Master Program was amended and included as a general element of the Plan in 1996. Comprehensive Plan goals for the shoreline include conservation, protection, enhancement, and proper management of natural resources and shorelines, while providing for a balanced pattern of development and the needs of its citizens. Goals, objectives and policies relevant to shoreline restoration are included in the Shoreline Land Use Element, Open Space Habitat and Recreation Element (see discussion below), and Parks and Recreation Element.

Open Space Habitat and Recreation Plan (proposed Comprehensive Plan Amendment; August 2008) The City of Tacoma has been planning for and purchasing open space since the early 1970's. Since then, the City and its partnering agencies have acquired hundreds of acres of natural open space areas within the city. However, many areas which are appropriate to remain as open space are still unprotected and declining in habitat quality due to invasive species. Recent studies have shown that without a concerted restoration effort, the City's natural areas will lose significant forested canopy and biodiversity within the next 20 years.

In response, the City of Tacoma, Green Tacoma Partnership and the Metropolitan Park District recently developed an Open Space Habitat and Recreation Plan. This plan and action program includes strategies for open space acquisition, management and restoration as well as city-wide green strategies. The Plan provides an integrated vision for Tacoma's habitat and recreation lands and facilities. The plan sets forth goals, policies, and implementation plans for Tacoma municipal open spaces and natural areas. The Open Space Habitat Plan was drafted to meet goals nine and ten of the GMA. Goal Nine encourages cities and counties to retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water and develop parks and recreation facilities. Goal Ten encourages cities and counties to protect the environment and enhance Washington's high quality of life, including air and water quality, and the availability of water.

In developing the Plan, the environmental quality and land use of Tacoma's open spaces and natural areas were analyzed; Natural Corridors and wetland mitigation sites within the identified Natural Corridors were identified; agency and community capacity to manage and restore natural areas were assessed; and recommendations for the restoration and management of Tacoma's open spaces were developed. This analysis, the Plan and associated maps serve as the basis of information for development of an Open Space Program. The Natural Corridors include public and acquired private lands to provide a city-wide open space management approach. Corridors include the City's significant critical areas, their connection to each other and bordering critical areas within the same watershed. Corridors identify interrupted connections between critical areas, as well as open spaces that support ecological functions. A goal of the Plan is to provide a balance between natural area protection, urban public recreation opportunities and aesthetics.

The Open Space Habitat and Recreation Plan was prepared as an element of the Comprehensive Plan and will be coordinated with the Shoreline Master Program and Critical Areas Protection Ordinance (see discussion below). The Plan was submitted to the City Council for consideration in August 2008 as part of the annual Comprehensive Plan update. The Plan would be implemented by the City in cooperation with the Green Tacoma Partnership (see below).

City of Tacoma Land Use Regulatory Code The key regulatory mechanism that implements the Comprehensive Plan is the Land Use Regulatory Code. This code contains the development

regulations that govern the manner by which land is used, developed, or redeveloped. This code is found in Title 13 of the Tacoma Municipal Code (TMC) and includes regulations for platting, zoning, shorelines, and critical areas (see critical areas discussion below). The zoning ordinance regulates land use by specifying which uses are appropriate within zoning districts, including the shoreline district. The Land Use Code is implemented by the Tacoma Building and Land Use Services (BLUS) division.

City of Tacoma Critical Areas Regulations The City of Tacoma's critical area regulations Critical Areas Preservation Ordnance (CAPO) were recently updated and are codified in the TMC 13.11. State laws and regulations require that a jurisdiction's shoreline district "provide a level of protection to critical areas within the shoreline that is at least equal to that provided by the local government's critical area regulations adopted pursuant to the GMA for comparable areas other than shorelines" (WAC 173.26.221(2)(a)(ii)).

Critical areas include wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas (including rivers, streams and marine shorelines), geologically hazardous areas, and frequently flooded areas (WAC 173.26.201(3)(c)(ii)). In further describing the approach for critical areas, the Guidelines describe standards for "critical saltwater" and "critical freshwater" habitats (WAC 173.26.221(2)(c)). Critical saltwater habitats include kelp beds, eelgrass beds, spawning and holding areas for forage fish, subsistence, commercial, and recreational shellfish beds, mudflats, intertidal habitats with vascular plants, and areas with which priority species have a primary association.

Under the CAPO, buffers on Type S rivers and streams (shorelines of the state) are 150 feet in width from the ordinary high water mark. Minimum marine buffers are 50, 115 or 200 feet in width, depending on ecological functions, ownership, and existing and proposed land uses. Tacoma's critical areas regulations are implemented by the Tacoma BLUS division.

Green Tacoma Partnership The Green Tacoma Partnership is a public-private partnership between the City of Tacoma, Metro Parks Tacoma, Tacoma Public Utilities, Cascade Land Conservancy, Tahoma Audubon Society, and the citizens of Tacoma. The Green Tacoma Partnerships' goal is to develop and foster community capacity and support to implement the Open Space Habitat Plan. The Green Tacoma Partnership will use the Open Space Program to identify priority projects, allocate project funding, and foster political and community support.

Green Ribbon Task Force Members of the City Council approved a resolution in April 2006 that affirmed the City's efforts to reduce greenhouse gases and curb global warming in accordance with the Kyoto Protocols. A Green Ribbon Climate Action Task Force was established to refine reduction goals and develop specific community and government greenhouse gas reduction measures. The Task Force was appointed by the Tacoma City Council and represents a diverse set of interests and community groups including government agencies, environmental groups, business and trade groups, higher education and the health community. Tacoma's Climate Action Plan recommendations were submitted by the Task Force to the City Council in July 2008.

Tacoma's Climate Action Plan establishes carbon reduction goals for the City and community and offers more than 40 new strategies to achieve those goals. Strategies identified for action

include adopting and funding the Open Space Habitat and Recreation Plan (see discussion of that plan in this section).

