

RESTORATION PLAN



Prepared for

City of Pasco

Prepared by

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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Purpose and Scope of Plan	1
1.2	Key Elements of Restoration Planning in Shoreline Master Program Process	3
2	BACKGROUND	4
2.1	Planning Area Characteristics	4
2.1.1	Geology	5
2.1.2	Climate	5
2.1.3	Water Resources	5
2.1.3.1	Columbia and Snake Rivers	6
3	EXISTING RESTORATION PLANNING, PROGRAMS, AND PARTNERS	7
3.1	Franklin Conservation District	7
3.2	Confederated Tribes of the Umatilla Indian Reservation	8
3.3	Washington State Recreation and Conservation Office	8
3.4	National Marine Fisheries Service	8
3.5	Nonprofit Groups	8
3.6	U.S. Army Corps of Engineers	9
3.7	U.S. Bureau of Reclamation	9
3.8	U.S. Department of Agriculture	10
3.9	U.S. Fish and Wildlife Service	10
3.10	Washington State	10
3.11	Washington State Conservation Commission	10
3.12	Washington State Department of Ecology	11
3.13	Washington State Department of Fish and Wildlife	11
3.14	Washington State Department of Natural Resources	11
3.15	Washington State Parks and Recreation Commission	11
3.16	Confederated Tribes of the Umatilla Indian Reservation	12
4	RESTORATION CONTEXT, GOALS, AND PRIORITIES	13
4.1	Shoreline Impairments	13
4.2	Restoration Goals and Objectives	16
4.3	Restoration Opportunities	16

4.3.1 General Restoration Opportunities16

4.3.2 Site-specific Restoration and Protection Opportunities20

4.4 Project Evaluation and Prioritization Criteria24

5 IMPLEMENTATION, MONITORING, AND REVIEW25

5.1 Potential Restoration Funding Partners25

5.2 Timelines, Benchmarks, and Monitoring27

5.3 SMP Review28

6 REFERENCES29

List of Tables

Table 1 Ecological Processes and Structures Affected by Major Alterations..... 14

Table 2 Restoration and Protection Opportunities and Priorities in Pasco..... 18

Table 3 Site-specific Restoration and Protection Opportunities in Pasco 21

LIST OF ACRONYMS AND ABBREVIATIONS

ALEA	Aquatic Lands Enhancement Account
BiOp	Biological Opinion
BMP	best management practice
City	City of Pasco
CRP	Community-based Restoration Program
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DNR	Department of Natural Resources
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
IAC	Inventory, Analysis, and Characterization
LCBAS	Lower Columbia Basin Audubon Society
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
OHWM	ordinary high water mark
Plan	Restoration Plan
RCO	Recreation and Conservation Office
RCW	Revised Code of Washington
SMA	Shoreline Management Act
SMP	Shoreline Master Program
TMDL	total maximum daily loads
UGA	Urban Growth Area
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code

WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area

1 INTRODUCTION

This Restoration Plan (Plan) has been prepared in support of the City of Pasco's (City's) Shoreline Master Program (SMP). The SMP is being prepared to comply with the Washington State Shoreline Management Act (SMA) requirements (Revised Code of Washington [RCW] 90.58) and the state's SMP guidelines (Washington Administrative Code [WAC] 173-26, Part III-201 2[f]), which were adopted in 2003. The SMP is composed of policies and regulations that regulate the use and development of the river, stream, and lake shorelines and this Plan. The area covered by this Plan includes the SMP jurisdiction within the City.

The scope of this document, the definition of restoration, and the key elements in restoration planning in the SMP process are discussed in the following sections.

1.1 Purpose and Scope of Plan

The purpose of this Plan is to describe how and where shoreline ecological functions can be restored within City SMP jurisdiction. The SMP guidelines (WAC 173-26-201(2)(f)) articulate that the Plan is to include specific elements. These elements are identified below along with the section in which the element occurs in this Plan:

1. An identification of degraded areas, impaired ecological functions, and sites with potential for ecological restoration – Section 4
2. An establishment of overall goals and priorities for restoration of degraded areas and impaired ecological functions – Section 4
3. An identification of existing and ongoing projects and programs that are currently being implemented that are designed to contribute to local restoration goals such as capital improvement programs and watershed planning efforts – Section 3
4. An identification of additional projects and programs needed to achieve local restoration goals and implementation strategies including identifying prospective funding sources for those projects and programs – Sections 4 and 5
5. An identification of timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals – Section 5

6. Provisions 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 – Section 5

While the Plan incorporates elements of other shoreline restoration planning documents that involve the shorelines under the City’s SMP jurisdiction, the scope of this Plan under the SMA guidance does not extend to that of a master document combining and aligning priorities of other shoreline restoration documents, plans, or efforts. It is expected that alignment or conflict between this Plan and the goals of other plans (such as Comprehensive Plans) that occurs during implementation will be addressed within the context of the applicable regulations and associated regulatory reviews.

It is important to clarify that restoration as it is discussed here is distinct from the concept of protection or no net loss. The WAC defines “restoration” or “ecological restoration” as follows:

“...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.”

The state’s SMP policies include a standard of no net loss of ecological functions that are necessary to sustain shoreline natural resources that must be adhered to by new SMPs. The Washington State Department of Ecology (Ecology) has clarified that no net loss means that “establishing uses or conducting development are identified and mitigated with a final result that is no worse than maintaining the current level of environmental resource productivity” and “no uses or development supersede the requirement for environmental protection” (Ecology 2004). Thus, mitigation activities are the method by which no net loss is compensated. The distinction between no net loss and SMP restoration is that restoration goes beyond no net loss by establishing an increase in the amount, size, and/or functions of an ecosystem or components of an ecosystem compared to a baseline condition (Thom et al. 2005). Therefore, mitigation activities, including redevelopment and new

development that include mitigation activities, could not be considered as part of restoration under this Plan unless there was a “beyond no net loss” component to the work.

