

APPENDIX D

Shoreline Restoration Plan

Prepared for the Clark County Coalition

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



Final Shoreline Restoration Plan

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Prepared For:
Clark County Coalition

June 2011



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Final Shoreline Restoration Plan
Clark County Coalition
June 2011

Phase 4, Year 1, Restoration Plan, Revisit Phase 3

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ACRONYMS

BMPs	Best management practices
BPA	Bonneville Power Administration
CIP	Capital improvement program
CREP	Conservation Reserve Enhancement Program
Ecology	Washington State Department of Ecology
EDT	Ecosystem Diagnosis and Treatment
EPA	Environmental Protection Agency
ESU	Evolutionarily Significant Unit
GIS	Geographic information system
LCFRB	Lower Columbia Fish Recovery Board
LCREP	Lower Columbia River Estuary Partnership
LID	Low impact development
LWD	Large woody debris
NFWF	National Fish and Wildlife Foundation
NGO	Non-governmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OHWM	Ordinary high water mark
RCO	Washington State Recreation and Conservation Office
RM	River mile
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
SNAP	Stormwater Needs Assessment Program
SRFB	Salmon Recovery Funding Board
TMDL	Total maximum daily load
TU	Trout Unlimited
UGA	Urban growth area
USFS	U.S. Forest Service

USFWS	U.S. Fish and Wildlife Service
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
WSU	Washington State University

CHAPTER 1 INTRODUCTION

The cities of Battle Ground, Camas, La Center, Ridgefield, Vancouver, Washougal, and Yacolt have formed a coalition with Clark County and joined efforts to complete comprehensive Shoreline Master Program (SMP) Updates. The updated SMPs must contain a plan to restore shoreline ecological functions where such functions are degraded or impaired. This Restoration Plan supplements the Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2010), which documents general shoreline conditions throughout the participating jurisdictions.

1.1 Plan Purpose and Scope

The Restoration Plan is designed to satisfy the shoreline guideline requirements for shoreline restoration planning, as well as provide a programmatic approach to establishing restoration priorities and actions for the shorelines of Clark County, Washington. It provides a planning-level framework for understanding how and where shoreline ecological functions can be restored in the jurisdictions participating in this Comprehensive Update. The plan also describes how future restoration activities can be integrated with existing and ongoing restoration efforts including: the region-wide effort to restore the lower Columbia River (implemented by various groups such as the Lower Columbia River Estuary Partnership, Lower Columbia Fish Recovery Board, the Bonneville Power Administration (BPA), and Northwest Power and Conservation Council); the work of the Clark County Environmental Services Clean Water Program and Vancouver Lake Watershed Partnership Technical Group; and the diversity of other restoration efforts being implemented by federal, state and local agencies, tribes, non-governmental organizations, and private citizens.

1.1.1 Format and Content – How to Use this Plan

In this document, the term “shoreline” is synonymous with “shorelines of the state.” These are defined in RCW.90.58, the Shoreline Management Act (SMA), and generally comprise all streams with a mean annual flow of 20 cubic feet per second or more, all marine shores, and lakes greater than 20 acres as well as the adjacent “shorelands” that accompany these waters. Shorelands means the lands extending 200 feet from the ordinary high water mark, floodways and contiguous floodplains 200 feet from the floodway, and all associated wetlands. For a list of all of the shorelines of the state in the Coalition jurisdictions, refer to the Draft Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2010).

The format and content of this plan are designed to:

- Describe an overarching **vision** that guides future restoration efforts;
- Summarize the jurisdictions’ shoreline restoration **goals and objectives**;
- Identify the waterbodies and shorelands that are high **priority areas** for restoration;
- Describe specific restoration **opportunities and recommend actions** for each watershed and waterbody;
- Identify potential **partners** and existing/ongoing restoration activities and describe opportunities to **integrate** this plan with those existing efforts; and

- Explain how future restoration efforts can be **implemented** in a way that maximizes effectiveness and achieves the greatest overall benefits.

To understand and effectively implement this plan, restoration planners and practitioners are encouraged to review the vision, goals, and objectives in Chapter 2 to understand the desired restoration outcomes. The information in Chapter 3 provides an overview and context of the watersheds where restoration would occur. Chapter 4 describes the methods used to identify and prioritize ecological restoration areas. Programmatic and specific opportunities and actions in those areas can be found in Chapter 5. Restoration projects can then be fully developed in cooperation with the partners and programs identified in Chapter 6 to maximize restoration benefits. For private landowners, Chapter 7 summarizes the most important actions that can be taken to restore shorelines on private lands. Chapter 8 describes timelines and benchmarks for implementing the Restoration Plan, recognizing that this plan is a long-range effort without dedicated funding. Public outreach and volunteer involvement are vital to implementing restoration projects.

The projects and actions described in this plan represent voluntary actions taken to restore shorelines in the Coalition's jurisdictions. It is not the intent of this plan to require restoration on private property or to commit privately owned land for restoration purposes without the willing cooperation and participation of affected landowners. However, the jurisdictions support restoration actions on both public and private lands and encourage private landowners to help implement this plan. In addition, private landowners who are required to provide mitigation for development-related impacts may wish to implement actions noted in this plan to meet their mitigation obligations (see Chapter 7).

Numerous restoration projects and programs are already underway within the shorelines of the jurisdictions. These projects and programs are discussed by waterbody in the Shoreline Inventory and Characterization report (ESA Adolfson et al., 2010). This Restoration Plan is focused on future shoreline restoration opportunities that will build on existing or proposed restoration efforts.

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

1.2 Defining Restoration

Restoration can be defined generally as re-establishing or repairing a degraded area in a manner that improves ecological structure and function. Restoration creates a net increase in the amount, size, and/or functions of an ecosystem or components of an ecosystem compared to a baseline

condition (Thom et al., 2005a). The shoreline guidelines define restoration more specifically as follows:

*“The reestablishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including but not limited to re-vegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions.”*¹

The guidelines require that restoration goals, policies and actions “be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program.”² Inherent in these definitions is the concept of repairing past damage to natural resources and habitats, but not necessarily recreating historic conditions. Some scientists and resource managers now prefer to use the term “rehabilitation” rather than “restoration.” The term *rehabilitation* is used to define the partial return to original function of ecological processes and physical, chemical, and biological characteristics of aquatic habitat within urban and urbanizing areas (IMST, 2010). Rehabilitation recognizes that functions within an urban setting cannot be fully restored, due to permanent or semi-permanent structures and alterations (such as dams, levees, impervious land cover, floodplain loss). However, this document relies on the term *restoration* for consistency with the shoreline guidelines and in keeping with the definition used above.

Many researchers have cautioned that simply recreating the form or structure of a particular habitat without also addressing the ecosystem processes and their interaction with ecological functions may not fully achieve restoration goals or objectives (Stanley et al., 2005, Montgomery et al., 2003; Gersib 2001). As a result, this plan emphasizes the need to restore ecosystem processes so that restoration strategies are sustainable and successful in the long-term. For example, when planning to create off-channel habitats for fish refuge and rearing, one would first need to consider the sediment transport issues in the river itself. If the off-channel habitats would be silted in quickly, then the long-term restoration goals may not be achieved.

1.2.1 Restoration versus Protection

Restoration is not the same as *protection* or *preservation*. For shorelines, *protection* or *preservation* is achieved primarily through the SMP policies and regulations (as well as other city, county, state, and federal regulations) that safeguard resources from damage caused by use and development. *Protection* or *preservation* requires that development be prohibited in areas that have high value functions or features. These areas are set aside for open space, conservation, and/or wildlife habitat. *Protection* requires deliberate measures to ensure that natural ecosystem

¹ WAC 173-26-020

² WAC 173-26-201(2)(f)

processes (such as channel migration, or large woody debris recruitment, for example) continue with minimal to no impairment.

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

According to the SMA Guidelines, incorporating the following direction in the development of shoreline master programs can help achieve *protection* of ecological functions of the shorelines:

“Programs shall contain policies and regulations that assure at minimum, no net loss of ecological functions necessary to sustain shoreline natural resources. To achieve this standard while accommodating appropriate and necessary shoreline uses and development, master programs should establish and apply: environment designations with appropriate use and development standards, and provisions to address the impacts of specific common shoreline uses, development activities and modification actions, and provisions for the protection of critical areas within the shoreline, and provisions for mitigation measures and methods to address unanticipated impacts.”³

To address *restoration* actions, SMA Guidelines require master programs to incorporate:

“Goals and policies that provide for restoration of impaired ecological functions. These master program provisions shall identify existing policies and programs that contribute to planned restoration goals and identify any additional policies and programs that local government will implement to achieve its goals. These master program elements regarding restoration should make real and meaningful use of established or funded nonregulatory policies and programs that contribute to restoration of ecological functions, and should appropriately consider the direct or indirect effects of other regulatory or nonregulatory programs under other local, state, and federal laws, as well as any restoration effects that may flow indirectly from shoreline development regulations and mitigation standards.”⁴

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

³ WAC 173-26-201(2)(c)

⁴ WAC 173-26-186(8)(c)

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

Examples of Protection Actions	Examples of Restoration Actions
<ul style="list-style-type: none"> a. Treating stormwater runoff using best management or low impact development b. Protecting associated wetlands c. Maintaining/repairing on-site septic systems d. Protecting vegetation in buffers and setbacks e. Protecting/preserving existing trees/vegetation f. Protecting water quality by limiting pesticide/fertilizer use g. Protecting soil integrity h. Regulating groundwater withdrawals i. Limiting construction of new docks and bulkheads j. Clustering residential development k. Preserving property through easement or acquisition l. Limiting public access to sensitive areas 	<ul style="list-style-type: none"> 1. Removing dikes and setting levees back 2. Removing bulkheads 3. Replacing bulkheads with soft shore stabilization (bio-stabilization) 4. Replanting/enhancing riparian vegetation 5. Replacing or enlarging blocked or undersized culverts 6. Removing fill from wetlands and floodplains 7. Rehabilitating soils 8. Removing invasive species 9. Replacing existing dock/pier decking with open grating material to allow light penetration 10. Replacing treated wood docks/piers with concrete, steel and other materials 11. Retrofitting existing impervious surfaces to add stormwater treatment and flow control 12. Removing derelict vessels, fishing gear, creosote pilings and other in-water apparatus 13. Decommissioning underused forest roads 14. Adding large woody debris or engineered log jams to streams 15. Replacing pavement with pervious pavement (such as parks/ boat launches) 16. Relocating public infrastructure outside of floodplains and other sensitive habitats 17. Enhancing off-channel habitat 18. Restoring incised channels 19. Recreating channel meanders

Restoration typically occurs in phases with each phase composed of one or more actions (Table 1-2). The first phase, planning and design, is extremely important in carrying out a restoration plan. The Washington State Stream Habitat Restoration Guidelines (Saldi-Caromile et al., 2004) describe how to plan for and implement numerous types of stream restoration projects, such as placement of large wood and log jams, salmonid spawning gravel, riparian restoration, fish passage restoration, and so on. Another example is the River Restoration Analysis Tool (River RAT), developed by NOAA Fisheries and the U.S. Fish and Wildlife Service, that provides guidance in evaluating the potential impacts of proposed projects on habitat for Pacific salmon and western trout species listed as threatened or endangered under the Endangered Species Act (Skidmore et al., 2010).

The progression from planning to reporting can take weeks, months, or even years depending on the complexity and scope of the restoration effort. In general, the phases and tasks build on and inform one another. Yet in some cases, the progression of phases and actions is not linear but iterative, meaning that it may be necessary to go back and revisit goals or priorities during the implementation phase or do more construction in response to performance monitoring information. This is an adaptive management approach and is discussed in detail in Chapter 8.

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

Table 1-2. Typical Restoration Phases and Actions

Phase	Actions	Timeline				
		Beginning	→	→	→	Completion
Planning	a) Visioning b) Collecting background data c) Setting goals d) Identifying watershed process conditions and problems e) Defining objectives f) Identifying priority areas g) Analyzing alternatives h) Defining success criteria i) Comparing to reference sites j) Identifying potential restoration measures in priority areas k) Identifying partners and collaborators l) Identifying funding sources					
Implementation	m) Selecting projects/sites n) Developing conceptual designs/plans o) Preparing detailed design plans p) Constructing project/site					
Performance Assessment / Monitoring	q) Measuring success criteria r) Comparing to reference sites s) Designing monitoring program t) Collecting performance monitoring data					
Adaptive Management	u) Adjusting design v) Correcting problems (barriers to success) w) Implementing contingency measures					
Reporting	x) Publishing reports documenting project effectiveness y) Communicating successes, failures, and lessons learned					

1.2.2 Restoration versus Mitigation

Restoration is different from mitigation for project impacts. For shorelines, mitigation is achieved primarily through the SMP policies and regulations that safeguard resources from damage caused by use and project development. Mitigation, as defined in WAC 197-11-768, requires sequencing of actions including taking steps to avoid and minimize project impacts prior to compensating for them. Mitigation is typically a required action to offset the impacts of a project to meet regulatory standards for shoreline development. Mitigation requirements are

tailored and specific to a development project and are commensurate with the size and degree of project impact. For example, mitigation for construction of a new dock within the shoreline may require a number of regulatory steps such as 1) avoidance of critical in-water habitats, 2) minimization of the dock width and length to reduce impacts through project design, 3) replacement plantings in the shoreline to offset impacts to habitat, and 4) long-term monitoring of mitigation measures to ensure overall success.

Restoration, on the other hand, involves more than simply following and enforcing existing rules. Restoration requires active steps to improve the condition of the existing resources and replace resources that have been historically lost. Restoration measures are intended to supplement and go beyond shoreline protection efforts such that environmental conditions improve over time. Therefore, restoration is typically non-regulatory, voluntary, and most often undertaken by public agencies, environmental stewardship groups, or local governments often in partnership with private landowners.

1.2.3 No Net Loss and Shoreline Restoration

The concept of *no net loss* of shoreline ecological functions is rooted in the Shoreline Management Act and in the goals, policies, and governing principles of the state's shoreline guidelines. The Act states: "permitted uses in the shoreline shall be designed and conducted in a manner that minimizes insofar as practical, any resultant damage to the ecology and environment of the shoreline area." The guidelines suggest that *no net loss* is achieved primarily through regulatory mechanisms such as mitigation requirements. However, restoration incentives and voluntary actions are also critical to achieving *no net loss* of shoreline functions at a city or county scale.

The SMP requires proponents of shoreline development to fully mitigate impacts caused by their projects. The proponents are not required to improve conditions over and above the impacts of their development actions. However, ongoing degradation from existing development and shoreline violations that are not brought into compliance are likely causing an overall loss of shoreline functions. Restoration actions to offset this degradation are needed to improve existing conditions and maintain *no net loss* of shoreline functions over time. The intent of this Restoration Plan is to provide a comprehensive outline of restoration actions that can be accomplished voluntarily to enhance and restore shorelines within Clark County. Citizens, agencies, and other groups typically elect to implement portions of this plan irrespective of any development activity. Components of this plan can also be implemented as part of future capital or resource management endeavors. As an example, a park improvement project could be designed to involve removal of wetland fill and restoration of riparian habitat within the shoreline. All of these actions would have the effect of improving conditions over time, which is necessary for achieving *no net loss*.

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CHAPTER 2 RESTORATION VISION AND GOALS

This plan establishes a basic framework for improving the quality and sustainability of shoreline resources over time in a collaborative and comprehensive manner. This framework is consistent with the Shoreline Management Act and the regional strategy for restoring the lower Columbia River and its major tributaries.

This plan is also intended to be compatible with and incorporate the restoration goals already developed by other restoration planning entities in the region, such as: Lower Columbia Fish Recovery Board, Lower Columbia River Estuary Partnership, WRIA Action Plans, and Native American Tribes: Chinook Indian Nation; Cowlitz Indian Tribe; and the Confederated Tribes of the Grand Ronde.

2.1 Restoration Vision

The restoration vision for the Clark County Coalition is as follows:

Battle Ground, Camas, Clark County, La Center, Ridgefield, Vancouver, Washougal, and Yacolt will strive to restore, protect and enhance the shoreline resources and ecological processes that contribute to those resources through a combination of public actions and voluntary private actions. Restoration efforts, combined with protection of existing shoreline resources, will be targeted to create a net improvement in the shoreline ecosystem over time so as to benefit native fish and wildlife, as well as maintain public access to and enjoyment of the shorelines in Clark County, Washington.

2.2 Existing Restoration Goals and Policies

Goals, objectives, and policies related to enhancement, improvement, or restoration of shoreline resources are established in the existing comprehensive plans and shoreline master programs of the local governments of the Coalition, and are listed below. The number of each goal or policy as designated in the jurisdiction's planning documents is provided in parentheses. These existing goals and policies provide a context for understanding the approach each jurisdiction has been taking to restoration. Section 2.3 provides a revised set of restoration goals, with corresponding restoration actions and measures of success, based on the common goals for the Clark County Coalition and the current science and technical information presented in the Inventory and Characterization Report (ESA Adolfson et al., 2010).

2.2.1 City of Battle Ground

The City of Battle Ground has established the following restoration goals and policies in its Comprehensive Plan 2004-2024 (2004b):

- The City will encourage the enhancement and protection of Critical Areas through appropriate development actions and the work of non-profits and community groups (Policy EO4.3).

- The City will work to restore the habitat of threatened and endangered species to aid the recovery of the species (Policy EO7.2).

The City of Battle Ground does not have an adopted Shoreline Master Program since shorelines of the state were not thought to occur within city limits.

2.2.2 City of Camas

The City of Camas has established the following restoration goals and policies in the Camas Comprehensive Plan (2004). The goals from the Camas Shoreline Master Program have been incorporated into the Comprehensive Plan, and those which are restoration-related are listed below:

- Within the natural environment preserve and restore those natural resource systems existing relatively free of human influence and those shoreline areas possessing natural characteristics intolerant of human use or having unique historical, cultural, or educational features (Policy EN-7).
- Preserve and enhance water resources (Goal EN-3).
- Develop and implement management practices that will ensure a sustained yield of renewable resources of the shorelines while preserving, protecting, enhancing, and restoring unique and nonrenewable shoreline resources or features, including forested areas, wetlands, and wildlife habitat (Goal EN-4).
- Reclaim and restore shoreline areas that are biologically and aesthetically degraded to the greatest extent feasible, while maintaining appropriate use of the shoreline (Goal EN-6).
- Maintain good surface water quality as defined by federal and state standards and rehabilitate degraded surface water (Policy EN-8).
- Preserve, protect, and, to the extent practical, restore the biological health and diversity of the watershed within and of interest to the City of Camas (Policy EN-9).
- Preserve and enhance vegetation and geologic resources (Goal EN-7).
- Preserve existing vegetation or provide/enhance vegetation that is compatible with the character of Camas (Policy EN-18).
- Consistent with the Critical Areas Ordinance and Shoreline Management Master Program, manage aquatic and riparian (streamside) habitats to preserve and enhance their natural functions of providing fish and wildlife habitat and protecting water quality (Policy EN-23).
- Preserve and enhance native vegetation in riparian habitats and integrate suitable native plants in urban landscape development (Policy EN-24).
- Reclaim and restore areas which are biologically and aesthetically degraded to the greatest extent feasible while maintaining appropriate use of the shoreline (Goal EN-20).
- Preserve and/or restore, to the maximum reasonable extent, the shoreline's natural features and functions in conjunction with any redevelopment or revitalization project (Goal EN-48).

- Ensure that activities and facilities are located on the shorelines in such a manner as to retain or improve the quality of the environment as it is designated for that area (Goal EN-54).
- Encourage restoration of shoreline areas that have been degraded or diminished in ecological value and function as a result of past activities or catastrophic events (Goal EN-59).

2.2.3 Clark County

Clark County has established the following restoration policies in the Clark County Comprehensive Plan (2009):

- Restore and maintain properly functioning ecosystem conditions for salmonids in all county waters. Embrace and implement recovery plans adopted by the National Marine Fisheries Service (NMFS) and the Lower Columbia Fish Recovery Board (Policy 4.4.3).
- Restore streams and fish passageways in urban sub-basins and other appropriate watershed basins (Policy 4.4.6).

Clark County's Shoreline Master Program (1974) has the following restoration goals and policies:

- To encourage the restoration of degraded shoreline areas to conditions of natural environmental quality, and promote the revitalization of abandoned shoreline facilities for practical and productive activities (Chapter IV, Shoreline Improvement Element Goal).
- Plans for improvements of existing and future industrial or port properties should integrate provisions for restoration or enhancement of the shoreline, such as providing vegetation, landscaping or public access along banks which are unused for other purposes and where safety conditions permit (Chapter VI, Ports and Water-Related Industry, Policy A.10).

The vision of the Vancouver-Clark Parks and Recreation Comprehensive Parks, Recreation and Open Space Plan (2007) includes providing an interconnected system of parks and natural areas that support environmental stewardship. Goal 3 for the Vancouver-Clark Parks and Recreation Department is to "Be Effective Stewards of the Land" which includes numerous objectives focused on protecting, conserving and enhancing important wildlife habitat and populations under the following topical areas:

- Natural Area Acquisition;
- Natural Area Management;
- Education and Stewardship; and
- Urban Forestry.

2.2.4 City of La Center

The City of La Center has established the following restoration policy in the *La Center Urban Area Comprehensive Plan* (2008):

- Limit clearing of vegetation from stream banks, and restore the integrity of stream banks where degraded by development.

The City of La Center does not have an adopted Shoreline Master Program.

2.2.5 City of Ridgefield

The City of Ridgefield has established the following restoration goals and policies in the *City of Ridgefield Comprehensive Plan 2005 Update* (2004):

- Promote and facilitate ecosystem restoration and enhancement (Policy EN-3).
- Protect and enhance surface, stormwater, and groundwater quality. Ensure adequate water supplies and promote wise use and conservation of water resources (Policy EN-7).

The City of Ridgefield does not have an adopted Shoreline Master Program.

2.2.6 City of Vancouver

The City of Vancouver has established the following environmental policies in its *Comprehensive Plan 2003-2023 (2004)* related to restoration:

- Restoration and enhancement - Promote and facilitate ecosystem restoration and enhancement (Policy EN-3);
- Habitat - Protect riparian areas, wetlands, and other fish and wildlife habitat. Link fish and wildlife habitat areas to form contiguous networks. Support sustainable fish and wildlife populations (Policy EN-5);
- Endangered species - Protect habitat for salmonids and other listed species and facilitate recovery. Encourage and support actions that protect other species from becoming listed (Policy EN 6);
- Water quality and quantity - Enhance and protect surface-, storm-, and groundwater quality from septic discharge, impervious surface runoff, improper waste disposal, and other potential contaminant sources. Ensure safe and adequate water supplies and promote wise use and conservation of water resources (Policy EN-3);
- Trees and other vegetation - Conserve and restore tree and plant cover, particularly native species, throughout Vancouver. Promote planting using native vegetation. Protect historic and other significant trees (from Comprehensive Plan, Policy EN-8).

Based on the 1997 Shoreline Management Master Program, the following are specific restoration goals in Appendix B of the Comprehensive Plan:

- Manage, conserve, protect, and restore those shoreline areas necessary for the support of wild and aquatic life and those identified as having geological, hydrological or biological significance (Goal 5).

- Ensure that utilization of a resource takes place with the minimum adverse impact to natural systems and quality of the shoreline environment (Goal 6).
- Preserve and/or restore, to the maximum reasonable extent, the shoreline's natural features and functions in conjunction with any redevelopment or revitalization project (Goal 25).

In addition to Goals 5 and 25 listed above, Vancouver's Shoreline Management Master Program (2007) has the following restoration goals and policies:

- Ensure that impacts to critical areas are first avoided, and where unavoidable, minimized and mitigated to result in no net loss of natural systems' functions and shoreline environment quality (Goal 6).
- Shoreline modification activities, with the exception of restoration, rehabilitation, stabilization, and enhancement projects, should be permitted only in association with a permitted shoreline use. Restoration, rehabilitation, and enhancement projects should be strongly encouraged (Policy 2).

See also discussion for Vancouver-Clark Parks and Recreation Comprehensive Plan under Section 2.2.3 Clark County.

2.2.7 City of Washougal

The City of Washougal has established the following restoration goals and policies in the Washougal Comprehensive Plan (2003):

- Provide management practices to minimize erosion and hazards in order to improve water quality for instream and out-of-stream uses (Section 2.3.3, Policy 1-D).
- Guide new development so as to protect, enhance, and respect sensitive and natural constraints (Section 2.3.3, Goal 2).
- Initiate cost-effective programs to protect and improve environmental quality (Section 2.3.3, Goal 3). Maximize the funding of publicly owned critical area lands by leveraging impact fee monies with possible grant funds and city funds (Policy 3-A).
- Assist in the enhancement of the US Fish and Wildlife Service's Steigerwald Lake National Wildlife Refuge (Section 2.3.3, Goal 6).

Washougal's Shoreline Master Program (1974) has the following restoration goals and policies:

- To encourage the restoration of degraded shoreline areas to conditions of natural environmental quality, and promote the revitalization of abandoned shoreline facilities for practical and productive activities (Shoreline Improvement Element Goal).
- Plans for improvements of existing and future industrial or port properties should integrate provisions for restoration or enhancement of the shoreline, such as providing vegetation, landscaping or public access along banks which are unused for other purposes and where safety conditions permit (Ports and Water-Related Industry, Policy 10).

2.2.8 Town of Yacolt

The Town of Yacolt has established the following goals and policies in its Comprehensive Plan (2004) that guide restoration:

- Encourage the retention of critical and unique open space and development of recreational opportunities; conserve fish and wildlife habitat; increase access to natural resource lands and water; and develop parks (Goal 5);
- Identify open space corridor, and important isolated unoccupied natural areas within the Yacolt urban growth area (UGA), which should be preserved or have potential to be developed as parks (Policy 5-1);
- Open space shall include unoccupied lands having the potential to be developed as parks or trails, and environmentally sensitive natural features providing visual relieve, landscape buffers, and fish and wildlife habitat (Policy 5-2);
- Designate and protect the following environmentally sensitive areas or critical areas and ecosystems: wetlands, areas with critical recharging effect on aquifers used for potable water; fish and wildlife conservation areas; frequently flooded areas; and geologically hazardous areas. (Policy 5-4)

The Town of Yacolt has no shorelines of the state within its town limits or UGA. They do not have and are not required to adopt a Shoreline Master Program.

2.3 Suggested Restoration Goals, Objectives, Actions, and Success Measures

The general restoration goals and objectives outlined in this plan relate to specific voluntary restoration actions with potential measures of success. Table 2-1 provides general measures that could be used to determine project goals, objectives and success. The goals and objectives in Table 2-1 were developed by the Coalition through its project management team to determine the basic tenets of restoration in Clark County. However, detailed measures of success must be determined for each project through the establishment of project-specific performance criteria and long-term monitoring. The results of monitoring should be used to refine project design and management through an adaptive management process (described in Chapter 8).

Similarly, the potential for restoration projects to improve specific ecological functions can only be accurately determined on a case-by-case basis. Ideally, each project will be designed to ensure a high likelihood of success in restoring the functions that are targeted for that project. This Restoration Plan summarizes restoration opportunities with moderate to high potential for success in improving ecosystem-wide processes and shoreline functions. Other projects with lower potential for success have not been identified in this plan.

