

STEVENSON

SHORELINE MASTER PROGRAM



SECOND DRAFT

INVENTORY AND CHARACTERIZATION REPORT

TASK 2.2

PREPARED BY STEVENSON PLANNING DEPARTMENT &



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Table of Contents

ACKNOWLEDGEMENTS	I
TABLE OF CONTENTS	III
LIST OF TABLES	VI
1.0 INTRODUCTION	1
1.1 STUDY AREA BOUNDARY (SHORELINE JURISDICTION)	2
1.1.1 <i>Regulatory Overview and Definitions</i>	2
1.1.2 <i>Preliminary Shoreline Jurisdiction</i>	4
1.2 METHODOLOGY	4
1.2.1 <i>Data Sources</i>	5
1.2.2 <i>Shoreline Reaches</i>	5
1.3 RELATIONSHIP TO OTHER PLANS AND PROGRAMS	6
1.3.1 <i>Local Plans and Programs</i>	7
1.3.2 <i>State and Federal Plans and Programs</i>	8
1.4 SUMMARY OF RECOMMENDATIONS FROM SECTION 1	11
2.0 ECOSYSTEM-WIDE PROCESSES	12
2.1 GEOLOGIC PROCESSES	12
2.1.1 <i>Rock Units</i>	12
2.1.2 <i>Plates, Faults, and Folds</i>	14
2.1.3 <i>Landslides and Waterfalls</i>	14
2.2 CLIMATE	18
2.2.1 <i>Temperature</i>	18
2.2.2 <i>Wind</i>	19
2.2.3 <i>Precipitation</i>	20
2.3 HYDROLOGY	21
2.3.1 <i>Groundwater</i>	21
2.3.2 <i>Ashes Lake</i>	22
2.3.3 <i>Rock Cove</i>	23
2.3.4 <i>Rock Creek</i>	23
2.3.5 <i>Columbia River</i>	24
2.4 BONNEVILLE DAM	25
2.4.1 <i>Physical Influences: Not a River/Not a Lake</i>	25
2.4.2 <i>Legal Influences: Flowage Easements</i>	27
2.5 SUMMARY OF RECOMMENDATIONS FROM SECTION 2	28
3.0 SHORELINE ECOLOGICAL FUNCTIONS	29
3.1 WATER QUALITY FUNCTIONS	29
3.1.1 <i>Sediment Transport</i>	29
3.1.2 <i>Nutrient and Toxic Filtration</i>	30
3.1.3 <i>Temperature Regulation</i>	31
3.2 WATER QUANTITY FUNCTIONS	31
3.3 HABITAT FUNCTIONS	31
3.3.1 <i>In-water Habitat and Anadromous Fish</i>	32
3.3.2 <i>Additional Protected Habitats and Species</i>	34
3.3.3 <i>Inputs of Organics and Large Woody Debris</i>	37
3.3.4 <i>Connectivity to Habitat Structures Suitable for Lifecycle Needs</i>	37
3.4 SUMMARY OF RECOMMENDATIONS FROM SECTION 3	38

4.0 REACH LEVEL CHARACTERIZATION	39
4.1 COLUMBIA RIVER REACH 1 – EAST URBAN AREA	41
4.1.1 <i>Summary of Ecological Functions</i>	42
4.1.2 <i>Physical Environment</i>	42
4.1.3 <i>Biological Environment</i>	43
4.1.4 <i>Altered Conditions</i>	44
4.1.5 <i>Public Access</i>	45
4.1.6 <i>Degraded Areas & Restoration Opportunities</i>	45
4.2 COLUMBIA RIVER REACH 2 – DOWNTOWN WATERFRONT	46
4.2.1 <i>Summary of Ecological Functions</i>	47
4.2.2 <i>Physical Environment</i>	47
4.2.3 <i>Biological Environment</i>	48
4.2.4 <i>Altered Conditions</i>	49
4.2.5 <i>Public Access</i>	50
4.2.6 <i>Degraded Areas & Restoration Opportunities</i>	52
4.3 COLUMBIA RIVER REACH 3 – WEST URBAN AREA	52
4.3.1 <i>Summary of Ecological Functions</i>	53
4.3.2 <i>Physical Environment</i>	54
4.3.3 <i>Biological Environment</i>	54
4.3.4 <i>Altered Conditions</i>	55
4.3.5 <i>Public Access</i>	56
4.3.6 <i>Degraded Areas & Restoration Opportunities</i>	56
4.4 ROCK CREEK REACH 1	57
4.4.1 <i>Summary of Ecological Functions</i>	58
4.4.2 <i>Physical Environment</i>	58
4.4.3 <i>Biological Environment</i>	59
4.4.4 <i>Altered Conditions</i>	60
4.4.5 <i>Public Access</i>	61
4.4.6 <i>Restoration Opportunities</i>	62
4.4.6 <i>Degraded Areas & Restoration Opportunities</i>	62
4.5 ROCK CREEK REACH 2	62
4.5.1 <i>Summary of Ecological Functions</i>	63
4.5.2 <i>Physical Environment</i>	64
4.5.3 <i>Biological Environment</i>	64
4.5.4 <i>Altered Conditions</i>	65
4.5.5 <i>Public Access</i>	66
4.5.6 <i>Degraded Areas & Restoration Opportunities</i>	66
4.6 ROCK COVE	67
4.6.1 <i>Summary of Ecological Functions</i>	68
4.6.2 <i>Physical Environment</i>	68
4.6.3 <i>Biological Environment</i>	69
4.6.4 <i>Altered Conditions</i>	70
4.6.5 <i>Public Access</i>	71
4.6.6 <i>Restoration Opportunities</i>	72
4.4.6 <i>Degraded Areas & Restoration Opportunities</i>	72
4.7 ASHES LAKE	72
4.7.1 <i>Summary of Ecological Functions</i>	74
4.7.2 <i>Physical Environment</i>	74
4.7.3 <i>Biological Environment</i>	75
4.7.4 <i>Altered Conditions</i>	75
4.7.5 <i>Public Access</i>	76

4.7.6 <i>Degraded Areas & Restoration Opportunities</i>	76
4.8 SUMMARY OF RECOMMENDATIONS FROM SECTION 4	76
5.0 USE ANALYSIS	77
5.1 LAND OWNERSHIP	77
5.2 LAND USE AND WATER DEPENDENCY	78
5.2.1 <i>Future Land Use & Zoning</i>	78
5.2.2 <i>Preferred and Water-Dependent Uses</i>	79
5.3 PROJECTED SHORELINE USE AND POTENTIAL USE CONFLICTS	81
5.4 SUMMARY OF RECOMMENDATIONS FROM SECTION 5	90
6.0 SHORELINE ENVIRONMENT DESIGNATIONS	91
6.1 RECOMMENDED SHORELINE ENVIRONMENTAL DESIGNATIONS	93
6.2 SUMMARY OF RECOMMENDATIONS FROM SECTION 6	96
7.0 REFERENCES	97
2.1 <i>Geological Setting</i>	97
2.2 <i>Climate</i>	98
2.3 <i>Hydrology</i>	98
2.4 <i>Bonneville Dam</i>	99
5.3 <i>Project Shoreline Use and Potential Use Conflicts</i>	99
A.0 GLOSSARY OF TERMS	100
A.1 ABBREVIATIONS AND ACRONYMS	100
A.2 WORDS AND PHRASES	101
B.0 INTERRELATED COMPREHENSIVE PLAN POLICIES	102
B.1 EXPLANATORY STATEMENTS	102
B.1.1 <i>Chapter 1</i>	102
B.1.2 <i>Chapter 2</i>	102
B.2 GOALS, OBJECTIVES, AND TACTICS	102
B.2.1 <i>Goal 1 – Community and Schools</i>	103
B.2.2 <i>Goal 2 – Urban Development</i>	103
B.2.3 <i>Goal 4 – Downtown and Waterfront</i>	104
B.2.4 <i>Goal 6 – Tourism</i>	106
B.2.5 <i>Goal 7 – Transportation and Circulation</i>	106
B.2.6 <i>Goal 8 – Utilities and Services</i>	107
B.2.7 <i>Goal 9 – Parks and Recreation</i>	107
APPENDIX C MAP PORTFOLIO	109
C.0 MAP PORTFOLIO[A1]	
Map 1 – Preliminary Shoreline Jurisdiction	
Map 2 – Land Cover	
Map 3 – Soils	
Map 4 – Contours	
Map 5 – Geological Hazards	
Map 6 – Floodplain	
Map 7 – PHS Data Priority Habitats and Species	
Map 8 – Wetlands	
Map 9 – Existing Land Use	