1.2 Key Elements of Restoration Planning in Shoreline Master Program Process

Washington’s guidelines state that the SMP must give preference to certain shoreline uses, in the order as follows: 1) reserve appropriate areas for protecting and restoring ecological functions to control pollution and prevent damage to the natural environment and public health; 2) reserve shoreline areas for water-dependent and associated water-related uses; 3) reserve shoreline areas for other water-related and water-enjoyment uses that are compatible with ecological protection and restoration objectives; 4) locate single-family residential uses where they are appropriate and can be developed without significant impact to ecological functions or displacement of water-dependent uses; and 5) limit non-water-oriented uses to those locations where the above described uses are inappropriate or where non-water-oriented uses demonstrably contribute to the objectives of the SMA (WAC 173-26-201(2)(d)).

The guidelines also state that SMPs are to “include goals, policies and actions for restoration of impaired shoreline ecological functions” (WAC 173-26-186). The impaired functions are to be identified based on a detailed inventory and characterization of the shoreline ecosystem, and a restoration plan is to be formulated based on that information (WAC 137-26-201). The results of the inventory assessment were presented in the *Shoreline Inventory, Analysis, and Characterization Report* (IAC Report) for the City (Anchor QEA 2014). This Plan uses the information from the IAC Report to address the restoration plan requirements discussed in the SMP guidelines. This Plan is not a regulatory document or a set of regulatory requirements. However, the SMP points to this Plan as a guide outlining opportunities for improving shoreline ecological function.

2 BACKGROUND

The City is located at the confluence of the Columbia and Snake rivers in southeastern Washington within Franklin County. The City is located at the southern edge of Franklin County, bounded by the Columbia River to the south and the Snake River to the southeast. The City is part of the Tri-Cities Metropolitan Area in southeast Washington and includes 25,247 acres in the current incorporated City limits and an additional 5,433 acres within its associated Urban Growth Area (UGA). The City is the major urban area within Franklin County. The City and its associated UGA compose about 72% of the 55 square miles of designated UGA in Franklin County (Franklin County 2008). The study area for this Plan includes all land currently within the shoreline jurisdiction for incorporated City limits and the City's unincorporated UGA (Anchor QEA 2014).

2.1 Planning Area Characteristics

Land within the City is mostly under private ownership. Public lands are dominated by City-owned parcels. The U.S. Army Corps of Engineers (USACE) owns lands at various locations along the shoreline of Columbia River. Sacajawea State Park is a public space owned by Washington State Parks and Recreation Commission at the confluence of the Columbia and Snake rivers.

Land ownership within shoreline jurisdiction includes upland lands (above the ordinary high water mark [OHWM]) and aquatic lands (below the OHWM). Upland shoreline jurisdiction lands are primarily publicly owned. USACE is the largest public owner of shoreline lands below the OHWM. Washington State Parks and Recreation Commission owns Sacajawea State Park, which comprises 6% of shoreline lands. The Port of Pasco owns the industrial area between State Route 397 bridge and Sacajawea State Park. The rest of public ownership can be found at various locations in Reaches 1, 5, and 6. Aquatic shoreline jurisdiction lands (below the OHWM) are almost entirely publicly owned among various federal and state agencies.

Land cover in the City is dominated by developed areas and shrub/scrub habitat (not including open water) within the City limits and within the shoreline jurisdiction. The dominant land cover in the City consists of developed areas (56%) and shrub/scrub habitat (20%). Other land cover types include agriculture (14%), wetlands, and pasture grass

areas. Residential and industrial/business park and commercial use composes the majority of the City's land area, with natural and developed open space composing less than 20% of the City's area (Anchor QEA 2014).

2.1.1 Geology

The geology, soils, and topography of the City area are primarily dictated by glacial outburst flooding that occurred near the end of the last major glacial period, approximately 18,000 to 20,000 years ago. This event is referred to as the Missoula Floods. The geologic makeup is the result of erosion of pre-flood geologic units, deposition of sediments carried by the floodwaters, and the formation of unique topographic features that influence present-day hydrology. Prior to the Missoula Floods, the geology of Franklin County consisted primarily of Miocene-aged Columbia River Basalt flows that were in some places (e.g., plateaus) capped with varying thicknesses of wind-blown fine sands and silt known as loess (Grolier and Bingham 1978). The segments of the Columbia and Snake rivers around the City are located in a wide valley primarily comprising alluvial soils with relatively high infiltration rates. Within upland areas, particularly areas farther from the confluence of the river, outburst flood deposits of gravel occur as well.

2.1.2 Climate

The City falls within the Central Basin region of Washington, which has the lowest precipitation rates in the state. Annual precipitation averages around 7.15 inches, and precipitation is commonly associated with summer thunderstorms, winter rains, and snowfall. Snowfall depths rarely exceed 2 to 3 inches and occur from November to March. High temperatures in January can range from 35 to 45 °F (1.6 to 7.2 °C) with low temperatures between 20 to 30 °F (-6.7 to -1.1 °C). Summer high temperatures are usually in the high 80s to low 90s with low temperatures in the high 50s (WRCC 2012).

2.1.3 Water Resources

The planning area is mostly located in the Esquatzel Coulee basin (Water Resource Inventory Area [WRIA] 37). A small area along the eastern boundary of the planning area is located in the lower Snake River basin (WRIA 33). The Columbia and Snake rivers are major surface water resources.

2.1.3.1 *Columbia and Snake Rivers*

Lake Wallula is the major surface water resource for the planning area. The portion of the Columbia and Snake rivers within the planning area is part of the upstream portion of Lake Wallula. The lake is created from the impoundment of the Columbia River by McNary Dam.

Sections of the Lake Wallula shorelines are designated as protected shoreline areas set aside to maintain or restore fish and wildlife habitat; to maintain or restore cultural, aesthetic, or other environmental values; to prevent development in areas subject to heavy erosion, excessive siltation, or exposure to high wind, wave, or current action; or where development would interfere with navigation.

Generally, no private recreation facilities are permitted in these designated protected areas, except for some existing private docks along a short stretch of shoreline within the City. The location of each of these docks has been designated as a “site-specific” limited development area. The docks will be allowed to remain in their locations, and a change in ownership will not affect the status of the site-specific limited development area. However, upon removal of the dock for anything but maintenance or replacement, the limited development status will be revoked, and the dock site will be designated as protected (USACE 2012).

The Columbia River’s active continuous U.S. Geological Survey (USGS) gage nearest to the planning area is gage No. 12514500 (on Clover Island in Kennewick, Washington). The Columbia River at this gage drains 104,000 square miles. This gage is a water surface elevation gage and has records from Water Year 1988 to present. The water surface elevation at this gage ranges from 335 feet to 344 feet (National Geodetic Vertical Datum 1929).