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

Goal	Objective	Potential Restoration Actions	Potential Measures of Success
<p>1. <i>To improve ecosystem processes, functions and values over time.</i></p>	<p>Restore native riparian vegetation and floodplain vegetation communities.</p> <p>Restore connectivity to floodplains and channel migration zones.</p> <p>Restore sediment source, transport, and deposition processes.</p> <p>Restore LWD recruitment and retention.</p> <p>Restore nutrient pathways.</p> <p>Improve soil integrity.</p>	<p>Remove or modify features (dikes and levees) that artificially confine stream channels or limit floodplain connectivity.</p> <p>Set back levees to allow for wider floodplains along rivers and streams.</p> <p>Remove/replace bulkheads.</p> <p>Remove invasive species and replant riparian and floodplain vegetation.</p> <p>Decommission roads.</p> <p>Restore wetlands.</p> <p>Improve soils through removal of fill and/or addition of soil amendments.</p>	<p>Acres of riparian enhancement.</p> <p>Linear feet of bulkhead removed.</p> <p>Acres of reconnected floodplain.</p> <p>Linear feet of road decommissioned.</p> <p>Acres of wetland restored; presence of wetland indicators, particularly wetland hydrology, within restored areas over time.</p> <p>Acres of topsoil restored; continued development of organic matter in soils over time.</p> <p>Acres of invasive vegetation removed; maintenance of low levels of invasive vegetation cover over time.</p> <p>Acres of native vegetation planted; high survival and growth of installed plants over time.</p> <p>Acres of restored habitat maintained.</p>
<p>2. <i>To increase habitat quality and availability for salmon and other sensitive and/or locally important species, and support biological recovery goals for federally listed species.</i></p>	<p>Restore stream channels, channel migration zones, side channels, and floodplains.</p> <p>Restore wetlands.</p> <p>Improve water quality and reduce toxic chemicals in waterbodies to create conditions suitable for the life cycles of salmon and other sensitive species.</p> <p>Restore riparian zones to improve habitat for native wildlife species.</p>	<p>Reduce overwater shading by replacing decking on overwater structures with open grating or light penetrating material, wherever possible. Protect grated areas from being covered during subsequent development and structure occupation activities.</p> <p>Design overwater structures to accommodate juvenile salmon migration along the shoreline.</p> <p>Improve water quality by removing fill, contaminated sediments, creosote-contaminated logs, pilings and debris. Replace treated wood docks/piers with concrete, steel and other materials.</p>	<p>Number of culverts replaced or number of miles of stream open to migration.</p> <p>Number of creosote structures/ pilings removed.</p> <p>Acres of riparian enhancement; survival and growth of installed native vegetation over time.</p> <p>Acres of wetland restored; presence of wetland indicators, particularly wetland hydrology, within restored areas over time.</p>

Goal	Objective	Potential Restoration Actions	Potential Measures of Success
		<p>Restore fish passage to blocked habitats; for example by replacing or enlarging blocked or undersized culverts.</p> <p>Replant/enhance riparian vegetation.</p> <p>Remove invasive species.</p> <p>Restore in-stream habitat cover and complexity; for example by adding large woody debris to stream channels.</p> <p>Remove abandoned overwater and in-water structures.</p> <p>Retrofit existing impervious surfaces to add stormwater treatment and flow control.</p> <p>Restore natural channel morphology.</p> <p>Enhance availability of spawning habitat and substrate.</p> <p>Restore availability of and access to off channel rearing areas.</p> <p>Restore in-stream flows.</p>	<p>Acres of invasive vegetation removed and maintained at low levels over time.</p> <p>Area of side channel habitat created or enhanced, and use of these areas by salmonids over time.</p> <p>Water quality measurements.</p> <p>Area of retrofit.</p> <p>Increase in diversity of native aquatic species in treated reaches (e.g., salmonids, benthic macro-invertebrates).</p> <p>Amount of LWD added to stream channels.</p> <p>Changes of in-stream habitat over time; e.g., recruitment of spawning gravels and wood, formation of pools.</p>
<p>3. To integrate restoration efforts with capital projects and resource management efforts.</p>	<p>Evaluate restoration opportunities when planning for parks, transportation, and other capital projects.</p>	<p>Replace paved parking areas with pervious pavement at parks or other public properties where feasible.</p> <p>Relocate public infrastructure outside of floodplains, migration zones and other sensitive areas where feasible.</p> <p>Retrofit existing impervious surfaces to add or improve stormwater treatment and flow control.</p>	<p>Number of restoration actions implemented in conjunction with other projects.</p> <p>Decrease in pollutant loading in shoreline waters from impervious surfaces and urban stormwater runoff.</p>

Goal	Objective	Potential Restoration Actions	Potential Measures of Success
<p>4. <i>To encourage cooperative restoration actions involving local, state, and federal public agencies, tribes, NGOs, and landowners.</i></p>	<p>Engage in coordinated planning to identify and scope restoration projects.</p> <p>Provide incentives to landowners to restore private properties.</p> <p>Establish systems to facilitate and fund restoration.</p> <p>Incorporate citizen perceptions of restoration approaches and success into future planning.</p>	<p>Provide incentives to landowners who restore shorelines through an open space taxation program or other mechanism.</p> <p>Sponsor an annual restoration planning workshop with other partners.</p> <p>Work with restoration partners to establish a database and tracking program for restoration projects.</p> <p>Fund or otherwise facilitate a restoration demonstration project such as a soft shore armoring project.</p> <p>Create stewardship programs and/or work with existing stewardship programs to educate private landowners on appropriate restoration actions.</p> <p>Engage with local schools to have classes participate in restoration projects.</p>	<p>Number of collaborative projects implemented.</p> <p>Number of projects tracked via database.</p> <p>Number of landowners participating in stewardship workshops.</p> <p>Number of partners participating in joint efforts.</p> <p>Response to surveys of citizen awareness of and involvement in restoration activities.</p> <p>Response to surveys of how citizens perceive success of restoration projects, and suggestions for improvement.</p>
<p>5. <i>To participate in the Lower Columbia River Estuary Partnership (LCREP) and the Lower Columbia Fish Recovery Board (LCFRB) to help achieve the Estuary Partnership and LCFRB's vision statements.</i></p>	<p>Support restoration projects in the County and partnering cities identified as priorities by the Partnership and Board.</p>	<p>Implement restoration projects that focus on salmon and native fish recovery or improvement to habitats along the Lower Columbia River and its tributaries.</p>	<p>Number of priority projects implemented along the lower Columbia River, and within tributaries to the Columbia in Clark County.</p> <p>Other measures listed for Goals 1 and 2, as appropriate for each project.</p>

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CHAPTER 3 WATERSHED OVERVIEW

This chapter provides an overview of watersheds that comprise Clark County (Figure 3-1). This background information is provided to help set the context for the discussion in the subsequent chapters of this plan.

Clark County is located in southwest Washington, covering approximately 628 square miles with the Columbia River providing the southern and western boundaries. The county extends north to the Lewis River, and east to the Cascade Mountain foothills. There are three significant drainage basins within the county: the Columbia River, the Salmon Creek-Washougal River, and the Lewis River.

3.1 Columbia River

The Columbia River is one of the largest rivers in North America, draining 258,000 square miles to the Pacific Ocean over a course of 1,240 miles (Kammerer, 1990). The portion of the Columbia River in Clark County is a 29-mile stretch between approximately river miles 87 and 116.

The Columbia River is a landmark for the region, and the reach along Clark County marks a significant change in the river's character as the Columbia begins its transition from narrow river gorge to the relatively wide Lower Columbia River estuary. The Columbia River is tidal along this entire reach, with mean daily range of 2.44 feet (NOAA Station at Vancouver 9440083).

The transition from freshwater river to tidal estuary occurs abruptly at Bonneville Dam, upstream of Clark County. The Bonneville Dam is the furthest downstream dam of an extensive federal program of dams that provide substantial power generation capacity.

3.2 Watershed Descriptions

Clark County is divided into two Water Resource Inventory Areas (WRIAs): the Salmon-Washougal and the Lewis (Figure 3-1). A brief description of each of these WRIAs and their respective shorelines follows.

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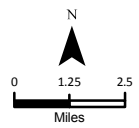


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- WRIA 27 | WRIA 28 Boundary
- Subbasins
- County Boundary
- Streams
- Waterbodies
- City Limits
- Urban Growth Areas
- Forest Service
- Fish and Wildlife Service

Figure 3-1
 WRIAs and Basins

Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602
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Data Sources: Clark County, 2009;
 ESRI, 2008



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3.2.1 WRIA 28 – Salmon–Washougal

Water Resource Inventory Area (WRIA) 28 (Figure 3-2) covers 494 square miles of which approximately 75 percent lies within southern Clark County. WRIA 28 is not a single drainage system, but is actually a collection of smaller drainages that are tributary either directly to the Columbia River or to Lake River. Major surface water resources consist of: the Washougal River, Lacamas Creek, Burnt Bridge Creek, Salmon Creek, Lake River, and several smaller streams east of the Washougal River that are directly tributary to the Columbia River.

The Washougal River is the largest single drainage within WRIA 28, followed by Salmon Creek and Lacamas Creek, respectively. WRIA 28 has approximately 4,500 acres of lake surface area, including 2,858 acres in Vancouver Lake. Approximately 168 linear miles of shoreline are contained within the WRIA 28 shoreline planning area. WRIA 28 includes the largest population and manufacturing centers in Clark County. At the same time, WRIA 28 features three National Wildlife Refuges, located along the Columbia River (Wildrick et al., 1998).

Land ownership in the Washougal River basin is mostly private (61 percent) with significant state land (30 percent) and federal lands (8 percent) also present in the basin. Land cover analysis for the Washougal River basin (based on Landsat data obtained from the U.S. Geological Survey [USGS] National Land Cover Dataset) indicate that 74 percent of the basin is forested. Only 26 percent of the basin is non-forest or developed (LCFRB, 2010).

Land ownership within the Lake River/Salmon Creek basin is mostly private (89 percent). Land cover analysis for the basin (based on Landsat data obtained from the USGS National Land Cover Dataset) indicates that 71 percent of the basin is non-forest, developed as either urban or agricultural uses (LCFRB, 2010).

The Washougal River and Salmon Creek support federally listed Chinook, chum, and coho salmon, and steelhead.

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**WRIA 28
 Salmon-Washougal**

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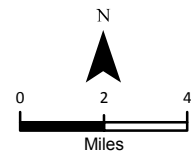
- ▭ WRIA 28 - Salmon-Washougal
- ▭ Streams
- ▭ Waterbodies
- City Limits
- Urban Growth Areas
- County Boundaries
- Forest Service
- Fish and Wildlife Service

Figure 3-2
 WRIA 28 - Salmon-Washougal

Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602

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 ESRI, 2008



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3.2.2 WRIA 27 – Lewis

Water Resource Inventory Area (WRIA) 27 (Figure 3-3) includes portions of Cowlitz, Skamania, and Clark Counties, with much of the upper watershed in the Gifford Pinchot National Forest. Approximately 1,310 square miles of this WRIA lies within the northern portion of Clark County. An estimated 176 linear miles of shoreline are contained within the WRIA 27 shoreline planning area. WRIA 27 is focused on the Lewis River drainage, tributary to the Columbia River near river mile (RM) 87. The North Fork (also referred to as mainstem) Lewis River and the East Fork Lewis River are the primary surface water features within Clark County in this WRIA.

The North Fork Lewis River has three significant impoundments: Swift Reservoir (RM 47.9), Yale Reservoir (34.2), and Merwin Lake (RM 19.5). Both Yale Reservoir and Merwin Lake are partially located within Clark County and partially within Cowlitz County (Wade, 2000). Siouxon Creek, Canyon Creek, and Cedar Creek are the primary tributaries. The majority of WRIA 27 is in managed forestland, with virtually the entire upper watershed owned by private timber companies, the Washington Department of Natural Resources, or the U.S. Forest Service (USFS).

Within the East Fork Lewis River basin, 63 percent of the land is privately owned, with 20 percent held in federal ownership and 16 percent in state ownership as forest resources (LCFRB, 2010). The basin is primarily forested with only 25 percent in non-forest cover.

The upper Lewis River watershed is largely owned by commercial timber companies and PacifiCorp, a private utility company that owns and operates the dams. The lower watershed includes Cedar Creek and its tributaries and the section of the Lewis River mainstem below Merwin Dam. The lower Lewis River watershed is 84 percent privately owned with 16 percent as state lands. Approximately 80 percent of the land in the lower watershed is forest lands.

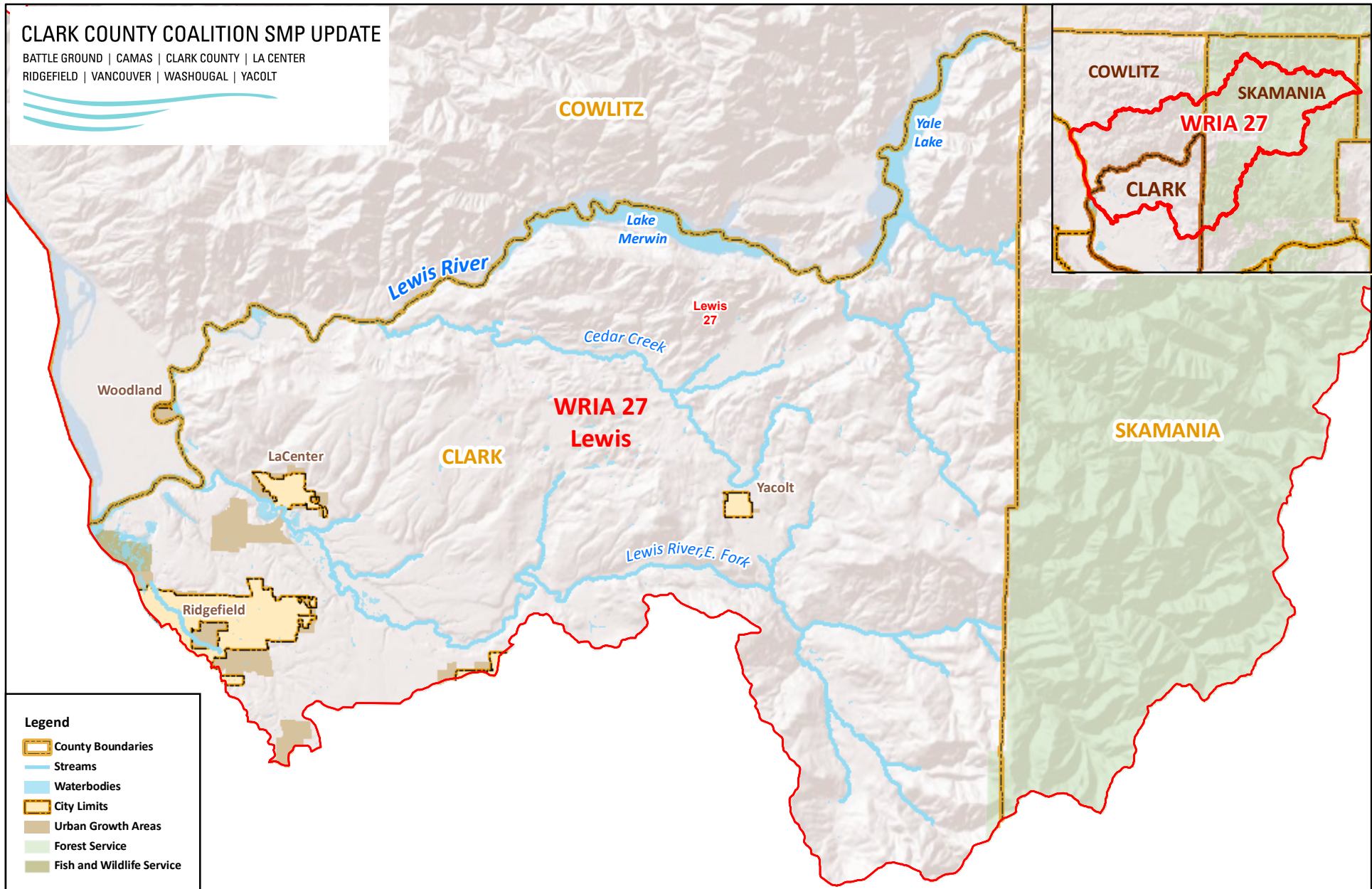
The East Fork Lewis River is mostly contained within Clark County, with the headwaters located to the east, in Skamania County. Rock Creek (upper and lower), Copper Creek, Mason Creek, Lockwood Creek, King Creek, and Big Tree Creek are the major tributaries to the East Fork. Lucia Falls (RM 21.3) blocks upstream migration for most anadromous fish species with the exception of steelhead and low numbers of coho salmon.

WRIA 27 is home to significant stocks of most anadromous fish species, such as: chum salmon, coho salmon, Chinook salmon, and steelhead. All of these anadromous salmonid species are listed as federally threatened under the Endangered Species Act. In addition, the Lewis River is the only major tributary in WRIA 27 to support bull trout, also a federally threatened species.

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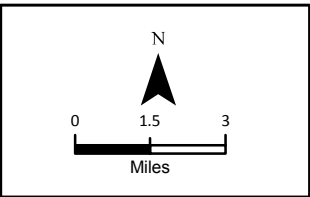
- County Boundaries
- Streams
- Waterbodies
- City Limits
- Urban Growth Areas
- Forest Service
- Fish and Wildlife Service

Figure 3-3
 WRIA 27 - Lewis

**Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602**

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CHAPTER 4 OVERVIEW OF RESTORATION PRIORITIES

This chapter provides a broad overview of the individual watersheds, sub-basins, and stream reaches that are considered high priority for restoration or protection. Chapter 5 and Appendices C and D provide information on specific restoration opportunities by shoreline waterbody within these watersheds/reaches. The Shoreline Inventory and Characterization report (ESA Adolfson et al., 2010) identified important shoreline processes and discussed threats and alterations to assess the potential for shoreline restoration based upon the condition of the watershed and important landscape scale functions. Restoration opportunities identified in the shoreline inventory report or other technical studies are the focus of this Restoration Plan. Restoration actions already taken or in progress on a given shoreline waterbody are documented in the shoreline inventory report and are not repeated here.

4.1 Determining Restoration Potential

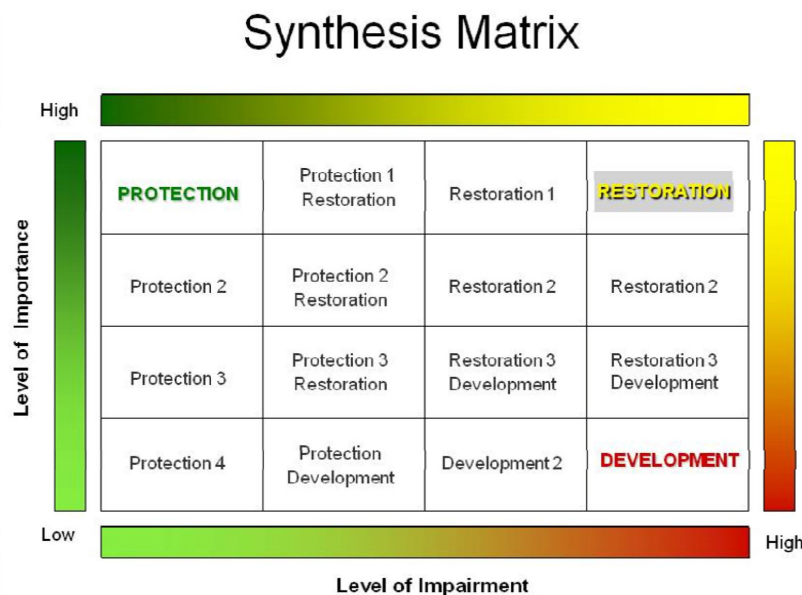
Two existing data sets were used to identify and prioritize ecological restoration potential throughout Clark County. One data set was developed by the Washington State Department of Ecology (Ecology) during its work to characterize the watersheds of Clark County (Ecology, 2009). The other is based on the Ecosystem Diagnosis and Treatment (EDT) models which were developed as part of sub-basin planning work coordinated by the Lower Columbia Fish Recovery Board (LCFRB, 2004). These two methods were selected to meet appropriate shoreline planning criteria, and to consider two approaches to identify and prioritize restoration potential. These approaches are intended to consider processes from both the “watershed down” and “stream up” perspectives.

The Ecology Watershed Characterization method was applied at the sub-basin scale throughout Clark County to assess relative restoration potential and priority (Ecology, 2009). Briefly, basin scale spatial datasets were used to rate each sub-basin in terms of its level of *importance* (High, Medium, and Low) in performing freshwater hydrologic and nitrogen cycling processes, and the extent to which each watershed is *impaired*. The “importance rating” was then considered in relation to the “impairment rating” so that each watershed could be categorized in terms of its relative suitability for restoration, protection, or development. As shown on Figure 4-1 this approach assumes that, in general:

- Areas of High (H) importance are higher priorities for protection and restoration,
- Areas of Low (L) alteration are higher priorities for preservation than highly impaired areas, and
- Restoration potential for areas of High (H) impairment varies depending on the relative importance rating.

The importance and alteration scores are then taken together to provide a combined score that can be used to suggest future management priorities (Figure 4-1). For example, a sub-basin with high importance and high level of impairment would be given a high ranking for Restoration and would be a candidate for activities that focus on restoring functions. Similarly, a sub-basin with high importance and a low level of impairment would rank as Protection and would be a candidate for activities that focus on preservation.

Figure 4-1. Rankings and groupings for restoration, protection and development categories for hydrologic processes used for Clark County



This method was intended to provide a first-order ranking of sub-basins for restoration and preservation priority from the “watershed-down” perspective. This approach is better at identifying broad patterns on the landscape, but, in its current form, does not consider ecological conditions at a specific location (e.g., within a stream channel).

Stream reach rankings based on Ecosystem Diagnosis and Treatment Model (EDT) data were also considered. Briefly, the EDT model uses analyses of salmonid populations, stream reaches, and habitat factors to develop a relationship between physical conditions in the stream system to biologic production.

The EDT tier rankings include a combination of output and recovery plan population priorities, primarily for salmon production. Specific fish populations are targeted to be restored to various levels of viability in order to meet overall viability criteria for each Evolutionarily Significant Unit (ESU). Primary salmon populations need to be restored to high levels of viability; contributing populations need some improvement and are mostly targeted for medium viability; and stabilizing populations need to be maintained at their current viability level. The population targets were developed using a collaborative stakeholder process considering scientific, biological, social, cultural, political and economic factors. These populations targets (primary, contributing, stabilizing) are combined with EDT output data regarding habitat conditions in each reach to result in the reach tiers (Tiers 1 through 4) described in Table 4-1. For a detailed description of the EDT method, please refer to Appendix E of the Lower Columbia Recovery Plan (LCFRB, 2010).

Table 4-1. Rules for Designating Reach Tiers (LCFRB, 2004)

Designation	Rule
Tier 1	All high priority reaches (based on EDT) for one or more primary populations.
Tier 2	All reaches not considered Tier 1 and which are medium priority reaches for one or more primary species and/or all high priority reaches for one or more contributing populations.
Tier 3	All reaches not considered Tiers 1 and 2 and which are medium priority reaches for contributing populations and/or high priority reaches for stabilizing populations.
Tier 4	Reaches not considered Tiers 1, 2, or 3 and which are medium priority reaches for stabilizing populations and/or low priority reaches for all populations.

One set of results is shown in Figure 4-2. The figure displays the hydrology rankings from the Ecology watershed characterization method (Ecology, 2009) and the EDT stream tiers. The overall hydrology ranking was selected as the broadest summary of the Ecology method, but other results (e.g., surface or groundwater specific rankings, nitrogen cycling rankings) could also be used. The Ecology datasets are collapsed into fewer categories, for visual clarity. Protection 1-4, Protection-Restoration 1-3, Restoration 1 and 2, and Restoration-Development are each grouped together. The term “All” was used by Ecology to highlight sub-basins that could not be readily classified; these sub-basins contained characteristics of several categories (shown as red areas on Figure 4-2). Certain partially developed areas scored medium to high for restoration potential due to their position in the landscape and relative watershed function. There are several notable results from each individual data set, and from the combination of the two. From the Ecology Watershed Characterization method:

- The bulk of the protection sub-basins are focused in the upper portions of the watershed, with some areas along the mainstem Columbia River mainly in existing refuges.
- The transition area from the foothills to the terrace is dominated by subunits ranked as protection-restoration and restoration areas.
- The rankings within the urban areas along the edge of the terrace are a mix of restoration, restoration-development, and development.

From the stream tier rankings:

- In Clark County, the mainstem rivers provide higher ranked restoration opportunities than tributary streams. This is likely because of the number of species present and their priority for recovery, as well as potential for benefits from restoration in those reaches.
- The North Fork Lewis River mainstem has numerous Tier 1 and 2 reaches.
- The East Fork Lewis River mainstem has long stretches of Tier 1 and 2 ranked stream, extending well into the upper watershed.
- The Washougal River has long stretches of Tier 1 and 2 ranked stream, extending well past the county boundary.

From other watershed documents:

- Tidal sections of rivers and streams provide unique habitat to salmonids and other aquatic species due to tidal influence; these sections should also be given higher priority for restoration.

Taking the data sets together, there are specific areas where results consistently point to restoration being the key management measure. The East Fork Lewis River, generally between Battle Ground and La Center, contain the longest stretch of Tier 1 ranked stream reach, which corresponds to a Restoration ranking from the watershed characterization. Similarly, the mainstem Washougal River is primarily Tier 1 or 2, corresponding with Restoration and Protection rankings from the watershed characterization.

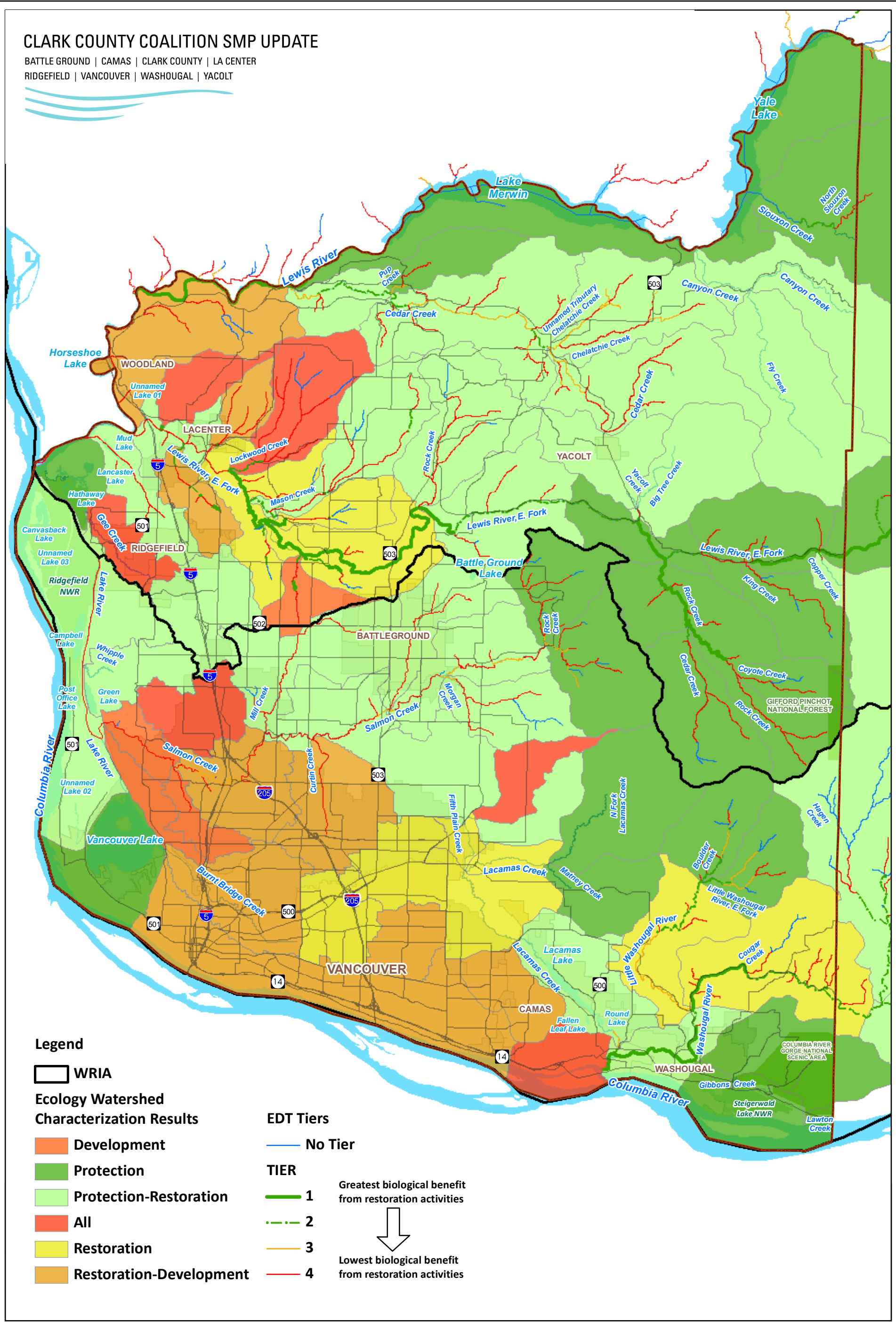
Another key result of the comparison of these data sets is that it underlines the need to consider the location of a sub-basin within the watershed in addition to its overall importance to watershed processes. For instance, many of the topographically lower sub-basins in Clark County rank lower for overall importance for hydrologic processes using the watershed characterization methods. This is logical since these areas have less opportunity to interact or modify hydrologic processes than the larger upstream area. On the other hand, the stream tier rankings that are ranked high continue to have a high ranking down through the areas that rate lower for importance. This is also logical when examined from an anadromous fish population perspective, since these lower reaches will be used as migration corridors to connect the Lower Columbia to the smaller tributaries in the upper watershed. This suggests the need to have a balanced approach between preserving and enhancing these key aquatic areas while allowing surrounding development to occur.

Although useful for looking at the watershed condition, the two models described above are limited in determining shoreline restoration projects and opportunities. The Ecology model bases its conclusions on general geographic information system (GIS) modeling at the landscape level and may not fully represent the watershed processes in play within each waterbody. The EDT model focuses on fish recovery and does not encompass other factors related to habitats and shoreline functions. This information should be paired with more detailed evaluations and field studies to determine specific restoration opportunities within Clark County, Washington.

For example, Clark County Public Works Department of Environmental Services has recently completed a Stream Health Report that identifies streams and rivers in Clark County with degraded water quality, impaired function, eroded stream banks and other alterations. This report provides a partial county-wide data set based upon field measurements and water quality monitoring that can be used to identify restoration opportunities. Fifteen of the 24 county subwatersheds have been evaluated and monitored. Based upon the Stream Health Report, five of the subwatersheds with monitoring data have degrading water quality over time (2005 to 2009). Biological data indicate degrading conditions over time and the need for additional restoration in the Salmon Creek area. In addition, the County Department of Environmental Services has prepared Stormwater Needs Assessment Program Reports (SNAP Reports) for many of the shoreline rivers and streams. The SNAP Reports completed between 2007 to 2010 are referenced later in this report for information regarding more specific restoration opportunities by waterbody.

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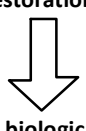
WRIA

Ecology Watershed Characterization Results

- Development
- Protection
- Protection-Restoration
- All
- Restoration
- Restoration-Development

EDT Tiers

- No Tier
- TIER**
- 1 Greatest biological benefit from restoration activities
- 2
- 3
- 4 Lowest biological benefit from restoration activities



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602
 NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolphson implies no warranties or guarantees regarding any aspect of data depiction.

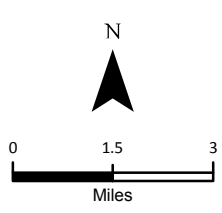


Figure 4-2
 Ecology Watershed Characterization Results with EDT Reach Tier Results

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

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4.2 Restoration Priorities

Restoration priorities for Clark County will be based upon information found in watershed or basin plans and local programs. The general priorities for shoreline restoration in the County have been identified in the Salmon-Washougal & Lewis Watershed Management Plan (LCFRB, 2006) and are supported in various other County and City plans. The priorities are:

1. Restore water quality in rivers and lakes. This will occur through implementation of Total Maximum Daily Load (TMDL) plans, point-source pollutant control, improved stormwater management, and use of best management practices. Clark County's new Stormwater Management Plan (2010) states that reducing pollutants and contaminants in surface waters is one of the County's major objectives.
2. Manage stormwater runoff to protect stream flow and salmonid habitat. This restoration can be implemented through retrofits, low impact development measures, improvements to stormwater facilities, and other means. Where needed to protect key habitat, implement programs that exceed minimum requirements.
3. Protect floodplains from modification that would impair hydrologic functions or habitat.
4. Restore floodplain functions that have been degraded or damaged, where feasible, to improve hydrologic functions or habitat.
5. Restore wetlands in the shoreline jurisdiction to improve hydrologic conditions and enhance habitat.
6. Protect and restore important habitats for key salmonid species and support regional efforts for salmonid recovery. This includes protection and restoration for Tier 1 and 2 streams as identified by EDT modeling.
7. Restore and revegetate lake, river and stream riparian zones to improve habitat conditions for fish and wildlife and eliminate non-native invasive plants.

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CHAPTER 5 RESTORATION ACTIONS

The restoration opportunities and recommended actions presented here were derived from technical studies prepared in support of the Clark County SMP update or other published reports. In compiling the lists of recommended actions for each watershed, ESA Adolphson identified some of the most apparent and significant causes of shoreline degradation and impairment and matched them with the restoration actions (from Tables 1-1 and 2-1) that would have the greatest opportunity for achieving the goals in Chapter 2.