Commencement Bay Aquatic Ecosystem Assessment – Ecosystem-Scale Restoration for Juvenile Salmon Recovery (2000) This report provides an ecological assessment of the potential contribution of restoration and mitigation to salmon recovery in the Commencement Bay watershed that should be considered under CERCLA clean-up and compensation for contaminated sediments in Commencement Bay. Organized around broad landscape and ecosystem processes, the report identifies criteria that can guide selection of restoration sites and actions in Commencement Bay to benefit juvenile salmon. A list of priority projects and their rankings is provided.

Citizens for a Healthy Bay (2004) State of Commencement Bay Citizens for a Healthy Bay was formed to provide a community voice in the Superfund clean-up process. This report provides an overview of the status of CERCLA clean-up efforts since they were initiated in 1981. Progress at each Superfund site in the Bay is evaluated. The organization undertakes stewardship projects and monitors their success.

Puget Creek Restoration Society The Puget Creek Restoration Society protects, enhances, and restores the Puget Creek Watershed and other streams, wetlands, and green spaces in South Puget Sound. The Society involves the community in restoration and stewardship, research and monitoring, education and advocacy. Puget Creek/Gulch is a 66-acre natural area in Tacoma's North End and one of only three salmon-bearing streams within the city limits.

Titlow Beach Marine Preserve The Metropolitan Park District of Tacoma established Titlow Beach Marine Preserve in March 1994. The Preserve includes all waters and tidal and submerged lands in the area between the southernmost point of the Tacoma Outboard Association leasehold and the old ferry dock at the foot of the 6th Avenue extension, and between the mean high water line and the outer harbor line. The purpose of the Preserve is to:

- Preserve tidelands, beach and the bank;
- Prohibit harvesting of all life forms;
- Ensure enhancement projects do not have adverse effects on the natural environment;
- Provide education on the importance of the marine environment; and
- Coordinate education between the Titlow Marine Preserve, Interpretive Center and Education Link.

The Park Board management goals for the Preserve include maintaining and protecting the physical attributes of the park, and enhancing visitors' enjoyment of the park.

6.2 Regional

Salmon Habitat and Protection Strategy – WRIA 10 (Puyallup Watershed) and WRIA 12 (Chambers/Clover Watershed) (2005) The Salmon Habitat Protection and Restoration Strategy for the Puyallup and Chambers/Clover watersheds was developed in response to the listing of Chinook salmon as threatened under the Endangered Species Act. Pierce County, the lead entity for recovery planning in these watersheds, coordinated citizen and technical advisory groups to identify habitat conditions, prioritize habitat areas and near and long-term actions, and provide policy recommendations. The policy recommended for the Puyallup Watershed was to continue the role of hatchery production, but a reform of hatchery management policies. Chambers Creek habitat was identified as important for Chinook spawning and rearing. The policy recommended for Chambers/Clover Watershed was to allow wild Chinook to spawn naturally upstream.

The Strategy supports efforts that protect and restore intertidal and shallow subtidal habitat throughout Commencement Bay. General protection and restoration measures (listed below) and general priorities for shoreline reaches are, though no specific projects are identified.

- Reduce and minimize shoreline armoring wherever feasible and unnecessary to support water-dependant uses.
- Control point and non-point sources of contamination.
- Restore, enhance, or protect viable habitat that provides connective corridors between riverine and estuarine habitats and between estuarine and open water.
- Allow LWD to remain in the shoreline to provide structure for refuge.
- Limit additional bulkheads; promote development of natural shorelines and habitats.
- Include the use of shoreline setbacks for new construction and promote shoreline vegetation buffers.
- Maintain public access to the shoreline.
- Conserve or restore stream mouths.
- Protect and restore intertidal and shallow subtidal habitat throughout Commencement Bay to provide rearing habitat for salmonids.

The Shoreline Inventory and Characterization synthesizes restoration opportunities on Tacoma's shorelines based to some extent on the WRIA 10 and 12 Limiting Factors Reports.

Lower Puyallup Watershed Action Plan (1995) Pierce County coordinated the Lower Puyallup Watershed Management Committee in developing and action plan to address declining water quality and habitat degradation in the river. The Lower Puyallup Watershed Action Plan is based on information developed as part of the Lower Puyallup Watershed Phase 1 Report on nonpoint water pollution issues, goals and objectives. Water quality concerns associated with

agriculture, boats and marinas, forest practices, on-site sewage disposal, stormwater and erosion and other sources were evaluated and a list of action items was prepared. Implementation responsibility, a funding source, time frame and potential benefits of each action were identified. An implementation budget and monitoring program were included in the plan as well.

South Puget Sound Salmon Enhancement Group The South Puget Sound Salmon Enhancement Group protects and restores South Puget Sound salmon populations and aquatic habitat through scientifically informed projects, community education, and volunteer involvement. The group works in cooperation with landowners and other organizations to help plan, fund, carry out, and monitor fishery enhancement and habitat restoration projects. Over 100 projects have been completed since the group formed in 1990.

The Washington State Legislature formed salmon enhancement groups in 1990 as a means of directly involving communities, citizen volunteers, and landowners in salmon recovery. Enhancement groups are funded by surcharges on sport and commercial fishing licenses and the sale of eggs and carcasses from state hatcheries.

Puget Sound Nearshore Project The Puget Sound Nearshore Project (PSNP) (also referred to as the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP)) is a large-scale, multi-agency initiative to address habitat restoration needs in the Puget Sound basin. Nearshore Project goals are to identify significant ecosystem problems, evaluate potential solutions, and restore and preserve critical nearshore habitat. PSNP represents a partnership between the U.S. Army Corps of Engineers (Corps); local, state and federal government organizations; Indian tribes; industries and environmental organizations.