The closest Snake River historic USGS gage that measured streamflow near the City is gage No. 13353000 (below Ice Harbor Dam, Washington). The Snake River at this gage drains 108,500 square miles. It has records from Water Years 1913 to 2000.

Because the planning area is within the Lake Wallula portion of the Columbia and Snake rivers, water levels are generally stable. Floodplain levels are also confined due to river regulation.

3 EXISTING RESTORATION PLANNING, PROGRAMS, AND PARTNERS

This section describes the range of restoration planning, programs, and partners at work in the area.

There is a sizable body of literature on recent habitat and environmental planning that pertains to shoreline ecosystems, flora, and fauna in the region, as well as several documents that specifically address shoreline conditions within the City. These documents collectively describe a number of plans and projects and the status of science regarding restoration of shorelines within the interior mid-Columbia basin. The documents are as follows:

- ICBEMP 2003
- MIG 2012
- *Tri-Cities Rivershore Enhancement* 1997
- *Pasco Rivershore Enhancement Vision 2012*
- Pasco 2012
- Link et al. 2006
- USFWS 2008
- USACE 2012

Many organizations are involved in shoreline restoration and protection in the City, including federal and state government, tribal government, Franklin Conservation District, and local conservation organizations. The work of many of these organizations overlap and coordinate in a number of different ways. The more prominent organizations and their contributions are described in the following sections; the descriptions may not name all groups that have contributed to shoreline restoration or protection in the past and may in the future, as there may be other groups that arise or that Anchor QEA is unaware of at this time.

3.1 Franklin Conservation District

The Franklin Conservation District (District) helps landowners to develop solutions to local resource concerns (e.g., soil, air, and water) by providing technical and financial assistance.

3.2 Confederated Tribes of the Umatilla Indian Reservation

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) is a fish and wildlife co-manager of the mid-Columbia Basin. CTUIR works for the protection and enhancement of treaty fish, wildlife, and habitats within the City and the region for present and future generations.

3.3 Washington State Recreation and Conservation Office

The Washington State Recreation and Conservation Office (RCO), formerly the Interagency Committee for Outdoor Recreation, administers the Salmon Recovery Funding Board for funding habitat protection and restoration projects and associated activities to benefit salmon (see also Section 3.10).

3.4 National Marine Fisheries Service

The National Marine Fisheries Service (NMFS), a division of the National Oceanographic and Atmospheric Administration Fisheries Department (NOAA), regulates development of in-water actions within waterways that provide habitat for Endangered Species Act (ESA)-listed salmonid species. NMFS issued a Biological Opinion (BiOp) related to the USACE management of the McNary Pool shoreline, which included conservation measures and recommendations for shoreline and riparian improvement along the Columbia River, including within the City. NMFS also leads recovery efforts for populations of salmon and steelhead in Washington and other states, which often includes consideration of protection and restoration of shoreline habitat that supports various life stages of these fish. NMFS also administers the Watershed Program, which evaluates the effectiveness of habitat and watershed restoration strategies or techniques.

3.5 Nonprofit Groups

Washington Trout is a nonprofit conservation ecology organization that seeks to preserve, protect, and restore Washington's wild fish and their habitats. Pheasants Forever contributes to the restoration of grasslands to benefit upland game birds. The Lower Columbia Basin Audubon Society (LCBAS) seeks to conserve and restore regional ecosystems, focusing on

birds and wildlife. LCBAS also provides environmental education opportunities for the general public and advocates responsible public policy and legislation for natural resources.

3.6 U.S. Army Corps of Engineers

USACE administers federal shoreline lands in the City. The various shoreline reaches within the City are classified by USACE as either Limited Development Areas, Public Recreation Areas, Protected Shoreline Areas, or Prohibited Access Areas, based on an analysis of current land use, bathymetric information, habitat requirements, and known environmentally and culturally sensitive areas (USACE 2012).

These designations serve to facilitate management and protection of the environment and the public, while allowing some level of private development to adjacent property owners. The entire Lake Wallula reservoir was designated as critical habitat for eight stocks of fish found in Lake Wallula (upper Columbia River spring Chinook salmon, upper Columbia River steelhead, mid-Columbia River steelhead, Snake River sockeye salmon, Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, Snake River steelhead, and bull trout). The fish were listed as either threatened or endangered under ESA; therefore, habitat protection is a federal priority on the Snake and Columbia Rivers (USACE 2012).

The City leases and manages much of the land owned by USACE and complies with provisions to protect and manage resources, including shallow-water habitat along shorelines important to juvenile salmonid survival for resting and foraging during their migration to the ocean and riparian vegetation along the shoreline providing benefits to fish and a wide range of wildlife (USACE 2012).

3.7 U.S. Bureau of Reclamation

The U.S. Bureau of Reclamation (USBR) manages the federal Columbia Basin Project, with irrigation operations provided locally by the South Columbia Basin Irrigation District. The Columbia Basin project provides irrigation water. It is located in east central Washington and currently serves about 671,000 acres, or approximately 65% of the 1,029,000 acres originally authorized by Congress, and includes agricultural lands in the City and Franklin County.

The Columbia River Basin project is subject to the terms and conditions of the BiOps for the Federal Columbia River Power System (FCRPS) developed by NMFS for the 14 hydropower projects owned and operated by USACE and USBR. The NMFS Reasonable and Prudent Alternative includes a suite of required actions to mitigate the impacts of operation of the FCRPS on threatened or endangered fish species and their habitats in the Columbia River. In 2008, USBR entered into agreements to support the 2008 FCRPS BiOp and anadromous fish recovery through funding of restoration efforts and other actions included in those agreements.

3.8 U.S. Department of Agriculture

The U.S. Department of Agriculture administers several programs through its Natural Resource Conservation Service that protect and restore shorelines, including the Wetlands Protection Program, the Resource Conservation and Development Program, the Wildlife Habitat Incentives Program, and the Conservation Reserve Program, among several others.

3.9 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) administers a number of programs that restore and protect other shoreline and aquatic habitats. The Partners for Fish and Wildlife Program helps private landowners restore wetlands and other habitats on their properties through voluntary cooperative agreements. The Water Management and Evaluation Program coordinates and manages issues that affect instream flows and shorelines.