The Salmon Recovery Plan and Habitat Strategy for the Lower Columbia River estuary identify multi-species protection and restoration values for each stream reach studied by the Lower Columbia Fish Recovery Board (LCFRB, 2010). Programmatic and project-specific actions summarized in this document are included here. In addition, the multi-species habitat restoration priorities are illustrated in maps within Appendix A of this report.

Additional shoreline restoration opportunities may be present in Clark County that have not been identified here. Some of the actions identified here may prove to be infeasible or impractical based on further analysis. This chapter should be used as a starting point for future discussion and planning. Prior to undertaking any restoration work, studies should be undertaken to determine the proper approach and to ensure that the project fits within a watershed context, that it will be effective in achieving restoration objectives, and that it will be sustainable over the long term.

Programmatic restoration/conservation actions applicable to all Clark County jurisdictions are identified in Section 5.1. Then Section 5.2 introduces restoration opportunities in WRAs 27 and 28, and refers to the tables in Appendices C and D for actions specific to each waterbody under shoreline jurisdiction in these watersheds.

5.1 Programmatic Actions

Certain restoration actions should be broadly and comprehensively implemented on a programmatic basis to help achieve restoration goals. The following programmatic actions are recommended for shorelines within Clark County as funding permits. Which County or City department(s) or other entities will take the lead on these actions will be determined in the future. The Coalition jurisdictions will continue to coordinate with each other on restoration activities. The funding mechanism for many of these actions has not yet been identified.

Education and Incentives:

- Educate property owners about proper vegetation/landscape maintenance (such as preserving native vegetation along stream/nearshore riparian corridors) to promote shore stabilization and protect water quality.
- Encourage low-impact development (LID) practices for shoreline property owners.
- Educate property owners about the negative impacts of shore armoring and over-water structures and encourage soft shore protection where shore protection is unavoidable.

- Educate boaters about proper waste disposal methods, anchoring techniques, prevention of invasive aquatic plant transport, and other best boating practices to minimize habitat damage and prevent water quality contamination.
- Educate boaters and shoreline property owners about invasive aquatic plants and animals, and methods to control these species and prevent transport.
- Encourage incentive programs for shoreline property owners, such as transfer or purchase of development rights and tax incentives for shoreline restoration and protection.
- Where shorelines have been modified, provide incentives to encourage salmonid habitat restoration in redevelopment projects.
- Implement best management practices to control runoff from agricultural lands.
- Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach.

Lakes and Rivers:

- Remove armoring and bulkheads especially in public parks, or wherever feasible.
- Design docks and piers to allow light penetration for protection of aquatic habitats.
- Encourage construction of joint-use docks to minimize the need for new dock construction.
- Encourage lake associations or stewardship organizations to initiate efforts to protect water quality and control invasive aquatic weeds in freshwater lakes, rivers, and streams.
- Encourage protection of native aquatic plant species such as American waterweed, bladderwort, coontail, water celery, spatterdock, and others (<http://www.ecy.wa.gov/programs/wq/plants/native/>).
- Encourage projects which relocate levees further inland (levee setback) or remove levees to allow for the meandering of river channels and provide off-channel habitat for salmonids.
- Restrict new development in the floodplain and channel migration zone.
- Restore floodplains on lands being phased out of agricultural production.
- Remove invasive vegetation (including noxious weeds), restore soils, and replant native vegetation in riparian areas.
- Restore channel morphology and sediment processes to benefit salmonid habitat.
- Restore or remove private ponds that impact salmonid passage, water quality, and in-stream flows.
- Use existing plans and regulations to manage future growth and development patterns to ensure the protection of watershed processes.

Infrastructure:

- Remove culverts and blockages from smaller tributaries and replace them with larger culverts or bridges as appropriate to allow for fish passage and channel migration. See Appendix B for a list of fish passage barriers by waterbody identified by the Washington Department of Fish and Wildlife (WDFW).
- Coordinate with state agencies to manage water withdrawals to address in-stream flows, especially in water-limited basins; enforce regulations addressing illegal water withdrawals.
- Monitor water quality and septic systems to prevent nutrient and bacteria loading in streams. Where possible, public sewer systems should be installed to replace on-site septic systems. The WRIA Plans recommend conversion of septic to sewer systems only when municipal wells are also converted to public water systems.
- Reforest commercial forest lands and repair or abandon forest roads in rural lands.
- Retrofit stormwater systems using low-impact development strategies.
- During utility upgrades or replacement, relocate the utilities to outside of shoreline areas.

Planning and Coordination:

- Match mitigation, both off-site and compensatory mitigation, to appropriate restoration and enhancement activities as identified in salmon recovery, watershed management plans and this Restoration Plan.
- Coordinate shoreline restoration with salmonid recovery and watershed management plans to align with projects prioritized in salmon recovery plans.
- Continue to survey and monitor invasive species, such as noxious weeds and other non-native species (e.g., nutria), and initiate eradication programs as needed.
- Continue to monitor water quality and provide incentives and education to landowners in addressing nonpoint sources of pollution.
- Assist organizations, agencies, and private landowners in identifying funding sources and obtaining funds and technical expertise for restoration projects.
- Purchase easements or property in sensitive areas in order to protect watershed functions where existing regulatory programs are inadequate.

5.2 Restoration Opportunities – WRIAs 27 and 28

Restoration opportunities for shorelines of the Lewis Basin (WRIA 27) and the Salmon-Washougal Basin (WRIA 28) are provided in the tables in Appendices C and D. The tables are organized by sub-watershed units (the Lower Columbia River, Lewis River and East Fork Lewis River in WRIA 27, and the Lower Columbia River, the Washougal River and Salmon Creek in WRIA 28).

Implementing these recommendations would complement the protection efforts encompassed in the SMP. Both protection and restoration efforts are necessary to offset impacts of existing and future development, repair past damages, and improve the ecological baseline.

The shoreline restoration opportunities involve both programmatic and project-specific actions that have been identified by various government and non-government entities. Some rivers and lakes do not have site-specific identified restoration opportunities; for example, data are lacking for small lakes and streams.

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

CHAPTER 6 EXISTING RESTORATION PROGRAMS AND PARTNERS

Numerous agencies and organizations are planning and implementing restoration efforts in Clark County. Most restoration efforts are implemented because citizens, tribes, non-government entities and local, state and federal resource agencies collaborate to solve problems and achieve shared goals. Continued collaboration at all levels is needed if the goals of this plan are to be achieved.

The Shoreline Inventory and Characterization Report (ESA Adolfson, et al., 2010) provides additional details about restoration projects and programs that are already underway. The focus of this Restoration Plan is on future shoreline restoration opportunities that will build on the existing, ongoing efforts.

6.1 Existing Restoration Programs

6.1.1 City of Battle Ground

The *City of Battle Ground Stormwater Management Plan Draft Report* (2004) creates a coordinated long-term management approach to issues affecting flood hazards, water quality and protection of natural resources. Several best management practices (BMPs) were recommended to reduce pollutants in the stormwater system. BMPs include increasing enforcement/inspection staffing resources to ensure construction site erosion control activities are properly maintained and developing a water quality monitoring program for volunteers. The plan also established a capital improvement program that recommends developing five regional stormwater detention projects. The projects would reduce stormwater flows and stream bank erosion during storm events and lower water levels in downstream channels.

6.1.2 City of Camas

The *City of Camas Draft Stormwater Management Plan* (2008) establishes BMPs that protect water quality by reducing the discharge of pollutants from the municipal storm sewer system. BMPs include developing a low impact development ordinance, identifying and removing illicit discharges, monitoring outfalls to identify discharges that exceed water quality standards, conducting construction site inspections to monitor erosion and sediment controls, developing an operations and maintenance program, developing a stormwater pollution prevention plan, and developing alternative maintenance practices for open space and parks.

6.1.3 Clark County

Several County-led programs and plans address restoration opportunities and projects within the shoreline areas of Clark County. These programs and plans involve community stakeholders, the tribes, non-governmental organizations, and other partners.

The Clean Water Program administrated by Clark County Environmental Services implements stormwater-related restoration projects. It also actively monitors streams and lakes to assess current conditions and stormwater impacts. A series of stormwater needs assessment reports

have been developed by the County Clean Water Program for various sub-watersheds. The reports identified stormwater-related projects and activities that would improve stream health.

The Clark County Clean Water Program administers the County's National Pollutant Discharge Elimination System (NPDES) permit program as described in the *Clark County Stormwater Management Plan*. This program includes NPDES Phase I municipal stormwater permit activities; pollution prevention at businesses and industrial sites; a Stormwater Capital Improvement Program to retrofit areas for increased stormwater flow control and water quality treatment; floodplain, wetland and riparian habitat restoration projects; promotion of LID for new development and redevelopment; operation and maintenance of County facilities to reduce pollutants; and education and outreach.

The Environmental Services department also administers an Endangered Species Program to address Endangered Species Act requirements and develop a comprehensive salmon recovery strategy. The Lower Columbia Salmon Recovery and Fish and Wildlife Plan was developed in 2004 and updated in 2010. It identified restoration actions addressing the range of threats to listed species.

The County's Vegetation Management program, also administered by Environmental Services, provides a key restoration effort by controlling and eradicating noxious weeds such as knotweed and non-native invasive blackberry along streams and waterways. The Clark County Growing Green Program, initiated in 2010, focuses on enhancing riparian areas with native plantings. In addition, Clark Public Utilities is focused on long-term restoration of the Salmon Creek watershed by involving volunteers in restoration of shoreline riparian zones and wetlands through the Stream Team and Stream Stewards Programs.

Clark County Legacy Lands purchases and administers hundreds of acres of open space, much of which is shorelines. The program is funded by Conservation Futures property tax levies. The Vancouver-Clark County Parks and Recreation department has identified restoration opportunities along the County and City of Vancouver-owned greenways and lowlands. The focus has primarily been on the following greenways: East Fork of the Lewis River Greenway (Lewisville Park to La Center Bottoms), Salmon Creek Greenway (I-5 Bridge to NW 36th Avenue), Burnt Bridge Creek Greenway (headwaters to mouth) and the Vancouver Lake Lowlands.

6.1.4 City of La Center

The Wetland Stewardship Volunteer Program in La Center entered its third year of operation in 2010. The Department of Public Works and citizen volunteers have been working together to improve the functions and aesthetics of the wetland which lies between South View Heights and Vista View Ridge (City of La Center, 2010). A wetland planting event on February 20, 2010, was a success, with over 50 volunteers planting a total of 300 plants of 22 different species (City of La Center, 2010).

The La Center Wastewater Treatment Plant upgrade will produce Class A Reclaimed Water, as defined by Ecology. This high quality effluent could be used for parkland irrigation, river flow augmentation or for wetland enhancement. Using the reclaimed water will conserve groundwater to meet future potable water needs. Flow augmentation could improve stream flows in the East

Fork Lewis River and reduce high temperatures found in the river during the summer, supporting the goals of the East Fork Lewis River Watershed Management Plan. Wetland enhancements could improve wildlife habitat in La Center Bottoms and provide critical habitat for endangered salmonids migrating in the East Fork Lewis River basin. All of these benefits would help improve water quality, enhance wildlife habitat and generally protect the environment (City of La Center, 2010).

6.1.5 City of Ridgefield

The City of Ridgefield Comprehensive Stormwater Management Plan (City of Ridgefield, 2007) characterized the drainage basins, developed alternative solutions for stormwater quantity and quality control, and recommended a stormwater management program.

The City and the Gee Creek Enhancement Committee (volunteer group) have led efforts in native plant re-establishment and invasive plant removal, primarily Japanese knotweed, Himalayan blackberry and English ivy. Much of the work has been through volunteer effort, grants, and City in-kind staff labor.

The Port of Ridgefield is currently involved in environmental remediation on waterfront property along Lake River. Cleanup is focused on eliminating the migration of contaminants to Lake River and Carty Lake, which is in the Ridgefield National Wildlife Refuge. The Port is anticipating a significant shoreline restoration effort as part of a redevelopment project now in the planning and design stages.

6.1.6 City of Vancouver

Creating a More Sustainable Vancouver, a Continuing, Dynamic Plan for a Better Future (2009) establishes goals and strategies such as: reducing total pollutant load in effluent from City treatment plants; reducing impervious surfaces to improve water quality and reduce runoff impacts; and encouraging residents and businesses to decrease purchases of toxic products and generation of hazardous waste, and increase use of non-toxic products.

In 2006, Vancouver Public Works and Vancouver-Clark County Parks and Recreation departments implemented the Burnt Bridge Creek Greenway Project. The project re-established the natural floodplain and multi-story canopy along Burnt Bridge Creek. The project was funded by Surface Water Management Program enterprise funds and an Interagency Committee for Outdoor Recreation grant. The City also developed the Burnt Bridge Creek Watershed Program (2007) which establishes goals for the Burnt Bridge Creek Water Quality Monitoring Program. The purpose of the program is to collect water quality data to assist the City in assessing the effect of existing programs and implementing adaptive management strategies to protect water resources.

Vancouver also maintains an ongoing Water Resources Protection program which identifies and eliminates existing and potential illicit discharges to the stormwater system and reduces risks to surface and groundwater in the City. In 2006, a systematic outfall screening program was initiated to locate, map, and evaluate stormwater discharges to Burnt Bridge Creek and the Columbia River (City of Vancouver, 2007).

The Erosion Prevention Program requires best management practices to be applied to land-disturbing activities. The City works with multiple counties in Washington and Oregon on an annual regional Erosion Prevention Award Program. The goals of the program are to encourage erosion prevention practices during construction, provide uniformity and consistency across jurisdictional boundaries and develop strong partnerships within the building community (City of Vancouver, 2007).

The Sewer Connection Incentive Program encourages homeowners to connect to public sanitary sewers and decommission septic systems. Since 1993, more than 1,200 houses have connected to public sewers (City of Vancouver, 2007).

6.1.7 City of Washougal

The *City of Washougal Stormwater Management Plan* (2008) establishes goals to minimize stormwater runoff from municipal operations, such as: developing an operations and maintenance program, developing a stormwater pollution prevention plan, conducting routine inspections and repairing leaks of City-owned vehicles, determining ways to reduce the amount, concentration, and frequency of pesticide use in the City, and reducing nutrient loading generated by lawns.

6.1.8 Town of Yacolt

The Town of Yacolt does not currently have a Shoreline Master Program (SMP) as it does not contain any jurisdictional shorelines. Also, the Town has not yet prepared a city-wide stormwater management plan. The *Yacolt General Sewer Plan* (Kennedy/Jenks Consultants, 2009) evaluated options for transitioning the town from septic systems to sanitary sewer service. The preferred discharge option for direct and indirect discharges would be to the East Fork Lewis River watershed near the confluence of Yacolt, Big Tree and Weaver Creeks. The secondary discharge option recommended would be to the Lewis River watershed on Cedar Creek.

6.2 Key Partners

Organizations and partners that are likely to play a major role in carrying out the restoration efforts described in this plan and others are listed alphabetically in Table 6-1. These are some of the key organizations with a primary focus on ecological restoration that are actively involved in restoration and stewardship of the Clark County jurisdictions' shoreline resources. The list, which is not exhaustive, describes the organizations' missions or areas of focus, the role they can likely play in future restoration activities, and some of their past projects.

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

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Clark County Environmental Services Clean Water Program	<ul style="list-style-type: none"> Clark County administers the Clean Water Program to safeguard the quality of water and comply with the federal Clean Water Act. The program's primary activities consist of stormwater capital improvements, water quality monitoring, public education and outreach, regulations and enforcement, and stormwater maintenance. As the county's population continues to increase, the Clean Water Program is committed to keeping the waterways clean for people, fish, and wildlife. 	<ul style="list-style-type: none"> Capital improvement projects, maintenance of existing stormwater system, outreach and education, enforcement, water quality monitoring. Coordinating with a citizen advisory commission providing advice to the Board of County Commissioners regarding Clean Water Program performance. 	<ul style="list-style-type: none"> Water quality monitoring reports, outreach materials, and stormwater needs assessment at sub-watershed level. Technical assistance to the Vancouver Lake Watershed Partnership, the Lower Columbia Fish Recovery Board, and Department of Ecology TMDL implementations in Salmon Creek and Gibbons Creek.
Clark County Environmental Services ESA Program	<ul style="list-style-type: none"> Address Endangered Species Act requirements and inform the public about measures to protect listed species. 	<ul style="list-style-type: none"> Coordinate with County departments such as Public Works on projects to restore habitat for listed salmonids. 	<ul style="list-style-type: none"> Changes to routine road maintenance activities to minimize use of chemicals. Removal of fish barriers on several streams. Improvements to erosion and sediment control program. Storm drain stenciling program.
Clark County Environmental Services Growing Green	<ul style="list-style-type: none"> Install native plants on County lands in partnership with other agencies and private landowners. Enhance wetlands and wildlife habitat, improve hydrology and aesthetics. 	<ul style="list-style-type: none"> Coordination and recruitment of volunteers for large-scale planting efforts. 	<ul style="list-style-type: none"> Program has identified riparian planting sites in Salmon Creek, Whipple Creek, and Lewis River watersheds.

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Clark County Environmental Services, Legacy Lands Program	<ul style="list-style-type: none"> Acquires properties to protect important ecological areas and protect agricultural areas and working forests. Works with LCFRB and others to implement Lower Columbia River Fish Recovery Plan. 	<ul style="list-style-type: none"> Acquisition and protection of properties along Lewis River, Washougal/Little Washougal River, Lacamas Creek and Lacamas Lake, Burnt Bridge Creek and Salmon Creek greenways. 	<ul style="list-style-type: none"> Acquired shoreline, riparian, wetlands, and floodplain habitat on East Fork Lewis River, Whipple Creek, and Lacamas Lake. Acquired property to enable development of trail in Washougal River Greenway.
Clark Public Utilities	<ul style="list-style-type: none"> Implements restoration projects on public and private properties. Engages volunteers for restoration of shoreline riparian zones and wetlands through the Stream Team and Stream Stewards Programs. 	<ul style="list-style-type: none"> Recruitment and coordination of volunteers for stream restoration in Salmon Creek watershed. 	<ul style="list-style-type: none"> In Salmon Creek watershed, planted more than 600,000 trees along 15 miles of stream; installed 10 miles of livestock exclusion fencing and 2 miles of bank stabilization. Began a major stream restoration project along Salmon Creek Greenway in 2010.
Columbia Gorge Refuge Stewards	<ul style="list-style-type: none"> Volunteers who assist the USFWS in preserving and maintaining Steigerwald Lake, Franz Lake, and Pierce National Wildlife Refuges. 	<ul style="list-style-type: none"> Habitat restoration projects in national wildlife refuge areas. Educational opportunities for the public. 	<ul style="list-style-type: none"> Developing an environmental education program for local schools. Hosts regular work parties to remove invasives and install native vegetation near Gibbons Creek.
Columbia Land Trust	<ul style="list-style-type: none"> Columbia Land Trust works to permanently conserve the natural resources of the Columbia River region. They conserve, restore, and manage signature landscapes, vital habitats, and working farms and forests in Oregon and Washington from east of the Cascade Mountains to the Pacific Ocean. 	<ul style="list-style-type: none"> Protection of land through purchase, donation, easement, or other means. Implementation of restoration projects. 	<ul style="list-style-type: none"> Led the conservation of more than 9,800 acres.

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Columbia Springs Environmental Education Center	<ul style="list-style-type: none"> Columbia Springs was created in 1997 through the partnership of Clark Public Utilities, Evergreen School District, the Washington Department of Fish and Wildlife, City of Vancouver/Clark County, and Clark College. Columbia Springs' goal is to provide environmental education to the community through on-site education for local students in grades K-12 and college and off-site through outreach programs. 	<ul style="list-style-type: none"> Community involvement, education and outreach to children. Organize volunteers to restore habitats along the Columbia. Coordinate with other existing education programs, such as The Salmon in the Classroom program. 	<ul style="list-style-type: none"> Salmon in the Classroom programs goal is to engage Clark County students, parents, and community members in positive environmental stewardship through increased awareness of the unique salmon life cycle and habitat requirements. Healthy Water and Habitats Tour.
Cowlitz Indian Tribe	<ul style="list-style-type: none"> To protect, conserve, restore and promote culturally relevant species and landscapes integral to the unique identity of the Cowlitz People. 	<ul style="list-style-type: none"> Potential restoration partner and reviewer of projects proposed in culturally sensitive areas. 	<ul style="list-style-type: none"> Salmon and stream restoration projects in the Cowlitz and Lewis River basins. Acquisition of prairie lands to protect listed prairie plant species.
Fish First	<ul style="list-style-type: none"> To restore native Pacific Ocean salmon and steelhead runs to levels sufficient enough to support responsible harvest by commercial, tribal and non-commercial fishermen. 	<ul style="list-style-type: none"> Coordinate restoration activities. Utilize volunteers in restoration projects on both public and private lands. 	<ul style="list-style-type: none"> Raise fry in net pens and release 140,000 Chinook salmon, and 70,000 steelhead each year in the North Fork Lewis River. Restoration projects along Upper Mason Creek, East Fork Lewis River, and Cedar Creek.
Friends of East Fork Lewis River	<ul style="list-style-type: none"> Friends of The East Fork is a non-profit 501C-3 group dedicated to the improvement of river habitat, good land stewardship, and restoration of the East Fork Lewis River near Vancouver, Washington. Friends of The East Fork and Fish First have been cooperatively working with local property owners along the East Fork Lewis River and have constructed a number of fish habitat projects. 	<ul style="list-style-type: none"> Community involvement and education. Organize volunteers to restore habitats. Develop conceptual restoration designs. 	<ul style="list-style-type: none"> Designed and installed 26 restoration projects in the past 11 years to benefit fish habitat and restore streambanks. Restoration projects include: <ul style="list-style-type: none"> West Day Break Restoration 90% Planning Design (E Fork Lewis) Manly Road Creek Culvert Replacement

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Friends of the Ridgefield National Wildlife Refuge	<ul style="list-style-type: none"> Promotes educational programs, and protects and enhances the natural and cultural resources of the refuge and Lower Columbia River area. 	<ul style="list-style-type: none"> Community involvement and education. Organize volunteers to restore habitats within the refuge. 	<ul style="list-style-type: none"> Organize volunteer activities. Remove invasive plants and replace with native plantings.
Lower Columbia Fish Enhancement Group	<ul style="list-style-type: none"> A non-profit organization working on salmon recovery throughout southwest Washington. 	<ul style="list-style-type: none"> Plan and conduct habitat restoration projects through landowner partnerships and collaborations with individuals, groups, corporations, tribes, foundations and agencies. 	<ul style="list-style-type: none"> Nutrient enhancement by placing several thousand dead salmon into Washougal, West Fork Washougal, North Fork Lewis, East Fork Lewis and Kalama River watersheds.
Lower Columbia Fish Recovery Board	<ul style="list-style-type: none"> Leading a collaborative approach to restoring threatened anadromous fish species and rebuilding other focal fish and wildlife species in the Lower Columbia River region in Washington. 	<ul style="list-style-type: none"> Developing watershed management plans, salmon recovery plans, managing the Salmon Partners Ongoing Tracking System. Recommend projects to be funded by the BPA Fish and Wildlife Sub-basin Program. 	<ul style="list-style-type: none"> Identify key restoration priorities for salmon recovery. Develop and implement a 6-Year Habitat Work Schedule.
Lower Columbia River Estuary Partnership	<ul style="list-style-type: none"> Increase habitat and habitat functions. Provide education, information, and volunteer programs. Evaluate the impact of actions and prevent toxic and conventional pollution. 	<ul style="list-style-type: none"> Secures funds from BPA and other agencies for projects to restore salmonid habitat. The Partnership uses a strategic habitat restoration prioritization framework to develop restoration actions. 	<ul style="list-style-type: none"> Identifies locations for restoration projects and types of projects that will have the greatest ecological benefits.
The Nature Conservancy of Washington	<ul style="list-style-type: none"> Conservation organization that works with private landowners, public land managers, and local communities to protect and restore ecologically important areas of the state. 	<ul style="list-style-type: none"> Land acquisition and protection. Public involvement and education. 	<ul style="list-style-type: none"> Has helped protect more than 550,000 acres in Washington; owns and manages 55,000 acres across the state. Owns and manages Pierce Island Preserve in the Columbia River east of Vancouver.

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Northwest Power and Conservation Council	<ul style="list-style-type: none"> A multi-state planning agency responsible for development of the Columbia River Fish and Wildlife Program and its implementation by federal agencies. 	<ul style="list-style-type: none"> Guide Bonneville Power Administration's funding of projects to implement the fish and wildlife program. 	<ul style="list-style-type: none"> Development of fish and wildlife program.
PacifiCorp	<ul style="list-style-type: none"> Large private utility operating in Oregon, Washington, California, Utah, Wyoming and Idaho. Operates hydroelectric dams on the Lewis River. Funds protection, mitigation and enhancement measures for fish, wildlife, recreation, cultural resources and flood management. 	<ul style="list-style-type: none"> Potential funding source and partner for projects on the Lewis River. 	<ul style="list-style-type: none"> Currently undertaking a plan to restore salmonid access to 170 miles of habitat upstream of Lewis River dams.
Salmon Creek Watershed Council	<ul style="list-style-type: none"> To engage and inspire community investments in the Salmon Creek Watershed for the protection and enhancement of its natural resources. Provides a forum for citizens and organizations residing in Clark County to participate and partner for "on the ground" restoration, water quality and advocacy of the Salmon Creek Watershed. 	<ul style="list-style-type: none"> Coordinate and fun restoration activities. Community involvement and education. 	<ul style="list-style-type: none"> Restoration along lower Salmon Creek. Water typing reconnaissance to identify fish bearing streams not mapped by WDFW.
Vancouver Public Works	<ul style="list-style-type: none"> To protect the rivers, lakes, streams and groundwater, which are important to our community and high quality of life. 	<ul style="list-style-type: none"> Water Resources Protection Program. 	<ul style="list-style-type: none"> Managing stormwater runoff to streams, lakes and rivers in the City of Vancouver.
Vancouver-Clark Parks and Recreation	<ul style="list-style-type: none"> Promote development and maintenance of Clark County and City of Vancouver parks, trails and open space for the enjoyment of the public. 	<ul style="list-style-type: none"> Manages and plans for County and City-owned park, open space and greenways, some of which contains shorelines. 	<ul style="list-style-type: none"> Coordinates volunteers such as AmeriCorps in planting native plants in the riparian zone.

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
Vancouver Lake Watershed Partnership Technical Group	<ul style="list-style-type: none"> • A partnership between Port of Vancouver, City of Vancouver, Clark County, Fruit Valley Neighborhood Association, Clark County Health Department, Port of Ridgefield, Clark Public Utilities, Washington Dept. of Natural Resources, Washington Dept. of Fish & Wildlife, Washington Dept. of Ecology, Lower Columbia River Estuary Partnership and US Army Corps of Engineers. • Coordinate restoration activities in the Vancouver Lake watershed. 	<ul style="list-style-type: none"> • Develop studies and implement restoration activities in Vancouver Lake and its watershed. 	<ul style="list-style-type: none"> • Wetland habitat restoration and recent study of algae grazing in Vancouver Lake.
Vancouver Watersheds Council	<ul style="list-style-type: none"> • Mission is to engage the community to protect and enhance the natural environment of the Vancouver watersheds. 	<ul style="list-style-type: none"> • Coordination of grant funding and volunteers for planting projects. 	<ul style="list-style-type: none"> • Plans annual planting events on Martin Luther King Jr. Day and Make A Difference Day.
Washington Department of Fish and Wildlife	<ul style="list-style-type: none"> • State agency with a dual mandate from the Washington Legislature to: (1) Protect and enhance fish and wildlife and their habitats; (2) Provide sustainable, fish- and wildlife-related recreational and commercial opportunities. 	<ul style="list-style-type: none"> • Technical assistance, grant funding for shoreline restoration projects. • Permitting for in-water restoration work. 	<ul style="list-style-type: none"> • Maintains list and maps of Priority Habitats and Species throughout the state and provides management recommendations. • Screens forest practices applications, hydraulic project approvals, and provides SEPA review. • Operates nine public water access sites in Clark County. • Stocks fish in Battle Ground Lake and Kline Pond. • Manages the Shillapoo Wildlife Area for habitat protection and bird hunting.

Partner Organization/ Program	Mission and Scope	Role in Future Restoration Efforts	Examples of Past and Ongoing Projects
WSU Extension Watershed Stewards Program	<ul style="list-style-type: none"> A partnership between Washington State University Clark County Extension and Clark County Clean Water Program. Program trains people to be volunteers for clean water in the community and presents workshops in rain barrels, rain gardens, green cleaning and other ways to improve watersheds. 	<ul style="list-style-type: none"> Community involvement and education. 	<ul style="list-style-type: none"> Organize workshops, lectures, and family fun days throughout Clark County.
WRIA 28 and 27 – Lewis River Basin and Salmon / Washougal River Basin	<ul style="list-style-type: none"> “Develop and implement a watershed management plan for the responsible use of water to balance the needs of people and natural resources.” Adopted by Clark County. 	<ul style="list-style-type: none"> Foster communication and collaboration among stakeholders, citizen outreach, and report on state of the watersheds. 	<ul style="list-style-type: none"> WRIA 27 and 28 Implementation Plan. Currently developing a major new water supply near the confluence of the North Fork Lewis River and the Columbia River. This new supply will provide water to meet growth needs and improve stream flows in the East Fork Lewis River sub-basin. Includes Fish Recovery Plan as a restoration component.
Yakama Nation (The Confederated Tribes and Bands of the Yakama Nation)	<ul style="list-style-type: none"> To protect, restore, and enhance the ecosystem integrity and traditional use of wildlife and other natural resources. Maintains usual and accustomed fishing rights in the Columbia River basin. Member of the Columbia River Inter-Tribal Fish Commission. 	<ul style="list-style-type: none"> Potential restoration partner and reviewer of projects that affect culturally sensitive areas or resources. 	<ul style="list-style-type: none"> Wildlife surveys including listed and non-listed species, wetland and riparian restoration, invasive plant management.