A General Investigation Reconnaissance Study (2000) conducted by the U.S. Army Corps of Engineers identified a direct link between healthy nearshore habitat and the physical condition of the shoreline. The study identified several actions that would be central in restoring nearshore processes to a more natural state:

- Providing marshes, mudflats, and beaches with essential sand and gravel materials;
- Removing, moving and modifying artificial structures (bulkheads, rip rap, dikes, tide gates, etc.);
- Using alternative measures to protect shorelines from erosion and flooding; and
- Restoring estuaries and nearshore habitat such as eelgrass beds and kelp beds.

PSNP also provides outreach and guidance materials related to nearshore ecosystem restoration principals, concepts, and methods of implementation.

Puget Sound Salmon Recovery Plan Shared Strategy for Puget Sound (Shared Strategy) is a collaborative effort between local stakeholders and regional leaders to protect and restore salmon runs across Puget Sound that was initiated as a result of Endangered Species Act (ESA) listings of salmonid species in the Puget Sound region. 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.

In June 2005, Shared Strategy presented its regional plan for Puget Sound Chinook to the National Oceanic and Atmospheric Administration (NOAA) for approval. The NOAA Northwest Region then prepared a supplement that clarified and expanded on ESA recovery requirements. Following public comment on the proposed plan, NOAA finalized these two documents on January 19, 2007. Together the Shared Strategy plan and NOAA supplement comprise a final recovery plan for Puget Sound completing for the first time ever in the history of the Endangered Species Act a recovery plan developed and endorsed by the community.

Cascade Land Conservancy The Cascade Land Conservancy (CLC) seeks to conserve urban and rural natural spaces within the Central Puget Sound region, including areas throughout King and Pierce Counties. Priority natural areas include lands along streams, rivers, other areas in the cascade foothills, and estuary areas. The CLC conservation strategies have included securing lands through purchase and donation, conservation easements, and ownership agreements. CLC is participating in conservation efforts in Tacoma, such as the Green Tacoma Partnership (described in this section).

Puyallup River Watershed Council Formed in 1995, the Puyallup River Watershed Council is an action group made of citizens, local governments, businesses, elected officials, and environmental agency representatives who support strategies to preserve, protect, and improve the Puyallup River watershed. The Council provides opportunities for collaboration and cooperation between the public and watershed stakeholders, establishes outreach programs to encourage citizens to make a difference in their communities, and creates and submits grant proposals for watershed improvement projects. The Puyallup River Watershed Council received the Washington State Environmental Excellence Award in 2002 for creating a unique public forum to benefit the watershed.

Pierce County Lower Puyallup River Feasibility Study Pierce County is currently developing a feasibility study to investigate measures to address the potential for levee failure and/or flooding in the Lower Puyallup basin. This work was prompted by the recent significant revisions to the FEMA floodplain as the levees do not provide sufficient freeboard, and have therefore been de-certified. This study will investigate options to reduce the potential for flooding and improve habitat within the Lower Puyallup River.

6.3 State and Federal

Commencement Bay Natural Resource Restoration Plan (1997) The City of Tacoma has an active and well-established history in nearshore and intertidal restoration, particularly in Commencement Bay. 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 options for Commencement Bay cleanup are outlined in detail in Volume II - Restoration Options, Commencement Bay Cumulative Impact Study (see discussion below). The

Integrated Approach outlined in the EIS includes the implementation of a combination of restoration projects that are designed to maximize the benefits to the damaged natural resources in Commencement Bay, and meet the goals and objectives of the Commencement Bay Natural Resource Trustees. Additional detail on restoration activities is included in the Shoreline Inventory and Characterization, particularly in Sections 4 (Nearshore Marine Shoreline Planning Area) and 8 (Assessment of Shoreline Functions and Opportunity Areas).

The CB/NRDA restoration plan focuses on the 25 square miles of Commencement Bay as its primary restoration area, including the mouths of Hylebos Creek, Wapato Creek and the Puyallup River. Identified as the primary area where natural resources have been damaged by past releases of hazardous substances, this area is where remediation efforts are focused and ongoing.

The NRDA Trustees evaluated a number of potential restoration sites in conjunction with the potentially responsible cleanup parties, environmental groups and the public. Broad-based action groups such as Citizens for a Healthy Bay and the Commencement Bay Cleanup Action Committee, along with the City of Tacoma and other partners, have developed visions for the Commencement Bay restoration framework and activities. Site screening and selection criteria were developed through this process and over 100 potential restoration sites were evaluated. All SMP restoration activities proposed within the Commencement Bay area should be conducted in coordination with the CB/NRDA restoration plan, in particular, and its framework.

The four main objectives of the CB/NRDA restoration plan are:

- Provide a functioning and sustainable ecosystem where selected habitats and species of injured fish and wildlife will be enhanced to provide a net gain in habitat function beyond existing conditions;
- Integrate restoration strategies to increase the likelihood of success;
- Coordinate restoration efforts with other planning and regulatory activities to maximize habitat restoration; and
- Involve the public in restoration planning and implementation.

Six specific habitat areas were selected as the areas of focus for the CB/NRDA restoration plan. These habitat areas are all within the City of Tacoma's shoreline jurisdiction and include the following:

- Puyallup River wetlands and riparian corridor;
- Heads of waterways and river delta;
- The Hylebos Waterway;
- The eastern shoreline of Commencement Bay;
- The western shoreline of Commencement Bay; and

- Hylebos and Wapato creeks wetlands and riparian corridors.

Commencement Bay Cumulative Impact Study – Vol. II Restoration Options (1993) The Commencement Bay Restoration Options Project involves federal, state, local and tribal efforts to assess cumulative impacts on habitats and resources of Commencement Bay and the Puyallup River estuary, and to identify options to restore, replace or rehabilitate habitats and resources. This comprehensive plan for the area is used to guide restoration and mitigation actions undertaken through the Superfund cleanup effort, navigational dredging operations, the Puyallup Settlement and port development.