[Map 10 – Zoning](#)
[Map 11 – Public Ownership](#)
[Map 12 – Impervious Surfaces](#)
[Map 13 – Rooftops](#)
[Map 14 – Archeology/Historic](#)
[Map 15 – Armoring/Stabilization](#)^[A2]

List of Tables

Table 1.2-1 Stevenson’s Ecosystem-Wide Processes, Ecological Functions, and Reach-Scale Indicators.....	4
Table 1.2-2 Shoreline Waterbodies & Reach Designations.....	6
Table 4.0-1 – Characterization Maps & Attributes.....	40
Table 4.1-1 – Columbia River Reach 1 Land Use Trends.....	41
Table 4.1-2 – Columbia River Reach 1 Land & Water Areas	43
Table 4.1-3 – Columbia River Reach 1 Impervious Surface Comparison.....	44
Table 4.1-4 – Columbia River Reach 1 Development Proximity to OHWM.....	45
Table 4.2-1 – Columbia River Reach 2 Land Use Trends.....	47
Table 4.2-2 – Columbia River Reach 2 Land & Water Areas	48
Table 4.2-3 – Columbia River Reach 2 Impervious Surface Comparison.....	49
Table 4.2-4 – Columbia River Reach 2 Development Proximity to OHWM.....	50
Table 4.3-1 – Columbia River Reach 3 Land Use Trends.....	53
Table 4.3-2 – Columbia River Reach 3 Land & Water Areas	54
Table 4.3-3 – Columbia River Reach 3 Impervious Surface Comparison.....	55
Table 4.3-4 – Columbia River Reach 3 Development Proximity to OHWM.....	55
Table 4.4-1 – Rock Creek Reach 1 Land & Water Areas.....	58
Table 4.4-2 – Rock Creek Reach 1 Impervious Surface Comparison.....	60
Table 4.4-3 – Rock Creek Reach 1 Development Proximity to OHWM.....	60
Table 4.5-1 – Rock Creek Reach 2 Land Use Trends.....	63
Table 4.5-2 – Rock Creek Reach 2 Land & Water Areas.....	64
Table 4.5-3 – Rock Creek Reach 2 Impervious Surface Comparison.....	65
Table 4.5-4 – Rock Creek Reach 2 Development Proximity to OHWM.....	65
Table 4.6-1 – Rock Cove Land Use Trends.....	67
Table 4.6-2 – Rock Cove Land & Water Areas	69
Table 4.6-3 – Rock Cove Impervious Surface Comparison	70
Table 4.6-4 – Rock Cove Development Proximity to OHWM	70
Table 4.7-1 – Ashes Lake Land Use Trends.....	73
Table 4.7-2 – Ashes Lake Impervious Surface Comparison	75
Table 4.7-3 – Ashes Lake Development Proximity to OHWM	75
Table 5.1-1 – Existing Ownership by Jurisdiction.....	78
Table 5.2-1 – Future Land Use and Zoning Designations.....	79
Table 5.2-2 – Existing Water-Oriented Uses	81
Table 5.3-1 – Projected Shoreline Uses and Potential Conflicts	83
Table 6.0-1 – Reach Summary and Recommended Shoreline Environment Designations.....	95

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1.0 Introduction

The purpose of this study is to conduct a baseline inventory of shoreline conditions within and adjacent to the City of Stevenson, Washington. This study includes an inventory and analysis of shoreline conditions related to land use, public access, environmentally sensitive areas and fish habitat, including habitat for species listed as threatened or endangered under the federal Endangered Species Act (ESA) (a comprehensive list of abbreviations and acronyms are found in Appendix A). More specifically, the shoreline inventory collected existing plans, surveys, studies, inventories, and other information applicable to the City's shorelines. In addition, Washington Administrative Code (WAC) 173-26-150 allows the City to predesignate the shorelines of urban growth areas that are located outside of existing City boundaries, which the City has elected to do for areas in Skamania County. The study also conducted a physical inventory of land use, shoreline modifications, and public access and used the information that resulted to evaluate and characterize shoreline functions and ecological processes and to recommend enhancement and restoration projects.

This characterization report documents those ecosystem-wide processes that contribute to the structure and functions of Stevenson's shorelines and compares them to the human-based modifications that are working to change the same structure and functions. The descriptions in this report will be the basis upon which the City can continue the comprehensive update of the 1977 Shoreline Management Program (SMP), a revision process required of the City by the Shoreline Management Act (SMA), Revised Code of Washington (RCW) 90.58, and Shoreline Master Program Guidelines, WAC 173-26, and Washington State Department of Ecology (Ecology) Grant G1200044. This report is intended to summarize the existing conditions for a wide audience and is not intended to be highly technical or analytical.

The information is organized in the following sections:

- **Section 1** introduces the report, defines and identifies the City's shoreline jurisdiction and the relationship of the City's SMP to other plans and programs, and describes the methods used to conduct the shoreline inventory and characterization.
- **Section 2** goes into detail on the ecosystem-wide processes that have set the stage on which Stevenson has been built. This section characterizes the geology, climate, hydrology, and game-changing processes associated with the Bonneville Dam, and describes the structures these processes have left behind.
- **Section 3** discusses what ecological functions are provided by the processes and structures along Stevenson's shorelines. The functions discussed in this section are categorized according to their importance to water quality, water quantity, and habitat. This section also introduces the indicators that will be used to measure ecological functions over time.
- **Section 4** analyzes how the processes, structures, and functions interact on a reach-by-reach basis along local shorelines. The information in this section is organized in tables characterizing the existing conditions of each indicator, the likelihood of impending land use changes along the reach, and the overall contribution of each reach to the ecological functions of the shoreline.

- **Section 5** analyzes the current uses of Stevenson's shorelines, defines whether these uses are preferred or water-oriented, analyzes potential future uses of shoreline areas, and recommends ways to accommodate such uses in the future.
- **Section 6** consists of preliminary shoreline environmental designation (SED) recommendations based on existing land uses, zoning, current ecological functions, and existing shoreline environmental designations.

The City will use this report in the next steps of the SMP update process, which will include developing proposed shoreline environment designations; preparing draft SMP goals, policies, and regulations; developing a restoration plan to take advantage of opportunities to improve degraded conditions in the City's shoreline jurisdiction; and evaluating anticipated cumulative impacts of the new program's implementation.