3.10 Washington State

The State of Washington Office of the Governor coordinates restoration efforts with state agencies under the legislation of the Salmon Recovery Planning Act and the Salmon Recovery Funding Act. Washington State administers the RCO, as discussed in Section 3.2.

3.11 Washington State Conservation Commission

The Washington State Conservation Commission provides incentives to restore and improve salmon and steelhead habitat on private land under its Conservation Reserve Enhancement Program.

3.12 Washington State Department of Ecology

Ecology works with local jurisdictions, agricultural interests, and others to develop cleanup plans, or total maximum daily loads (TMDLs) for waterbodies, which contain pollutants that exceed state water quality criteria. The Columbia and Snake rivers are on the Ecology 303(d) list of impaired waters for temperature within the planning area. The Columbia River also has a TMDL for total dissolved gas and is a 305(b) water of concern for pH. Additionally, the Snake River has TMDLs for dioxin and total dissolved gas, and it is a 305(b) water of concern for pH and dissolved oxygen (Anchor QEA 2014).

Ecology provides water quality monitoring grants and administers the Watershed Planning Act, which supplies grants to local groups to produce watershed plans.

3.13 Washington State Department of Fish and Wildlife

Washington Department of Fish and Wildlife (WDFW) participates in the management of the McNary Pool. WDFW participates and directs the restoration of natural environments and the ecological communities that inhabit them and promotes protection and restoration of aquatic and shoreline ecological functions for public benefit and sustainable social and economic needs (WDFW 2010). WDFW works to protect and restore natural habitat for fish and wildlife near rivers and streams statewide through the following mechanisms: providing technical assistance to public agencies, non-profit groups, and landowners on habitat protection measures; managing wildlife areas; and protecting water quality for fish.

3.14 Washington State Department of Natural Resources

Washington State Department of Natural Resources (DNR) restores freshwater and marine habitat under its Aquatic Lands Enhancement Account Grant Program.

3.15 Washington State Parks and Recreation Commission

Washington State Parks and Recreation Commission manages Sacajawea State Park located at the confluence of the Columbia and Snake rivers and has been involved in a planning and design project that included restoration of the shoreline and native riparian, wetland, and shrub steppe habitat at the park (Anchor QEA 2006).

3.16 Confederated Tribes of the Umatilla Indian Reservation

CTUIR is a union of the following three tribes: Cayuse, Umatilla, and Walla Walla. As part of the Columbia Basin Fish Accords¹, CTUIR is annually implementing more than 19 contracts for work related to habitat enhancement, fish passage improvement, hatchery supplementation, and monitoring and evaluation. The goal of these projects is increased spawning success, rearing capacity, smolt escapement, and adult holding in CTUIR project areas of the Umatilla, Walla Walla, John Day, Grande Ronde, North Fork John Day, and Tucannon basins. In addition, CTUIR seeks to achieve healthy watersheds (Jones et al. 2008) and provide sustainable harvest opportunities for aquatic species of the first food order² by protecting, conserving, and restoring native aquatic populations and their habitats (Federal Caucus 2015).

¹ Under the Columbia Basin Fish Accords, federal agencies, tribes, and states work together as partners to provide tangible survival benefits for salmon recovery by upgrading passage over federal dams, restoring river and estuary habitat, and through scientific hatchery management.

² CTUIR's Department of Natural Resources has adopted a mission based on "First Foods" ritualistically served in a tribal meal.

4 RESTORATION CONTEXT, GOALS, AND PRIORITIES

Shoreline restoration is a response to habitat impairment that has occurred as a result of alterations to the hydrology and physical structure of the shore. To plan restoration, there must be an understanding of the major existing impairments, an overarching set of goals to guide the work, a prioritization context to organize the efforts, and a list of the available opportunities.

4.1 Shoreline Impairments

The ecosystem-wide processes and structure of City shorelines were described in detail in the IAC Report for the City (Section 5; Anchor QEA 2014). In addition, the alterations to these processes were discussed in terms of how the processes are interrupted or curtailed within the City and how physical and biological functions of habitat are affected.

Table 1 provides a summary of the major City shoreline processes, alterations, and impairments. As shown in Table 1, alterations have occurred and impacted shoreline processes involving hydrology, sediment, water quality, and habitat. These alterations include Columbia and Snake River Basin water storage and conveyance, impervious surfaces, vegetation alterations, water quality impacts, structural effects on habitat, shoreline hardening/stabilization, channel realignment, and other alterations such as lighting, noise, recreation, and species competition.

**Table 1
Ecological Processes and Structures Impaired by Major Alterations**

		Ecological Processes and Structure																	
		Hydrology					Sediment	Water Quality			Habitat								
		Storage	Subsurface Infiltration and Flow	Surface Flows	Hyporheic Exchange	Groundwater Recharge	Soil Erosion	Deposition/Storage	Nutrient Sources	Temperature/Dissolved Oxygen	Toxins/Pathogen Sources	Riparian Vegetation Recruitment	Native Grasslands and Shrub Steppe	Terrestrial Species – Foraging	Terrestrial Species – Breeding/Nesting	Terrestrial Species – Migration	Aquatic Species – Spawning	Aquatic Species – Rearing	Aquatic Species – Migration
Major Alterations	Impairments																		
Snake and Columbia Basin Project(s) Storage	Restricts water movement	x		x			1	x		x	x	x					x	x	x
	Restricts sediment movement		x		x		x	x	x	x	x								
	New lakes and wetlands	x			x	x	x		x	x	x	x	x	x	x	x	x	x	x
	More rapid pool elevation fluctuations				x		x		x		x						x	x	x
Snake and Columbia Basin Project Diversion/Conveyance	New or relocated channels and wetlands	x			x	x	x		x	x		x	x	x	x	x	x	x	x
	New recharge areas					x													
	Water velocity increases						x	x			x	x							
Impervious Surfaces	Runoff rather than infiltration	x	x	x	x	x	x		x	x	x						x	x	
	Stormwater management/infrastructure	x	x			x			x		x								
	Habitat loss								x	x		x	x	x	x	x	x	x	x
Vegetation Alterations	Loss of nutrient and organic inputs, reduced evapotranspiration and bioinfiltration, and increased toxin and nutrient loading								x	x	x	x	x						
	Invasive species (terrestrial and aquatic)											x	x	x	x		x	x	
	Aquatic species												x	x	x		x	x	
	Increased soil erosion						x			x	x	x		x			x	x	
Water Quality Impacts	Fertilizer/pesticide/herbicide Inputs										x						x	x	
	Effluent inputs									x	x						x	x	
	Temperature increases									x							x	x	
	Bioaccumulation of toxins										x			x	x		x	x	
Structural Effects on Habitat	Habitat fragmentation by roads											x	x	x	x	x			
	Overwater structures alter sediment, organic material pathways, and the photic zone			x					x			x	x				x	x	x
	Aquatic fill and reduced water storage	x		x						x							x		x
Shoreline Hardening/Stabilization	Habitat loss and replacement of variable-sized material with large homogenous substrate			x								x		x	x	x	x	x	x
	Increased wave energy at toe of slope and energy transfer downstream/downcurrent of hardening			x			x	x											x
	Sediment and subsurface water cycle disruption				x			x											
	Organic material cycle disruption							x	x									x	
Channel Realignment	Water velocity increases			x				x		x							x	x	x
	Reduced floodplain connection and functions				x		x		x		x						x	x	
	Decreased temporary storage of sediment and nutrient-, toxin-, or pathogen-laden water in streams							x	x	x	x								