Restoration planning in this project emphasized an ecosystem approach and public participation in identifying specialized habitats and their loss over time and technically feasible and cost-effective recovery methods. The list of restoration goals and sites is used by state and federal natural resource trustee agencies, the Puyallup and Muckleshoot Indian Tribes, the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, the Port of Tacoma and the City.

Puget Sound Partnership The Puget Sound Partnership was formed in December 2005 by the Governor to focus attention on the overall needs and health of Puget Sound. The Partnership is a community effort of citizens, governments, tribes, scientists and businesses working together to restore and protect Puget Sound.

Puget Sound Partnership is drafting a 2020 Action Agenda that prioritizes cleanup and improvement projects, coordinates federal, state, local, tribal and private resources, and ensures interagency cooperation. Decisions within the Action Agenda are to be based on science, focus on actions that have the biggest impact, and hold people and organizations accountable for results. The Action Agenda will be completed in December 2008.

The Puget Sound Action Team, created by legislature in 1996 as the state's partnership for Puget Sound, became part of the Puget Sound Partnership in 2005.

Salmon Recovery Funding Board In 1999, the Washington State Legislature created the Salmon Recovery Funding Board (SRFB). The Board provides grant funds to protect or restore salmon habitat and assist with related activities. It works closely with local watershed groups (known as lead entities). Composed of five citizens appointed by the Governor and five state agency directors, the Board brings together the experiences and viewpoints of citizens and the major state natural resource agencies.

The Board administers annual grant programs and supports feasibility assessments for future projects and other recovery activities. Eligible applicants include municipal subdivisions (cities, towns, counties, and special districts such as port, conservation, utility, parks and recreation, and schools), tribal governments, state agencies, nonprofit organizations, regional fisheries enhancement groups, and private landowners. SRFB has helped finance over 900 projects.

7.0 IMPLEMENTING THE SHORELINE RESTORATION PLAN

7.1 Funding and Partnership Opportunities

The City of Tacoma will continue to pursue partnership opportunities and grant funds to implement identified restoration actions and priorities. Table 3 identifies funding opportunities.

7.2 Timelines and Benchmarks

[Note: Near, mid and long term timelines and benchmarks will be included in this Plan after further review and discussion of restoration actions and metrics]

7.3 Strategies for Measuring and Ensuring Effectiveness

Restoration Demonstration Project

A small demonstration restoration project that includes a variety of techniques could be completed by the City as an example for private landowners, or the City could identify a set demonstration projects and actively solicit entities to implement one or more of them. Additionally, the City could work with existing programs such as the South Puget Sound Salmon Enhancement Group, to leverage funding and efforts where available to implement demonstration projects.

Environmental Education and Volunteer Coordination

The City should create a shoreline restoration initiative the Department of Public Works, Surface Water Management, Education and Involvement Program. Through such an initiative, the City could accomplish restoration projects together with community volunteers. Volunteers could be provided with shoreline stewardship training, and recruited for project implementation and monitoring. General shoreline stewardship education could be provided through the program. The City would provide equipment and expertise; new staffing and funding may be necessary to implement the initiative.

Regional Coordination

The City should continue to take an active role in the Puget Sound Nearshore Project, Puget Sound Partnership and Commencement Bay restoration efforts and pool resources with regional entities to achieve as much restoration as possible. The City should also look for new opportunities for involvement in regional restoration planning and implementation.

Capital Facilities Program

The City should include shoreline restoration as a new section of the 6-year Capital Facilities Program. This would ensure that shoreline restoration projects are considered during the City's budget process.

Development Opportunities

When shoreline development occurs, the City should look for opportunities to conduct or encourage restoration in addition to minimum mitigation requirements. Development may present opportunities for restoration that would not otherwise occur and may not be available in the future. When on-site mitigation opportunities are limited due to site constraints or limited potential ecological gains, the City could direct mitigation to priority off-site restoration needs.

Table 3. Funding Opportunities

Grant Name	Allocating Entity	Grant Size	Web Site
Acorn Foundation	Acorn Foundation	$5,000 - 12,000	http://www.commoncounsel.org/Acorn%20Foundation
Allen Family Foundation, Paul G. – Science and Technology Program	Allen Family Foundation, Paul G.		http://www.pgafamilyfoundation.org/
Aquatic Lands Enhancement Account (ALEA)	Washington Recreation and Conservation Office	$10,000 – 1 Million	http://www.rco.wa.gov/rcfb/grants/alea_application.htm
Audubon Washington			http://wa.audubon.org/
Various programs	U.S. Army Corps of Engineers	varies	http://www.usace.army.mil/
Various programs	National Fish and Wildlife Foundation	varies	http://www.nfwf.org/AM/Template.cfm?Section=Browse_All_Programs
Bullitt Foundation	Bullitt Foundation	varies	http://www.bullitt.org/
Coastal Grant Program	U.S. Fish & Wildlife Service	$5,000 - 50,000	http://www.fws.gov/coastal/
Coastal Zone Management Grants	Washington State Department of Ecology	$19,000 - 29,000	http://www.ecy.wa.gov/programs/sea/grants/czm/index.html
Community-Based Restoration Program	National Oceanic and Atmospheric Administration – Fisheries Restoration Center	$1,000 to 500,000	http://www.nmfs.noaa.gov/habitat/restoration/funding_opportunities/funding_nwr.html
Endangered Species Program	U.S. Fish & Wildlife Service	$1,000 - 14,000	http://www.fws.gov/endangered/grants/index.html
Doris Duke Charitable Foundation	Doris Duke Charitable Foundation	Multi-year grants that range from $125,000 - 3.5 million	http://www.ddcf.org/page.asp?pageId=6