1.1 Study Area Boundary (Shoreline Jurisdiction)

The City's preliminary shoreline jurisdiction is identified in Appendix C, Map 1 and will be refined in the City's final Shoreline Management Program. This map includes the shorelines and shorelands of the Columbia River, Rock Creek, and a dam-flooded inlet of the Columbia called Rock Cove. These waterbodies and adjacent lands represent the "shorelines of the state," which include "shorelines", "shorelines of statewide significance," and "shorelands" in Stevenson, as are further described below. As established by state law (RCW 35A.21.090 and 35.21.160) the waterward extent of the City's shoreline jurisdiction is the mid-line of the Columbia River, beyond the City limit boundary that mostly follows the land's edge. This report also includes information on the Columbia River and Rock Creek reaches and another dam-flooded inlet of the Columbia called Ashes Lake that currently lie outside the City's 2015 jurisdiction but within the boundary of the urban area established in the Columbia River Gorge National Scenic Area (NSA). Including an analysis of these additional areas will allow the City to predesignate lands in the SMP so additional territory can be annexed unfettered by jurisdictional issues over shoreline management. While the City is opting to exercise its authority to predesignate, these areas remain under the jurisdiction of Skamania County until annexation occurs. The area outside the City's 2015 jurisdiction represents nearly 4.5 miles of the 10 total miles of shoreline characterized in this report.¹

1.1.1 Regulatory Overview and Definitions

This report limits its discussion to the Columbia River, Rock Cove, and Rock Creek based on the definitions and standards established by the state in the SMA and WAC.

Shorelines of the State – The SMP update process begins with the identification of "shorelines of the state" which comprise the geographic area where the SMA applies within a local jurisdiction. Shorelines of the State include "shorelines" and "shorelines of statewide significance."

Shorelines – "Shorelines" are described as certain water areas of the state along with the lands underlying them. The SMA applies to shorelines as follows:

¹ Recommendation #1-1 for SMP Update: Evaluate and predesignate lands outside of the 2014 city limits as part of the final SMP.

- All marine waters.
- Rivers and streams with more than 20 cubic feet per second (cfs) mean annual flow.
- Lakes and reservoirs greater than 20 acres in area.
- Associated wetlands and river deltas.
- Shorelands adjacent to these waterbodies.

Shorelines of Statewide Significance – The SMA provides special emphasis on certain waterbodies in addition to those described below. The Columbia River, as a river having a mean annual flow greater than 1,000 cfs, is considered a shoreline of statewide significance and is joined by others in the following categories:

- The harbors, bays, estuaries, and inlets of the Pacific Ocean.
- Several named and unnamed deltas, bays, and passages of the Puget Sound.
- Any lakes and/or reservoirs with a surface area greater than 1,000 acres.
- Any Western Washington river having a mean annual flow greater than 1,000 cfs.
- Any Eastern Washington river having a mean annual flow greater than 200 cfs or a drainage area greater than 300 square miles.
- Associated wetlands and river deltas.
- Shorelands adjacent to these waterbodies.

Shorelands – “Shorelines of the state” include more than just the waterbodies meeting the threshold. Its definition includes all lands extending landward for 200 feet from the ordinary high water mark (OHWM) as well as floodways and their landward floodplains within 200 feet.

Ordinary High Water Mark – The OHWM is used as the basis for identifying shoreline locations and can be found by examining the bed and banks of a waterbody to ascertain where the presence and action of waters are so common and usual that they have marked the land as distinctly different from the abutting uplands. Because the OHWM is not a fixed elevation and subject to change over time, it is difficult to map its location precisely. The shoreline jurisdiction depicted in Map 1 should be taken to represent the general location of shorelines in Stevenson, and the regulatory provisions established during this SMP update should require a case-by-case verification of the OHWM.²

Optional Areas – The City’s shoreline jurisdiction may also include areas outside of those mandated through the SMA – municipalities may elect to include certain optional areas as well. The most common cases involve the inclusion of 100-year floodplains and the buffers required to protect critical areas. Critical areas include aquifer recharge areas, frequently flooded areas, geologic hazard areas, habitat areas, and wetlands which are now required to be regulated by the City under the state Growth Management Act (GMA). Extending the shoreline jurisdiction to these areas increases efficiencies of the permitting process and minimizes confusion about what and how many regulations apply within shoreline areas.

² Recommendation #1-2 for SMP Update: Include regulatory provisions requiring the OHWM be determined at the time of project review so that it is always based on the most recent information.

1.1.2 Preliminary Shoreline Jurisdiction

Stevenson's preliminary shoreline jurisdiction and predesignation areas are depicted in Map 1 and is based on the minimum jurisdiction for shorelines of statewide significance (Columbia River), shorelines (Ashes Lake, Rock Cove, and Rock Creek), associated wetlands, and their shorelands (areas within 200 feet of the OHWM of these waterbodies). Optional areas associated with wetland buffers and the 2007 Piper Road landslide are included in this preliminary determination of shoreline jurisdiction for future evaluation and consideration for inclusion in the final SMP. The information in this report and the will of the public as it is identified during the update process will help guide the decision about the inclusion of the optional areas.³

1.2 Methodology

Ecology provided the City with guidance for conducting this inventory and characterization through meetings, correspondence, and written handbooks. Stevenson's Shoreline Inventory and Characterization Report incorporates this guidance and reviews shorelines through a lens involving Ecosystem-Wide Processes, Shoreline Ecological Functions, and Reach-Scale Indicators.

Table 1.2-1 Stevenson's Ecosystem-Wide Processes, Ecological Functions, and Reach-Scale Indicators

Characterization Methodology		Ecosystem-Wide Processes	Geology	Climate	Hydrology	Bonneville Dam
		<p>Shoreline Ecological Functions</p>	Reach-Scale Indicators			
			<p>Water Quality Functions</p> <p>Sediment Transport</p> <p>303(d) Listings, Fish-Blocking Culverts, Impervious Surface Area, Permanently Protected Areas, Riparian Vegetation, Shoreline Stabilization, Urban Runoff, Wetland Acreage</p> <p>Nutrient & Toxic Filtration</p> <p>303(d) Listings, Available Floodplain Area, Impervious Surface Area, Permanently Protected Areas, Riparian Vegetation, Setbacks to OHWM, Urban Runoff, Wetland Acreage</p> <p>Temperature Regulation</p> <p>303(d) Listings, PHS Listings, Permanently Protected Areas, Riparian Vegetation, Setbacks to OHWM, Urban Runoff</p> <p>Water Quantity Functions</p> <p>Water Storage & Flow Regulation</p> <p>Available Floodplain Area, Fish-Blocking Culverts, Impervious Surface Area, Overwater Roads & Structures, Riparian Vegetation, Urban Runoff, Wetland Acreage,</p> <p>Habitat Functions</p> <p>Input of Organics & LWM</p> <p>Available Floodplain Area, Impervious Surface Area, PHS Listings, Permanently Protected Areas, Riparian Vegetation, Shoreline Stabilization</p> <p>Connectivity to Suitable Habitat</p> <p>Fish-Blocking Culverts, Impervious Surface Area, Overwater Roads & Structures, PHS Listings, Permanently Protected Areas, Riparian Vegetation, Setbacks to OHWM, Shoreline Stabilization, Wetland Acreage</p>			

Through this lens, Ecosystem-Wide Processes refer to the dynamic physical and chemical interactions that form, maintain, and change natural landscapes. These processes are fairly predictable, and changes to them occur relatively gradually or with a great deal of human influence. Shoreline Ecological Functions are more prone to influence by human actions but the services they perform continue to operate to a greater or lesser

³ Recommendation #1-3 for SMP Update: Evaluate and consider extending shoreline jurisdiction during later stages of the SMP update, paying special attention to the benefits of eliminating redundancy in the permitting process.

130 extent despite these influences. Reach-Scale Indicators are used to describe how well or poorly Ecosystem
Functions are occurring. Such indicators are helpful both because they describe performance of multiple and
interacting Ecological Functions, and because they are variable and highly subject to changes based on
human influence. Discreet and manageable, Reach-Scale Indicators can be controlled during a permitting
135 process, and their variability can therefore be made more predictable. As a result, human investments in
shoreline areas can continue subject to greater certainty, and subject to changes based on the slower moving
processes of the wider ecosystem and economy. This status quo is what Ecology asks us to maintain when
they use the phrase "No Net Loss of Ecological Functions". The characterizations of this report aid in
understanding the current state of these processes, functions, and indicators so that Stevenson can achieve
Ecology's standard.