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CHAPTER 7 VOLUNTARY RESTORATION ON PRIVATE LANDS

Much of the shoreline area in Clark County, Washington, lies within private properties; therefore, public outreach and voluntary restoration actions are a key component of the success of this plan. Private property owners often serve as the best stewards for their land and will voluntarily enhance or restore conditions. As stated in Chapter 1, the Shoreline Restoration Plan is a non-regulatory and voluntary program undertaken by Clark County, the cities, citizens and other public agencies and environmental partners willing to improve habitat and existing conditions within the shoreline jurisdiction.

Voluntary actions may include citizens assisting a public agency or stewardship group with plantings, habitat improvement or shoreline ecology on public lands such as parks or open space. Voluntary actions may also include restoration undertaken on private properties by land owners to improve habitat, water quality or stabilize streams. This section addresses the types of actions that a private property owner can undertake to restore conditions in the shoreline jurisdiction.

Voluntary restoration on private properties may range from minor projects that do not require permitting in and of themselves (such as removal of ivy) to larger-scale improvements that require permit approval (such as grading, culvert removal, or streambank stabilization). Expert assistance is required to design and permit large-scale restoration projects on private properties. Expertise needed may include engineering, fisheries biology, wetland or wildlife science or geotechnical. Minor restoration may not require expert assistance and can be accomplished with general information provided by the cities and County or state government.

The following web sites provide information for shoreline land owners for voluntary restoration actions:

- WSU Clark County Extension Office – Habitat Restoration (<http://clark.wsu.edu/volunteer/ws/restoration.html>)
- Clark County Environmental Services, Vegetation Management (<http://www.co.clark.wa.us/weed/index.html>)
- Clark County Clean Water Program (<http://www.co.clark.wa.us/water-resources/index.html>)
- Green Shorelines: Bulkhead Alternatives for a Healthier Lake Washington (<http://www.ecy.wa.gov/programs/sea/events/greenshorelines.html>)
- Water quality – aquatic plants, algae and lakes: (<http://www.ecy.wa.gov/programs/wq/links/plants.html>)
- Protecting Your Stream - Ten Actions for Streamside Property Owners (WSU Extension Office, Clark County, 2008) (available at: <http://clark.wsu.edu/volunteer/ws/faqs.html>)
- Regional Coalition for Clean Rivers and Streams (<http://www.co.clark.wa.us/water-resources/education/coalition.html>)

The top five shoreline preservation or restoration actions easiest to implement on private property include:

1. Protect and preserve existing native vegetation, especially native trees.

Native trees and shrubs in the shoreline provide shade, shelter and food necessary for both terrestrial and aquatic species. Native vegetation along shoreline rivers and streams also stabilizes banks, reduces erosion and filters pollutants from runoff. Protection of existing vegetation preserves those important habitat functions in the shoreline.

2. Protect and preserve “associated wetlands.”

Wetlands considered “associated” with shorelines provide important flood storage, water detention, pollutant removal, and habitat for waterfowl and wildlife. By protecting and preserving these special wetlands, private landowners may protect the water quality, flood capacity and habitat in the nearby river.

3. Remove invasive non-native plants and install native trees and shrubs.

Invasive non-native plants like Himalayan blackberry, Japanese knotweed, English ivy, reed canarygrass, morning glory, holly, and butterfly bush can occupy habitat in the riparian zone along rivers, streams and lakes. These plants limit the habitat for native bird and wildlife species which do not typically use these plants. Oftentimes, invasive plants are fast-growing and shallow rooted, and make slopes and stream banks susceptible to erosion.

4. Remove debris, refuse and derelict structures from the shoreline.

Removing man-made debris from the shorelines helps keep beaches, lakeshores and streams free of harmful substances and materials. Removal of tires and other man-made debris improves the health of the shoreline and long-term quality of water. Work within water may require permits.

5. Reduce use of fertilizers and pesticides.

Minimizing use of fertilizers and pesticides within 200 feet of shorelines will improve water quality, reduce the risk of algae and nuisance aquatic plants (especially in lakes) and avoid impacts to downstream habitats.

CHAPTER 8 IMPLEMENTATION AND MONITORING

As a long-range planning effort without dedicated funding, it is difficult to articulate a firm strategy for accomplishing the goals of this plan. Under the Shoreline Management Act, the Coalition jurisdictions are required to review, and amend if necessary, their SMPs once every seven years (RCW 90.58.080(4)). At the time of this update (2009-2011), the Coalition jurisdictions are required to report progress toward meeting their restoration goals, but there is no requirement or timeframe for specifically *implementing* the Restoration Plan.

8.1 Timelines and Benchmarks

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

Within 0 to 7 years of adoption of this plan:

- Identify at least 3 potential bulkhead removal/ bio-stabilization projects on high priority shorelines. Establish a schedule for obtaining and assigning staff, applying for funding, and initiating steps toward implementation.
- Identify at least 4 potential riparian enhancements (including invasive vegetation removal) or levee setback projects on high priority shorelines. Establish a schedule for obtaining and assigning staff, applying for funding, and initiating steps toward implementation.
- Identify at least 3 public agencies planning culvert removal projects on a high priority shoreline.

Within 7 to 10 years of adoption of this plan (assuming funding is available):

- Complete at least 3 bulkhead removal/ bio-stabilization projects.
- Complete at least 4 riparian enhancement/invasive vegetation removal or levee setback projects.
- Complete design work for at least 3 culvert removals on a high priority shorelines on public lands.

Ongoing projects:

- Identify and complete at least 2 new bulkhead removal/ bio-stabilization projects.
- Identify and complete at least 3 new riparian enhancement/invasive vegetation removal or levee setback projects.
- Construct at least 2 new potential culvert removals on high priority shorelines on public lands.

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

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

More specific benchmarks should be developed for specific projects. For example, a project that involves fill removal and wetland restoration might be evaluated based on the number of acres of wetland habitat, the number of different plant species present, or the degree of use by birds.

8.2 Potential Funding

Implementing restoration activities identified in this plan will be a challenge given the national and local economic situation, and the lack of dedicated funding sources. However, the future cost of *not* undertaking shoreline restoration should be considered in terms of the ecosystem services that may be lost or further degraded. For example, it may be less expensive in the long run to preserve and restore a wetland system than to replace the functions provided by that wetland with an engineered structure in the future.

At present, shoreline restoration is almost entirely dependent on grant funding, which relies on state and federal monies. The Coalition's ability to devote any general funds to the implementation of this plan is doubtful, but potential internal funding sources do exist. One potential funding mechanism would be the establishment of a shoreline restoration program organized similar to or integrated with a capital improvement program (CIP). Similar to an infrastructure CIP, a shoreline restoration CIP would be evaluated and updated regularly. A restoration CIP could be focused on site-specific projects and could be funded through state grants or federal funding. For example, funds could be dedicated to support bulkhead removal, wetland restoration and riparian enhancements in the shoreline jurisdiction. Further, existing CIP projects, such as stormwater facility and road improvements, could be evaluated to determine if their design could advance shoreline restoration goals.

Special Districts or local improvement districts could also be established to help fund and/or implement restoration projects. A Special District is a local unit of government authorized by law to perform a single function or a limited number of functions. Examples of these

governments are water-sewer districts, irrigation districts, and transportation districts. Local improvement districts are primarily a means of financing needed capital improvements; they allow improvements to be financed and paid for over a period of time through assessments on properties that will benefit from the improvements. They require the approval of the local government and benefited property owners. Local improvement districts involve the sale of bonds to investors and the retirement of those bonds via annual payments by the property owners within a district. Both of the models would provide a potential mechanism for achieving some of the goals of this plan.

A variety of outside funding sources are available for restoration projects in Clark County. 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. Funding sources are listed below alphabetically by organization or agency.

**Bonneville Power Administration
Environment, Fish & Wildlife**

P.O. Box 3621
Portland, OR 97208-3621
503-230-5136
800-282-3713 (Toll Free)
<http://efw.bpa.gov/>

BPA partners with the Northwest Power and Conservation Council, the Columbia Basin Fish and Wildlife Authority, Columbia Basin Tribes, and other federal, state, and private organizations to mitigate the effects of hydropower development on fish and wildlife. BPA's fish and wildlife program provides direct funding of fish and wildlife projects, such as habitat restoration, research, and land acquisition. BPA also reimburses other agencies (U.S. Army Corps of Engineers, Bureau of Reclamation, and U.S. Fish and Wildlife Service) for expenses relating to hatchery operations and improvements at the dams for fish passage. The U.S. Treasury is reimbursed for construction of capital projects such as hatcheries and fish passage facilities.

**Ducks Unlimited
Matching Aid to Restore States Habitat (MARSH)**

(916) 852-2000
conserve@ducks.org
<http://www.ducks.org/states/68/index.html>

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

Ecotrust

721 NW Ninth Ave., Suite 200
Portland, OR 97209
Phone: 503.227.6225
Fax: 503.222.1517
<http://www.ecotrust.org/wwri/>

Ecotrust is an organization that incorporates both for-profit and non-profit projects. Its Whole Watershed Restoration Initiative provides competitive grants for salmon habitat restoration efforts in targeted areas of high ecological importance in Oregon, Washington and Idaho. The lower Columbia River is one of the priority areas. The grants are funded in partnership with the National Oceanic and Atmospheric Administration, Oregon Watershed Enhancement Board, U.S. Forest Service, Bureau of Land Management and Natural Resources Conservation Service. Funding for individual projects ranges from \$20,000 to \$100,000.

Environmental Protection Agency

Region 10: Pacific Northwest

Grants Administration Unit
Bob Phillips
phillips.bob@epa.gov
(206) 553-6367
<http://www.epa.gov/epahome/grants.htm>

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

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

- *Environmental Education Grants:* This program funds a broad variety of environmental education, training, and outreach activities. Grant awards of up to \$50,000 are provided to universities, state, local, and tribal education agencies, and nonprofit organizations.

Lower Columbia Fish Recovery Board (LCFRB)

2127 8th Avenue
Longview, WA 98632
360 425-1555
<http://www.lcfrb.gen.wa.us/>

The LCFRB disburses funding for habitat projects from a variety of sources such as the federal Pacific Coastal Salmon Recovery Fund, Washington State Salmon Recovery Funding Board, Lewis River Habitat Enhancement Fund and the National Fish and Wildlife Foundation Community Salmon Fund. Since 1998 the Board has secured funding for over 219 habitat projects awarded to 30 sponsors. The Board places a high value on partnerships with local groups. Sponsors provide almost 50 percent of the total cost of the projects.

Lower Columbia River Estuary Partnership

811 SW Naito Parkway Suite 410
Portland, OR 97204
Phone: 503-226-1565
Fax: 503-226-1580
<http://www.lcrep.org/habitat-restoration>

The Lower Columbia River Estuary Partnership (LCREP) administers a Habitat Restoration Program that works to protect and restore the lower Columbia River estuary through habitat restoration activities, education and stewardship programs, and improved collaboration among jurisdictions and stakeholders. LCREP provides grants to non-profit organizations and local governments. Funding is provided primarily by the Bonneville Power Administration, the NOAA Community Based Habitat Restoration Program, and the EPA National Watershed Initiative.

National Fish and Wildlife Foundation

1120 Connecticut Avenue, NW, #900
Washington, DC 20036
Kathleen Pickering 202-857-0166
<http://www.nfwf.org/AM/Template.cfm?Section=GrantPrograms>

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

- *Bring Back the Natives: A Public-Private Partnership for Restoring Populations of Native Aquatic Species:* The Bring Back the Natives initiative funds on-the-ground efforts to restore native aquatic species to their historic range. Projects should involve partnerships with private landowners, demonstrate successful collaborative efforts, address watershed health issues that would lead to restoring, protecting, enhancing native

aquatic. Projects should focus on habitat needs of species such as fish, invertebrates, and amphibians that originally inhabited the waterways across the country. Twelve to twenty-two grants averaging \$60,000 are awarded annually.

- *Five-Star Restoration Grant Program:* The Five-Star Restoration Program provides modest financial assistance on a competitive basis to support community-based wetland, riparian and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities.
- *Community Salmon Fund Partnerships:* NFWF has established local partnerships throughout Washington State through the Community Salmon Fund program to engage landowners, community groups, tribes, and businesses in stimulating smaller-scale, community-oriented habitat restoration and protection projects to aid in salmon recovery. Grants made under this program are administered by NFWF. There are currently three Community Salmon Fund partnership programs. NFWF has partnered with the Washington State Salmon Recovery Funding Board (SRFB) to administer a statewide Community Salmon Fund program that is coordinated with the individual Lead Entity groups.

Natural Resources Conservation Service

Washington State

Puyallup Service Center

1011 E Main Ste 106

Puyallup, WA 98372-6768

(253) 845-9272

(253) 445-9934 Fax

<http://www.wa.nrcs.usda.gov/programs/>

The Natural Resources Conservation Service (NRCS) is a federal agency that provides planning and technical assistance to private landowners. NRCS activities include farmland protection, upstream flood prevention, emergency watershed protection, urban conservation, and local community projects designed to improve social, economic, and environmental conditions.

- *Wetlands Reserve Program:* The NRCS Wetlands Reserve Program provides financial incentives to restore and protect wetlands in exchange for retiring marginal agricultural land. Landowners may sell a conservation easement or enter into a cost-share restoration agreement while retaining private ownership.
- *Wildlife Habitat Incentive Program:* Through this program, the NRCS provides a 25% cost share for restoration of wildlife habitat on private property including uplands, wetlands, threatened and endangered species habitat, and fish habitat.

**NOAA Restoration Center
Community-based Restoration Program**

Northwest Region

Jennifer Steger, Director

Jennifer.Steger@noaa.gov

http://www.nmfs.noaa.gov/habitat/restoration/funding_opportunities/funding.html

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

- *NOAA RC National and Regional Partnership Grants*: These grants fund national and regional habitat restoration partnerships for up to 3 years that provide sub awards for individual grass-roots restoration projects. Typical awards range from \$500,000 to \$1,000,000.
- *American Sportfishing Association's FishAmerica Foundation Grants*: Since 1998, NOAA has partnered with the FishAmerica Foundation to provide funding for fisheries habitat restoration projects nationwide. Grants will fund marine and anadromous fish habitat restoration projects that benefit recreationally fished species. Typical awards range from \$10,000 to \$75,000.
- *Stream Barrier Removal Grants*: NOAA provides funding that is distributed by American Rivers through a competitive grant program for projects that benefit fish and restore riverine ecosystems. Grants are provided for three project phases—feasibility analysis, engineering design, and construction—with the average grant size between \$25,000 - \$50,000. <http://www.americanrivers.org/our-work/restoring-rivers/dams/noaa-grants-program.html>
- *Community-based Marine Debris Removal Grant*: Provides competitive grants for projects involving the removal of marine debris and derelict fishing gear, as well as activities that provide social benefits for communities. <http://marinedebris.noaa.gov/funding/welcome.html>
- *Coastal Counties Restoration Initiative*: This program is a partnership between NOAA and the National Association of Counties. It funds innovative, high-quality, county-led or supported projects to improve stream, river, estuarine and other important marine habitats. A priority area is the removal of fish passage barriers in coastal streams and rivers. <http://www.naco.org/programs/csd/Pages/CoastalCounties.aspx>

PacifiCorp Energy

825 NE Multnomah Street, Suite 1500

Portland, OR 97232

<http://www.pacificorp.com/es/hydro/hl/lr.html>

PacifiCorp operates hydroelectric dams on the Lewis River. Through the Lewis River Aquatic Fund, PacifiCorp supports projects to benefit fish recovery throughout the North Fork Lewis River, support the reintroduction of anadromous fish in the Lewis River basin, and enhance fish habitat in the basin.

Trout Unlimited
Embrace-A-Stream

406-543-1192

www.tu.org

<http://www.tu.org/conservation/watershed-restoration-home-rivers-initiative/embrace-a-stream>

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

USDA Farm Service Agency
Puyallup Service Center

1011 E Main Ste 106

Puyallup, WA 98372-6768

(253) 845-9272

(253) 445-9934 Fax

<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=cep>

The USDA Conservation Reserve Enhancement Program (CREP) is a voluntary land retirement program. It provides incentives for landowners to restore and improve salmon and steelhead habitat in riparian buffers. Landowners are paid an annual rental rate in return for a 10- to 15-year commitment to keep the land out of agricultural production. CREP also provides cost-sharing for installation of native vegetation and other practices to protect waterbodies from sedimentation and runoff.

U.S. Fish & Wildlife Service

Nell Fuller

911 NE 11th Avenue

Portland, OR 97232-4181

(503) 231-2014

Nell_Fuller@fws.gov

<http://www.fws.gov/grants/>

- *Partners for Fish and Wildlife Program*: This program provides technical and financial assistance to private landowners and Tribes who are willing to work with USFWS and other partners on a voluntary basis to help meet the habitat needs of Federal Trust Species. The Partners Program can assist with projects in all habitat types which conserve or restore native vegetation, hydrology, and soils associated with imperiled ecosystems such as longleaf pine, bottomland hardwoods, tropical forests, native prairies, marshes, rivers and streams, or ecosystems that otherwise provide an important habitat

requisite for a rare, declining or protected species. The typical grant award is approximately \$25,000.

- *National Fish Passage Program*: Each year the Service solicits and inputs select fish passage projects into the Fisheries Operational Needs System database. Projects are prioritized and selected based upon the benefits to species and the geographical area. Typical projects include barrier culvert removal or replacement with a fish passable culvert or bridge, and re-opening oxbow and off channel habitats. Typical funding amounts range from \$30,000 to \$110,000 with a minimum 25% cost share requested.
- *Cooperative Endangered Species Conservation Fund*: Grants offered through the Cooperative Endangered Species Conservation Fund support participation in a wide array of voluntary conservation projects for candidate, proposed and listed species. These funds may in turn be awarded to private landowners and groups for conservation projects.
- *North American Wetlands Conservation Act Grants Program*: The North American Wetlands Conservation Act of 1989 provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects in the United States, Canada, and Mexico for the benefit of wetlands-associated migratory birds and other wildlife. The Standard Grants Program supports projects in Canada, the United States, and Mexico that involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats. The Small Grants Program operates only in the United States; it supports the same type of projects and adheres to the same selection criteria and administrative guidelines as the U.S. Standard Grants Program. However, project activities are usually smaller in scope and involve fewer project dollars. Grant requests may not exceed \$75,000, and funding priority is given to grantees or partners new to the Act's Grants Program.
- *National Coastal Wetlands Conservation Grant Program*: This program provides half of the cost for projects involving acquisition, restoration, or enhancement of coastal wetlands and adjacent uplands to provide long-term conservation benefits to fish, wildlife and their habitats. Award amounts are up to \$1 million.

Washington State Department of Ecology

P.O. Box 47600

Olympia, Washington 98504-7600

360-407-6300

<http://www.ecy.wa.gov/fap.html>

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

- *Aquatic Weeds Financial Assistance Program*: This program provides funding for technical assistance, public education and grants to help control aquatic weeds. Grant projects must address prevention and/or control of freshwater, invasive, non-native aquatic plants. The types of activities funded encompass: Planning, education, monitoring, implementation, pilot/demonstration projects, surveillance and mapping projects. Grant applications are accepted from October 1 through November 1 of each year during a formal application process.

- *Water Quality Program:* The Department of Ecology's Water Quality Program administers four major funding programs that provide low-interest loans and grants for projects that protect and improve water quality in Washington State. Ecology acts in partnership with state agencies, local governments, and Indian tribes by providing financial and administrative support for their water quality efforts. As much as possible, Ecology manages the four programs as one; there is one funding cycle, application form, and offer list. The four programs are: The Centennial Clean Water Program, The Water Pollution Control Revolving Fund, The Clean Water Section 319 Program, and Stormwater Retrofit and Low Impact Development Grant Program. Local governments, Native American tribes, conservation districts, and non-profit groups are eligible for funding. Grants and loans are available for point source and nonpoint source projects, for example, treatment facilities, stormwater control and treatment, stream restoration and protection, and on-site septic repair and replacement.
- *Columbia River Basin Water Management Grant Program:* The Department of Ecology's Water Resources Program administers funds for water storage and conservation projects and studies located within the Columbia River Basin. Projects must meet the following criteria to be considered eligible: 1) a valid water right must exist if construction funding is requested; 2) the water right must be "trustable" for conservation projects; 3) the project must be consistent with adopted watershed plans; and 4) storage projects must manage funds so that two-thirds of the money is applied out-of-stream and one-third is applied in-stream.
- *Oil Spill Response Equipment Grant Program:* Local governments, Native American tribes, fire departments, port districts, and public utility districts who can show that there is a substantial threat of an oil spill occurring may apply for funds to purchase oil response equipment.
- *Freshwater Algae Control Program:* Provides tools to local governments to control blue-green algae. The program provides for: algae identification, toxicity testing (microcystin and anatoxin-a), an on-line database to post the laboratory results, and small grants (up to \$50,000) for algae or nutrient management projects. For more information: <http://www.ecy.wa.gov/programs/wq/plants/algae/index.html>.
- Washington Department of Ecology provides loans and grants for stormwater retrofit projects, habitat enhancement projects, and watershed planning projects.

Washington State Department of Fish & Wildlife

600 Capitol Way North

Olympia, WA 98501-1091

360-902-2806.

<http://wdfw.wa.gov/grants/index.html>

- *Aquatic Lands Enhancement Account Volunteer Cooperative Projects Grant Program:* The Washington Department of Fish and Wildlife (WDFW) accepts grant applications from individuals and volunteer groups conducting local projects to benefit fish and wildlife. Grants have ranged from \$300 to \$75,000 in past years to help volunteers pay for materials necessary for projects approved by the agency. Funding cannot be used for wages or benefits. Examples of past projects cover habitat restoration, improving access

to fish and wildlife areas for disabled people, fish and wildlife research, public education and fish-rearing projects that can benefit the public.

- *Landowner Incentive Program*: The Landowner Incentive Program is a competitive grant program designed to provide financial assistance to private landowners for the protection, enhancement or restoration of habitat to benefit species at risk on privately owned lands. At risk species depend on specific ecosystems for survival. These ecosystems are identified as riparian areas, wetlands, oak woodlands, prairies and grasslands, shrub steppe and nearshore environments. Through Washington's program, individual landowners are eligible to apply for up to \$50,000 in assistance. In addition, \$50,000 is typically set aside for small grants. Any individual applying for these small grant funds may apply for up to \$5,000. A 25% non-federal contribution is required, which is not always cash but can be an in-kind (labor, machinery, materials) contribution. Funding is not currently available through the program. Future funding opportunities will be made available once funding is received from the federal government.

**Washington State Department of Natural Resources
Aquatic Lands Restoration Funding**

Aquatic Resources Division

360-902-1100

Fax 360-902-1786

ard@dnr.wa.gov

http://www.dnr.wa.gov/ResearchScience/Topics/AquaticClean-UpRestoration/Pages/aqr_aquatic_clean_restoration.aspx.

The Washington State Department of Natural Resources provides funding for removal of creosote piles, removal of derelict vessels and other clean up in the nearshore environment. Funding typically awarded to restoration projects between 2004 and 2007 ranged from \$8,000 to \$35,000.

Washington State Recreation and Conservation Office (RCO)

1111 Washington St. SE

PO Box 40917

Olympia, WA 98504

360-902-3000

<http://www.rco.wa.gov/grants/index.shtml>

info@rco.wa.gov

The RCO (formerly Interagency for Outdoor Recreation) supports the work of several organizations such as the *Recreation and Conservation Funding Board* and the *Salmon Recovery Funding Board*.

The Recreation and Conservation Funding Board provides funds for the acquisition and development of recreation and conservation lands. The board distributes funds through eight grant programs, for instance:

- *Aquatic Lands Enhancement Account*: This program is targeted at re-establishing the natural, self-sustaining ecological functions of the waterfront, providing or restoring

public access to the water, and increasing public awareness of aquatic lands as a finite natural resource and irreplaceable public heritage.

- *Land and Water Conservation Fund:* This program provides funding to preserve and develop outdoor recreation resources, such as parks, trails, and wildlife lands.
- *Washington Wildlife Recreation Program:* The Washington Wildlife Recreation Program Account involves support for critical habitat, natural areas, urban wildlife, local parks, state parks, trails, and water access categories.

The Recreation and Conservation Funding Board's grant process is open and competitive. Applications are submitted annually for some grant programs and every two years for others. The grant applications are reviewed by board staff and citizen committees. Letters of intent are usually due March 1. Applications are usually due May 1.

The Salmon Recovery Funding Board (SRFB) supports salmon recovery by funding habitat protection and restoration projects. It also supports related programs and activities that produce sustainable and measurable benefits for fish and their habitat. SRFB distributes funds through three grant programs, two of which are described below:

- *Family Forest Fish Passage Program:* The program will pay qualified landowners up to 100% for replacing blocked culverts. The Forest Riparian Easement Program also pays qualified landowners 50 to 100% of the value of timber they leave in riparian zones in exchange for a 50-year easement.
- *Salmon Recovery:* Grants can be used for buying salmon habitat, restoring areas along streams and other waterways, replacing barriers to fish passage, and creating fish habitat.

The grants from SRFB range from \$10,000 to nearly \$900,000. They have been awarded to organizations in 28 counties for work ranging from planting trees along streams to cool the water for salmon, to replacing culverts that prevent salmon from migrating to spawning habitat, to restoring entire floodplains.

Depending on the grant program, eligible applicants may include municipal subdivisions (cities, towns, counties, and special districts such as port, conservation, utility, park and recreation, and school), tribal governments, state agencies, nonprofit organizations, regional fisheries enhancement groups, and private landowners. To be considered for funding, acquisition projects must be operated and maintained in perpetuity for the purposes for which funding is sought. Restoration projects must be operated and maintained for ten years after construction is completed. All projects require lead entity approval and must address the goals and actions defined in the lead entity strategy or regional recovery plan.

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

Other Potential Sources

A number of private foundations, businesses, and other organizations administer grant programs with the intent of restoring habitat and ecosystems. Listed below are organizations with focal areas in watershed protection and habitat conservation:

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

8.3 Obstacles and Challenges

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

- Lack of funding or other resources: Designing, carrying out, and monitoring the success of restoration efforts can be an expensive undertaking, particularly at larger (e.g., watershed or reach) scales. In general, funding for restoration is limited and competition for funds extensive. Staff resources or other resources may also be lacking.
- Determination of Project Lead or sponsor: Restoration efforts cross jurisdictional boundaries and oftentimes require collaboration between agencies and governments to be successful. Determining the appropriate project lead for a multi-agency team can be a challenge to restoration in the shoreline.
- Landowner participation: Ownership of shorelines is highly variable. Landowners in areas identified as priorities for restoration efforts may be unwilling or unable to participate in those efforts, while others may be willing to participate in future projects.
- Project permitting: Obtaining necessary permits from local, state, and federal regulatory agencies can require substantial time and effort. Although encouraged and allowed by the SMP, complicated restoration projects may take a year or more to permit.

8.4 Monitoring and Adaptive Management Strategies

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

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

As defined by Salafsky et al. (2001), adaptive management is “the integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn.” Testing assumptions involves first thinking about the situation at a specific location and developing a specific set of assumptions about what is occurring at that site and what actions one might be able to use to affect these events. Restoration practitioners can then implement these actions and monitor the actual results to see how they compare to the ones predicted by the set of assumptions.

Adaptation, in turn, is about taking action to improve a project based on the results of monitoring (Salafsky et al., 2001). Adaptation involves changing assumptions and interventions to respond to new information obtained through monitoring efforts. Learning is an additional important component of adaptive management (Salafsky et al., 2001). Learning is about systematically documenting the process of restoration and the results achieved, in order to prevent the repetition of mistakes in the future. Others in the conservation community can benefit from this information, as they can design and manage better projects and avoid some of the hazards and perils of previous efforts that were well documented by practitioners.

The Coalition jurisdictions plan to review shoreline processes and functions at the time of periodic SMP updates to validate the effectiveness of their SMPs. This review will consider what restoration activities actually occurred, compared to stated goals, objectives and priorities, and whether restoration projects resulted in a net improvement of shoreline resources.

Under the Shoreline Management Act, the SMP must result in “no net loss” of shoreline ecological functions. If reviews demonstrate that this standard has not been met, the jurisdictions will be required to take corrective actions. The goal for restoration is to achieve a net improvement of shoreline resources. The cumulative effect of restoration over the time between reviews will be evaluated, along with an assessment of impacts of development that is not fully mitigated to determine effectiveness at achieving a net improvement to shoreline ecological resources.

To conduct a valid reassessment of the shoreline conditions, it is necessary to monitor, record, and maintain key environmental metrics to allow a comparison with baseline conditions. No comprehensive monitoring of ongoing restoration efforts within the County has been undertaken to date. Therefore, the effectiveness of current restoration efforts on a county-wide scale is unknown.

As part of the restoration planning component, the Coalition jurisdictions will consider conducting system-wide monitoring of shoreline conditions and development activity, recognizing that individual project monitoring does not provide an assessment of overall shoreline ecological health.

The Coalition jurisdictions will consider tracking information using their GIS and permit systems as activities occur (development, conservation, restoration, and mitigation). Specific benchmarks that should be tracked include the following:

- a. New shoreline development
- b. Shoreline variances and the nature of the variance
- c. Exemptions from shoreline substantial development permits
- d. Compliance issues
- e. New impervious surface areas
- f. Native vegetation converted to lawn or impervious surface area
- g. Number of new or replaced pilings
- h. Removal of fill
- i. Vegetation retention/loss (area)
- j. Lineal feet of bulkheads/armoring removed
- k. Lineal feet of levee removed
- l. Acres of wetland or floodplain restored

The Coalition jurisdictions will require project proponents to monitor the success of their mitigation, to capture improvement of habitat conditions and features within the mitigation area. Each of the Coalition jurisdictions will then monitor shoreline conditions to determine whether both project-specific goals and the overall SMP goals are being achieved. Monitoring will need to contain a tracking and reporting mechanism. For example, one of the most effective ways to monitor change in the shoreline jurisdictional area is through an analysis of current aerial photographs.

Based upon the results of monitoring, Coalition jurisdictions will reassess environmental conditions and restoration objectives. Those ecological processes and functions that demonstrate a downward trend of impairment need to be elevated for priority action to prevent loss of critical shoreline resources. Alternatively, successful restoration may reduce the importance of some restoration objectives in the future.