Grant Name	Allocating Entity	Grant Size	Web Site
FishAmerica Grant Program	FishAmerica Foundation	varies	http://www.fishamerica.org/grants/
Various	Environmental Protection Agency	varies	http://www.epa.gov/epahome/grants.htm
Forest Legacy Program	U.S. Forest Service, Washington Department of Natural Resources	varies	http://www.dnr.wa.gov/BusinessPermits/Topics/ConservationTransactions/Pages/forest_legacy.aspx
Conservation Grants	U.S. Fish and Wildlife Service Coastal Program	varies	http://www.fws.gov/birdhabitat/Grants/NAWCA/Small/index.shtm http://www.fws.gov/midwest/Fisheries/library/CelebratingHabitat05/The%20National%20Coastal%20Wetlands%20Conservation%20Grant%20Program_2-1.pdf
Hugh and Jane Ferguson Foundation	Hugh and Jane Ferguson Foundation	$2,000 - 7,500	http://foundationcenter.org/grantmaker/ferguson/
Landowner incentive program	Washington State Department of Fish and Wildlife, Lands Division	up to $5,000 for small grants; others up to $50,000	http://wdfw.wa.gov/lansd/lip
Matching Aid to Restore States Habitat (MARSH)	Ducks Unlimited	varies	http://www.ducks.org/
Water quality grants	Environmental Protection Agency, Washington State Department of Ecology	varies	http://www.ecy.wa.gov/biblio/0810013.html
Planning/Technical Assistance Program	Bureau of Reclamation	Technical assistance	http://www.usbr.gov/pmts/tech_services/manage/index.html
Wetland Restoration Programs	Washington State Department of Ecology	varies	http://www.ecy.wa.gov/programs/sea/wetlands/stewardship/celcp.html http://www.ecy.wa.gov/programs/sea/wetlands/stewardship/nwcgp.html
Regional Fisheries Enhancement Groups	Washington State Department of Fish and Wildlife	$10,000 - 40,000	http://wdfw.wa.gov/volunter/index.htm
Salmon Recovery Funding Board	Interagency Committee for Outdoor Recreation	varies	http://www.rco.wa.gov/
Transportation Environmental Research Program (TERP)	Federal Highway Administration	$20,000 - $50,000	http://www.fhwa.dot.gov/terp/

Grant Name	Allocating Entity	Grant Size	Web Site
Various programs	Washington Department of Transportation	varies	http://www.wsdot.wa.gov/environment/

Development Incentives

The City could provide development incentives for restoration, such as waiving some or all permit fees when shoreline restoration is included in a project. This could serve to encourage developers to try to be more imaginative or innovative in their development designs to include more access and preservation.

Resource Directory

The City could develop a resource list for property owners that want to be involved in restoration.

Stewardship Certification and Tax Incentives

The Shore Stewards program sets up guidelines for shoreline residents to preserve and enhance the shoreline environment. With a verification component, Shore Stewards could provide certification and tracking. This could be implemented as a Shoreline Tax Incentives when someone participates in the WDFW backyard sanctuary program. Since the City recognizes that there are important opportunities to improve shoreline ecological conditions and functions through non-regulatory volunteer actions, it might examine the potential for property tax breaks for shoreline property owners who are actively manage their property for habitat protection or enhancement. The City could participate in the open space tax program pursuant to Chapter 84.43 RCW to provide such benefits to landowners.

7.4 Adaptive Management

This Shoreline Restoration Plan is based on a synthesis of existing plans, programs and policies and the analysis completed in the Tacoma Shoreline Inventory and Characterization. This plan does not constitute an exhaustive review of restoration opportunities and projects, but will guide the City's restoration efforts. As part of its Shoreline Master Program updates (required at least every seven years; WAC), the City will review project monitoring information and shoreline conditions, and reevaluate restoration goals, priorities and opportunities. The City will seek partnerships with existing local, regional and federal groups working in Tacoma to adaptively manage the shoreline.

8.0 REFERENCES

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ATTACHMENT 1. Shoreline Restoration Plan Maps

Map 1. Conceptual Restoration Opportunities

Map 2a. Existing Restoration Sites (West)

Map 2b. Existing Restoration Sites (East)

ATTACHMENT 2. Assessment of Shoreline Functions

The Shoreline Inventory and Characterization (2007) provided a comprehensive assessment of ecosystem functions along Tacoma's shoreline. Information from the Inventory on watershed context, shoreline modifications, habitat and species, land use and altered ecosystem processes is summarized below, along with information from newly available technical analyses. Further discussion and references can be found in the Shoreline Inventory and Characterization.

Watershed Context and Shoreline Modifications

The City of Tacoma includes portions of two Water Resource Inventory Areas (WRIAs), the Puyallup River Watershed (WRIA 10) and the Chambers/Clover Creek Watershed (WRIA 12). Much of the marine nearshore areas of Commencement Bay are included in WRIA 10.The nearshore areas of the Tacoma Narrows and a portion of Commencement Bay to just east of Puget Creek in the Ruston Way area are included in WRIA 12. The Puyallup River is the largest watercourse draining WRIA 10, with Swan Creek being the largest tributary stream to the Puyallup River within the city. Hylebos Creek, also located within WRIA 10, is an independent tributary that drains to Commencement Bay within the city. Several other small independent tributaries to Commencement Bay drain WRIA 10, including Wapato Creek and other drainage features (gulches) draining the slopes along the northern plateau above Marine View Drive. Chambers Creek is the largest stream draining WRIA 12; however, this stream lays outside the city limits to the south. Flett Creek is the largest tributary within the city draining to the Chambers Creek basin.