**Table 1
Ecological Processes and Structures Impaired by Major Alterations**

		Ecological Processes and Structure																						
		Hydrology					Sediment		Water Quality			Habitat												
		Storage	Subsurface Infiltration and Flow	Surface Flows	Hyporheic Exchange	Groundwater Recharge	Soil Erosion	Deposition/Storage	Nutrient Sources	Temperature/Dissolved Oxygen	Toxins/Pathogen Sources	Riparian Vegetation Recruitment	Native Grasslands and Shrub Steppe	Terrestrial Species – Foraging	Terrestrial Species – Breeding/Nesting	Terrestrial Species – Migration	Aquatic Species – Spawning	Aquatic Species – Rearing	Aquatic Species – Migration					
Major Alterations	Impairments																							
Other Alterations	Artificial lighting increases light delivery at unnatural times																	X	X	X	X	X	X	
	Increased noise																		X	X	X			
	Recreation infrastructure increases wave energy at shoreline (boat ramps and wakes)							X	X												X	X	X	
	Non-native species predation																		X	X	X	X	X	X
	Competition for resources from non-native species																		X	X	X	X	X	X

4.2 Restoration Goals and Objectives

As described in Section 3, much work has been done to set the direction for habitat management and restoration planning in the region. The general management goals identified in the plans for these areas were used to formulate a list of goals and example objectives for this Plan. These goals and objectives will guide the restoration actions described herein and can be used to formulate metrics to monitor progress in implementing the Plan.

The goals and objectives are as follows:

1. Protect, maintain, and, where feasible, enhance or restore riparian, shrub-steppe, wetland, and floodplain areas within SMP jurisdiction. Example objectives include removing or managing invasive vegetation and re-planting natives and consolidating recreation access away from sensitive habitats.
2. Promote and enhance habitat diversity, especially for sensitive or rare areas (e.g., shrub-steppe and riparian zones). Example objectives include incorporating habitat complexity and vegetative components into soft bank stabilization techniques or reconnecting off-channel habitat.
3. Protect and maintain water quality, which contributes to the recovery of sensitive species and improves impaired temperatures and contaminant conditions. Example objectives include implementing best management practices (BMPs) for soil erosion and for applying pesticides, herbicides, and fertilizers in irrigated areas, as well as reducing unnecessary impervious surface area.

4.3 Restoration Opportunities

Several opportunities now exist for restoration of the City shorelines, presented in the following sections by reach and by specific projects or sites.

4.3.1 General Restoration Opportunities

Various ecological benefits can be realized if shoreline impairments are addressed by restoration in the City. Opportunities can be identified and compared against various criteria to prioritize implementation. The habitat plans and programs described in Section 3 describe direction and/or recommendations for actions to address many of the impairments that occur within the City. Table 2 shows the restoration or protection opportunities that these plans and

programs have identified, including the reasons for the habitat impairment and a summary of the ecological benefits to be realized from the actions. The IAC Report (Anchor QEA 2014) also recommended actions for specific areas within City SMP boundaries, shown in Table 2 by reach and sub-reach (see the IAC Report for reach extents).

Major opportunities include establishing or protecting sensitive habitats such as riparian, wetland, off-channel, and shrub-steppe habitats. This could be accomplished by consolidating or restricting access to these areas for recreation purposes and development in general. WDFW has recommended specific measures for shrub-steppe habitat restoration (WDFW 2011a) and has given direction for managing these habitats in developed areas (WDFW 2011b). Protecting or improving water quality was also a key element of habitat management under these plans, particularly water temperature. Examples of measures that could be used to improve or protect water quality include implementing the most recent state stormwater controls, as well as using BMPs for soil erosion and control of pesticides, herbicides, and fertilizers to irrigated areas in agricultural areas within the City's UGA.