1.2.1 Data Sources

The data used in this characterization of the City's shorelines comes from the most current, accurate,
complete, applicable and available information from existing reports, site visits, and remote sensing data. A
number of state and federal agency data sources and City records, maps, aerial photos, and technical reports
140 were compiled as the basis for the shoreline inventory. Section 7.0 lists the data sources. The following were
among the most helpful:

- Stevenson Comprehensive Plan (City of Stevenson, 2013)
- Biological Assessment of the Effects of the Rock Creek Debris Removal, Bridge Protection and Fish
Habitat Improvement Project (SWCA Environmental Consultants, 2007)
- 145 • Lower Columbia Fish Recovery Plan (Lower Columbia Fish Recovery Board, various dates, including
2010)
- Wind/White Salmon Watershed (WRIA 29) Level 1 Technical Assessment (Envirovision, 2003)
- Rock Creek Watershed Analysis (U.S. Forest Service, 2000)
- 150 • Rock Cove Environmental Evaluation and Comprehensive Plan (Fishman Environmental Services,
1997)

1.2.2 Shoreline Reaches

The Columbia River is a shoreline of statewide significance with annual flows over 1,000 cfs, Rock Creek, Rock
Cove and Ashes Lake are shorelines with annual flows of more than 20 cfs or an area of greater than 20 acres.
Therefore, the Columbia River, Rock Creek, Rock Cove, and Ashes Lake and their associated "shorelands"
155 comprise the geographic area where the SMA applies in the City.

To assess the physical and biological resources of the shorelines of these waterbodies, this inventory and
characterization breaks them into seven relatively homogeneous and manageable units based on geographic
location as described in section 1.2. The reaches are described in detail below. The reaches are categorized
generally according to the level of ecological functions they provide and by existing and projected land uses.
160 Figure 1 locates these segments visually and Table 1.2-1 provides more detailed descriptions of the reach
boundaries.

Table 1.2-2 Shoreline Waterbodies & Reach Designations

Streams & Rivers Constituting Shorelines of the State	Reach Name	Description	Approximate Length	
			Predesignated	City Jurisdiction
Columbia River	Reach 1—East Urban Area	USGS Bonneville Dam & Carson Quad Maps North bank of river and associated wetlands from Urban Area boundary at the mouth of Nelson Creek to city limits at the mouth of Kanaka Creek. Note: This reach includes shorelands and associated wetlands that are within the City's current shoreline jurisdiction.	5,550 LF	0 LF
	Reach 2—Downtown Stevenson	USGS Bonneville Dam Quad Map North bank of river within city limits from the mouth of Kanaka Creek to the mouth of Rock Creek	0 LF	4,175 LF
	Reach 3—West Urban Area	USGS Bonneville Dam Quad Map North bank of river from the mouth of Rock Creek to Urban Area boundary west of Stevenson Co-Ply site.	8,000 LF	0 LF
Rock Creek	Reach 1—City Reach	USGS Bonneville Dam Quad Map West/South bank of stream from its mouth to Ryan Allen Road. East/North bank of stream from its mouth to ~continuation of Lasher Street.	0 LF	10,375 LF
	Reach 2—Predesignation Reach	USGS Bonneville Dam Quad Map West/South bank of stream from Ryan Allen Road to Urban Area boundary. East/North bank of stream from ~continuation of Lasher Street to Urban Area boundary.	5,325 LF	0 LF
Streams & Rivers Subtotal			18,875 LF	14,550 LF
Lakes Constituting Shorelines of the State	Description		Approximate Length	
			Predesignated	City Jurisdiction
Rock Cove		USGS Bonneville Dam Quad Map Entire bank of lake, islands, and SR 14/ railroad berm.	0 LF	18,800 LF
Ashes Lake		USGS Bonneville Dam Quad Map Extreme Northeast end of Ashes Lake within Urban Area boundary.	425 LF	0 LF
Lakes Subtotal			425 LF	18,800 LF
TOTAL			19,300 LF	33,350 LF

1.3 Relationship to Other Plans and Programs

165 The SMA requires local governments and state agencies to review the plans, regulations, and ordinances applying to areas of shoreline jurisdiction and modify them to ensure they are consistent with the SMP. Waterfront lands are regulated by various local, state, and federal policies, and the SMP update needs to ensure these are integrated to avoid inconsistencies or conflicts between the regulations.

1.3.1 Local Plans and Programs

Stevenson's SMP intersects with its comprehensive plan, municipal code, and other regulatory plans and programs to manage and regulate development in shoreline areas. Local plans and regulations that relate to shoreline management include those discussed in the next sections.

Comprehensive Plan – The Stevenson Comprehensive Plan (April 2013) uses the cornerstone principles of high quality of life, natural/scenic beauty, healthy economy, and active waterfront to frame goals for growth, development, and change in the city. The plan contemplates the use of area plans, such as the SMP, as components of Stevenson's overall system of plans and one way to implement its strategies. The comprehensive plan is intended to be acted upon, and Goal 4A addresses the waterfront when it lays out a future where "the waterfront is an extension of the downtown core and a place where people live, work, and play." The objectives and tactics adopted to advance the City toward that goal provide instrumental guidance for the SMP update, as do the future land use map and several objectives and tactics associated with other goals in the comprehensive plan. The SMP update process will also provide a feedback loop for the continued relevance of the 2013 comprehensive plan, and that plan should be revisited and amended to reflect the new SMP as an area plan to be implemented under the aegis of the comprehensive plan.⁴ Appendix B of this report provides a complete list of current comprehensive plan statements, objectives, and tactics that interrelate with the SMP.

Zoning Code [A3]– The City's zoning code provides use, design, and procedural standards adopted for all areas of the City, including those within the shoreline jurisdiction. The zoning code contains clear but imperfect attempts to reconcile its design-based regulations with the existing SMP, especially within the Commercial (C1), Commercial Recreation (CR), and Public Use & Recreation (PR) districts. However, there is no evidence of any attempts to reconcile the use-based regulations or procedural requirements of the existing SMP and zoning code. The SMP update process will provide an opportunity to better align shorelines policies and procedures with those of the zoning code.⁵

Critical Areas Code – Like the SMP, the state mandates that the City adopt regulations to protect what it has deemed "critical areas," including aquifer recharge areas, frequently flooded areas, geologically hazardous areas, habitat areas, and wetlands. This mandate came as part of the GMA, and the overlapping regulatory requirements of critical areas protection and the SMA have been troublesome for many municipalities and state agencies. These tensions have required guidance from the state courts, and the City's SMP update will need to follow that guidance, which means that the City may either refer to the existing critical areas code in

⁴ *Recommendation #1-4 for SMP Update:* SMP update should include a list of desirable comprehensive plan changes to bring the two documents into alignment. Specific recommendations should be made regarding the 1975 SMP's references in Chapter 2 and Goal 4A.

⁵ *Recommendation #1-5 for SMP Update:* Evaluate and consider inclusion of the shoreline's use, design, and procedural regulations adopted as part of the SMP Update as a component of a more unified development code along with those of the Zoning Code.

the SMP or adopt specific critical areas provisions to apply when they exist in shoreline areas, or a combination thereof.⁶

State Environmental Policy Act (SEPA) – The State Environmental Policy Act has been adopted locally as SMC 18.04 – Environmental Policy. This program reviews all actions taken by the City to determine whether the action is likely to have a significant adverse environmental impact. Action is very broadly defined to include, among others, city-funded construction projects, policy adoption, and permitting of private projects. The City's decision to take such actions must be mindful of whether projects will have a significant impact, whether their impacts can be mitigated, and the full scope of the impact if unavoidable. Checklists associated with SEPA are required in all areas of the city, including those within shoreline jurisdiction.⁷

1.3.2 State and Federal Plans and Programs

The City's SMP must also be compatible with state and federal regulations and programs that relate to shoreline management. State and federal regulations and programs that intersect with Stevenson's SMP update are listed alphabetically below.