The Puyallup River is a shoreline of statewide significance (WAC 173-18-310) that travels approximately 54 miles from its headwaters on the southwest slopes of Mount Rainier to its mouth at Commencement Bay. The entire Puyallup River basin covers 1,065 square miles and consists of 728 rivers and streams, with the largest tributaries being the White and Carbon Rivers (Kerwin, 1999). The Puyallup River is fed primarily by the Tahoma and Puyallup Glaciers on the southwest slope of Mount Rainier. The Carbon River originates from the Carbon Glacier located on the north slope of Mount Rainier, and the White River is fed primarily by the Emmons Glacier on the northeast slopes of Mount Rainer.

The City of Tacoma lies between River Miles (RM) 0.0 and 2.8 on the Puyallup River in the Lower-Puyallup River basin (Map 2). The city and its urban growth area occupy approximately 27.1 square miles, or 2.5 percent of the land area included in WRIA 10. The portion of the Puyallup River within the city and its Urban Growth Area is approximately 5.2 percent of the total length of the river.

Hylebos Creek enters the Hylebos Waterway in Tacoma and drains to Commencement Bay. Hylebos Creek drains approximately 18,300 acres, and contains 25 miles of stream, 11 named lakes, and 250 acres of wetlands (Kerwin, 1999). There are two major tributaries to Hylebos Creek, referred to as the West and East Forks. The headwaters of the West Fork of the Hylebos are located in the City of Federal Way near South 320th Street (Pierce County, 2005). The East Fork originates in King County near North Lake and Lake Killarney in the Federal Way potential annexation area. The confluence of the two forks lies east of Interstate-5 within the City of

Milton. From the confluence of these forks in Milton downstream, the Hylebos Creek itself is considered a shoreline of the state due to its mean annual flow of greater than 20 cfs (Kresch, 1998). Approximately one-half mile of the Hylebos Creek lies within the City of Tacoma, from about USGS River Mile (RM) 0.00 to RM 0.51.

The south and southeastern portions of the City are located within WRIA 12, which drains an area of approximately 179.5 square miles. The City occupies approximately 43.7 square miles, or 24.3 percent of the land area included in WRIA 12. In addition, WRIA 12 contains many small independent drainages including Crystal Creek, Narrows Creek, Crystal Springs, and 16 smaller drainages (gulches) that drain the western plateau either toward the Tacoma Narrows (west) or toward Commencement Bay (north). The 34-acre Wapato Lake is also located within WRIA 12 and the City of Tacoma. Wapato Lake is made up of three hydrologically connected waterbodies. The northernmost waterbody is essentially an open-water wetland complex. The upper waterbody opens up into a larger, middle waterbody, with wetlands surrounding the fringe. The lower waterbody constitutes the main lake area and contains the majority of development, which is primarily restricted to Wapato Park and its amenities. A stormwater bypass exists at the southwestern end of the middle waterbody. This bypass routes the stormwater flows around the main lake to Ward's Lake and then to the Flett Holding Basins. A dike was constructed in 1981 when the lake was dredged and "restored." The dike was designed to keep sediments in the stormwater from entering the wetlands and the main lake area.

See the Shoreline Use Analysis for specific discussion of existing shoreline modifications.

Habitat and Species

A number of fish and wildlife species use the shorelines in Tacoma for habitat. Critical fish and wildlife habitat conservation areas are those areas identified as being of critical importance to the maintenance of fish and wildlife species, and if altered may reduce the likelihood that the species will survive and reproduce. Species listed under the federal Endangered Species Act that have critical habitat in Tacoma include Chinook salmon and bull trout. The killer whale and Steller sea lion are not documented as occurring in Commencement Bay, but have the potential to occur and have been sighted within this area. Other federal species of concern or State-listed species include the peregrine falcon, purple martin, coho salmon, steelhead, cutthroat trout, and the western pond turtle.

In addition to the above listed species, the State Priority Habitats and Species maps include chum salmon, pink salmon, sockeye salmon, bald eagle, seabird nesting colonies, waterfowl concentrations and harbor seal/California sea lion haul-out sites. Priority habitats shown on the map include riparian areas, urban natural open spaces, wetlands, cliffs and bluffs, estuarine zones and lagoons. See Section 3.1 of the Shoreline Inventory and Characterization for further information on habitat and species in Tacoma.

Land Use

Tacoma is the second largest urban center in the Puget lowlands. Its land uses and cover are similar to other highly urbanized city centers. In general, there have been three key phases of changing land use between 1800 and the present.

Prior to the mid-1800s, the area around Tacoma was characterized by both a significant delta system where the Puyallup River meets Commencement Bay, and dense forestlands on the floodplain and surrounding uplands (Kerwin, 1999, Collins et al., 2003). As populations in western Washington grew, timber harvesting throughout the watershed and establishment of agriculture on floodplains represented the first phase of land use changes. Filling of tidelands within Commencement Bay began as early as 1877 with the initial installation of railroad beds (U.S. Army Corps of Engineers et al, 1993; Kerwin, 1999; Simenstad, 2000).

The presence of a deepwater embayment (Commencement Bay) resulted in the early establishment of a port that influenced the development of the City. A significant channel

change occurred in 1906 when the White River moved south to entirely flow into the Puyallup River. This alteration initiated a series of projects intended to manage the size, location, and behavior of the Puyallup River and its tributaries (King County, 1988). Between 1908 and 1917, significant relocation, armoring, and diking of the Puyallup River was completed. Much of the work was completed under the auspices of the Inter-County River Improvement District, which was formed as an organization to share costs between King and Pierce Counties to address river issues surrounding the White River's movement into the Puyallup basin (King County, 1988).