Table 2
Restoration and Protection Opportunities and Priorities¹ in Pasco

Restoration/Protection Opportunities	Key Impairments ²	Key Benefits to Ecological Functions ²	Pasco (All Reaches)	Reach 1A	Reach 1B	Reach 1C	Reach 1D	Reach 1E	Reach 2	Reach 3A	Reach 3B	Reach 4A	Reach 4B	Reach 5A	Reach 5B	Reach 5C	Reach 5D	Reach 6A	Reach 6B	Reach 6C	Reach 7	Reach 8A	Reach 8B		
1	Establish riparian buffers where absent and/or remove invasives where present	Loss of nutrient and organic inputs and reduced evapotranspiration and bioinfiltration	Riparian vegetation recruitment																						
			Temperature/dissolved oxygen improvements																						
			Improved toxin/pathogen management capabilities		IAC	IAC	IAC	IAC	IAC	IAC			IAC			IAC	IAC	IAC	IAC		IAC	IAC	IAC	IAC	IAC
			Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration																						
2	Restore/enhance shrub-steppe along shorelines	Shrub-steppe habitat loss and fragmentation	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration			IAC															IAC	IAC	IAC		
3	Protect intact shrub-steppe habitat	Shrub-steppe habitat loss and fragmentation	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration				IAC			IAC	IAC						IAC				IAC	IAC	IAC		
4	Protect/enhance riparian vegetation along shorelines	Habitat loss	Increased native riparian habitat for terrestrial and aquatic species foraging/breeding/nesting/migration Protections for aquatic and terrestrial species foraging/breeding/nesting/rearing		IAC	IAC	IAC	IAC	IAC	IAC	IAC		IAC						IAC	IAC	IAC				
5	Add vegetative filter strips (grass or woody plants) between agricultural fields and adjacent waterbodies	Runoff rather than infiltration, habitat loss, and temperature impairment	Increased infiltration and groundwater recharge																						
			Support native grassland and shrub steppe features						IAC																
			Increased habitat for terrestrial species foraging/breeding/nesting/migration																						
6	Manage built environment encroachment or recreation use to minimize disturbance to shoreline vegetation and aquatic habitat	Habitat loss	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat																						
			Temperature/dissolved oxygen improvements		IAC	IAC	IAC	IAC	IAC			IAC	IAC		IAC	IAC	IAC	IAC	IAC	IAC		IAC	IAC	IAC	
			Improved toxin/pathogen management capabilities																						

Table 2
Restoration and Protection Opportunities and Priorities¹ in Pasco

Restoration/Protection Opportunities	Key Impairments ²	Key Benefits to Ecological Functions ²	Pasco (All Reaches)	Reach 1A	Reach 1B	Reach 1C	Reach 1D	Reach 1E	Reach 2	Reach 3A	Reach 3B	Reach 4A	Reach 4B	Reach 5A	Reach 5B	Reach 5C	Reach 5D	Reach 6A	Reach 6B	Reach 6C	Reach 7	Reach 8A	Reach 8B
7 Provide stormwater controls	Runoff rather than infiltration	Increased infiltration and groundwater recharge	IAC																				
	Stormwater management/infrastructure	Protections for surface water quality																					
8 Use Best Management Practices for landscaped irrigated areas/provide incentives to homeowners to convert lawn areas to native plantings	Demand on water supply for irrigation	Reduced demand on water supply for irrigation			IAC				IAC														
	Fertilizer/pesticide/herbicide Inputs	Reductions in evapotranspiration; improved temperature/dissolved oxygen and protection against toxin and pathogen sources																					
	Habitat loss																						
	Temperature impairment																						
Bioaccumulation of toxins																							
9 Replace creosoted in-water structures (e.g., docks and dolphins)	Bioaccumulation of toxins	Reduced toxin sources																					
	Habitat loss	Improved habitat for aquatic species rearing/migration																	IAC				
	Water quality impairment	Protect water quality																					
10 Set aside to maintain or restore environmental values including fish and wildlife habitat	N/A	Maintained or increased habitat for terrestrial and aquatic species		MSMP	MSMP	MSMP	MSMP	MSMP	MSMP													MSMP	
10 Incorporate soft shore stabilization where appropriate (large woody debris and vegetation)	Habitat loss along shoreline	Maintained or increased habitat for aquatic species rearing/migration																					
	Increased wave energy due to shoreline armoring	Reduced soil erosion/sediment movement										IAC		IAC	IAC	IAC	IAC	IAC					

Notes:

1 Priority categories are Very High (habitat protection actions) - shown in ***bold italics***, High (actions that restore ecosystem function) shown in ***bold***, and Moderate (actions that restore habitat structure) shown in *italics*.

2 Impairment and benefits general categories come from Table 1 of this Restoration Plan

N/A = not applicable

MSMP = McNary Shoreline Management Plan

IAC = Inventory, Analysis, and Characterization

Source: *Shoreline Inventory, Analysis, and Characterization Report* (Anchor QEA 2014)

4.3.2 Site-specific Restoration and Protection Opportunities

While most plans and programs from the SMP jurisdictional area address large-scale direction and management, there is a small set of actions that are named or have been suggested for specific areas. Table 3 lists these locations and opportunities and includes the source document, the impairment to be addressed, and key benefits to ecological function expected as a result of the project implementation.

**Table 3
Site-specific Restoration and Protection Opportunities in Pasco**

	Site	Restoration/Protection Opportunities	Priority ¹	Source	Key Impairments ²	Key Benefits to Ecological Functions ²
1	Richland Bend Habitat Unit – USACE Wildlife Habitat Management Area (southern portion of SR 1c – Pasco Ranch and all of SR 1d – Horrigan Farms)	Set aside to maintain or restore riparian and upland environmental values including wildlife habitat	Very High	MSMP	Habitat loss	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat
		Manage built environment encroachment or recreation use to minimize disturbance to shoreline vegetation and aquatic habitat	High	IAC/RLAP/MSMP		Temperature/dissolved oxygen improvements
		Provide incentives to homeowners to replace lawn with native vegetation and implement BMPs for water conservation, application of fertilizer, pesticides, and herbicides (Broadmoor future planned development)	Moderate	BPJ		Improved toxin/pathogen management capabilities
		Set aside to maintain and restore aquatic and riparian environmental values including fish and wildlife habitat	High	MSMP		Increased habitat for terrestrial species foraging/breeding/nesting; protect against toxin and pathogen sources
		Protect and enhance existing riparian and shrub steppe habitat	High	IAC/MSMP		Increased habitat for terrestrial and aquatic species foraging/breeding/nesting/rearing/migration
		Establish riparian buffer between aggregate sorting facility and river	Moderate	IAC/MSMP		Protection for aquatic and terrestrial species
		Explore opportunities for restoring off-channel habitat at two existing small embayments used for boat access (near Dent Road) and as a water intake farther south	Very High	IAC/MSMP		Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration
2	Chiawana Park (public park leased from USACE; all of SR 3 a)	Protect and enhance riparian buffer habitat throughout the park and limit mowed lawn areas extending to the shoreline	High	IAC/MSMP	Habitat loss	Riparian vegetation recruitment
		Implement vegetation management program for purple loose strife infestation	High	TCRM		Temperature/dissolved oxygen improvements
		Protect existing shrub-steppe habitat	High	IAC		Improve toxin/pathogen management capabilities
		Replace/update existing boat launch to current standards concerning grating and reduction in overwater cover	High	BPJ		Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration
		Manage existing and planned high intensity recreational development to minimize disturbance to shoreline vegetation and aquatic habitat	High	IAC/RLAP/MSMP		Increased habitat for terrestrial species foraging/breeding/nesting
		Provide stormwater controls and incorporate LID measures	Moderate	IAC		Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration
						Protections for aquatic species foraging/breeding/nesting/migration/rearing
			Protections for aquatic and terrestrial species foraging/breeding/nesting/migration			
			Runoff rather than infiltration	Increased infiltration and groundwater recharge		
			Requires more built environment to manage (stormwater management infrastructure)	Protections for surface water quality		