Bonneville Dam – The Bonneville Lock and Dam Project and the Bonneville Power Administration (BPA) are components of a federal water resource management program designed to manage flood risk, generate power, improve water quality, provide irrigation, and preserve and enhance fish and wildlife habitat, recreation, and navigation on the Columbia River and some of its tributaries. Bonneville Dam, located 6 miles downstream from Stevenson, is the earliest in a system of 31 hydropower dams generating power which the BPA distributes throughout the Pacific Northwest. To balance the diverse needs of this water resource management program, the U.S. Army Corps of Engineers (USACE) operates Bonneville Dam and the Columbia River as a system, raising and lowering water levels in the Bonneville Pool based on complex projections of the system's water availability and power generation demands. This artificial control has a great effect on the water and sediment regime of the City's shoreline areas as will be discussed in section 2.4.

Clean Water Act (CWA) – Section 401 of the federal CWA requires projects obtain certification from the state regarding compliance with water quality standards and other aquatic resource protections under Ecology's purview. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States. Any project that proposes such impacts in waters of the United States, including special aquatic sites such as wetlands, must obtain a permit from USACE.

Under the authority of the CWA, the Environmental Protection Agency (EPA) authorizes Ecology to issue permits under the National Pollutant Discharge Elimination System (NPDES). This system covers a wide range of projects that discharge water. They are referred to as point source projects and include wastewater treatment plants, industrial facilities, and large construction sites. The program also covers a graduated

⁶ Recommendation #1-6 for SMP Update: Consider methods to integrate and reduce redundancy between Critical Areas and Shorelines permitting, especially regarding riparian habitat and wetland areas.

⁷ Recommendation #1-7 for SMP Update: Develop shoreline management policies that will help ensure projects avoid determinations of significant adverse environmental impacts under the SEPA.

system of municipal separate storm sewer systems (MS4s) to eliminate pollution from stormwater runoff. Two phases of this program have been implemented to cover medium and large cities, but because of Stevenson's size and location, its stormwater system is exempt from MS4 regulation. Ecology's Stormwater Management Manual for Western Washington (2014) provides useful technical information and alternative low impact development (LID) methods for managing runoff to help minimize pollution even in smaller communities.⁸

Columbia River Gorge National Scenic Area Act – Congress passed the Columbia River Gorge National Scenic Area Act in 1986 to protect and enhance the scenic, cultural, recreational, and natural resources of the Columbia River Gorge – the National Scenic Area, or NSA. The Act also seeks to protect and support the economy of the Gorge by encouraging growth within existing urban areas like Stevenson. Unlike Washington's GMA, the Act is focused far more on *resource management* than *growth management*. Whereas the statewide GMA establishes urban growth areas that are expected to continually expand to meet the population management demands of projected 20-year growth, the NSA Act established urban areas within which all industrial development and most commercial and residential development are expected to occur. Minor revisions to the NSA boundaries are permissible, but not at the expense of the scenic resources the Act was established to protect. While the Act severely limits the types of development that can occur outside the urban areas, it places no planning requirements or development restrictions on the City. Instead, it increases the pressure for Stevenson to accommodate the growth and uses prohibited elsewhere in the NSA. Stevenson's SMP will be a key ingredient of the place-based solution required to absorb the added development pressures created by the Act.

Endangered Species Act (ESA) – The federal ESA was adopted in 1973 as a regulatory measure to prevent the extinction of plant and animal species. By establishing a "consultation" process, the Act provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range. During consultation, the National Marine Fisheries Service (NOAA Fisheries) (NMFS) and/or US Fish and Wildlife Service (USFWS) review project proposals to ensure they do not result in the "take" of a listed species. Take is broadly defined as any action that would "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such action." Agency feedback must then be accommodated by the project.

Hydraulic Project Approval (HPA) – The state HPA program applies to any construction activity that would alter the bed or bank of a water of the state. The program is administered by the Washington Department of Fish and Wildlife (WDFW). All projects covered by the requirements must submit permit applications to show that construction is done in a manner that prevents damage to the state's fish, shellfish, and their habitats.

Magnuson-Stevens Fishery Conservation and Management Act – This national act protects fish and fisheries in the high seas and the anadromous species spawning in the rivers of the United States. The act was originally adopted in 1976, and its focus on the nutritional, economic, and recreational value of fish species differentiates it from the ESA. Whereas the latter seeks to prevent the extinction of the species it

⁸ Recommendation #1-8 for SMP Update: Evaluate and consider LID methods identified in the 2014 stormwater manual as appropriate to limit net loss of shoreline ecological functions.

protects, the Magnuson-Stevens Act seeks to maintain stocks of the species it protects to ensure optimum ongoing yields for human consumption.

Migratory Bird Treaty Act – Originally adopted in 1918 as a treaty with Canada, this federal law has been updated based on additional treaties with Mexico, Japan, and Russia. The Act seeks to prevent the unlicensed killing, capturing, and commodification of migratory birds and their products (feathers, eggs, nests, etc.). The Act also authorizes the Secretary of the Interior and the President to adopt suitable regulations regarding the methods by which certain species of migratory birds may be hunted, captured, or commodified. The Migratory Bird Treaty Act does not deal specifically with bird habitats and is primarily implemented through state game wardens and hunting license provisions.

Rivers and Harbors Act of 1899 – The USACE reviews projects for compliance with Section 10 of the federal Rivers and Harbors Act of 1899, which seeks to prohibit the unauthorized obstruction or alteration of navigable waters of the United States (waters subject to the ebb and flow of the tide and/or are presently used, previously used, or subject to future use to transport interstate commerce) without a USACE permit.

Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan – An integrated plan satisfying the requirements of several state, regional, and federal programs. This plan is adopted by NMFS as a non-regulatory guidance document. The purpose of the plan is to restore the region's threatened fish species to healthy, harvestable levels and to protect and enhance other species adversely affected by human actions. The plan provides site-specific management actions necessary for the conservation and survival of threatened species, measurable criteria that be used to delist recovered species, and the project inventories, priorities, and cost estimates necessary accomplish recovery goals.

Water Pollution Control Act – All projects affecting surface and ground waters in the state, including those that are not subject to the CWA sections 401 and 404, must still comply with the provisions of the state's Water Pollution Control Act. It authorizes Ecology to operate a state waste disposal permitting system for industrial, commercial, and municipal discharges of pollutants.

Other relevant federal laws include the National Environmental Policy Act, Anadromous Fish Conservation Act, and the Clean Air Act. State laws that address shoreline issues include the Forest Practices Act, tribal agreements and case law, the Watershed Planning Act, the Water Resources Act, and the Salmon Recovery Act.

1.4 Summary of Recommendations from Section 1^[A4]

[To be compiled in later draft after public review]

DRAFT

2.0 Ecosystem-Wide Processes

Ecosystem-wide processes are the dynamic physical and chemical interactions that form and maintain natural landscapes. These processes occur over large landscapes that include both shoreline areas and the wider watershed draining to the shoreline. The SMA requires local jurisdictions to consider the ecosystem-wide processes that are at play in shaping the structure of shorelines.

This section of the shoreline inventory and characterization report describes ecosystem-wide processes and the structures they have created. It focuses on the swift and cataclysmic nature of the ecosystem-wide processes at work in Stevenson and the Columbia River Gorge. The natural forces of geology, climate, and hydrology are especially visible in Stevenson. They are characterized below because of the massive scale of their impacts on Stevenson's shorelines and because they demonstrate the complexity of developing place-based solutions to problems that can change overnight because of causes that are beyond Stevenson's ability to influence.