Evaluation of shoreline conditions, permit activity, GIS data, and policy and regulatory effectiveness will occur at varying levels of detail consistent with the comprehensive SMP update cycle. A complete reassessment of conditions, policies and regulations will be considered every seven years. Through this adaptive management approach, the Coalition jurisdictions will seek to improve the effectiveness of restoration efforts through better coordination of projects and monitoring of restoration success. Addressing the data gaps identified in the Shoreline Inventory and Characterization Report and implementing measures to collect the information will aid in the success of restoration. Additional information about shoreline processes and restoration opportunities will continue to inform the evaluations and be added to the database as part of this process.

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CHAPTER 9 CONCLUSIONS

This Restoration Plan has been prepared as part of the Shoreline Master Program update process consistent with WAC 173-26-201(2)(f). It includes “goals, policies and actions for restoration of impaired shoreline ecological functions.” Restoration opportunities within Clark County and its cities will be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status of functions at the date of adoption of the Shoreline Master Program. This Restoration Plan demonstrates how potential restoration opportunities meet the goals of regional entities, Clark County, cities, watershed planning entities, and environmental organizations that contribute or could potentially contribute to improved ecological functions of the shoreline.

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CHAPTER 10 GLOSSARY

Anadromous fish means fish species that spend most of their lifecycle in saltwater, but return to freshwater to reproduce.

Armoring means the addition of structures or material along the shoreline to decrease the impact of waves and currents or to prevent the erosion of banks or bluffs.

Associated wetlands means wetlands that are in proximity to and either influence or are influenced by a stream, lake or tidal water. This influence includes but is not limited to one of more of the following: periodic inundation, location within a floodplain, or hydraulic continuity (WAC 173-22-040).

Best management practices means conservation practices or systems of practices and management measures that: control soil loss, reduce water quality degradation, minimize impacts to surface waters, and control site runoff.

Bio-stabilization means biostructural and biotechnical alternatives to hardened structures (bulkheads, walls) for protecting slopes or other erosive features. Bioengineered stabilization uses vegetation, geotextiles, geosynthetics and similar materials. An example is Vegetated Reinforced Soil Slopes (VRSS), which uses vegetation arranged and imbedded in the ground to prevent shallow-mass movement and surficial erosion.

Bulkhead means a wall-like structure such as a revetment that is placed parallel to the shoreline (at or near the OHWM) primarily for retaining uplands and fills prone to sliding or sheet erosion, and to protect uplands and fills from erosion by waves or currents.

Channel migration zone means the area along a river or stream within which the channel can reasonably be expected to migrate over time as a result of normally occurring processes. It encompasses that area of current and historic lateral stream channel movement that is subject to erosion, bank destabilization, rapid stream incision, and/or channel shifting, as well as adjacent areas that are susceptible to channel erosion.

Channelization means the straightening, relocation, deepening or lining of stream channels, including construction of continuous revetments or levees for the purpose of preventing gradual, natural meander progression.

Conservation means the prudent management of rivers, streams, wetlands, wildlife and other environmental resources in order to preserve and protect them. This includes the careful use of natural resources to prevent depletion or harm to the environment.

Conservation easement means a legal agreement that the property owner enters into to restrict uses of the land for purposes of natural resources conservation. The easement is recorded on a property deed, runs with the land, and is legally binding on all present and future owners of the property.

Ecological Functions or **Shoreline Functions** means the work performed or role played by the physical, chemical, and biological processes that contribute to the maintenance of the aquatic and terrestrial environments that constitute the shoreline's natural ecosystem. See WAC 173-26-200 (2)(c). Functions include, but are not limited to, habitat diversity and food chain support for fish and wildlife, ground water recharge and discharge, high primary productivity, low flow stream

water contribution, sediment stabilization and erosion control, storm and flood water attenuation and flood peak desynchronization, and water quality enhancement through biofiltration and retention of sediments, nutrients, and toxicants. These beneficial roles are not listed in order of priority.

Ecosystem Processes, or Ecosystem-wide processes means the suite of naturally occurring physical and geologic processes of erosion, transport, and deposition; and specific chemical processes that shape landforms within a specific shoreline ecosystem and determine both the types of habitat and the associated ecological functions.

Enhancement means actions performed within an existing degraded shoreline, critical area and/or buffer to intentionally increase or augment one or more functions or values of the existing area. Enhancement actions include, but are not limited to, increasing plant diversity and cover, increasing wildlife habitat and structural complexity (snags, woody debris), installing environmentally compatible erosion controls, or removing non-indigenous plant or animal species.

Erosion means a process whereby wind, rain, water and other natural agents mobilize, and transport, and deposit soil particles.

Evolutionarily significant unit means a population of organisms that is considered distinct for purposes of conservation. Delineating ESUs is important when considering conservation actions. This term can apply to any species, subspecies, geographic race, or population.

Fish habitat means a complex of physical, chemical, and biological conditions that provide the life supporting and reproductive needs of a species or life stage of fish. Although the habitat requirements of a species depends on its age and activity, the basic components of fish habitat in rivers, streams, ponds, and nearshore areas include, but are not limited to, the following: clean water; appropriate temperatures; adequate water depth and velocity; appropriate substrates for spawning; adequate supply of aquatic and terrestrial insects; and unimpeded passage.

Headwater means the source and upper part of a stream, especially of a large stream or river, including the upper drainage basin.

Impervious surface means a hard surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development or that causes water to run off the surface in greater quantities or at an increased rate of flow compared to natural conditions prior to development. Common impervious surfaces may include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled macadam or other surfaces which similarly impede the natural infiltration of storm water. Impervious surfaces do not include surface created through proven low impact development techniques.

Invasive species means a species that is 1) non-native (or alien) to a specific geographic area and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and other organisms (e.g., microbes). Human actions are the primary means of invasive species introductions.

Juvenile salmon are immature salmon; fry.

LWD means large, woody debris; pieces of wood, often tree trunks, placed in a stream to help create habitat complexity.

Mainstem means the principal course of a stream.

Native vegetation means plant species that are indigenous to the local area.

No net loss means the maintenance of the aggregate total of the local government's shoreline ecological functions. The no net loss standard requires that the impacts of shoreline development and/or use, whether permitted or exempt, be identified and mitigated such that there are no resulting adverse impacts on ecological functions or processes.

Non-point source means a diffuse source of contaminants without a single point of origin introduced into a receiving stream whether from a specific outlet or not.

Off-channel habitat means areas distinctly separate from the main channel that lie outside the main channel cross-sectional profile; such as sloughs, meander cutoffs, and secondary or abandoned channels

Ordinary High Water Mark or **OHW** on all lakes and streams means that mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with approved development; provided that, in any area where the OHW cannot be found, the OHW adjoining fresh water shall be the line of mean high water. For braided streams, the OHW is found on the banks forming the outer limits of the depression within which the braiding occurs.

Reach means a segment of shoreline and associated planning area that is mapped and described as a unit (for purposes of inventorying conditions) due to homogenous characteristics that include land use and/or natural environment characteristics.

Rearing habitat means areas where juvenile fish grow and mature.

Riprap means dense, hard, angular rock free from cracks or other defects conducive to weathering used for revetments or other flood control works.

Riparian corridor or Riparian zone means the area adjacent to a waterbody (stream or lake) that contains vegetation that influences the aquatic ecosystem, nearshore area and/or fish and wildlife habitat by providing shade, fine or large woody material, nutrients, organic debris, sediment filtration, and terrestrial insects (prey production). Riparian areas include those portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems (i.e., zone of influence). Riparian zones provide important wildlife habitat. They provide sites for foraging, breeding and nesting; cover to escape predators or weather; and corridors that connect different parts of a watershed for dispersal and migration.

Riparian vegetation means vegetation that tolerates and/or requires moist conditions and periodic free flowing water thus creating a transitional zone between aquatic and terrestrial habitats which provides cover, shade and food sources for aquatic and terrestrial insects for fish species. Riparian vegetation and their root systems stabilize stream banks, attenuate high water

flows, provide wildlife habitat and travel corridors, and provide a source of limbs and other woody debris to terrestrial and aquatic ecosystems, which, in turn, stabilize stream beds.

River mile means the distance measured from the mouth of a river, traveling upstream.

Riverine located on or inhabiting the banks of a river.

Runoff means surface waters that flow overland during rain events and storms.

Salmon or **salmonid** is the common name for several species of fish of the family Salmonidae. Typically, salmon are anadromous: they are born in fresh water, migrate to the ocean, then return to fresh water to reproduce.

Shoreline Modification means any human activity that changes the structure, hydrology, habitat, and/or functions of a shoreline. Bulkheads, piers, docks, shoreline stabilization systems, berms, and dikes are all examples of shoreline modifications

Shoreline Stabilization are structural or non-structural modifications to the existing shoreline intended to reduce or prevent erosion of uplands or beaches. They are generally located parallel to the shoreline at or near the OHWM.

Shorelands or Shoreland areas mean those lands extending landward for 200 feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward 200 feet from such floodways; and all wetlands and river deltas associated with the streams, lakes and tidal waters which are subject to the provisions of Chapter 90.58 RCW.

Shorelines are all of the water areas of the state as defined in RCW 90.58.030, including reservoirs and their associated shorelands, together with the lands underlying them except:

- Shorelines of statewide significance;
- Shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second (20 cfs) or less and the wetlands associated with such upstream segments; and
- Shorelines on lakes less than twenty (20) acres in size and wetlands associated with such small lakes.

Shoreline Jurisdiction means all shorelines of the state and shorelands.

Shorelines of Statewide Significance means the shorelines identified in RCW 90.58.030 which because of their elevated status require the optimum implementation of the Shoreline Management Act's policies.

Shorelines of the State means the total of all "Shorelines" and "Shorelines of Statewide Significance" within the state and which is the subject of the Shoreline Management Act and its implementing mechanism, the Shoreline Master Program.

Stormwater means water that accumulates on land as a result of storms, and can include runoff from urban areas such as roads and roofs.

Total Maximum Daily Load or **TMDL** is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. Water quality standards are set by States, Territories, and Tribes. They identify the uses for each waterbody, for example, drinking water supply, contact

recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources.

Tributary means a stream feeding, joining, or flowing into a larger stream or into a lake.

Waterbody means a body of still or flowing water, identified at its outer limits by the OHWM.

Water Quality means the characteristics of water, including flow or amount and related, physical, chemical, aesthetic, recreation-related, and biological characteristics.

Watershed means a geographic region within which water drains into a particular river, stream or body of water.

Wetlands means areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands do not include those artificial wetlands intentionally created for non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass lines swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands.

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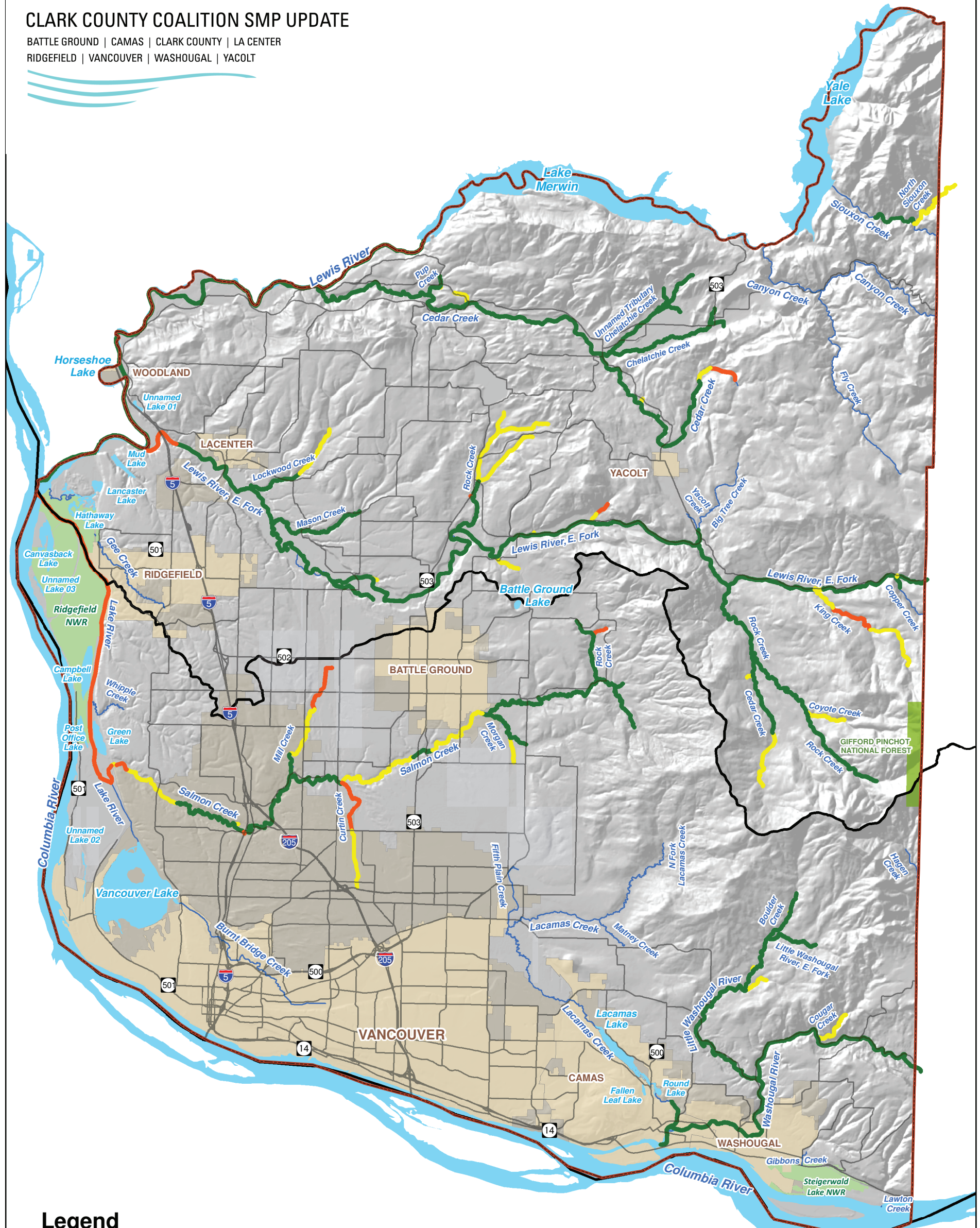
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Appendix A
EDT Recovery Scenario

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
 RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



Legend

Restoration Needs

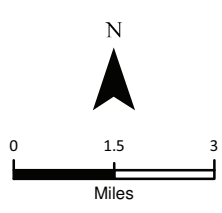
Stream Channel Habitat Structure and Bank Stability

- High (Restoration Benefit)
- Medium
- Low



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602

NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolphson implies no warranties or guarantees regarding any aspect of data depiction.

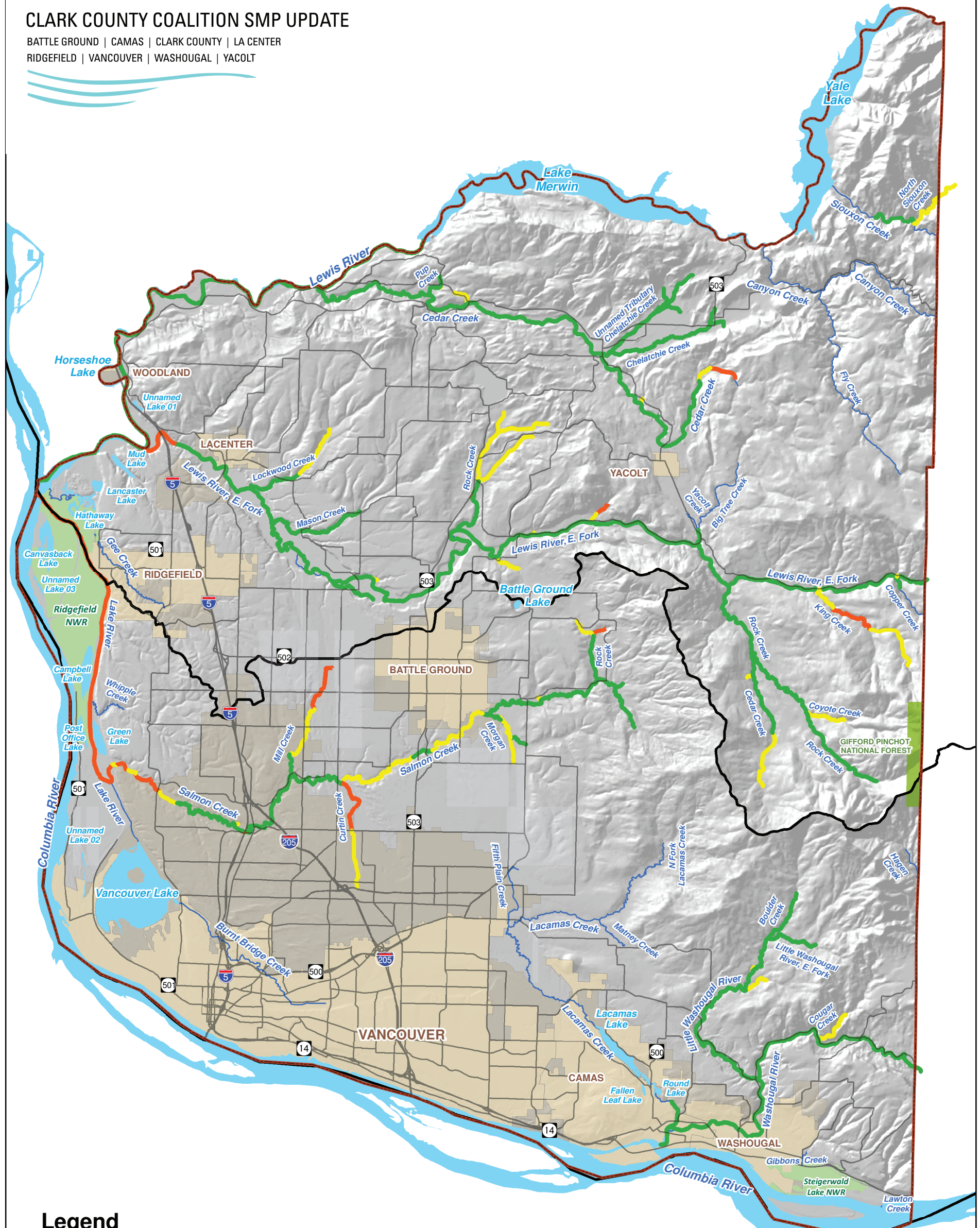


Map A-1
 Restoration Needs
 Multi-Species Priorities - Stream Channel
 Habitat Structure and Bank Stability

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
 RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



Legend

Multi-Species Priorities

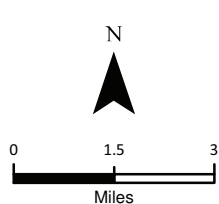
Off channel & side channel habitat

- High (Restoration Benefit)
- Medium
- Low



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602

NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolphson implies no warranties or guarantees regarding any aspect of data depiction.



Map A-2
 Restoration Needs
 Multi-Species Priorities - Off Channel and Side Channel Habitat

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
 RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



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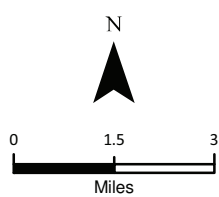
Multi-Species Priorities

Floodplain function and channel migration processes

- High (Restoration Benefit)
- Medium
- Low



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602
 NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolphson implies no warranties or guarantees regarding any aspect of data depiction.

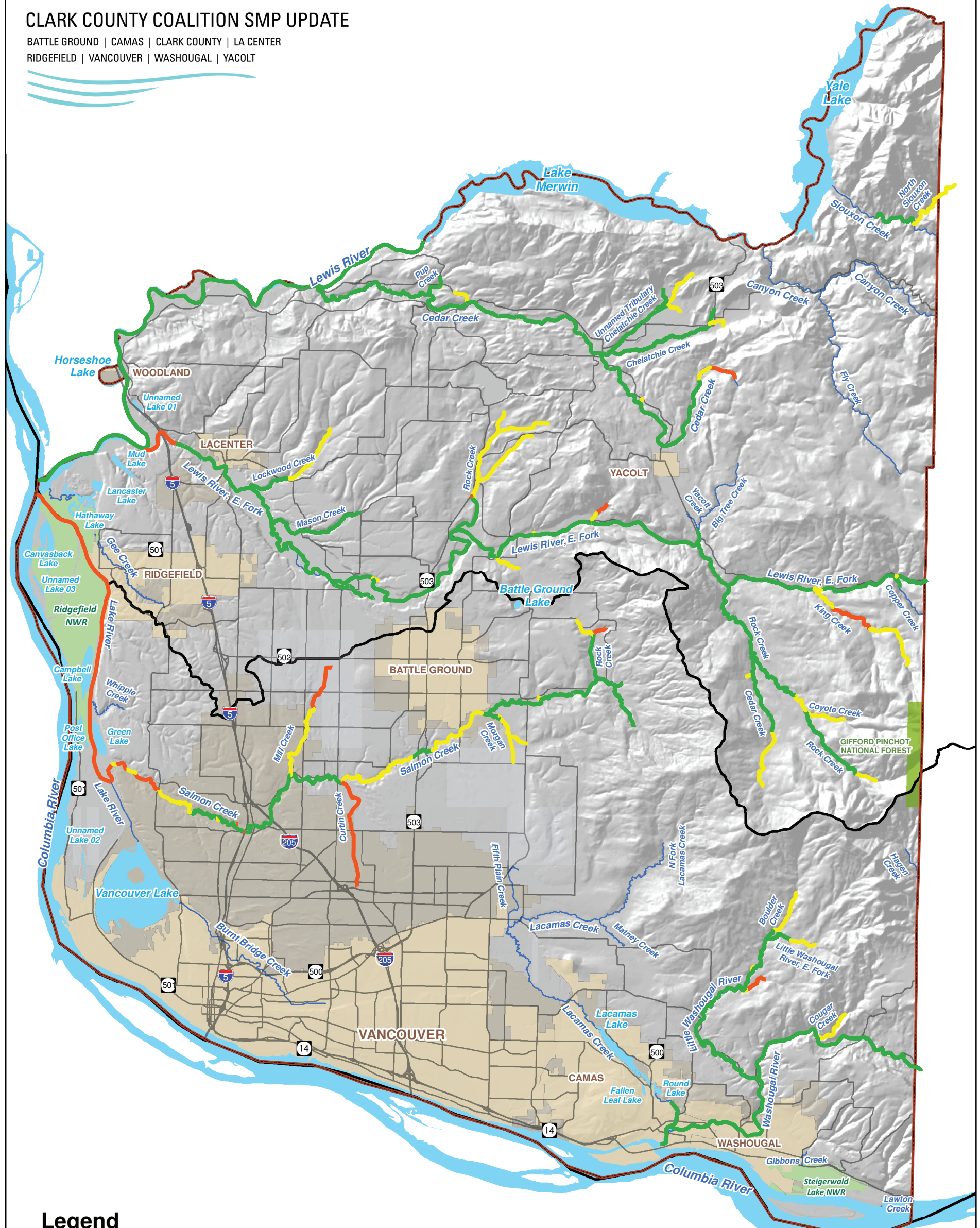


Map A-3
 Restoration Needs
 Multi-Species Priorities - Floodplain function and channel migration processes

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
 RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



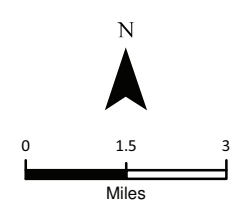
Legend

Multi-Species Priorities Riparian Condition and Functions

- High (Restoration Benefit)
- Medium
- Low



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602
 NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolphson implies no warranties or guarantees regarding any aspect of data depiction.



Map A-4 Restoration Needs Multi-Species Priorities - Riparian Condition and Functions

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
 RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



Legend

Multi_Species Priorities

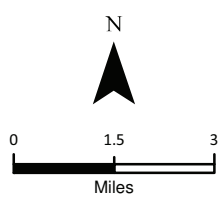
Water Quality

- High (Restoration Benefit)
- Medium
- Low



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602

NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolfson implies no warranties or guarantees regarding any aspect of data depiction.

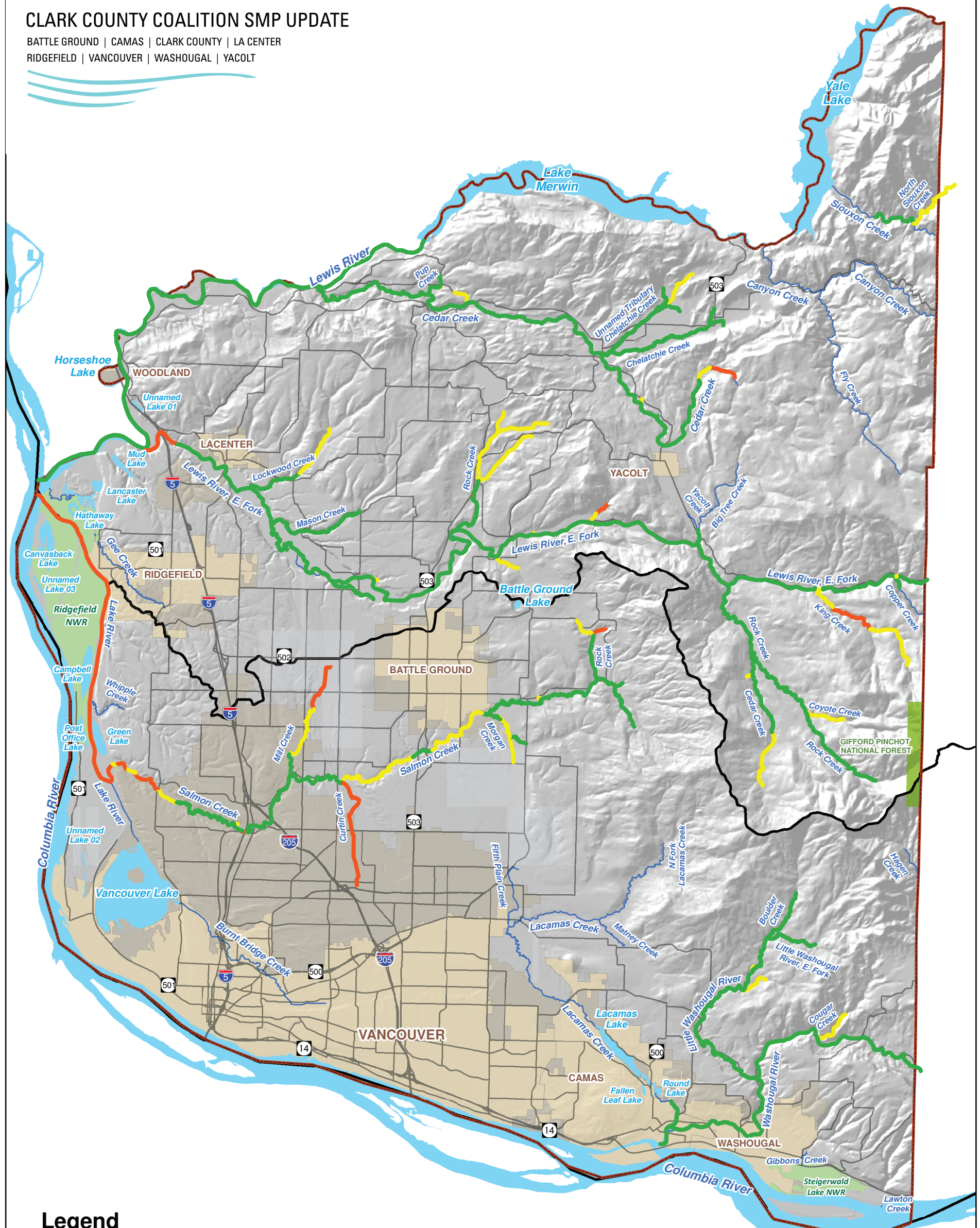


Map A-5 Restoration Needs Multi-Species Priorities - Water Quality

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
 RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



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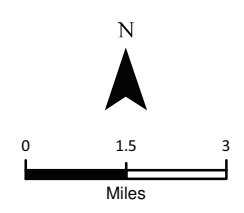
Multi-Species Priorities

Instream Flows

- High (Restoration Benefit)
- Medium
- Low



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602
 NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolfson implies no warranties or guarantees regarding any aspect of data depiction.

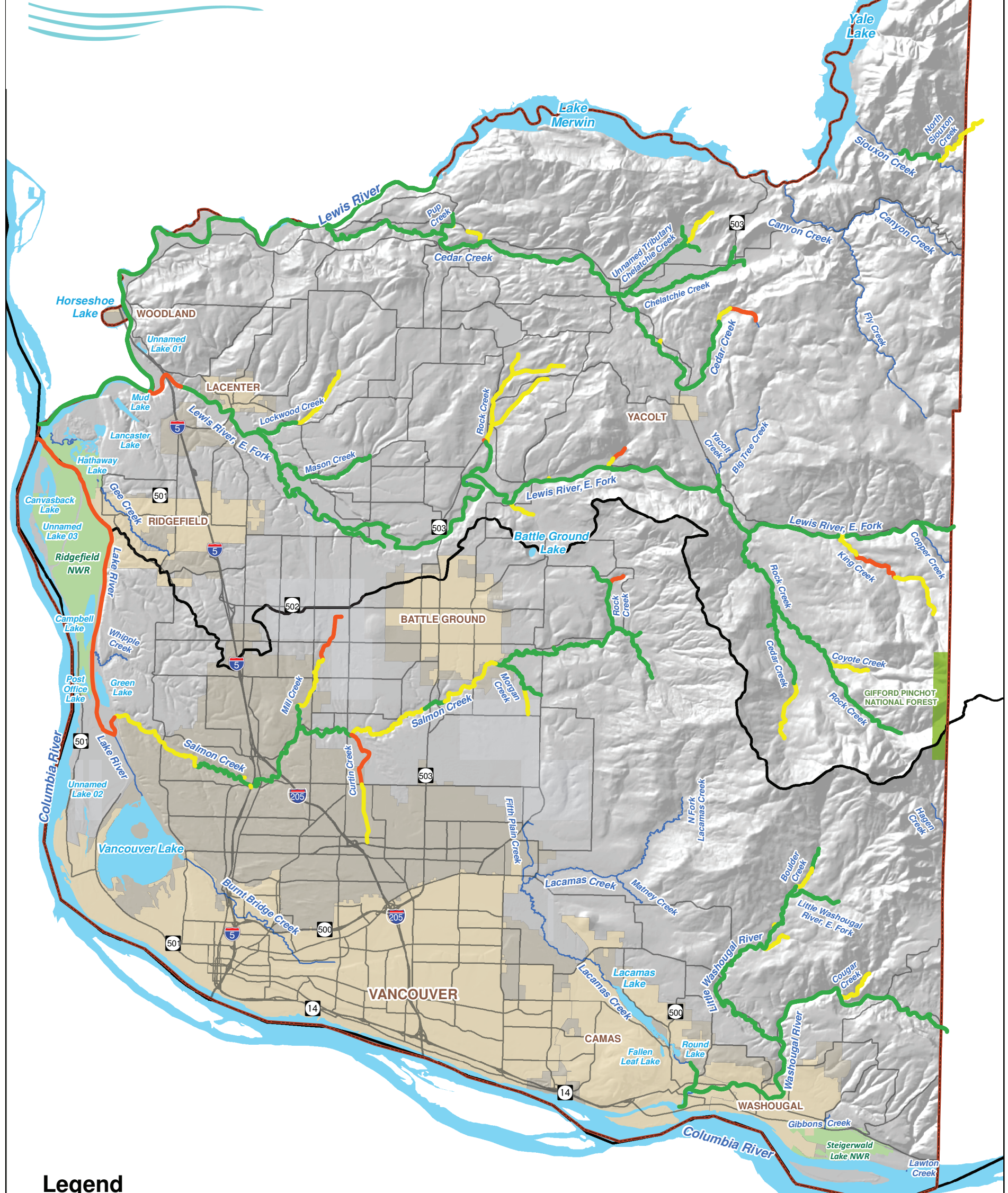


Map A-6
 Restoration Needs
 Multi-Species Priorities -
 Instream Flows

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

CLARK COUNTY COALITION SMP UPDATE

BATTLE GROUND | CAMAS | CLARK COUNTY | LA CENTER
 RIDGEFIELD | VANCOUVER | WASHOUGAL | YACOLT



Legend

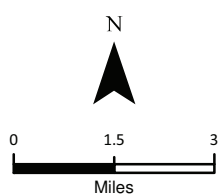
Multi-Species Priorities

Watershed Conditions and Hillslope Processes

- High (Restoration Benefit)
- Medium
- Low



SMA Grant Agreement No. G1000058
 Task 4.01
 Coordinate System: State Plane NAD1983 (ft)
 Washington South FIPS 4602
 NOTE: Map data shown here are the property of the sources listed below. Inaccuracies may exist, and ESA Adolfsen implies no warranties or guarantees regarding any aspect of data depiction.