River projects continued through the 1970s, resulting in the channelization and construction of levees along significant portions of the lower Puyallup River. Once the system of channels and levees was completed, river management shifted to the removal of in-channel sediments to preserve the flood-carrying capacity of the system. In the late 1980s, dredging was restricted, and in the late 1990s, further restrictions were imposed following the listing of salmonid species as threatened under the Endangered Species Act (ESA). The carrying capacity of the lower Puyallup River has generally decreased as sediments deposited in the White, Carbon and Puyallup River deltas now build up within the leveed channels (USGS, 1990; Kerwin, 1999). Today, much of the upper watershed of the Puyallup River is in forest land uses, either within the Mt. Rainier National Park, Mt. Baker-Snoqualmie National Forest, or privately held timber operations (Kerwin, 1999). Agricultural land uses dominate the floodplains of the middle and upper portions of the watershed (Kerwin, 1999, Collins and Sheikh, 2005). Urban land uses also exist in the middle and upper portions of the watershed, including the cities of Puyallup, Auburn, Orting, Federal Way, Fife, Sumner, Buckley, Enumclaw and Milton. Urban land uses are typically located on either alluvial valley or on the relatively level surrounding uplands. The City of Tacoma also includes substantial industrial and commercial land uses along the Interstate 5 corridor extending west through the Port of Tacoma. At the end of World War II, the urban population within the cities in the Puyallup watershed increased substantially (Washington Office of Financial Management Historical Data).

See the Shoreline Use Analysis for specific discussion of existing land uses and future demand.

Altered Ecosystem Processes

Sections 3.0 and 4.0 of the Shoreline Inventory and Characterization discuss the status of watershed process controls and shoreline ecosystem processes in detail.

Climate Change

Climate change is a consideration in shoreline management in that it is expected to affect water temperatures, flows and the sea level over time. King County's Shoreline Inventory and Characterization (2007) discussed the potential effects on Puget Sound shorelines and fresh water shorelines; relevant excerpts from that discussion follow:

> Casola et al. (2005) summarized the information presented at a conference in 2005 to address predicted effects of climate change on Washington's hydropower, water supplies, forests, fish populations, and agriculture (see http://dnr.metrokc.gov/dnrp/climate-change/conference-2005-results/plenarysession/background.htm).
>
> The Intergovernmental Panel on Climate Change (IPCC 2007) predicts that global surface air temperature could increase by 2.5 to 10.4 ºF (about 1 to 6 °C), and global sea level could rise from 8 to 18 inches between 2000 and 2100, depending on both the rate of natural changes and the response of the climate system to greenhouse gas emissions both now and into the future. However, the IPCC models do not take polar ice cap melting into account. Rahmstorf (2007) uses another method of estimation and derives a predicted range of sea level increase of 21 to 55 inches by 2100. Neither of these methods take into account the effects of local earth movements into account, and these processes could also impact the relative sea level in the Puget Sound region. Temperature In the Pacific Northwest, Casola et al. (2005) noted that, "The average temperature in the Pacific Northwest (PNW) increased approximately 1.5°F (0.8°C) over the last century; snowpack has been declining over the last 80 years, especially at lower elevations; the onset of snow melt and peak streamflows in snow-fed rivers has moved earlier in the year; and many species of plants are blooming earlier in the year." They also noted that "although direct observations are not available, hydrologic models indicate that spring soil moisture has also been increasing."
>
> In the future, Casola et al. (2005) expect increases in air temperature across all seasons for the Pacific Northwest. Using global climate models, they project that by the year 2020 temperatures will likely increase between 2.5 to 3.7°F (about 1 to 2°C), and by 2040 the increase will be between 3.1 and 5.3°F (about 1.5 to 3°C). At the same time, water temperatures are also expected to increase.
>
> Increases in both water and air temperature will have impacts on many species, but for shorelines in particular, warmer water temperatures will be of major importance. Casola et al. (2005) note that fish will have to respond to changes in habitat caused by responses of vegetation, streamflow, temperature patterns and oxygen to climate change. In some cases, these changes may occur faster or be more extreme than some species can accommodate. For example, although Casola et al. (2005) do not explicitly predict the fate of particular species, it is reasonable to expect that some more temperatures-sensitive species, such as sockeye salmon, may have more difficulty adapting than others, such as coho and Chinook.
>
> Marine plant species, such as eel grass and bull kelp, appear to have a narrow range of water temperature tolerance and extensive stands may also suffer as a result of the projected changes (Snover et al. 2005). Effects on aquatic plants could have a cascading effect of

habitat change, affecting other species that might not have narrow temperature tolerances but do have an important dependence on those plant stands for food, nesting sites, or refuge.

Warmer water temperatures may change seasonal variation in planktonic community structure in both marine and freshwater systems. Longer periods of warm temperatures in shallow waters will likely favor certain groups, including: (1) bluegreen cyanobacteria, some of which make toxic substances that harm pets and people; (2) dinoflagellates, some of which cause red tides, causing toxic accumulations in shellfish; and (3) chlorophyte algae, some of which form large filamentous masses that cover rocks and structures, as well as wash up on shoreline to cover beaches and cause nuisances.

Implications for precipitation and runoff are more difficult to predict, due to uncertainty over the interplay among many factors affecting precipitation. However, the majority of models indicate that an increase in cool season precipitation (October to March) will include a greater portion of the precipitation as rain rather than snow, which will result in reduced residual spring snowpack

and earlier snowmelt. Casola et al. (2005) predict that stream flow, stormwater runoff, and water temperature patterns will likely be affected by changes in both air temperature and precipitation.

For marine coastal areas, Rahmstorf (2007) predicts a global sea level rise of 2 to 4.5 ft, while the IPCC is conservative, forecasting a rise of 0.7 to 1.5 ft., but does not include polar ice melt. Casola et al. (2005) report that sea level could rise almost 3 feet by the year 2100 in south Puget Sound (Tacoma), taking into account the net subsidence in crustal elevations in the Puget Sound region, although it is not clear if subsidence should be estimated as a continuous rate (Petersen, in prep). Rising relative sea level is a response to a series of complicated processes that are in turn impacted by factors affecting other parameters on a global as well as local scale, such as temperature, wind patterns, oceanic currents, and precipitation.