2.1 Geologic Processes

In a place known for its jaw-dropping waterfalls and picturesque cliff faces, geology is *the* story of the Columbia River Gorge. The characters in this story include the joints between layers of sedimentary and igneous rock units, the lifting and folding of the ground caused by the shifting of the Earth's plates, and the persistent forces of gravity, water, and their conflicting relationship with beauty and destruction. The descriptions in this section quite literally set the stage upon which Stevenson and the ecosystem-wide processes play out.

2.1.1 Rock Units

The oldest and deepest geologic formation in the Stevenson area is called the **Ohanapecosh Formation**. This sedimentary layer is rarely visible from the surface, but some layers of its tuffs (igneous rock that forms from the debris ejected by explosive volcanic events), breccias, conglomerates, sandstones, and claystones (various types of sedimentary rocks composed of rock fragments cemented within a matrix of smaller particles) are exposed in the Wind River canyon beneath and upstream of Carson's Conrad Lundy ("High") Bridge to the east of Stevenson.

The Stevenson Ridge Volcanics (sometimes referred to as Stevens Ridge Volcanics) is an igneous layer of basaltic-andesite lava and breccias flows visible in several places near Stevenson, especially along the shorelines of the Columbia River and in cuts for BNSF railroad tracks. This layer is highly permeable along its fractures and columnar joints and water percolates relatively freely through the Stevenson Ridge Volcanics, where it is then impeded by the relatively impermeable layer of thick clay-rich paleo-soil horizon that separates the Stevenson Ridge Volcanics from the underlying Ohanapecosh Formation.

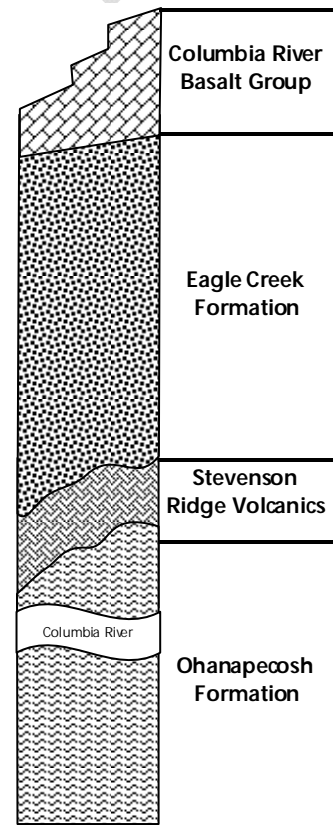


Figure 2.1-1 Generalized Stratigraphic Column

Figure Credit: Ben Shumaker, based on Berri & Korosec (1983) & Yinger (2007)

The **Eagle Creek Formation** is the thickest rock unit in the Stevenson area and overlies the Stevenson Ridge Volcanics. This sedimentary formation consists of volcanic conglomerates, sandstones, and mudstones deposited as fluvial sediment drained from a volcanic terrain. This layer is visible in the stratified cliff faces of Red Bluffs and Table Mountain to the west of Stevenson. A thick clayey soil horizon separates the Eagle Creek Formation from the underlying Stevenson Ridge Volcanics and impedes the movement of water from one layer to the next.



Figure 2.1-2 Columbia River Basalt Group & Missoula Floods

Figure Credit: Hansen & Rosoff (2004)

The **Columbia River Basalt Group**, typically the darling of the Columbia River Gorge's geologic story, provides the uppermost and—at nearly 17 million years old—the youngest rock unit found in the Stevenson area. This series of basalt flows flooded out of eastern Washington and Oregon at an average rate of 3 miles per hour covering more than 100,000 square miles of territory with molten rock. Filling in the ancestral Columbia River valley on their way to the Pacific Ocean, these flows of rock pushed the river itself to the northern margin of the trough. Nowhere is this more visible than in the stretch of river valley near Stevenson where one can see what happens when a river is caught between a rock and a not-so-hard place. Here on the south side of the Gorge, the layers of the Columbia River Basalt Group form cliffs approximately 2,000 feet thick. Just over on the north side of the river, however, these massive flows are limited to small areas and generally cap only the highest ridges. Instead, the river cuts through the older and more erosive formations described above. The beautiful and destructive results of this anomaly are described more fully in section 2.1.3.

2.1.2 Plates, Faults, and Folds

The process of plate tectonics has been well documented as the force behind dramatic events like volcanic eruptions and earthquakes, but it also results in more subtle shifts to landscapes that drive ecological processes at the local level. In places like Stevenson where multiple geologic processes converge, the shifts are often less subtle, with discrete change-inducing events occurring relatively frequently.

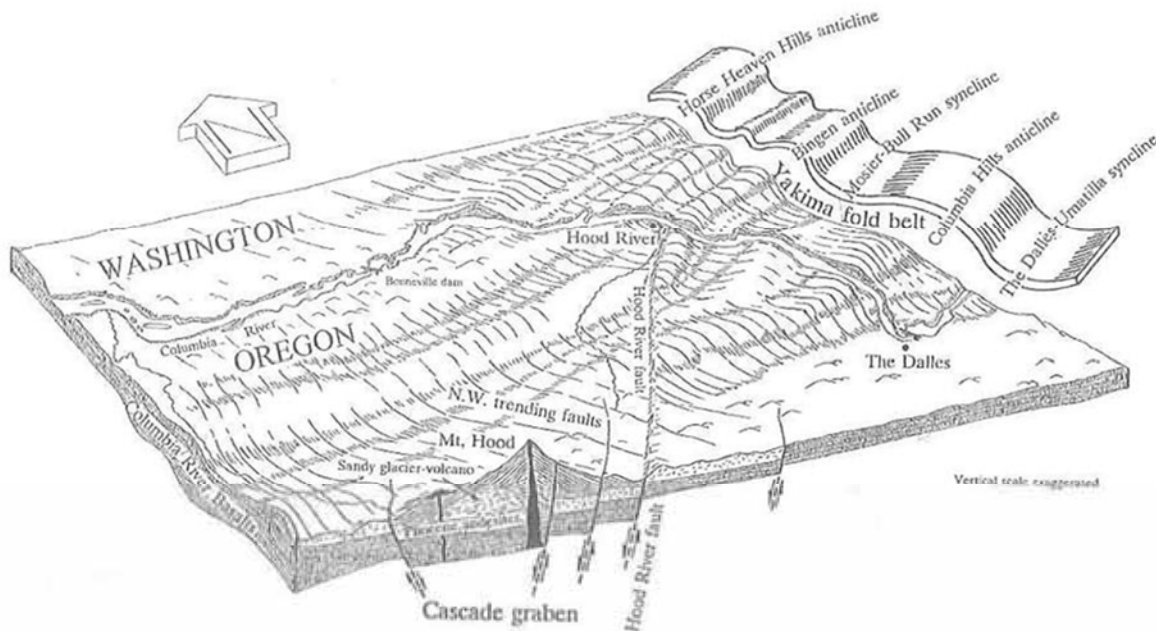


Figure 2.1-3 Yakima Fold Belt

Figure Credit: Orr & Orr (2012)

The constant shifting, convergence, and compression of the Earth's plates upon one another in the 17 million years since the Columbia River Basalt Group flooded the ancestral Columbia River Valley have created a regional feature known as the **Yakima Fold Belt**. Northwest-southeast compression in this area has resulted in broad northeast trending folds of anticlines (convex upward folds of the geologic strata—hills) and synclines (concave downward folds of the geologic strata—holes) and northwest trending strike-slip faults (intra-plate faults separating individual sides of a rock unit that move laterally along a near-vertical crack). The south-facing slope of one of these folds underlies Stevenson, the Columbia River, and the surrounding landscape. Dipping southeasterly at an angle between 2 and 10 degrees, the orientation of this fold conspires with other ecosystem-wide processes and is another key contributor to shoreline structure and ecosystem functions, especially the persistent admission of new sediments into the water columns of Rock Creek and the Columbia River.