Map A-7 Restoration Needs Multi-Species Priorities - Watershed Conditions and Hillslope Processes

Data Sources: LCRFRB, 2004 (2008); Clark County, 2009; DNR, 2007; Department of Ecology, 2009; ESRI, 2008

Appendix B
Fish Passage Barrier Table

DRAFT

Fish Passage Barriers Identified by WDFW

Stream Reach	No. of Barriers
Big Tree Creek	
BIGT_CK_01	
BIGT_CK_02	
Boulder Creek	
BOUL_CK_01	
Burnt Bridge Creek	
BURN_CR_01	
Cedar Creek 1	
CEDA_CR_01	
CEDA_CR_02	
CEDA_CR_03	
Chelatchie Creek	
CHEL_CR_02	
Columbia River	
COLU_RV_02	4
East Fork Lewis River	
EFLE_RV_01	
EFLE_RV_02	2
EFLE_RV_03	10
EFLE_RV_04	1
EFLE_RV_05	
EFLE_RV_08	2
Gee Creek	
GEE_CR_01	
Lake River	
LAKE_RV_01	
LAKE_RV_02	
Lewis River	
LEWI_RV_02	
Little Washougal River	
LWAS_RV_01	1
Lockwood Creek	
LOCK_CR_01	
Mason Creek	
MASO_CK_01	
Rock Creek 1	
ROC1_CR_01	
Round Lake	
ROUN_LK_01	2
Salmon Creek	
SALM_CR_01	1
SALM_CR_03	
Unnamed Lake 01	
UNNA_LK_01	
Vancouver Lake	
VANC_LK_01	
Washougal River	
WASH_RV_03	
WASH_RV_04	2
Yacolt Creek	
YACO_CK_01	3
Grand Total	28

Source: WDFW Barrier Inventory, 2006

Appendix C
WRIA 27 Restoration Opportunities

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Table C-1. Key to Programmatic Restoration Measures

Measure ID	Description
Water Quality	
WQ-1	Protect water quality.
WQ-2	Implement best management practices for use of pesticides and fertilizers.
WQ-3	Use construction best management practices to minimize runoff.
WQ-4	Restrict livestock access to streams.
WQ-5	Remove and/or replace failing septic systems.
WQ-6	Identify and reduce sources of contaminants in soils and water.
WQ-7	Maintain adequate summer flows to control high temperature.
WQ-8	Reduce excessive fine sediments.
WQ-9	Improve water quality (dissolved oxygen, bacteria, temperature).
WQ-10	Decommission or repair logging roads to prevent erosion.
WQ-11	Use timber harvest best management practices to reduce erosion.
WQ-12	Control agricultural runoff.
WQ-13	Educate shoreline property owners on best management practices to minimize impacts to water quality.
Fish Habitat	
F-1	Protect remaining off-channel habitat.
F-2	Create additional side channel habitat.
F-3	Restore off-channel rearing habitat.
F-4	Remove barriers to fish passage.
F-5	Remove or repair failing culverts.
F-6	Supplement large woody debris.
F-7	Enhance spawning gravel.
F-8	Recreate stream meanders.
F-9	Improve stream channel shading.
Hydrology	
H-1	Restore stream connectivity to off-channel and floodplain habitats.
H-2	Remove, lower, or set back dikes and levees.
H-3	Provide for adequate in-stream flows through management of water withdrawals.
H-4	Address water withdrawal policies for lakes.
H-5	Acquire diked properties.
H-6	Protect remaining floodplains.
H-7	Restore natural hydrology and movement of sediment.
Riparian	
R-1	Protect intact riparian areas.
R-2	Acquire riparian properties.
R-3	Enhance riparian vegetation.
R-4	Restore riparian forest.
R-5	Increase native conifer component of riparian vegetation.
R-6	Fence livestock away from riparian areas.
R-7	Restore riparian buffers impacted by agricultural practices.
R-8	Restore topsoil in riparian buffers impacted by fill, compaction, agricultural practices, or other uses.
R-9	Educate and provide incentives to landowners to restore riparian conditions.

Measure ID	Description
Stormwater	
SW-1	Retrofit stormwater facilities to meet performance standards.
SW-2	Implement stormwater best management practices.
SW-3	Improve urban stormwater infrastructure to provide flow treatment.
SW-4	Use groundwater recharge and infiltration techniques as part of stormwater management strategy.
Non-native Species	
NN-1	Take aggressive measures to prevent the introduction of non-native invasive plant and animal species.
NN-2	Control invasive riparian vegetation.
NN-3	Use weed management and education to control invasive plant species.
Wetlands	
W-1	Protect wetland habitat.
W-2	Enhance and restore degraded wetland habitats.

Timeline Definitions:

Short-term (approximately 1-5 years) restoration projects include those that could be implemented by local landowners and volunteers and that would benefit the areas that are most in need. Short-term restoration efforts include habitat restoration and enhancement efforts in publicly owned areas. These projects could be implemented in the near term, depending on grant cycles and coordination with volunteer and community organizations.

Long-term (more than 5 years) restoration projects could be those that require coordination with other jurisdictions or that cover larger land areas. These projects may be more difficult to implement and would likely require additional planning and permitting.

LOWER COLUMBIA RIVER

WRIA 27

Lower Columbia River Floodplain



Impairments:

- Installation of levees that reduced floodplain width, channel migration and disconnected associated wetlands.
- Removal of sediment to maintain deep channels.
- Reduced variability of flow and delivery of sediments due to hydropower dams.
- Channelization, dredging, jetties, removal of wetlands, and isolation of wetlands from the former floodplain.
- Non-native and invasive species.
- Listed industrial facilities and contaminated sites.
- Degraded water quality.

Programmatic Restoration Opportunities:

- F-2, WQ-6, WQ-7, W-2, H-2, H-5, R-3 (see Table C5-1)
- Restore floodplain connectivity and connections between channels, sloughs, lakes, and mainstem.
- Protect rearing and spawning habitat.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>
- Lower Columbia River Estuary Partnership web site: <http://www.lcrep.org/restoration-projects-0>
- Columbia River Estuary Study Task Force (CREST), web site: <http://www.columbiaestuary.org/projects.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed
	See other Lower Columbia River Restoration table, WRIA 28 (Appendix D)		

MUD LAKE	WRIA 27	North Fork Lewis River Tributaries & Lakes
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Impairments:

- Conversion of forests to residential uses.
- Increased magnitude, duration and frequency of peak flows and reduced summer base flows caused by increases in impervious surfaces.
- Discharge of turbid waters (e.g., gravel mining operations) affecting water quality.
- Invasive aquatic species.

Programmatic Restoration Opportunities:

- NN-3, W-1 (see Table C-1)
- Acquire properties to improve vegetative buffer and increase habitat diversity.
- Protect wetland habitat to minimize sedimentation and improve water quality.
- Preserve habitat for waterfowl and wildlife.

Information Sources and Organizations:

- Washington Wildlife and Recreation Commission, web site: <http://wildliferecreation.org/>
- Clark County Legacy Lands at: <http://www.clark.wa.gov/legacylands/index.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	County is acquiring 340 acres of property on Mud Lake using WWRP grant and Conservation Futures funding.	High	Habitat connectivity	Short term

LANCASTER LAKE**WRIA 27****Lower Columbia River Tributaries & Lakes****Impairments:**

- Altered connections to the Lower Columbia River, therefore reduction in periodic flooding of floodplain.
- Invasive plants and invasive non-native fish (i.e., carp).
- Loss of riparian forest and native plant diversity through agricultural use.

Programmatic Restoration Opportunities:

- NN-3, W-1 (see Table C-1)
- A 500-acre wetland mitigation bank is proposed north of and partially including Lancaster Lake, extending from the east bank of the North Fork Lewis River to the BNSF railroad tracks.
- Protect wetland habitat to minimize sedimentation and improve water quality.

Information Sources and Organizations:

- Joint Public Notice, Proposal for a Wetland Mitigation Bank, Clark County Mitigation Partners LLC, March 23, 2007.
- Friends of the Ridgefield National Wildlife Refuge, source of volunteers, web site:
<http://www.ridgefieldfriends.org/index.php>
- National Wildlife Refuges, web site:
<http://www.fws.gov/ridgefieldrefuges/complex/>
- Ridgefield National Wildlife Final Comprehensive Conservation Plan (USFWS, Sept. 2010):
<http://www.fws.gov/ridgefieldrefuges/ridgefield/>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Lake currently in good stewardship under private ownership. However, long-term preservation of lake shoreline habitat through easement or purchase by USFWS Ridgefield NWR would be consistent with goals of the Conservation Plan	Medium	Habitat	Long term

HATHAWAY LAKE (or Fowler Lake)**WRIA 27****Lower Columbia River Tributaries & Lakes****Impairments:**

- Altered connections to the Lower Columbia River, therefore reduction in periodic flooding of floodplain.
- Invasive plants and invasive non-native fish (i.e, carp).
- Conversion of forest to railroad tracks and roads.
- Loss of riparian forest and native plant diversity

Programmatic Restoration Opportunities:

- NN-3, W-1 (see Table C-1)
- Protect wetland habitat to minimize sedimentation and improve water quality.
- Acquire properties adjacent to Hathaway Lake to protect waterfowl habitat and increase habitat diversity.

Information Sources and Organizations:

- Friends of the Ridgefield National Wildlife Refuge, source of volunteers, web site:
<http://www.ridgefieldfriends.org/index.php>
- National Wildlife Refuges, web site:
<http://www.fws.gov/ridgefieldrefuges/complex/>
- Ridgefield National Wildlife Final Comprehensive Conservation Plan and EA (USFWS, Sept. 2010):
<http://www.fws.gov/ridgefieldrefuges/ridgefield/>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian floodplain forests to increase habitat complexity	High	Habitat	Short term
All	Remove four roads on south side of lake to enhance and improve habitat for dusky Canada geese.	High	Habitat	Long term

**Impairments:**

- Floodplains and channel migration zones confined by development.
- Channel alterations, bridge stream crossings, culverts and fish passage barriers.
- Bank erosion caused by livestock access and grazing.
- Lack of large woody debris.
- Degraded riparian habitat conditions due to invasive vegetation.
- Private dams and associated ponds along the mainstem and tributary reaches.
- Increased magnitude, duration and frequency of peak flows and reduced summer base flows caused by increases in impervious surfaces.
- Drainage ditches in fields and along roadways
- Contaminants from agriculture, livestock, stormwater runoff impair water quality.

Programmatic Restoration Opportunities:

- R-3, R-4, R-6, R-8, NN-2, WQ-4, WQ-13, F-4 F-6, W-1, SW-4 (see Table C1)
- Prevent riparian degradation through education and acquisition.
- Remove or stabilize small dams.

Information Sources and Organizations:

- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Clark County Public Works Clean Water Program. 2007 Stormwater Needs Assessment Program Upper Gee Creek / Lower Gee Creek / Cathlapotle Subwatershed Needs Assessment Report. <http://www.clark.wa.gov/water-resources/documents/SNAP/GeeCreekSNAPfinal.pdf>.
- Gee Creek Watershed Restoration Project web page: <http://clark.wsu.edu/natural/geeCreek.html>
- Gee Creek Watershed Restoration Background Report (Cornelius 2006).

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower watershed	<ul style="list-style-type: none"> Acquire wetlands west of NW 51st Avenue and north of NW 289th Street. 	High	Protect stream flow and hydrology	Long term
Upper watershed	<ul style="list-style-type: none"> Reforest the floodplain and riparian corridor upstream of I-5. 	Medium	LWD, habitat, instream fish habitat	Short term
Lower watershed	<ul style="list-style-type: none"> Preserve intact forest areas between Royle Road and I-5. 	High	Protect stream flow and hydrology	Long term
Various	<ul style="list-style-type: none"> Upgrade stormwater facilities and outfalls at numerous locations noted in 2007 Stormwater Needs Assessment Program report. 	High	Hydrology	Long term
Various	<ul style="list-style-type: none"> Control invasive vegetation at numerous locations noted in 2007 Stormwater Needs Assessment Program report. 	High	Habitat	Short term
	<ul style="list-style-type: none"> Conduct further analysis of fish passage barriers and replace culverts as needed at numerous locations noted in 2007 Stormwater Needs Assessment Program report. 	Medium	Habitat for salmonids	Long term
	<ul style="list-style-type: none"> Assess and replace fish passage barriers at Union Pacific railroad crossing near mouth of Gee Creek. 	High	Habitat for salmonids	Long term
	<ul style="list-style-type: none"> Assess and replace fish passage barriers between Main Street and Royle Road. 	High	Habitat for salmonids	Long term



Impairments:

- Hydropower system impacts on channels, floodplains, flow, sediment transport, and LWD transport.
- Lower seven miles of river is diked primarily to protect agricultural uses.
- Lower seven to 15 miles of river are armored to protect residential, agricultural and transportation uses.
- Diking and channelization have reduced connection to floodplains and off channel habitat.
- Increase in impervious area.
- Bank armoring, levees, dredging, and gravel extraction.
- Cleared riparian areas.
- Limited availability of large woody debris.
- Leaking underground storage tanks.
- Impaired water quality.

Programmatic Restoration Opportunities:

- H-1 (lower river), H-3, H-6, H-7, R-5, R-8, F-1, F-2, F-3, F-6, WQ-10, NN-2 (see Table C-1)
- Continue to support LCFRB and LCREP in ongoing restoration activities
- Address agricultural and rural/suburban development impacts to floodplains and riparian areas for the middle reaches.
- Use land use controls to protect habitat and watershed processes for the middle reaches.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Lower Columbia River Estuary Partnership site: http://maps.lcrep.org/program/habitat_restoration
- R2 Resource Consultants. 2004. Kalama, Washougal and Lewis River Habitat Assessments - Chapter 3: The North Fork Lewis River Basin.
- Inter-fluve, Inc. et al. 2009. Lewis River – Eagle Island Project Identification and Design.
- Inter-fluve Inc. et al. 2008. Lewis River Large Woody Debris Assessment.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- G. Wade. 2000. Salmon and Steelhead Habitat Limiting Factors - WRIA 27. <http://www.scc.wa.gov/index.php/291-WRIA-27-Lewis-Watershed/View-category.html>
- PacifiCorp. 2008. Lewis River Wildlife Habitat Management Plan.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
LEW_RV_01	<ul style="list-style-type: none"> A 500-acre wetland mitigation bank is proposed along the North Fork Lewis River, north of the confluence with Gee Creek, which provides an opportunity to restore degraded pasture to floodplain wetlands, and restore habitat connectivity between the wildlife refuge, the rivers, and surrounding agricultural fields. 	High	Habitat, LWD	Long term
LEW_RV_01	<ul style="list-style-type: none"> Restore tidal slough and floodplain forest habitats at the confluence of the Lewis and Columbia Rivers. 	High	Habitat, Hydrology	Long term
LEWI_RV_02, LEWI_RV_03	<ul style="list-style-type: none"> Preserve and restore floodplain habitats at RM 2 to 3 and RM 13 to 15. 	High	Habitat, Hydrology	Long term
Reach 1	<ul style="list-style-type: none"> Complete high priority projects identified in the Lewis River – Eagle Island Project Identification and Design Report including enhancement of: existing side channel habitat, channel dynamics, LWD, riparian habitat, and existing backwater habitat. 	High	Habitat, Hydrology	Short term
All Reaches	<ul style="list-style-type: none"> Add LWD in the lower main channel and side channels; several locations for LWD placement are identified up to RM 18.6. 	High	LWD	Long term
All Reaches	<ul style="list-style-type: none"> Add large wood to existing armored banks during future maintenance or repair activities from mouth to RM 15. 	Medium	LWD	Long term
LEWI_RV_02	<ul style="list-style-type: none"> Limit intensive recreational use of stream channel during adult salmonid holding and spawning periods, between Woodland and Merwin Dam. 	Medium/High		Long term



Impairments:

- Impoundment of the Lewis River upstream of Merwin Dam.
- Hydroelectric dam and facilities.
- Fish passage barriers.
- Impaired water quality.

Programmatic Restoration Opportunities:

- Encourage PacifiCorp Energy with implementation of the Lewis River Wildlife Habitat Management Plan.
- Coordinate with PacifiCorp as they reintroduce anadromous fish upstream of the dams.
- Work with PacifiCorp as they administer their Lewis River Aquatics Fund, to support projects to enhance and improve wetlands, riparian, and riverine habitats in support of salmonid recovery.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- PacifiCorp: <http://www.pacificorp.com/index.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
MERW_LK_01 and 02	Protect existing riparian forest	High	LWD, Habitat	Long term

YALE RESERVOIR**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Impoundment of the North Fork Lewis River behind Yale Dam.
- Hydroelectric dam and facilities.
- Blocks natural fish passage.
- Water quality affected by impoundment.

Programmatic Restoration Opportunities:

- NN-2, R-3 (see Table C-1)
- Encourage PacifiCorp Energy with implementation of the Lewis River Wildlife Habitat Management Plan.
- Coordinate with PacifiCorp as they reintroduce anadromous fish upstream of the dams.
- Work with PacifiCorp as they administer their Lewis River Aquatics Fund, to support projects to enhance and improve wetlands, riparian, and riverine habitats in support of salmonid recovery.
- Recent preservation of forested shoreline for elk habitat (<http://lewisriver.com/valley/01-11-elk.pdf>).

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- PacifiCorp: <http://www.pacificorp.com/index.html>
- Lewis River Valley Information web page: <http://lewisriver.com/valley/>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
YALE_LK_01	<ul style="list-style-type: none"> • Work with PacifiCorp to reduce total dissolved gas at outlet. 	High	Water quality	Short term

HORSESHOE LAKE

WRIA 27

North Fork Lewis River Tributaries & Lakes



Impairments:

- High nutrient levels causing excessive algal growth.
- Invasive aquatic plants including Eurasian milfoil.
- Poor water quality due to lack of water flow and urban runoff.
- Interstate 5 disconnects Horseshoe Lake from the Lewis River floodplain.
- Excess sedimentation in the lake from residential development.
- Shoreline erosion from boat wakes and/or development.

Programmatic Restoration Opportunities:

- WQ-13, R-3, R-8, NN-2, W-1 (see Table C-1)
- Educate landowners on lawn maintenance practices to reduce nutrient input.

Information Sources and Organizations:

- Lewis River valley web site:
<http://lewisriver.com/horseshoe.html>
- City of Woodland Parks, web site:
<http://www.ci.woodland.wa.us/Dept/ParksRec/cityparks.htm>
- Ecology Water Quality Assessment and Lake Restoration program, web site:
http://www.ecy.wa.gov/programs/eap/lakes/wq/lk_man.html

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	City of Woodland planted trees in March 2010. Coordinate with Woodland to continue planting native trees in the riparian zone.	High	LWD, Shade and Habitat	Short term

UNNAMED LAKE 1**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Increased runoff caused by increases in impervious surfaces.
- Runoff from adjacent highways, I-5 and NW Pacific Highway.
- Lack of riparian forest vegetation.

Programmatic Restoration Opportunities:

- NN-2, R-3, SW-1, SW-2, SW-3, SW-4 (see Table C-1)
- Work with private property owner to restore riparian areas.

Information Sources and Organizations:

- None available.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian areas with planting of native trees	Medium	Habitat, LWD, Water Quality	Short term
All	Use best management practices in agriculture.	Medium	Water Quality	Long term

CEDAR CREEK

WRIA 27

North Fork Lewis River Tributaries & Lakes



Impairments:

- Deforestation has resulted in erosion.
- Lack of large woody debris.
- Poor substrate conditions between headwaters and Pup Creek.
- Rural residential and agricultural uses have impacted riparian areas and floodplains.
- Confined floodplains.
- Streambank instability and degraded riparian buffers, especially between Pup Creek and Chelatchie Creek (RM 11.2) due to logging, grazing, residential development.

Programmatic Restoration Opportunities:

- H-3, R-3, R-5, R-8, W-2, F-2, F-3, F-5, F-6, WQ-4, WQ-5, WQ-10, SW-1, SW-2, SW-3, SW-4, NN-2 (see Table C-1)
- Preserve and enhance Cedar Creek spawning habitats.

Information Sources and Organizations:

- R2 Resource Consultants, Inc. 2004. Kalama, Washougal and Lewis River Habitat Assessments - Chapter 3: The North Fork Lewis River Basin.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Friends of the East Fork Lewis River web page: <http://www.eastforklewisriver.org/river-restoration.html>.
- Fish First web page: <http://www.fishfirst.org>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
CEDA_CR_01	<ul style="list-style-type: none"> • Restore riparian habitats 	High	Habitat	Long term
CEDA_CR_02	<ul style="list-style-type: none"> • Survey for and control invasive weeds and maintain riparian plantings (i.e., Cedar Creek Wildlife Area). 	High	Habitat	Short term

PUP CREEK**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Conversion of forests to agriculture, residential development and roads.
- Degraded in-stream habitats and processes due to residential development and forestry activities.

Programmatic Restoration Opportunities:

- Educate and provide incentives to landowners to restore riparian conditions.
- Use of agricultural BMP's to protect water quality.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Work with landowners to restore riparian vegetation	Medium	LWD, shade, habitat	Long term

CHELATCHIE CREEK**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Oversupply of fine sediments.
- Disruption of sediment supply to the stream by roads and riparian degradation.
- Lack of large woody debris.
- Streambank erosion and degradation due to livestock access.

Programmatic Restoration Opportunities:

- H-3, WQ-8, R-3, R-5, R-6, SW-1, SW-2, SW-3, SW-4, NN-2, F-6, W-1, W-2 (see Table C-1)

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- R2 Resource Consultants, Inc. 2004. Kalama, Washougal and Lewis River Habitat Assessments - Chapter 3: The North Fork Lewis River Basin.
- The Conservation Registry, web: <http://www.conservationregistry.org/projects/3200>
- Fish First: <http://www.fishfirst.org/projects.htm>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower watershed	<ul style="list-style-type: none"> • Protect and enhance wetland complexes in the lower two miles to provide overwintering and rearing habitat for coho salmon. 	High	Hydrology, Habitat	Long term
All	<ul style="list-style-type: none"> • Restoration of riparian areas and fencing to limit livestock access along 2,400 feet of Chelatchie Creek. A joint project by NRCS, Clark Conservation District, Fish First and a private landowner. http://www.conservationregistry.org/projects/3200 	High	Habitat, LWD	Short term

UNNAMED TRIBUTARY TO CHELATCHIE CREEK

WRIA 27

North Fork Lewis River Tributaries & Lakes

Impairments:

- Disruption of sediment supply to the stream by roads and riparian degradation.
- Lack of large woody debris.
- Streambank erosion and degradation due to livestock access.

Programmatic Restoration Opportunities:

- R-3, R-5, R-6, NN-2, F-6, SW-4, H-3 (see Table C-1)

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- R2 Resource Consultants, Inc. 2004. Kalama, Washougal and Lewis River Habitat Assessments - Chapter 3: The North Fork Lewis River Basin.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
UCHE_CK_01	Protection of associated wetlands in the upper watershed	High	Habitat, Hydrology, Protection of stream baseflow	Long term

CANYON CREEK**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Removal of timber in the upper watershed affecting runoff and water quality downstream.
- Lack of riparian vegetation.
- Elevated stream temperatures
- Landslides and bank instability due to increased surface water flows

Programmatic Restoration Opportunities:

- R-1, R-4, F-9, NN-2 (see Table C-1)
- Protect potential bull trout spawning areas by restoring riparian areas and controlling erosion/sedimentation.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Protect riparian areas and restore riparian forests	High	LWD, water quality improvement	Long term
CANY_CR_02	Restore riparian forest and trees in upper watershed	Medium	LWD, water quality improvement	Long term

FLY CREEK**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Removal of trees in the upper watershed.
- Lack of riparian vegetation.
- Elevated stream temperatures

Programmatic Restoration Opportunities:

- WQ-10, R-4, F-5, NN-2 (see Table C-1).

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County Stream Health Report 2010

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
FLY_CR_01	Restore riparian forest by tree planting within 200 feet of OHWM	Medium	LWD, water quality and temperature improvement	Long term

SIOUXON CREEK**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Removal of forest in the upper watershed.
- Inundation due to dam creating Yale Reservoir
- Dams are barrier to natural fish passage.

Programmatic Restoration Opportunities:

- WQ-10, R-4, F-5, NN-2 (see Table C-1)

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
SIOU_CR_01	Protect forested riparian zones	High	LWD, Habitat	Long term

NORTH SIOUXON CREEK**WRIA 27****North Fork Lewis River Tributaries & Lakes****Impairments:**

- Removal of forest in the upper watershed.
- Inundation due to dam creating Yale Reservoir
- Dam is fish passage barrier

Programmatic Restoration Opportunities:

- WQ-10, R-4, F-5, NN-2 (see Table C-1)

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page:
<http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County Stream Health Report 2010

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Work with landowners to revegetate riparian areas	Medium	LWD, shade, habitat	Long term



Impairments:

- Deforestation has reduced quality of riparian habitat.
- Wildfires have removed forested cover and increased sediment loading.
- Decline in LWD inputs to stream channel and floodplain.
- Agricultural ditching and runoff.
- Livestock access to stream causing streambank erosion.
- Bank armoring, levees, bridges, floodplain fill resulting in channel confinement and loss of processes that allow meanders to form.
- Predation on native salmonids by non-native warm water fish species in lower sections of river.
- Invasive vegetation in aquatic and riparian areas.
- Gravel mining has contributed to loss of floodplain function and channel instability.
- Failing culverts in tributaries to the river.
- Degraded water quality – TMDL under development for fecal coliform and temperature.

Programmatic Restoration Opportunities:

- H-1, H-2, H-3, H-7, WQ-1, WQ-4, WQ-5, WQ-9, WQ-10, WQ-12, R-4, R-6, NN-2, F-3, F-5, F-6, SW-1, SW-2, SW-3, SW-4, W-2 (see Table C-1)
- Protect intact middle and upper stream reaches.
- Monitor water temperatures and groundwater connectivity to support off-channel enhancement projects.

Information Sources and Organizations:

- East Fork Lewis Working Group. 2009. Lower East Fork Lewis River Habitat Restoration Plan.
- Friends of the East Fork Lewis River web page: <http://www.eastforklewisriver.org/>
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Stormwater Needs Assessment Program (SNAP) reports: <http://www.co.clark.wa.us/water-resources/documents>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- G. Wade. 2000. Salmon and Steelhead Habitat Limiting Factors - WRIA 27. <http://www.scc.wa.gov/index.php/291-WRIA-27-Lewis-Watershed/View-category.html>
- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Clark County projects. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/overview.html>. Accessed February 2010.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
EFLE_RV_03	<ul style="list-style-type: none"> Numerous restoration opportunities are identified on County and private properties near Lewisville Regional Park and Lewis River Ranch, including off-channel and side channel enhancement, streambank and in-channel enhancement, streambank stabilization, and riparian restoration. 	High	Hydrology, in-stream habitat, LWD	Short term (public properties) Long term (private properties)
EFLE_RV_03	<ul style="list-style-type: none"> Side channel enhancement, levee removal, off-channel restoration, in-channel and streambank enhancement at and near Daybreak Regional Park. 	High	Hydrology, in-stream habitat, LWD	Short term
EFLE_RV_03	<ul style="list-style-type: none"> Evaluate risk of channel avulsion into Daybreak Pits located in floodplain at RM 7.3 to 9.5; assess impact of existing levees; explore options to restore habitat. 	High	Hydrology	Long term
EFLE_RV_03	<ul style="list-style-type: none"> Off-channel restoration at mouth of Manley Creek. 	High	Habitat	Long term
EFLE_RV_03	<ul style="list-style-type: none"> Streambank restoration and in-channel habitat enhancement at power line crossing. 	High	Habitat	Long term
EFLE_RV_03	<ul style="list-style-type: none"> Remove riprap near airstrip, enhance in-channel and off-channel habitat, revegetate riparian area. 	Medium	Habitat	Long term
EFLE_RV_02	<ul style="list-style-type: none"> Revegetate riparian zone between Mason Creek and Ridgefield Pits. 	Medium	Habitat, LWD	Short term
EFLE_RV_02	<ul style="list-style-type: none"> Remove or set back levee on County owned Schaeffer property (RM 5). 	High	Channel migration, hydrology	Long term
EFLE_RV_01	<ul style="list-style-type: none"> Remove or set back levees on County owned property in La Center Bottoms (RM 3.2 to 4.4). 	High	Channel migration, hydrology	Long term
EFLE_RV_01	<ul style="list-style-type: none"> Riparian reforestation and wetland creation on Dyer Creek within East Fork Lewis River Greenway. 	High	Habitat, Surface water and stream baseflow	Short term
Various	<ul style="list-style-type: none"> Upgrade stormwater facilities and outfalls at numerous locations noted in SNAP reports. 	Medium	Surface water and stream baseflow	Long term
Various	<ul style="list-style-type: none"> Control invasive vegetation at numerous locations noted in SNAP reports. 	Medium	Habitat, LWD	Short term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Various	<ul style="list-style-type: none"> Work with landowners to apply agricultural BMPs at numerous locations noted in SNAP reports. 	High	Water quality	Long term
Various	<ul style="list-style-type: none"> Conduct further analysis of fish passage barriers and replace culverts as needed at numerous locations noted in SNAP reports. 	High	Habitat for Salmonids	Long term

LOCKWOOD CREEK**WRIA 27****East Fork Lewis River Tributaries & Lakes****Impairments:**

- Conversion of forests to residential development and high road density.
- Increased magnitude, duration and frequency of peak flows and reduced summer base flows caused by increases in impervious surfaces.
- Lack of floodplain connectivity.
- Lack of functioning pieces of large woody debris.
- Impaired water quality including elevated water temperatures and sediment levels.
- Potential fish passage barriers at road crossings.