**Table 3
Site-specific Restoration and Protection Opportunities in Pasco**

	Site	Restoration/Protection Opportunities	Priority ¹	Source	Key Impairments ²	Key Benefits to Ecological Functions ²
3	Sunset Acres (SR 3 b; owned by USACE)	Establish riparian buffers where absent and/or remove invasives where present	High	IAC	Loss of nutrient and organic inputs and reduced evapotranspiration and bioinfiltration	Riparian vegetation recruitment Temperature/dissolved oxygen improvements Improve toxin/pathogen management capabilities Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration
		Protect existing riparian and shrub steppe habitat	High	IAC/MSMP	Habitat loss	Protections for aquatic and terrestrial species foraging/breeding/nesting/rearing
		Remove old dock	High	TCRM	Habitat loss	Protections for aquatic species foraging/breeding/nesting/migration/rearing
		Include clusters of wildlife habitat in potential future expansion of park development	High	RLAP	Habitat loss	Protections for aquatic and terrestrial species foraging/breeding/nesting/migration/rearing
		Manage built environment encroachment and incorporate native vegetation restoration with existing and planned upland development	Moderate	IAC	Habitat loss	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat Improved toxin/pathogen management capabilities Temperature/dissolved oxygen improvements
4	Riverview Park (SR 5c)	Improve open-water pond habitat east of the park, including riparian vegetation restoration	High	TCRM	Habitat loss	Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration
		Consider soft-engineering techniques incorporating wood structure and vegetation to increase habitat function along hardened banks. Remove where reasonably practical or manage (trim or thin) Russian Olive to enhance foraging habitat for birds and replant with native vegetation.	High	IAC/MSMP	Habitat loss	Riparian vegetation recruitment
5	Osprey Pointe/Big Pasco (SR 6c)	Allow businesses to adopt segments of shoreline for restoration and invasive species removal	Moderate	TCRM	Habitat loss	Increased native shrub-steppe and riparian habitat for terrestrial species foraging/breeding/nesting/migration
		Protect existing riparian vegetation and do not mow woody species	High	IAC/MSMP	Habitat loss	Protections for aquatic and terrestrial species foraging/breeding/nesting/migration/rearing
		Establish riparian buffers where absent and/or remove invasives where present	High	IAC	Habitat loss	Riparian vegetation recruitment Temperature/dissolved oxygen improvements Improve toxin/pathogen management capabilities Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration

**Table 3
Site-specific Restoration and Protection Opportunities in Pasco**

	Site	Restoration/Protection Opportunities	Priority ¹	Source	Key Impairments ²	Key Benefits to Ecological Functions ²		
6	Sacajawea State Park (SR 6c – Port of Pasco and Reach 7 – State Parks)	Establish riparian buffers where absent and/or remove invasives where present	High	IAC	Habitat loss	Riparian vegetation recruitment Temperature/dissolved oxygen improvements Improve toxin/pathogen management capabilities Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration		
		Protect intact shrub-steppe	Very High	IAC/MSMP	Habitat loss	Increased native shrub-steppe and riparian habitat for terrestrial species foraging/breeding/nesting/migration		
		Manage built environment encroachment or recreation use to minimize disturbance to shoreline vegetation and aquatic habitat	Moderate	MSMP	Habitat loss	Riparian vegetation recruitment for terrestrial species foraging/breeding/nesting habitat		
		Explore opportunities for restoring off-channel habitat including the small embayment off the Snake River	Very High	CLSD/MSMP	Habitat loss	Water quality improvement at embayment Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration/rearing		
		Restore/enhance existing wetlands, shrub-steppe, and riparian habitat	Very high	CLSD	Habitat loss	Increased habitat for terrestrial and aquatic species foraging/breeding/nesting/migration/rearing Increased subsurface infiltration and flow; protect surface water quality		
		Replace/update existing boat launch to current standards concerning grating and reduction in overwater cover	High	CLSD	Habitat loss	Protections for aquatic species foraging/breeding/nesting/migration/rearing		
		Preserve existing shrub-steppe and riparian habitat	Very high	IAC/MSMP	Habitat loss	Protections for aquatic and terrestrial species foraging/breeding/nesting/rearing		
		Incorporate soft-engineering techniques to moderate slopes along hardened banks	Moderate	CLSD	Habitat loss	Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration/rearing		
		7	Sacajawea Heritage Trail Corridor (existing and planned extensions; all reaches)	Establish riparian buffers where absent and/or remove invasives where present within trail corridor	High		Loss of nutrient and organic inputs and reduced evapotranspiration and bioinfiltration	Temperature/dissolved oxygen improvements Improve toxin/pathogen management capabilities Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration
				Protect and enhance shrub-steppe and riparian habitat	Very High		Habitat loss	Increased native shrub-steppe and riparian habitat for terrestrial species foraging/breeding/nesting/migration
Provide stormwater controls for impervious facilities associated with the trail	Moderate				Runoff rather than infiltration More built environment required to manage stormwater management infrastructure	Increased infiltration and groundwater recharge Protections for surface water quality		

Notes:
 1 Categories are Very High (habitat protection actions), High (actions that restore ecosystem function), and Moderate (actions that restore habitat structure). Funded projects would take priority over other projects within each category.
 2 Impairment and Benefits categories come from Table 2 of this Restoration Plan.

- BMP = best management practice
- BPJ = Best Professional Judgment
- CLSD = Conceptual Level Shoreline Design Memorandum
- IAC = Inventory, Analysis, and Characterization Report
- LID = Low Impact Development
- MSMP = McNary Shoreline Management Plan
- RLAP = Rivershore Linkage and Amenity Plan
- SR = Washington State Route
- TCRM = Tri-Cities Rivershore Master Plan
- USACE = U.S. Army Corps of Engineers

4.4 Project Evaluation and Prioritization Criteria

Projects and opportunities in this Plan can be evaluated against various criteria to prioritize implementation. The following list includes a description of criteria that indicate that a project is viewed as implementable under this Plan.