Increased sea elevations will make development and infrastructure in low-lying areas more susceptible to flooding due to high tides and storms. Waves will encroach further onto low-lying beaches and cause greater beach erosion and threatening or damaging low-lying structures. At the same time steep slopes may receive increased moisture, due to predicted changes in precipitation patterns, potentially resulting in an increase in landslides that deliver more material to the marine shoreline, but which may cause property destruction and threaten human safety.

Where shorelines are currently armored, a slightly higher sea level may have minimal impacts. Significant rise might begin to allow overtopping of armoring with storms and very high tides. Shoreline reaches, known as transport zones, are composed of mostly stable bluffs and gentle sloping shorelines. A significant rise in

sea level will likely cause these areas to become active feeder bluffs, perhaps endangering residences currently considered safe. A rise in sea level also will likely cause current feeder bluffs to become more active and increase erosion rates.

Marshes, estuarine areas, and tributary mouths could experience changes in shape due to changes in accretion and erosion patterns, potential loss of eel grass beds and changes in plant communities associated with the estuarine and marsh areas, and increased erosion in drainage channels upstream of deltas.

A related impact of sea level rise would be to change the location and amount of land coming under shoreline jurisdiction over time, since a 2-foot vertical rise of the sea can mean a much more substantial incursion inland. This could cause flooding of some beach front properties.

Changes in sea level could affect the Puyallup River's flow regime, river height, and salinity, which has implications for existing habitat quality and the design and ultimate effectiveness of restoration projects.

ATTACHMENT 3. Sources of Criteria for Prioritizing Restoration Projects

Several existing sources of shoreline restoration prioritization criteria, including the Shoreline Inventory and Characterization (2007), the Commencement Bay Natural Resources Restoration Plan (1997), and the Commencement Bay Aquatic Ecosystem Assessment (2000), were relied upon in this Plan. These criteria, summarized below, were used to inform the criteria ultimately developed to prioritize projects in this Shoreline Restoration Plan.

First, in the assessment of shoreline functions and opportunity areas in the Shoreline Inventory and Characterization (Section 8.0), best professional judgment using a general set of criteria was used to rank restoration potential/opportunities as low, moderate or high. Factors considered in that ranking included: the number of goals that could be achieved by pursuing a restoration opportunity, likelihood of success given the level of ecological alteration, and whether the project was identified as a priority in other restoration planning efforts.

In the Commencement Bay Natural Resources Restoration Plan (1997), required criteria were used to screen out projects that do not attain a minimum level of land availability, source control, or adequately address injured natural resources. The overall goal of the plan was to clean up toxic sites along the Bay. Required criteria were:

- Site is or can be made available for restoration. In general, available sites are those that may not contain substantial structures or pavement.
- Source control is or will be sufficient. In general, source control is sufficient if an environmental audit or similar report demonstrates that the site has limited potential for recontamination.
- Restoration of the site will provide functional benefits to injured natural resources. Site restoration efforts may include restoration and preservation of habitat or enhancement of physical or biological conditions.

Then, preferred criteria were used to rank suitable restoration sites, as follows.

HIGH IMPORTANCE:

- Functional connectivity
- Location in existing critical habitat areas (for key species)
- Separation from sources of contamination
- Cost-effectiveness
- Sustainability

MEDIUM IMPORTANCE:

- Size of restored habitat
- Ownership and management

- Land use compatibility
- Water quantity and flow (as related to erosion potential) – rivers and streams only

LESSER IMPORTANCE:

- Public access or view of site

The Commencement Bay Aquatic Ecosystem Assessment (2000) includes restoration criteria for juvenile salmon habitat landscapes, given their dependence on landscape features and processes in the delta and Commencement Bay. The overall goal of the assessment was to aid salmon recovery. The following criteria guided analysis and priority setting for restoration opportunities:

- Restore and enhance inter-habitat mosaics and linkages that accommodate refugia, feeding and physiological requirements.
- Promote landscape structure and elements that result in diverse, productive primary- and secondary-producer populations that support juvenile salmon growth and survival.
- Take advantage of existing and restorable geomorphic structure that promotes the extent (opportunity, access) and utility (realized function) of habitat use.
- Preserve and augment fundamental estuarine processes that naturally build and maintain juvenile salmon habitats.
- Plan restoration and remediation that optimally addresses salmon life-history diversity to compensate for climatic variation, energy regimes, and disturbance.

The 2000 Assessment also generally identifies appropriate actions for enhancement of juvenile salmon rearing along five segments of the delta and Bay shoreline.

Tacoma's critical areas mitigation sequencing requirements can also be considered in developing prioritization criteria. TMC 13.11.900.M defines mitigation as:

> Avoiding, minimizing, or compensating for adverse critical areas impacts. Mitigation, in the following sequential order of preference, is:
>
> a. Avoiding the impact altogether by not taking a certain action or parts of an action.
>
> b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps such as project redesign, relocation, or timing, to avoid or reduce impacts.
>
> c. Rectifying the impact to wetlands by repairing, rehabilitation, or restoring the affected environment to the conditions existing at the time of the initiation of the project
>
> d. Minimizing or eliminating the hazard by restoring or stabilizing the hazard area through engineered or other methods.

e. Reducing or eliminating the impact or hazard over time by preservation and maintenance operations during the life of the action.

f. Compensating for the impact to wetlands by replacing, enhancing, or providing substitute resources or environments.

g. Monitoring the hazard or other required mitigation and taking remedial action when necessary. Mitigation for individual actions may include a combination of the above measures.