Programmatic Restoration Opportunities:

- WQ-1, WQ-5, WQ-8, H-2, H-3, F-4, F-6, R-3, R-5, R-8, NN-2, W-1, W-2, SW-4 (see Table C-1)

Information Sources and Organizations:

- Clark County Clean Water Program. 2007 Stormwater Needs Assessment Program Lockwood Creek Subwatershed Needs Assessment Report. <http://www.clark.wa.gov/water-resources/documents/SNAP/LockwoodSNAPfinal.pdf>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark Public Utilities, monitoring web page: <http://www.clarkpublicutilities.com/ourenvironment/streamTeam/monitoring>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Upper watershed	Complete riparian restoration project north of Lockwood Creek Road.	Medium	Habitat	Short term

MASON CREEK**WRIA 27****East Fork Lewis River Tributaries & Lakes****Impairments:**

- Conversion of forests to residential development and high road density.
- Degraded watershed conditions.
- Channel stability falls within a “zone of uncertain stability”.
- Impaired water quality (elevated temperature and fecal coliform).
- Channel simplification and incision, historic channel realignment for agricultural uses.
- Lack of woody cover in riparian zones.
- Invasive plant species.
- Fish passage barriers at road crossings.

Programmatic Restoration Opportunities:

- H-2, F-4, F-5, R-3, WQ-1, WQ-9, WQ-13, W-1, W-2, SW-4 (see Table C-1)
- Educate and provide incentives to landowners to restore riparian conditions, reduce nutrient inputs.
- Remove ponds in headwater tributaries.

Information Sources and Organizations:

- Clark County Public Works Clean Water Program. 2007 Stormwater Needs Assessment Program Mason Creek Subwatershed Needs Assessment Report. <http://www.clark.wa.gov/water-resources/documents/SNAP/MasonCreekSNAPfinal.pdf>.
- East Fork Lewis Working Group. 2009. Lower East Fork Lewis River Habitat Restoration Plan.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
MASON_CK-01	<ul style="list-style-type: none"> • Enhance channel structure and habitat, revegetate riparian areas along lower Mason Creek. 	Medium	LWD, shade, in-channel habitat	Long term
MASON_CK-01	<ul style="list-style-type: none"> • Enhance channel structure and habitat near Anderson Road crossing (RM 3.2 to 3.6). 	Medium	in-channel habitat	Long term

ROCK CREEK (LOWER)**WRIA 27****East Fork Lewis River Tributaries & Lakes****Impairments:**

- Lack of riparian vegetation causes streambank instability and erosion.
- Limited floodplain connectivity.
- Impaired stream function (hydroperiod) caused by water diversions.
- Failing culverts and fish passage barriers.
- Invasive vegetation in riparian areas.
- Streambank armoring and incised channels.
- Poor pool quantity and substrate.
- Lack of large woody debris.
- Impaired water quality.
- Agricultural runoff and livestock access to stream.

Programmatic Restoration Opportunities:

- H-3, WQ-2, WQ-4, WQ-5, WQ-12, R-4, R-5, R-8, F-3, F-4, F-5, F-6, NN-2, W-1, W-2, SW-1, SW-4 (see Table C-1)
- Control reed canarygrass and Himalayan blackberry.
- Educate and provide incentives to landowners to restore riparian and stream channel habitat; reduce nutrient inputs.
- Investigate and potentially remove small dams.

Information Sources and Organizations:

- Clark County Public Works Clean Water Program. 2009. 2008 Stormwater Needs Assessment Program - Rock Creek (North)/East Fork Lewis River (RM 15.75) Subwatershed Needs Assessment Report.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
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Various	• Upgrade stormwater facilities and outfalls at numerous locations noted in 2008 Stormwater Needs Assessment Program report.	High	Water quality	Long term
Various	• Control invasive vegetation at numerous locations noted in 2008 Stormwater Needs Assessment Program report.	High	Habitat	Short term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Various	<ul style="list-style-type: none"> Work with landowners to apply agricultural BMPs at numerous locations noted in 2008 Stormwater Needs Assessment Program report. 	High	Water quality	Short term
ROC1_01	<ul style="list-style-type: none"> Reforest riparian areas immediately downstream from Rock Creek Road bridge. 	Medium	Habitat, shade, LWD	Long term
ROC1_01	<ul style="list-style-type: none"> Reforest riparian areas in upper reaches within DNR land and near Farger Lake. 	Medium	Habitat, shade, LWD	Long term

BIG TREE CREEK**WRIA 27****East Fork Lewis River Tributaries & Lakes****Impairments:**

- Sub-basin is heavily logged and surface water runoff has increased in the watershed.
- Conversion of forests to impervious surfaces.
- Impaired water quality.

Programmatic Restoration Opportunities:

- WQ-1, WQ-10, F-5, R-4, W-1, W-2, SW-4 (see Table 5C-1)

Information Sources and Organizations:

- Clark County Public Works Clean Water Program. 2008 Stormwater Needs Assessment Program- Big Tree Creek/East Fork Lewis River (RM 26.30)/King Creek Subwatershed Needs Assessment Report. <http://www.co.clark.wa.us/water-resources/documents/SNAP/2008/BigTreeSNAPPreport.pdf>
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed
<u>Lower reaches</u>	No site-specific opportunities <u>Work with private landowners to re-vegetate riparian areas.</u>	<u>Moderate</u>	<u>LWD, shade, habitat</u>

YACOLT CREEK	WRIA 27	East Fork Lewis River Tributaries & Lakes
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Impairments:

- Conversion of forests to impervious surfaces; especially high road density.
- Impaired water quality.
- Loss of riparian forest to logging, agriculture, and residential use.
- Invasive vegetation in riparian areas.
- Lack of large woody debris.

Programmatic Restoration Opportunities:

- NN-2, R-4, WQ-1, WQ-5, SW-4, F-9, W-1, W-2 (see Table C-1)
- Coordinate stormwater management activities with the Town of Yacolt

Information Sources and Organizations:

- Clark County Public Works Clean Water Program. 2009. 2008 Stormwater Needs Assessment Program – Yacolt Creek/East Fork Lewis River (RM 21.40) Subwatershed Needs Assessment Report. April 2009.
- Cramer, S.P. & Associates, Inc. (January 2005). Chapter 4: East Fork Lewis River Basin – Habitat Assessment, report prepared for the Lower Columbia Fish Recovery Board under contract to Clark County Water Resources.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Restore riparian forest zones	Medium	Habitat, LWD	Long term

KING CREEK**WRIA 27****East Fork Lewis River Tributaries & Lakes****Impairments:**

- Impaired substrate.
- Lack of large woody debris due to timber harvest.
- Impaired water quality.
- Riparian zones lack forest cover.

Programmatic Restoration Opportunities:

- R-3, R-5, R-8, F-5, F-6, W-1, WQ-10 (see Table C-1)
- Prevent riparian degradation through education and acquisition.
- Undertake selective clearing and replant riparian areas with native trees, particularly conifers.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	<ul style="list-style-type: none"> • Restore vegetative canopy in logged areas to improve shading of pool and braided channel habitats and reduce the potential for erosion. 	High	LWD, shade, habitat	Long term

COPPER CREEK**WRIA 27****East Fork Lewis River Tributaries & Lakes****Impairments:**

- Timber harvest in upper watershed has affected stream flow and erosion.

Programmatic Restoration Opportunities:

- R-3, R-5, R-8, WQ-1, WQ-10, F-5, F-6, W-1 (see Table C-1)
- Prevent riparian degradation through education and acquisition.
- Undertake selective clearing and replant riparian areas with native trees, particularly conifers.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Install LWD to increase the formation of pools and offset time required for conifers planted along streambanks to be mature. 	High	Habitat, LWD	Long term

ROCK CREEK (UPPER)**WRIA 27****East Fork Lewis River Tributaries & Lakes****Impairments:**

- Logging road crossings and culverts.
- “Poor” or “not properly functioning” pool quantity, due largely to the topography and stream gradient.
- “Not properly functioning” LWD.
- Impaired water quality

Programmatic Restoration Opportunities:

- WQ-1, WQ-10, R-3, R-5, R-8, F-5, F-6, W-1, W-2, SW-4 (see Table C-1)
- Undertake selective clearing and replant riparian areas with native trees, particularly conifers.
- Prevent riparian degradation through education and acquisition.

Information Sources and Organizations:

- Clark County Public Works Clean Water Program. 2008 Stormwater Needs Assessment Program- Cedar Creek (East Fork)/Lower Rock Creek (South)/Upper Rock Creek (South) Subwatershed Needs Report. <http://www.co.clark.wa.us/water-resources/documents/SNAP/2008/CedarEFSNAPreport.pdf>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Install LWD to increase the formation of pools and offset time required for conifers planted along streambanks to be mature. 	High	Habitat, LWD	Long term
ROC3_CR_01 and 02	<ul style="list-style-type: none"> • Revegetate riparian areas along the lower reaches that have been impacted by residential development and downstream of the Dole Valley Road crossing. 	High	Habitat, LWD	Short term

CEDAR CREEK (EAST FORK LEWIS RIVER TRIBUTARY)

WRIA 27

East Fork Lewis River Tributaries & Lakes

Impairments:

- Logging road crossings and culverts.
- High water temperatures and summer low flow issues
- Lack of LWD and in-stream habitat

Programmatic Restoration Opportunities:

- R-3, R-5, R-8, WQ-1, WQ-10, F-5, F-6, SW-4, W-1, W-2 (see Table C-1)
- Undertake selective clearing and replant riparian areas with native trees, particularly conifers.
- Acquire riparian areas and preserve habitat.

Information Sources and Organizations:

- Clark County Public Works Clean Water Program. 2008 Stormwater Needs Assessment Program- Cedar Creek (East Fork)/Lower Rock Creek /Upper Rock Creek (South) Subwatershed Needs Report. <http://www.co.clark.wa.us/water-resources/documents/SNAP/2008/CedarEFSNAPReport.pdf>.
- Friends of East Fork Lewis River, web site: <http://www.eastforklewisriver.org/river-restoration.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Install LWD to increase the formation of pools and offset time required for conifers planted along streambanks to be mature. 	High	Habitat, LWD	Long term

COYOTE CREEK	WRIA 27	East Fork Lewis River Tributaries & Lakes
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Impairments:

- Logging road crossings and culverts.
- Timber harvest in the upper watershed affects stream flow and water quality.

Programmatic Restoration Opportunities:

- R-3, R-5, R-8, WQ-1, WQ-10, F-5, F-6, W-1, W-2, SW-4 (see Table C-1)
- Undertake selective clearing and replant riparian areas with native trees, particularly conifers.
- Prevent riparian degradation through education and acquisition.

Information Sources and Organizations:

- None identified

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Install LWD to increase the formation of pools and offset time required for conifers planted along streambanks to be mature. 	High	Habitat, LWD	Long term

Appendix D
WRIA 28 Restoration Opportunities

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Table D-1. Key to Programmatic Restoration Measures

Measure ID	Description
Water Quality	
WQ-1	Protect water quality.
WQ-2	Implement best management practices for use of pesticides and fertilizers.
WQ-3	Use construction best management practices to minimize runoff.
WQ-4	Restrict livestock access to streams.
WQ-5	Remove and/or replace failing septic systems.
WQ-6	Identify and reduce sources of contaminants in soils and water.
WQ-7	Maintain adequate summer flows to control high temperature.
WQ-8	Reduce excessive fine sediments.
WQ-9	Improve water quality (dissolved oxygen, bacteria, temperature).
WQ-10	Decommission or repair logging roads to prevent erosion.
WQ-11	Use timber harvest best management practices to reduce erosion.
WQ-12	Control agricultural runoff.
WQ-13	Educate shoreline property owners on best management practices to minimize impacts to water quality.
Fish Habitat	
F-1	Protect remaining off-channel habitat.
F-2	Create additional side channel habitat.
F-3	Restore off-channel rearing habitat.
F-4	Remove barriers to fish passage.
F-5	Remove or repair failing culverts.
F-6	Supplement large woody debris.
F-7	Enhance spawning gravel.
F-8	Recreate stream meanders.
F-9	Improve stream channel shading.
Hydrology	
H-1	Restore stream connectivity to off-channel and floodplain habitats.
H-2	Remove, lower, or set back dikes and levees.
H-3	Provide for adequate in-stream flows through management of water withdrawals.
H-4	Address water withdrawal policies for lakes.
H-5	Acquire diked properties.
H-6	Protect remaining floodplains.
H-7	Restore natural hydrology and movement of sediment.
Riparian	
R-1	Protect intact riparian areas.
R-2	Acquire riparian properties.
R-3	Enhance riparian vegetation.
R-4	Restore riparian forest.
R-5	Increase native conifer component of riparian vegetation.
R-6	Fence livestock away from riparian areas.
R-7	Restore riparian buffers impacted by agricultural practices.
R-8	Restore topsoil in riparian buffers impacted by fill, compaction, agricultural practices, or other uses.
R-9	Educate and provide incentives to landowners to restore riparian conditions.

Measure ID	Description
Stormwater	
SW-1	Retrofit stormwater facilities to meet performance standards.
SW-2	Implement stormwater best management practices.
SW-3	Improve urban stormwater infrastructure to provide flow treatment.
SW-4	Use groundwater recharge and infiltration techniques as part of stormwater management strategy.
Non-native Species	
NN-1	Take aggressive measures to prevent the introduction of non-native invasive plant and animal species.
NN-2	Control invasive riparian vegetation.
NN-3	Use weed management and education to control invasive plant species.
Wetlands	
W-1	Protect wetland habitat.
W-2	Enhance and restore degraded wetland habitats.

Timeline Definitions:

Short-term (approximately 1-5 years) restoration projects include those that could be implemented by local landowners and volunteers and that would benefit the areas that are most in need. Short-term restoration efforts include habitat restoration and enhancement efforts in publicly owned areas. These projects could be implemented in the near term, depending on grant cycles and coordination with volunteer and community organizations.

Long-term (more than 5 years) restoration projects could be those that require coordination with other jurisdictions or that cover larger land areas. These projects may be more difficult to implement and would likely require additional planning and permitting.



Impairments:

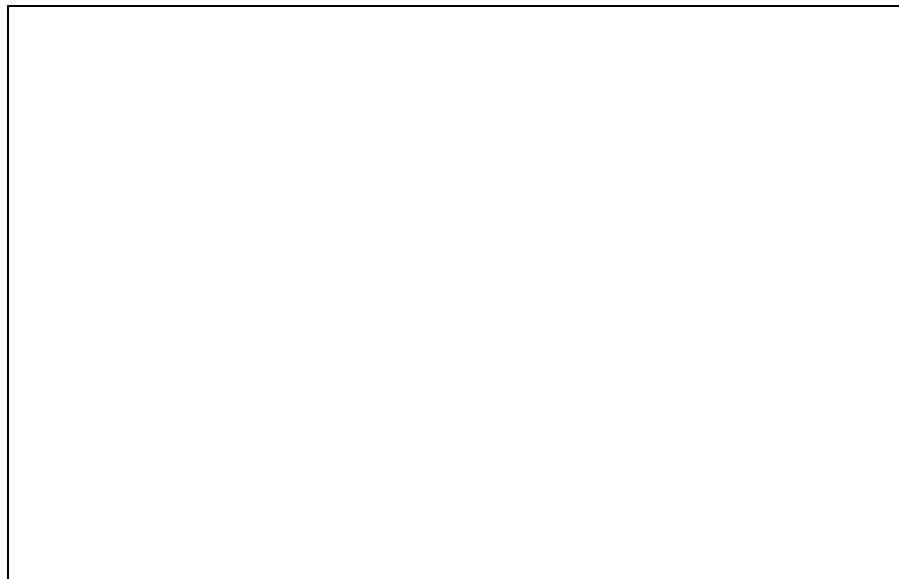
- Structures (e.g., levees, bridges) that limit historical floodplain connections and channel migration zones.
- Forested land converted to impervious surfaces for urban development and agriculture.
- Hydropower dams reduce stream flow variability, sediment delivery, and limit natural fish passage.
- Channel dredging and spoils disposal.
- River channel structures (e.g., jetties, bulkheads, breakwaters, and dikes).
- Disconnected wetlands and off-channel habitats.
- Introduction of non-native and invasive species.
- Degraded water quality.
- Fish passage barriers including tidegates and culverts that prevent access to off-channel habitats.
- Ecology-listed industrial facilities and contaminated sites.

Programmatic Restoration Opportunities:

- F-1, F-2, H-1, WQ-2, WQ-6, WQ-7, WQ-9, H-2, H-5, W-1, R-1, R-3, SW-2, NN-1, NN-2 (see Table D-1)
- Protect rearing and spawning habitat for salmonids, sturgeon, Pacific lamprey, and eulachon.
- Enhance connections between side-channels, sloughs, lakes, and the mainstem.
- Protect existing bald eagle nesting and foraging habitat (i.e., large, old trees on shorelines and islands).
- Remove or modify abandoned pilings and overwater structures in restore in-stream habitats.
- Coordinate and support LCFRB and LCREP efforts to restore and protect habitats.
- Support efforts by NOAA Fisheries, LCFRB and other entities to implement the salmon recovery management actions.

Information Sources and Organizations:

- Lower Columbia River Salmon Recovery & Fish and Wildlife Subbasin Plan (LCFRB, 2010).
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Lower Columbia River Estuary Program, web page: <http://www.lcrep.org/>
- Columbia River Estuary Study Task Force (CREST), web page: <http://www.columbiaestuary.org/restoration.html>
- Columbia River Inter-Tribal Fish Commission, web: <http://www.critfc.org/>.
- Cowlitz Tribe, web site: <http://www.cowlitz.org/>.



Information Sources and Organizations:

- Bonneville Power Administration, web page: <http://efw.bpa.gov/>
- US Army Corps of Engineers
- NOAA Fisheries Salmon Recovery, web page: <http://www.nwfsc.noaa.gov/trt/index.cfm>
- Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead, NOAA Fisheries (2011), web: <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Estuary-Module.cfm>.
- EPA Water Quality in the Columbia Basin, web site: <http://yosemite.epa.gov/r10/ECOCOMM.NSF/Columbia/WQS>.
- Ecology Columbia River Management Program: <http://www.ecy.wa.gov/programs/wr/cwp/crwmp.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
COLU_RV_02	<ul style="list-style-type: none"> • The Port of Vancouver mitigation bank site presents opportunities to reestablish native wetland vegetation and habitat. 	High	Hydrologic, sediment, water quality and habitat functions.	Short term
COLU_RV_03	<ul style="list-style-type: none"> • Protect springs in and around Vancouver and Camas near the I-205 bridge to protect spawning chum salmon in the mainstem Columbia River. 	High	Habitat	Long term
COLU_RV_03	<ul style="list-style-type: none"> • Remove invasive species and replant native vegetation at Steamboat Landing and William Clark Park. 	Medium	Habitat	Short term
All reaches	<ul style="list-style-type: none"> • Protect floodplain areas and associated wetlands. 	High	Habitat, Hydrology	Long term



Impairments:

- Development in the floodplain along tributary streams.
- Historical filling of Mulligan Slough.
- Increased sediment loading from urban runoff.
- Intense blue-green algae blooms occur during to excessive nutrients.
- Lack of shade and riparian forests along tributary streams.
- Poor agricultural practices contribute to water quality degradation.
- Decreased tidal flushing.
- Degraded water quality, including fecal coliform, low dissolved oxygen, PCBs and other contaminants.
- Lack of vegetation and structure for habitat.
- Invasive species in the watershed.
- Inadequate stormwater treatment and flow control.
- Failing septic systems.

Programmatic Restoration Opportunities:

- W-1, H-1, H-2, F-6, F-9, WQ-2, WQ-4, WQ-5, WQ-12, NN-2, SW-1, SW-2, SW-3, SW-4, R-5 (see Table D-1)
- Protect and restore floodplain wetlands in the Vancouver Lake lowlands.
- Control invasive fish species such as common carp through management and angler education.
- Increase habitat structure by reducing turbidity and allowing light penetration.
- Support public outreach and education efforts by Vancouver Lake Watershed Partnership.
- Support ongoing TMDL studies for Salmon Creek and Burnt Bridge Creek, upstream tributaries.

Information Sources and Organizations:

- Vancouver Lake Watershed Partnership web page: <http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>
- Technical Foundation for Future Management of Vancouver Lake, May 2011 (Vancouver Lake Watershed Partnership).
- Vancouver-Clark Parks and Recreation web page: <http://www.cityofvancouver.us/parks-recreation/make-difference/parktrail-volunteering.asp>
- Clark County Public Works, 2008 SNAP: Subwatershed Needs Assessment Report, Vancouver Lake/Lake River (March 2009).
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> Riparian forest restoration 	High	Habitat, LWD, Water Quality	Short term
	<ul style="list-style-type: none"> The Port of Vancouver mitigation bank site presents opportunities to reestablish native wetland vegetation and habitat. 	High	Habitat, LWD, Water Quality	Short term
Various	<ul style="list-style-type: none"> Upgrade stormwater facilities and outfalls at numerous locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Water quality	Short term
Various	<ul style="list-style-type: none"> Control invasive vegetation at numerous locations noted in 2007 Stormwater Needs Assessment Program report. 	High	Habitat	Short term

CANVASBACK LAKE**WRIA 28****Lower Columbia River Tributaries & Lakes****Impairments:**

- Reduction in historical flooding and sediment transport from the Columbia River.
- Increasing cover by invasive weeds.
- Agricultural practices nearby limit native tree and shrub cover.
- Forested riparian buffer lacking on east shoreline.

Programmatic Restoration Opportunities:

- NN-2, R-3 (see Table D-1)
- Continue to implement the Ridgefield National Wildlife Refuge management plan that controls and replaces invasive plants and noxious weeds.
- Coordinate with Friends of Ridgefield National Wildlife Refuge to remove invasive vegetation and restore habitats within the refuge.
- Coordinate with U.S. Fish and Wildlife Service during implementation of the conservation plan for Ridgefield National Wildlife Refuge.

Information Sources and Organizations:

- Ridgefield National Wildlife Refuge web page: <http://www.fws.gov/ridgefieldrefuges/ridgefield/>.
- Friends of the Ridgefield National Wildlife Refuge web page: <http://www.ridgefieldfriends.org/index.php>.
- Lower Columbia River Estuary Partnership, restoration projects map: <http://maps.lcrep.org/>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Re-vegetation of forest riparian buffer on east lake shore.	High	Habitat, LWD	Short term



Impairments:

- Reduction in historical flooding and sediment transport from the Columbia River.
- Increasing cover by invasive weeds.
- Agricultural practices limit native tree and shrub cover.
- Forested riparian buffer lacking on eastern shoreline.

Programmatic Restoration Opportunities:

- R-3, NN-2 (see Table D-1)
- Continue implementing the Ridgefield National Wildlife Refuge management plan to control and replace invasive plants and noxious weeds.
- Coordinate with Friends of Ridgefield National Wildlife Refuge to remove invasive vegetation and restore habitats within the refuge.
- Coordinate with U.S. Fish and Wildlife Service during implementation of the conservation plan for Ridgefield National Wildlife Refuge.
- Support ongoing vegetation and biological monitoring of Campbell Slough by LCREP.

Information Sources and Organizations:

- Ridgefield National Wildlife Refuge web page: <http://www.fws.gov/ridgefieldrefuges/ridgefield/>.
- Friends of the Ridgefield National Wildlife Refuge web page: <http://www.ridgefieldfriends.org/index.php>.
- Lower Columbia River Estuary Partnership, web site: <http://maps.lcrep.org/monitoringsite/2661>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Restore native riparian forest on eastern shoreline.	High	Habitat, LWD	Short term
All reaches	Protect lands through acquisition or conservation easement.	High	Habitat	Long term

Impairments:

- Conversion of watershed to impervious surfaces.
- Streambank hardening, channelization, and scour.
- Fish passage barriers.
- Diking and roads disconnecting streams from floodplains.
- Fine sediment accumulation.
- Stormwater runoff resulting in head-cutting and erosion.
- Lack of grade controls such as large wood.
- Invasive species in the understory.
- Degraded water quality.
- Livestock access to stream channels.

Programmatic Restoration Opportunities:

- H-1, H-2, H-3, F-4, F-6, NN-2, R-3, R-6, R-8, WQ-8, SW-1 (see Table D-1)
- Prevent additional channel modifications (channel incising, head-cutting, etc.).

Information Sources and Organizations:

- Inter-Fluve, Inc. 2006. Technical assessment of the Whipple Creek Basin to support stormwater basin planning efforts in Clark County.
- Clark County Public Works, Clean Water Program.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Legacy Lands Program, web page: <http://www.clark.wa.gov/legacylands/land.html>
- Upper Whipple Creek Habitat Protection Project, web site: <http://www.clark.wa.gov/water-resources/engineering/whipplehab.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower watershed	<ul style="list-style-type: none"> • Add spawning gravels in Packard Creek. 	Medium	Habitat	Long term
Lower watershed	<ul style="list-style-type: none"> • Protect oak woodland habitat near Packard Creek. 	High	Habitat	Long term
All	<ul style="list-style-type: none"> • Protect important habitats upstream and protect stream flows. 	High	Habitat, Hydrology, Hyporheic functions	Long term
Upper watershed	<ul style="list-style-type: none"> • Preserve important intact areas such as the mainstem above Union Road, the Packard Basin, Tributary W2.04, and wetlands. 	High	Habitat	Long term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Upper watershed	<ul style="list-style-type: none"> Install LWD jams on the mainstem above Union Road, below I-5, near Packard Creek, below the NW 179th St. crossing, the area near RM 2.3, and lower Packard Creek. 	Medium	Habitat, LWD	Long term
All	<ul style="list-style-type: none"> Enhance riparian habitats and protect wetland habitats during development of the Whipple Creek Greenway Trail (proposed). 	High	Habitat, Hydrology	Long term
Upper watershed	<ul style="list-style-type: none"> Address potential fish passage issues on the mainstem including the NW 11th Ave. crossing, I-5 crossing, and Union Road crossing. 	High	Habitat, Access	Long term
Reach 1	<ul style="list-style-type: none"> Install cattle fencing on the mainstem at the pasture area near RM 2 and on Packard Creek. 	Medium	Water Quality, Channel stability	Long term
All	<ul style="list-style-type: none"> Restore maintained lawns along the mainstem channel with riparian vegetation near RM 2.4, downstream of NW 179th St., near RM 5.7, and near RM 7.1. 	High	Habitat, LWD	Long term
Upper watershed	<ul style="list-style-type: none"> Remove old fill and abandoned crossing structures on the mainstem near RM 7.3, RM 5.2 and RM 4.2. 	High	Habitat, Hydrology	Long term
Lower watershed	<ul style="list-style-type: none"> Proposal to acquire 50 acres of wetlands, shoreline and floodplain on Whipple Creek. Funding pending approval through the Washington Wildlife and Recreation Program (2011). 	High	Habitat, Hydrology	Short term



Impairments:

- Reduction in historical flooding and sediment transport from the Columbia River.
- Increasing cover by invasive weeds.
- Forested cover lacking in the riparian zone.
- Agricultural practices have reduced tree and shrub cover.

Programmatic Restoration Opportunities:

- H-2, R-3, R-4, NN-2 (see Table D-1)
- Continue implementing the Ridgefield National Wildlife Refuge management plan to control and replace aggressive, weedy plants.
- Coordinate with Friends of Ridgefield National Wildlife Refuge to remove invasive vegetation and restore habitats.
- Coordinate with U.S. Fish and Wildlife Service during preparation of conservation plan for Ridgefield National Wildlife Refuge.

Information Sources and Organizations:

- Ridgefield National Wildlife Refuge web page: <http://www.fws.gov/ridgefieldrefuges/ridgefield/>.
- Friends of the Ridgefield National Wildlife Refuge web page: <http://www.ridgefieldfriends.org/index.php>.
- Lower Columbia River Estuary Program, web page: http://maps.lcrep.org/program/habitat_restoration.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Breach the dike separating Post Office Lake from the Columbia River, to allow tidal influence to return to this area.	High	Hydrology	Long term
All reaches	Restore riparian forest habitat along shorelines	High	Habitat, LWD	Short term
All	Preserve lake through conservation easement or acquisition.	High	Habitat	Long term

GREEN LAKE**WRIA 28****Lower Columbia River Tributaries & Lakes****Impairments:**

- Runoff from roads and other development.
- Conversion of forest land to agriculture, shrubs, and impervious surfaces.
- Railroad tracks within eastern shoreline.
- Ditching and draining of associated wetlands.

Programmatic Restoration Opportunities:

- NN-2, W-1, W-2, R-3, R-8 (see Table D-1)
- Coordinate restoration efforts with Vancouver Lake Watershed Partnership.