2.1.3 Landslides and Waterfalls

The combination of alternating rock units separated by thick clays, the deep percolation of surface waters through faults and fractures in the rock units, and the steep angle at which these units have been folded has been referred to by geologists as a "well-greased skidboard" (Waters, 1973, as quoted in O'Connor and Burns, 2009). Thousands of years' worth of Columbia River erosive power has ensured the freedom of

movement on this skidboard as gravity exerts its force. Two sets of cataclysmic experiences demonstrate the power of these lateral and vertical forces and their effects on Stevenson's shorelines.

The **Missoula Floods** (also referred to as the Bretz Floods) produced some of the earliest recognizable landslides in the Stevenson area. This series of floods resulted from the repeated formation and breaching of Lake Missoula, a glacially dammed lake that covered much of western Montana. The ice dam broke approximately 80 times during a 6,000-year period between 18,000 and 12,000 years ago and sent torrents of floodwater racing across eastern Washington and down through the Gorge on their way to the Pacific Ocean.

As depicted on Figure 2.1-2, the waters of Lake Missoula spread out over the relatively homogenous flood basalt bedrock of eastern Washington to form the Channeled Scablands, but as they funneled into the Gorge, the floods' destructive cocktail of ice, rock, water, and biological debris reached depths of more than 1,000 feet and scoured the hill slopes, leaving behind cliff faces free of vegetation and soil.

These exposed faces are still visible today at the approximately 800-foot elevation line and contribute to the dramatic scenery of the eastern Columbia River Gorge. The waters had a far different effect near Stevenson as they were pushed to the margin between the Columbia River Flood Basalts and the softer Eagle Creek Formation. These floods exposed the thicker basalt layers on the Gorge's south side, leaving near vertical walls supported by the intact bedrock farther down-gradient of the underlying fold terrain. It is over these walls of rock that many of the Gorge's spectacular waterfalls tumble. On the north side of the Gorge, however, the water's power stripped away the basalt and underlying sedimentary rock, leaving nothing down-gradient on the fold terrain to stabilize the rock units above. It is for this reason that the northern side of the Gorge is home to fewer waterfalls and more landslides.⁹

The **Cascade Landslide Complex** is one such set of landslides. Beginning approximately 1,000 years ago, the southern slopes of Table Mountain and Greenleaf Peak began mass wasting into the Columbia River through a series of landslides covering nearly 15 square miles, temporarily damming, and subsequently diverting, the Columbia River channel 1.5 miles south of its pre-slide location. The Bonneville Landslide is the most recent and, as the progenitor of several Bridge of the Gods legends, the most well-known landslide of this complex. A landscape-based allegory about love, loss, and familial relations, one **Native American legend** tells of two brothers, Wy'East (Mount Hood) and Pahto (Mount Adams), battling over the love of Loowit (Mount St. Helens). When Old Coyote grew tired of his sons using the land bridge across the Columbia to fight with each other, he settled their quarrels by collapsing the bridge and forever separating the land on each side of the river.

Empirical evidence confirms that this area would have been dammed by the slide, and even if the allegorical bridge did not represent the type of free-spanning bridge of the European Americans' imaginations, it still provided some type of ford or dike over which people could "cross the river without getting their feet wet" (Lawrence and Lawrence, 1958, as quoted in O'Connor and Burns, 2009). Today's evidence also indicates that the impounded waters behind this dam rose more than 60 feet and stretched more than 70 miles upstream

⁹ *Recommendation #2-XX for SMP Update:* Evaluate geologically [hazardous](#) areas along shorelines for inclusion within Shoreline Jurisdiction and consider voluntary protective measure and/or special standards for site development in such areas.

and, when they overtopped and breached the land bridge, they left observable marks of floodwaters nearly
115 100 feet deep at Troutdale, Oregon.

Though the exact date of the Bonneville Landslide is being debated, radio carbon dating indicates it occurred only 600 years ago. This timeline is generally borne out by modern historical Native American accounts, which instead of relying on “myth time” or “the time before memory” describe a time when their own known and remembered ancestors traveled by canoe between the Pacific Ocean and Celilo Falls without obstruction.

120 Although the dam created by the Cascades Landslide Complex has long since been breached, its effects remain visible and are important determinants of the human inhabitation of this area. Early European-American comments focused on this area as a natural feature. In 1805, during Lewis and Clark’s westward journey, they observed the peculiar submerged stumps of upstream trees followed by the harrowing Cascade Rapids, or, as Captain William Clark called them, the “Great Shoote” (Figure 2.1-4). The dangers of the
125 Cascade Rapids were also feared by settlers moving along the Oregon Trail—as they rafted downriver, many lost their belongings or their lives to the jagged rocks clogging the Columbia’s narrowly channeled waters.

Not to be outdone by the environmental obstacles, accounts of the human presence at this funneling of the Columbia soon began to reveal the strategic importance of the area for travel and trade. Native Americans recognized this long before Lewis and Clark’s paddles plied these waters and were there to witness, aid, and
130 exploit these and later explorers as they attempted to avoid this dangerous stretch of water by using the already well-worn portage trail.