Potential projects should meet the following requirements:

- Meet goals and objectives for shoreline restoration as described in Section 4.2
- Maintain consistency with existing plans and programs as described in Section 3
- Have public support
- Be located on public property or property owned by a willing partner in restoration projects
- Restore ecosystem processes or provide habitat protection (those that restore function by providing habitat structure only would take a lesser priority)
- Improve a rapidly deteriorating habitat condition
- Have high benefit to ecosystem function relative to cost
- Provide riparian, shoreline, or instream habitat for spawning and rearing listed salmonids or improve conditions in sensitive shrub-steppe systems for state and federally listed native wildlife (WDFW 2011b).

All specific projects or actions that compose a project listed in Table 2 exhibit some, if not all, of the above criteria. To prioritize these actions, they were assigned to a category of Very High, High, and Moderate relative to their value in achieving the SMP goal of no net loss for shorelines within the City's SMP jurisdiction (see Table 2). Projects were categorized as follows:

1. Very High: Habitat protection projects or actions
2. High: Restoration of ecosystem functions (funded actions take higher priority within this category)
3. Moderate: Restoration of habitat structure (funded actions take higher priority within this category)

5 IMPLEMENTATION, MONITORING, AND REVIEW

Implementation of the restoration plan will require close coordination among the City, Ecology, and other organizational partners noted in Section 3.

5.1 Potential Restoration Funding Partners

There are currently no confirmed funds available for the identified projects. Accordingly, the restoration described in this Plan is dependent on grant funding and the variety of outside funding sources available for restoration work. Funds are distributed through grant-making agencies at the local, state, and federal level; opportunities described below are primarily administered by state and federal agencies. It is expected that funding will be derived from various sources. Sources listed here do not represent an exhaustive list of potential funding opportunities but are meant to provide an overview of the types of opportunities available. These sources include the following:

- American Sportfishing Association’s Fish America Foundation Grants
- City Parks and Recreation Department
- Ecology
 - Aquatic Weeds Financial Assistance Program
 - Water Quality Grants, including federal Clean Water Act Section 319 Program
 - Coastal Protection Fund (Terry Hussman) Grant Program
 - Coastal Zone Management Administration/Implementation Awards
- U.S. Environmental Protection Agency Region 10: Pacific Northwest
 - The Clean Water State Revolving Fund Program
 - Nonpoint Source Implementation Grant (319) Program
 - Wetland Protection, Restoration, and Stewardship Discretionary Funding
- Franklin Conservation District
- National Fish and Wildlife Foundation
 - Bring Back the Natives: A Public-Private Partnership for Restoring Populations of Native Aquatic Species
 - Five-star Restoration Matching Grants Program
 - Marine Debris Prevention and Removal Program

- Native Plant Conservation Initiative
- The Migratory Bird Conservancy
- Recreation and Conservation Office of Washington
 - Salmon Recovery Funding Board
 - Aquatic Lands Enhancement Account (ALEA)
 - Estuary and Salmon Restoration Program
 - Family Forest Fish Passage Program
 - Land and Water Conservation Fund
 - Washington Wildlife Recreation Program
- USFWS
 - Partners for Fish and Wildlife Program
 - National Fish Passage Program
 - Cooperative Endangered Species Conservation Fund
 - North American Wetlands Conservation Act Grants Program
- USBR Columbia Basin Project implementation funding
- NOAA Restoration Center
 - Community-based Restoration Program (CRP)
 - NOAA CRP 3-Year Partnership Grants
 - NOAA CRP Project Grants
- WDFW
 - ALEA Volunteer Cooperative Projects Program
 - Landowner Incentive Program
- Private foundations, businesses, and other groups administer grant programs that include funding for shoreline habitat and ecosystems, including:
 - The Russell Family Foundation
 - William C. Kenney Watershed Protection Foundation
 - Northwest Fund for the Environment
 - Kongsgaard-Goldman Foundation
 - The Bullitt Foundation
 - The Compton Foundation

- Doris Duke Charitable Foundation
- The Hugh and Jane Ferguson Foundation
- Washington Trout
- Mid-Columbia Fisheries Enhancement Group

5.2 Timelines, Benchmarks, and Monitoring

The City's restoration work as it relates to this Plan should be monitored and evaluated on a set timeline against a suite of benchmarks to determine consistency with the State's SMP policy standard of no net loss of ecological functions. This Plan will be implemented when the SMP is adopted by Ecology and could be implemented with a suggested timeline (shown below), depending on funding availability.

Within 10 years of Plan adoption, objectives could include the following:

- Explore and solidify funding opportunities for projects
- Fund and complete two to five restoration projects, depending upon success of securing restoration funding.
- Identify and implement communication approaches for periodically updating residents on the City's shoreline restoration efforts.

Quantifiable benchmarks should also be established to track changes in shoreline conditions and to document no net loss of shoreline functions. This can be tracked through permitting activity at the City.

Information that could be tracked and monitored can be sourced from permit information, project applications, and completion reports. Possible tracking topics are as follows:

- Shoreline variances and reasons/nature of variance
- Linear distance of new hard armoring or hard armoring removed above the OHWM
- Linear distance of new soft shoreline stabilization
- Linear distance of new or enhanced riparian vegetation or vegetation removals
- Number of new docks and coverage area
- Number of new piles or piles removed
- Cubic yardage and coverage area of fill removed or replaced below the OHWM

- Number of new boat ramps or boat ramps removed
- Number of new outfalls or outfalls removed/consolidated
- Wetland acreage existing, restored, and lost
- Increase or decreases in impervious surface area

5.3 SMP Review

The City will be required to conduct periodic SMP updates, which will include an evaluation of the efficacy of the SMP and this Plan. This review will involve comparing past conditions with existing conditions and assessing whether the actions, policies, and regulations set since the last SMP update have been valuable in ensuring no net loss. The evaluation will be an opportunity to adjust these measures as applicable for the benefit of future shoreline conditions.

6 REFERENCES

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