Information Sources and Organizations:

- Vancouver Lake Watershed Partnership, web site:
<http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Restore forested riparian zones within shorelines.	High	Habitat	Short term



Impairments:

- Dikes, roads, railroads have disconnected floodplains from streams.
- Low habitat diversity, lack of riparian trees result in low supply of large woody debris.
- Stormwater runoff from urban areas impairs water quality in Vancouver Lake and Lake River system.
- Invasive species abundant in riparian zone.
- Lack of side channels negatively affects salmonid habitat.
- Agricultural uses and upstream residential uses contribute sediment and pollutants to Vancouver Lake and Lake River.
- Intense blue-green algae blooms occur during to excessive nutrients.

Programmatic Restoration Opportunities:

- F-2, F-3, R-4, R-6, NN-2, W-1, W-2, WQ-9, H-2, H-3 (see Table D-1)
- Create and/or restore side channel and off-channel habitat for chum spawning and coho overwintering.
- Restore riparian forest on the western shore.
- Support stewardship and volunteer opportunities for restoration through LCREP.
- Improve treatment of stormwater discharge to Vancouver Lake/Lake River system.
- Support ongoing TMDL studies for Salmon Creek and Burnt Bridge Creek, upstream tributaries.

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Water Resources & Clean Water Program: <http://www.co.clark.wa.us/water-resources/>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Vancouver Lake Watershed Partnership: <http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>.
- Clark County Public Works 2008 SNAP: Subwatershed Needs Assessment Report, Vancouver Lake/Lake River (March 2009).

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
LAKE_RV_01	<ul style="list-style-type: none"> Improve water quality by excluding livestock from riparian areas, increasing riparian shading, and reducing chemical contamination. 	High	Water Quality, Habitat	Long term
All reaches	Riparian forest restoration and restoration of hillslope processes (SNAP 2008)	High	Water Quality, LWD, Habitat	Long term

**Impairments:**

- Stream dredged, drained, and rerouted.
- Dikes and roads have disconnected stream from floodplain.
- Excessive peak flows and sediment transport from urban runoff.
- Degraded water quality – TMDL under development.
- Low stream shading levels and lack of riparian forested habitat. Greatest lack of shade and riparian canopy is near Andressen Road crossing and in lower Greenway (Ecology).
- Ditching and drainage of floodplain and wetlands.
- Livestock damage to riparian vegetation and stream.
- Fish passage barriers exist.
- Riparian vegetation devoured by non-native species, nutria.

Programmatic Restoration Opportunities:

- NN-2, R-3, R-4, R-8, W-1, W-2, H-1, H-2, H-3, H-6, WQ-5, WQ-8, WQ-9, F-4, F-6, F-8, F-9, SW-1, SW-2, SW-3, SW-4 (see Table D-1)
- Continue to trap and remove nutria.
- Public outreach and education related to residential lawn care and stormwater runoff.
- Preserve and protect associated wetlands which support stream baseflow and habitat.

Information Sources and Organizations:

- City of Vancouver Burnt Bridge Creek Watershed. <http://www.cityofvancouver.us/waterallaround.asp?menuid=10463&submenuID=20299&itemID=20392>
- Vancouver Lake Watershed Partnership web page: <http://www.cityofvancouver.us/publicworks/vancouverlake/index.htm>
- Vancouver-Clark Parks and Recreation web page: http://www.cityofvancouver.us/parks-recreation/make_difference/parktrail_volunteering.asp
- Vancouver Watersheds Council web page: <http://www.vancouverwatersheds.org/>
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>
- Clark County Public Works Clean Water Program. 2008 SNAP- Lower Burnt Bridge Creek Subwatershed Needs Assessment Report. <http://www.co.clark.wa.us/water-resources/documents/SNAP/2008/LowerBCSNAPReport.pdf>

Information Sources and Organizations:

- Clark County Public Works Clean Water Program.



2010. 2009 Stormwater Needs Assessment Program – Upper Burnt Bridge Creek/Middle Burnt Bridge Creek Subwatershed Needs Assessment Report.

- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Burnt Bridge Creek. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/burntbridge/burntbrtmdl.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Reach 2	<ul style="list-style-type: none"> Continue efforts to restore native habitat and reconnect stream to wetlands through the Burnt Bridge Creek Regional Wetland Bank & Greenway Trails Project from I-205 to 112th Avenue, and from Oakbrook Way to NE 127th Avenue. 	High	Habitat, Hydrology	Short term
Reach 2	<ul style="list-style-type: none"> Restore riparian forest, restore stream meanders, and remove reed canarygrass in the Meadowbrook North area between Burton Road and Royal Oaks Drive. 	High	Habitat	Long term
Upper watershed	<ul style="list-style-type: none"> Restore riparian forest, restore stream meanders, and remove reed canarygrass in the Beaver Marsh area from 39th Street to I-205. 	High	Habitat	Long term
Reach 1	<ul style="list-style-type: none"> Reforest riparian area and control invasive vegetation at the confluence of lower Burnt Bridge Creek and Cold Creek. 	High	Habitat	Short term
Reach 1	<ul style="list-style-type: none"> Restore degraded wetlands in County-owned property at Saint Johns Park. 	High	Habitat	Short term
Reach 1	<ul style="list-style-type: none"> Restore degraded wetlands in County-owned property north of Minnehaha Street below power lines. 	High	Habitat, Hydrology	Short term
Reach 1	<ul style="list-style-type: none"> Replace culvert at Hazel Dell Avenue that is a partial barrier to upstream movement of coho salmon. 	Medium	Hydrology, Access	Long term
All Reaches	<ul style="list-style-type: none"> Fence livestock out of stream and riparian area. 	Medium	Water Quality	Long term

Impairments:

- Floodplains reduced or eliminated along Lower Columbia River.
- Forests converted to residential lots and pastures.
- Increased impervious surfaces such as roads.
- Poor riparian habitat; lack of large woody debris.
- Degraded water quality – TMDL for fecal coliform.
- Invasive vegetation in riparian areas, particularly Japanese knotweed, reed canarygrass, and Himalayan blackberry.
- Fish passage barriers.

Programmatic Restoration Opportunities:

- H-1, H-7, SW-1, SW-2, SW-3, F-4, F-6, F-8, R-3, R-7, R-8, WQ-5, WQ-9, NN-2 (see Table D-1)
- Restore floodplains.

Information Sources and Organizations:

- Clark County Public Works Water Resources. 2007 SNAP – Gibbons Creek/Steigerwald Subwatershed Needs Assessment Report.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Clark County projects. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/overview.html>. Accessed February 2010.
- Steigerwald Lake National Wildlife Refuge, web site: <http://www.fws.gov/ridgefieldrefuges/steigerwaldlake/>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
GIBB_CR_01	<ul style="list-style-type: none"> • Explore restoration opportunities on Columbia Land Trust property upstream from SR-14. 	Medium	Habitat	Long term
Various	<ul style="list-style-type: none"> • Conduct further analysis of fish passage barriers and replace culverts as needed (2007 SNAP report). 	Medium	Access	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation noted in 2007 SNAP report. 	Medium	Habitat	Short term

LAWTON CREEK**WRIA 28****Lower Columbia River Tributaries & Lakes****Impairments:**

- Floodplains reduced or eliminated by development and infrastructure.
- Poor quality riparian habitat and lack of tree cover.
- Gravel roads within shoreline areas.
- Invasive plants.
- Placement of dikes and levees to confine channel.

Programmatic Restoration Opportunities:

- H-2, H-3, F-6, F-8, WQ-9, NN-2, R-3, R-6, R-8 (see Table D-1)
- Focus restoration actions on lower Lawton Creek.
- Assess floodplain conditions on Lawton Creek affected by past gravel mining.
- Acquire property or conservation easements along the lower reaches to provide opportunities to remove dikes and restore natural stream meanders within the floodplain.

Information Sources and Organizations:

- Clark County Public Works Water Resources. 2007 SNAP – Gibbons Creek/Steigerwald Subwatershed Needs Assessment Report.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Conserve agricultural lands and promote best practices	High	Habitat, LWD	Long term
All	Work with private property owners to promote restoration of riparian zones.	High	Habitat, LWD	Long term



Impairments:

- Urban and suburban development in the lower mainstem has altered hydrology; sediment delivery; and degraded habitat.
- Loss of floodplain connectivity.
- Forest practices increase runoff that scours stream channels.
- Agricultural runoff.
- Degraded water quality.
- Fish passage barriers.
- Lack of forested canopy cover to below state stream shading standards.
- Lack of large woody debris.
- Levees and roads confine channel migration.

Programmatic Restoration Opportunities:

- F-2, F-3, F-4, F-6, F-7, H-1, H-3, H-7, R-3, R-4, R-6, R-8, SW-3, NN-2, WQ-5, WQ-10, W-1 (see Table D-1)
- Increase public awareness about erosion issues associated with ATV use in and near streams.
- Manage forest practices, agriculture, and development to minimize impacts to sediment supply, runoff, and water quality.

Information Sources and Organizations:

- Parametrix. 2008. Washougal River Greenway Shoreline Inventory and Characterization.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- G. Wade. 2001. Salmon and Steelhead Habitat Limiting Factors – WRIA 28. <http://www.scc.wa.gov/index.php/259-WRIA-28-View-category.html>.
- Lower Columbia River Estuary Partnership site: http://maps.lcrep.org/program/habitat_restoration.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
WASH_RV_02	<ul style="list-style-type: none"> • Improve Hathaway Park by replacing degraded boat launch, stabilize bank, and restore riparian area. 	High	Water quality, habitat	Short term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
WASH_RV_02	<ul style="list-style-type: none"> Remove invasive knotweed/plants, especially at Sandy Swimming Hole and within and east of Riverbend Park area. 	High	Habitat	Short term
WASH_RV_01 and 02	<ul style="list-style-type: none"> Restore historical off-channel and side channel habitats and create new spawning channels on the lower Washougal River mainstem. 	High	Habitat	Long term



Impairments:

- Hydrology and sediment delivery (middle/lower reaches) altered by urban/suburban development.
- Conversion of agricultural land to residential in middle reaches.
- Loss of floodplain connectivity.
- Surface water diversions and impoundments.
- Forest practices in upper watershed.
- Agricultural runoff.
- Degraded water quality – TMDL under development for dissolved oxygen, fecal coliform, pH, temperature.
- Loss of rearing habitat, channel simplification and lack of LWD.

Programmatic Restoration Opportunities:

- H-1, H-6, SW-3, WQ-2, WQ-7, WQ-12, R-4, R-8, F-6, W-2 (see Table D-1)

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Clark County projects. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/overview.htm>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower	<ul style="list-style-type: none"> • Enhance floodplain and side channel habitat within public parks along lower Lacamas Creek. 	Medium	Hydrology	Short term
Lower	<ul style="list-style-type: none"> • Address minimum and maximum flow limitations on water diversions and releases from Round Lake that affect Lacamas Creek. 	High	Hydrology	Long term
All	<ul style="list-style-type: none"> • Conserve agricultural lands and promote best practices. 	High	Water Quality	Long term
All	<ul style="list-style-type: none"> • Maintain adequate flows in Lacamas Creek to buffer water temperatures during summer months. 		Water Quality	Long term

ROUND LAKE	WRIA 28	Washougal River Tributaries & Lakes
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Impairments:

- Hydrology of Lacamas Creek altered by diversion of water from Round Lake to Mill Ditch, and by large water releases from Round Lake to the creek.
- Conversion from pervious to impervious surfaces.
- Degraded water quality.

Programmatic Restoration Opportunities:

- WQ-13, H-4 (see Table D-1)
- Preservation of forested habitats and existing prairie.

Information Sources and Organizations:

- Wade, G. 2001. Salmon and Steelhead Habitat Limiting Factors. Water Resource Inventory Area 28. Washington State Conservation Commission, Final Report.
- City of Camas Parks Department, web page: <http://www.ci.camas.wa.us/parks/parktrail.htm>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Address minimum and maximum flow limitations on water diversions and releases from Round Lake. 	High	Hydrology, stream base flow	Long term

FALLEN LEAF LAKE**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Conversion of forests to residential uses and roads.
- Historical use of shoreline as a cemetery.
- Sedimentation from uphill developments and urban runoff.

Programmatic Restoration Opportunities:

- NN-2, R-3, R-8 (see Table D-1)
- Acquisition of properties by the City of Camas to preserve lake and shoreline habitats through the use of Washington Wildlife and Recreation Office funds.

Information Sources and Organizations:

- City of Camas Parks, web page:
<http://www.ci.camass.wa.us/parks/parktrail.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	<ul style="list-style-type: none"> • Reestablish native plantings, particularly in areas on the eastern side of the lake impacted by recreational access. 	Medium	Habitat	Short term



Impairments:

- Conversion from pervious to impervious surfaces results in increased stormwater runoff and habitat loss.
- Excessive aquatic plant growth contributes to high nutrient levels.
- Algal blooms.
- Degraded water quality, especially increased phosphorus and nutrients.
- Residential and road development has reduced riparian forested habitat.
- Dam impounds lake and prevents natural fish passage.

Programmatic Restoration Opportunities:

- NN-3, WQ-9, H-4, R-3, W-1, W-2, H-6 (see Table D-1)
- Control noxious Brazilian elodea growth.
- Prohibit or limit motorized watercraft.
- Support WSU Watershed Steward Program to continue restoration activities and public outreach.

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>
- WSU Clark County Extension Office, Watershed Stewards, web page: <http://clark.wsu.edu/volunteer/ws/index.html>
- Ecology, Water Quality Improvement Project, Lacamas Creek Area, Multi-parameter, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/LacamasTMDL.html>

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Restore riparian forest and enhance shoreline vegetation.	High	Habitat	Short term
All reaches	Reduce riprap and replace with bioengineered stabilization.	Medium	Habitat, Hydrology	Long term



Impairments:

- Converted forests to agricultural and rural residential uses.
- Conversion of pervious to impervious surfaces.
- Ditching, draining and loss of associated wetlands due to residential development and agricultural practices.
- Invasive species.
- Impaired water quality.
- Degraded habitat in wetlands.

Programmatic Restoration Opportunities:

- W-1, W-2, R-3, R-8, NN-2, WQ-5, WQ-12, SW-1, SW-2 (see Table D-1)
- Protect associated wetlands to protect stream baseflow and downstream habitats.
- Restore wetlands and riparian areas that have been impacted by grazing and agricultural activities.

Information Sources and Organizations:

- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Ecology, Water Quality Improvement Project, Lacamas Creek Area, Multi-parameter, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/LacamasTMDL.html>
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian forests and native vegetation.	High	Habitat	Short term
All	Preserve associated wetlands to protect stream baseflow and downstream water quality	High	Habitat, Hydrology	Short and Long Term
All	Remove ditches and drains to restore natural hydrology.	Medium	Hydrology	Long term
All	Conserve agricultural lands and promote best practices.	High	Habitat, Hydrology, Water Quality	Long term

MATNEY CREEK**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Conversion of forested lands into residential and pasture.
- Degraded habitat aquatic habitat.
- Impaired water quality.

Programmatic Restoration Opportunities:

- WQ-7, W-1, W-2, R-5, WQ-13 (see Table D-1)
- Educate residential and agricultural landowners on best management practices.

Information Sources and Organizations:

- Clark County Monitoring Documents web page:
<http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	<ul style="list-style-type: none"> • Maintain summer baseflow in stream to control high temperature through the protection of wetlands. 	Medium	Hydrology	Long term

NORTH FORK LACAMAS CREEK**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Degraded riparian habitat due to rural residential development and agricultural uses.
- Degraded water quality.
- Lack of riparian forest.

Programmatic Restoration Opportunities:

- WQ-7, WQ-10, WQ-13, R-4, F-5, W-1, W-2 (see Table D-1)
- Develop and enhance thermal refugia for rearing cutthroat trout.

Information Sources and Organizations:

- Ecology, Water Quality Improvement Project, Lacamas Creek Area, Multi-parameter, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/LacamasTMDL.html>
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Conserve agricultural lands and promote best practices to reduce runoff.	High	Water Quality	Long term



Impairments:

- Forests converted to residential and agricultural uses in the lower reaches.
- Agricultural diversion in the lower reaches.
- Degraded riparian habitat in the lower reaches.
- Low flow conditions from water withdrawals.
- Diked and armored streambanks channelize flows and reduce floodplain habitat.
- Degraded water quality.

Programmatic Restoration Opportunities:

- H-1, WQ-3, NN-2, R-3, R-7, R-8, F-3, F-4, F-7, W-1, W-2 (see Table D-1)
- Continue to remove invasive knotweed.
- Protect salmonid habitat in headwater reaches.
- Protect existing forests for timber and reforest vacant farm land.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All Reaches	<ul style="list-style-type: none"> • Remedy passage barriers along several small tributary streams such as Jackson Creek; Cotter Creek, and Larson Creek. 	High	Habitat, Access	Long term
Tributaries	<ul style="list-style-type: none"> • Reconnect the lower Little Washougal River with its floodplain. 	High	Hydrology	Long term
All	<ul style="list-style-type: none"> • Protect existing riparian forest 	High	Habitat, LWD	Long term

EAST FORK LITTLE WASHOUGAL RIVER

WRIA 28

Washougal River Tributaries & Lakes**Impairments:**

- Lack of large wood debris in lower segments of the East Fork Little Washougal River and Jones Creek.
- Lack of adequate stream shading.

Programmatic Restoration Opportunities:

- F-5, F-6, F-9, WQ-10, R-4 (see Table D-1)

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian forests to enhance habitats.	High	Habitat	Long term

BOULDER CREEK**WRIA 28****Washougal River Tributaries & Lakes****Impairments:**

- Timber harvest has reduced forested cover in the watershed.
- Logging roads cross creek and contribute to sediment loading.
- Low flows due to municipal water withdrawals.

Programmatic Restoration Opportunities:

- F-6, F-7, WQ-11 (see Table D-1)

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page:
<http://www.lcfrb.gen.wa.us/default1.htm>.
- Clark County 2010 Stream Health Report web page:
<http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Protect forested areas in the upper watershed.	High	Habitat, Hydrology	Long term
All	Restore riparian forests where appropriate	Medium	Habitat	Long term
All	Address low flows due to water withdrawals.	Medium	Habitat, Hydrology	Long term

COUGAR CREEK	WRIA 28	Washougal River Tributaries & Lakes
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Impairments:

- Forests converted to agricultural and residential uses.
- Impaired hydrologic conditions due to high road densities.
- Lack of mature trees for wood recruitment.

Programmatic Restoration Opportunities:

- WQ-10, WQ-11, R-4, R-8, F-5 (see Table D-1)
- Retain current forest cover.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page:
<http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Restore riparian forested cover.	High	Habitat	Long term

HAGEN CREEK	WRIA 28	Washougal River Tributaries & Lakes
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Impairments:

- Timber harvest has reduced forested cover in upper watershed.
- Forest roads cross creek and its tributaries contributing sediment.

Programmatic Restoration Opportunities:

- WQ-10, WQ-11, R-1, R-4, F-5 (see Table D-1)

Information Sources and Organizations:

- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Protect forested cover in upper watershed	High	Habitat	Long term
All	Protect and restore stream channels to protect downstream water quality.	High	Hydrology, Water Quality	Long term



Impairments:

- Conversion from pervious to impervious surfaces increases magnitude, duration and frequency of peak flows and reduces summer base flows.
- Streambank hardening, channelization, and incision.
- Limited Channel Migration Zones (CMZs).
- Shade levels below state targets in lower reaches.
- Inadequate stormwater treatment and flow control.
- Failing septic systems.
- Poor agricultural practices contribute to water quality degradation.
- Fish passage barriers.
- Disconnected floodplains due to diking, roads, and railroads.
- Impaired streambank stability.
- Lack of large woody debris.
- Low pool and riffle frequency.
- Lack of side channel habitat due to channelization, filling, and bank armoring.
- Sedimentation and compaction of spawning gravels.
- Degraded riparian conditions.

Impairments:

- Impaired water quality – TMDL for fecal coliform, turbidity,

Programmatic Restoration Opportunities:

- F-1, F-3, F-6, F-9, H-1, H-3, H-7, WQ-2, WQ-4, WQ-5, WQ-12, NN-2, R-3, R-5, R-6, R-8, R-9, W-2, SW-1, SW-2, SW-3, SW-4 (see Table D-1)
- Reconnect, restore, and protect cold-water side channels.
- Manage forest practices, agriculture, and development to minimize impacts to sediment supply, runoff, and water quality.
- Remove or limit ponds to improve water temperatures.
- Continue to build on reforestation projects being undertaken by Clark County in the Salmon Creek Greenway.
- Control reed canarygrass and plant native vegetation in wetlands associated with lower Salmon Creek.
- Investigate acquiring large parcels with favorable conditions for creation or enhancement of wetlands.

Information Sources and Organizations:

- Vancouver-Clark Parks and Recreation web page: http://www.cityofvancouver.us/parks-recreation/make_difference/parktrail_volunteering.asp
- Clark County Legacy Lands web page: <http://www.co.clark.wa.us/legacylands/index.html>
- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Stormwater Needs Assessment Program reports.
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.

Information Sources and Organizations:

- Lower Columbia Fish Recovery Board web page:

temperature.

- Stream channel avulsion into gravel pits.

<http://www.lcfrb.gen.wa.us/default1.htm>.

- G. Wade. 2001. Salmon and Steelhead Habitat Limiting Factors – WRIA 28. <http://www.scc.wa.gov/index.php/259-WRIA-28-/View-category.html>.
- Ecology. 2010. Water Quality Improvement Projects (TMDLs) – Clark County projects. Available: <http://www.ecy.wa.gov/programs/wq/tmdl/overview.html>. Accessed February 2010.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Upper Watershed	<ul style="list-style-type: none"> • Protect headwaters above 182nd Avenue for coho and steelhead spawning. 	High	Habitat	Long term
All Reaches	<ul style="list-style-type: none"> • Revegetate the mainstem particularly within the Greenway. 	High	Habitat	Short term
Upper Watershed	<ul style="list-style-type: none"> • Plant conifers and hardwood tree in riparian areas of RM 21.4 to 22.3 to increase large wood availability. 	Medium	Habitat, LWD	Short term
SALM_CR_01	<ul style="list-style-type: none"> • Stabilize the streambank and enhance in-stream habitat between I-5 and Highway 99 where the mainstem avulsed into streamside gravel mining ponds in 1996. 	High	Hydrology	Long term
SALM_CR_01	<ul style="list-style-type: none"> • Reestablish floodplain connectivity and protect floodplain wetlands in the lower and middle reaches of Salmon Creek. 	Medium	Hydrology	Long term
All Reaches	<ul style="list-style-type: none"> • Limit intensive use of stream channel at Salmon Creek County Park during fall Chinook and chum salmon spawning, egg incubation, and early rearing periods. 	High	Habitat, Access	Short term
RM 0.6	<ul style="list-style-type: none"> • Enhance wetlands along lower Salmon Creek floodplain. 	High	Habitat, Hydrology	Long term
SALM_CR_01	<ul style="list-style-type: none"> • Acquire parcels near Salmon Creek treatment plant for wetland enhancement (Clark County Legacy Lands potential acquisition project). 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation at numerous locations noted in Stormwater Needs Assessment Program reports. 	High	Habitat	Short term

Impairments:

- Conversion of forests to agricultural and residential uses.
- Increased magnitude, duration and frequency of peak flows and reduced summer base flows caused by increases in impervious surfaces.
- Undersized culverts.
- Non-native invasive vegetation in riparian areas (particularly reed canarygrass and Himalayan blackberry).
- Degraded water quality.
- Runoff from agricultural areas.
- Small private dams and associated ponds on tributaries.
- Incised channels.
- Creation of drainage channels.
- Disconnected floodplain.
- Streambank damage in upper reaches caused by livestock access and clearing.
- Lack of large woody debris.
- Poor pool quality.
- Lack of riparian habitat diversity.

Programmatic Restoration Opportunities:

- NN-2, W-1, H-1, WQ-8, WQ-9, WQ-12, F-4, F-6, R-6, R-8, R-9 (see Table D-1)
- Protect floodplain wetlands in upper reaches.
- Increase large woody debris availability in lower reaches.
- Protect headwaters for coho and steelhead spawning.
- Explore potential restoration opportunities with WSDOT as part of the future SR502 widening project.

Information Sources and Organizations:

- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Public Works Water Resources. 2008. 2007 Stormwater Needs Assessment Program – Mill Creek Subwatershed Needs Assessment Report.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
MILL_CR_01	<ul style="list-style-type: none"> • Address fish passage barrier at NE 179th Street crossing. 	Medium	Access	Long term
MILL_CR_01	<ul style="list-style-type: none"> • Protect forest and wetland habitats on property near WSU Vancouver campus, through acquisition or easements. 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation at numerous locations noted in 2007 Stormwater Needs Assessment Program report. 	Medium	Habitat	Short term

CURTIN CREEK	WRIA 28	Salmon Creek Tributaries & Lakes
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- Impairments:**
- Loss of floodplain and associated wetlands.
 - Impaired floodplain connectivity due to culvert crossings.
 - Lack of riparian habitat diversity and large woody debris availability.
 - Channel straightened and incised.
 - Conversion of forests to agriculture resulting in increased drainage ditches.
 - Poor pool quality.
 - Impaired water quality.

- Programmatic Restoration Opportunities:**
- W-1, R-9, F-6, WQ-4, WQ-8, WQ-9 (see Table D-1)
 - Protect headwaters for coho and steelhead spawning.
 - Protect all associated wetlands, especially those with floodplain connectivity.

- Information Sources and Organizations:**
- Clark County 2010 Stream Health Report web page: <http://www.clark.wa.gov/water-resources/stream.html>.
 - Ecology, Water Quality Improvement Project: Salmon Creek Area TMDL, web site: <http://www.ecy.wa.gov/programs/wq/tmdl/SalmonCr/SalmonCr.html>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All reaches	Protection of all associated wetlands.	Medium	Habitat, Hydrology	Long term

MORGAN CREEK**WRIA 28****Salmon Creek Tributaries & Lakes****Impairments:**

- Deforestation and conversion of forests to agricultural and residential uses.
- Section of stream channelized and culverted.
- Damaged streambank due to livestock access.
- Clearing and draining of wetlands for agricultural use.
- Lack of large woody debris.
- Poor pool quality.
- Elevated fecal coliform levels.
- Runoff from agricultural land and roads.
- Invasive species in riparian areas.
- Lack of shade in some areas.
- Excess sediment loading from developed and agricultural areas.
- Failing road culverts.

Programmatic Restoration Opportunities:

- W-2, F-4, F-5, F-6, F-9, NN-2, R-3, R-4, R-6, R-9, WQ-4, WQ-5, WQ-8, WQ-12, SW-1, SW-2 (see Table D-1)
- Acquire parcels containing intact habitat.
- Disconnect or provide shade to ponds that affect stream water temperature.
- Investigate acquiring large parcels with favorable conditions for creation or enhancement of wetlands.

Information Sources and Organizations:

- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Public Works Clean Water Program. 2010. 2009 Stormwater Needs Assessment Program – Morgan Creek/Salmon Creek (RM 14.66) Subwatershed Needs Assessment Report.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Upper watershed	<ul style="list-style-type: none"> • Restore riparian forest canopy along 1-mile reach downstream of NE 182nd Avenue. 	Medium	Habitat	Long term
Various	<ul style="list-style-type: none"> • Control invasive vegetation at numerous locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Habitat	Short term

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Various	<ul style="list-style-type: none"> Upgrade stormwater facilities and outfalls at numerous locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Hydrology	Long term
MORG_CR_01 and SALM_CR_03	<ul style="list-style-type: none"> Preserve mature forest near confluence of Morgan and Salmon Creeks. 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> Investigate acquisition of parcels for habitat preservation, wetland creation, and additional stormwater facilities, at locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Habitat, Hydrology	Long term

Impairments:

- Conversion of forests to residential and agricultural uses.
- Increased magnitude, duration and frequency of peak flows and reduced summer base flows caused by increases in impervious surfaces, clearing, and ditching.
- Impaired streambank stability.
- Limited side channel habitat.
- Lack of large woody debris.
- Elevated stream temperatures.
- Invasive vegetation in riparian areas.
- Runoff from agricultural lands and roads.
- Lack of stream shading in some areas.
- Failing culverts.

Programmatic Restoration Opportunities:

- F-4, F-5, F-6, F-9, R-4, R-5, R-9, SW-1, SW-2, SW-4, NN-2, WQ-12 (see Table D-1)
- Investigate acquiring large parcels with favorable conditions for creation or enhancement of wetlands.

Information Sources and Organizations:

- Salmon Creek Watershed Council web page: <http://www.salmoncreekwatershed.org/>
- Clark County Public Works Clean Water Program. 2010. 2009 Stormwater Needs Assessment Program – Rock Creek/Salmon Creek (RM 22.20) Subwatershed Needs Assessment Report.
- Clark County Monitoring Documents web page: <http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Lower Columbia Fish Recovery Board web page: <http://www.lcfrb.gen.wa.us/default1.htm>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
Lower Watershed	<ul style="list-style-type: none"> • Prevent riparian degradation, especially at RM 0 to RM 1.1. 	High	Habitat	Long term
Lower Watershed	<ul style="list-style-type: none"> • Improve riparian condition by hardwood and conifer riparian plantings to increase large woody debris recruitment at RM 0.0 to 1.1. 	High	Habitat, LWD	Short term
Various	<ul style="list-style-type: none"> • Investigate acquisition of parcels for restoration, habitat preservation, wetland creation, and additional stormwater facilities, at locations noted in 2009 Stormwater Needs Assessment Program report. 	High	Habitat, Hydrology	Long term
Various	<ul style="list-style-type: none"> • Conduct further analysis of fish passage barriers and replace culverts as needed in locations noted in 2009 SNAP report. 	Medium	Habitat, Fish access	Long term

BATTLE GROUND LAKE**WRIA 28****Salmon Creek Tributaries & Lakes****Impairments:**

- Infestation of Brazilian elodea.
- Impacts from public recreational uses as state park.

Programmatic Restoration Opportunities:

- R-3, NN-3 (see Table D-1)
- Restore native vegetation along lakeshore impacted by recreational activities.
- Public education and outreach.

Information Sources and Organizations:

- Clark County Monitoring Documents web page:
<http://www.clark.wa.gov/water-resources/documents-monitoring.html#volmon>.
- Washington State Parks web page:
<http://www.parks.wa.gov/parks/?selectedpark=BattleGroundLake>.

Reach or Location	Site-Specific Restoration Opportunities	Relative Priority of Actions	Ecosystem Functions Addressed	Timeline
All	Continue efforts to reduce and remove invasive aquatic plants.	High	Habitat	Short term