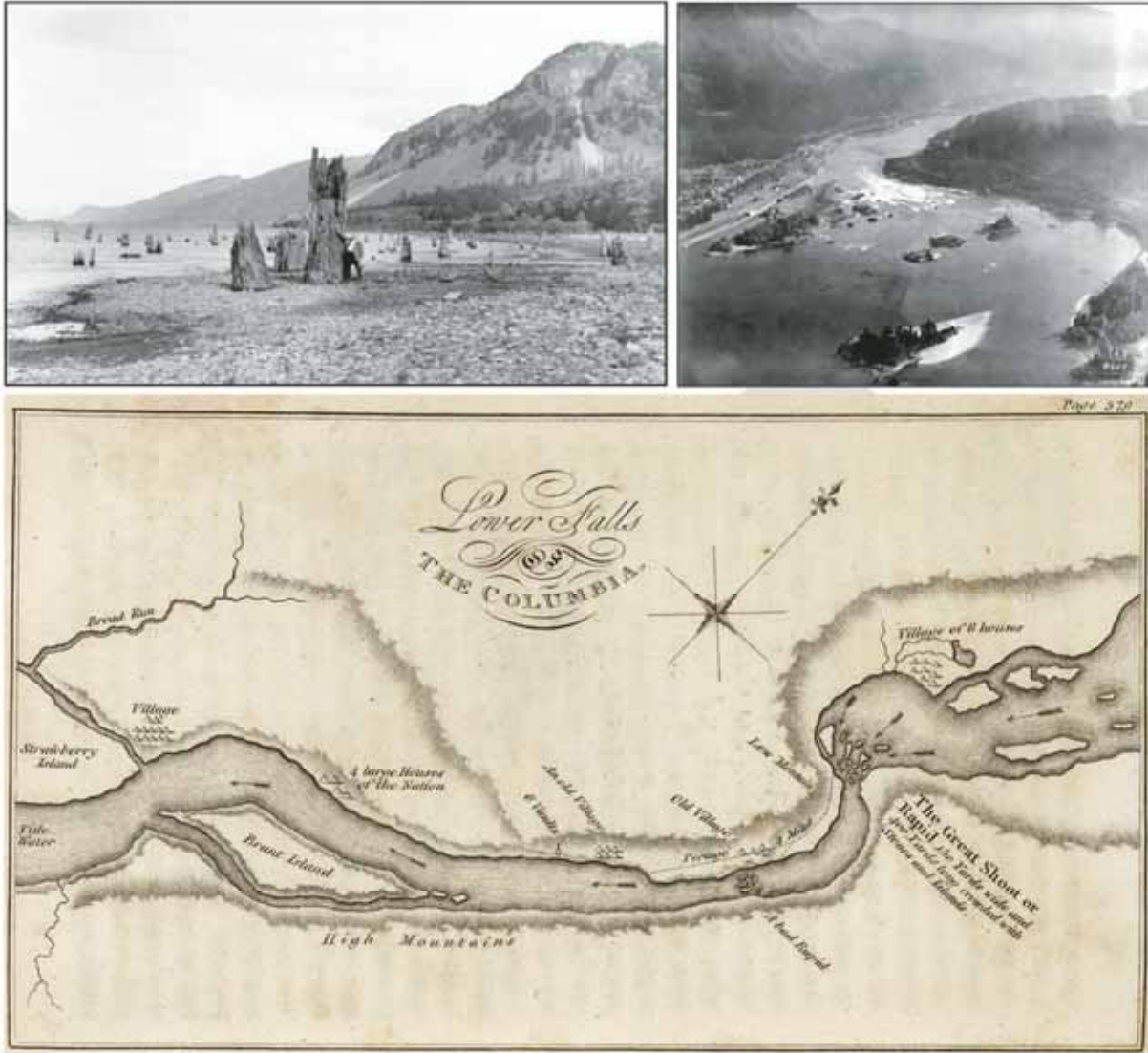


Figure 2.1-4 Early Observations of the Bonneville Landslide

Upper Left: Submerged tree stumps near Wind Mountain. Upper Right: Cascade Rapids and Cascade Locks.

Lower Map: 1815 Map of the Lower Falls of the Columbia, based on Captain William Clark's 1805 sketch.

Figure Credits: D.H. Lawrence & Oregon Historical Society (1933), US Army Corps of Engineers (1928), taken from O'Connor & Burns (2009), and Cartography Associates, David Rumsey Collection (1998)

The earliest accounts of European Americans focused on the perceived "otherness" of these peoples' dress, physical features, and social hierarchies, but soon the otherness of their trading and tolling customs increased in importance. Commonly accepted customs and cultural expectations of the Native Americans were unknown to the European Americans, whose trading practices and land settlement patterns were foreign to the Native American populations. Disagreements soon led to violence. The number of incidents initiated by one group or another waxed and waned. The Hudson's Bay Company opened Fort Vancouver in 1825, but by the 1850s, the military and organizational force of the U.S. Army was deployed to the Cascades where three forts (including Fort Vancouver) were set up along the Columbia's north shore, and the control of this strategic stretch of river was ceded to the hands of European Americans.

The strategic value of Stevenson's location at the head of the Cascade Rapids materialized in the decades after European Americans solidified control of the Columbia River and as steam-powered sternwheelers replaced rafts as the primary mode of transportation. In the 1890s, brothers George and Momen Stevenson of the Stevenson Land Company saw opportunity in a landing dock owned by Henry Shepard and his family on a river terrace pinched between the outlets of two wood-filled watersheds. Here, they purchased land and laid out the "Plat of Stevenson," an irregularly shaped, eight-block grid focused on its Columbia River wharf. The site became a strategic stopping point for refueling and relaxation as boats and passengers prepared for or recuperated from the passage through the Cascade Rapids. To serve the needs of the boats, cordwood from the surrounding hillslopes crowded the pier, ready to stoke the boilers of sternwheelers like the famous *Bailey Gatzert* on the route between Portland and The Dalles. Likewise, hotels and saloons crowded Stevenson's "Whisky Row," ready to quell the needs of weary and thirsty travelers.¹⁰[A5]

2.2 Climate

Stevenson's peculiar geologic setting magnifies the effects of ecosystem-wide processes related to climate and the atmosphere. Marine air masses from the Pacific Ocean largely determine the climate regime on the western side of the Cascade Range, while continental air masses from northern latitudes in British Columbia hold sway over the climate on the eastern side of the range. Stevenson is sited squarely in the transition zone between these two climate regions, and its average temperatures show a predictable gradient between the two. Local precipitation and wind patterns in Stevenson, however, demonstrate entirely different gradients that are unlike any other areas in the state.

2.2.1 Temperature

To the west of the Cascade crest, air masses move in from the Pacific Ocean and maintain fairly moderate air temperatures throughout the year, with average monthly temperatures ranging from 37° to 67° F. This variability is seasonal and primarily because of the sun's effect on the region's high latitude. The high altitudes of the Cascade Range mitigate the influence of this warm air, and to the east, the air masses from the Canadian interior have greater influence. Average monthly temperatures there range from 33° to 76° F. While the lower lows are a direct result of air stream patterns, the higher highs arise from the thermal gains imparted on the land by the high summer sun. Stevenson's average monthly temperatures tuck neatly between the averages on either side of the Cascade Range, with December being the coldest month with a temperature of 34.5° F and August being the warmest month at 69° F.

¹⁰ *Recommendation #2-XX for SMP Update:* Consider how the Stevenson shoreline areas can accommodate modern-day uses equivalent to the nineteenth-century amenities that led to the town's early success as a refueling and relaxation hub.

Figure 2.2-1 Temperatures & Precipitation Rates for Stevenson & Two Neighboring Climate Regimes (30-Year Average)

	St. Helens, OR	Battle Ground, WA	Stevenson, WA*	Prosser, WA	Kennewick, WA
Highest Temperature Month	67.2° F (Aug)	65.0° F (Aug)	68.9° F (Aug)	74.2° F (July)	76.0° F (July)
Lowest Temperature Month	37.1° F (Dec)	38.5° F (Dec)	34.5° F (Dec)	32.9° F (Dec)	34.3° F (Dec)
Annual Precipitation	46.64 in.	52.60 in.	77.52 in.	8.94 in.	7.73 in.
Highest Precipitation Month	7.22 in. (Dec)	8.14 in. (Nov)	12.64 in. (Nov)	1.36 in. (Dec)	1.13 in. (Dec)
Lowest Precipitation Month	0.72 in. (July)	0.87 in. (July)	0.92 in. (July)	0.20 in. (July)	0.18 in. (Aug)

Data Credit: NOAA (2010)

*Stevenson Data is taken from Bonneville Dam, located ~5 miles to the west

2.2.2 Wind

Associated with the different temperature regimes, the Cascade Range also separates different atmospheric pressure regimes. Wind is created as high pressure air moves toward lower pressure air. Often, the pressure differential is a result of surface air temperatures: as surface air heats up, it rises, leaving behind a vacuum into which cooler surface air is pulled. Lower elevations in such systems experience this effect to a greater degree than higher elevations, and as the only near sea-level pass through the Cascades, the Columbia Gorge provides the primary conduit through which the pressure regimes interact—and through which winds are funneled.

Because of the seasonal differences in temperatures on each side of the Cascades, there are also seasonal differences in the direction of prevailing winds. In the summer months, the hot continental air to the east of the Cascades rises, pulling west winds through the Gorge that increase in intensity as daytime heating increases the pressure differential. These summertime thermals produce the dependable and strong winds lauded as world class by sailors, windsurfers, and kiteboarders. The exhilarating rush of being pulled by 30-mph winds draws daytrippers from the Portland/Vancouver area and seasonal recreationalists from across the world.¹¹ In the winter, winds move in the opposite direction as the warmer maritime air to the west of the Cascades draws the cold continental air from the east. Anomalies to these norms do occur, but east winds during the summer and west winds during the winter are comparatively infrequent and short in duration.

A phenomenon known as “gap flow” also occurs through the Gorge, which affects wind intensity based on the direction of flow. As air moves down the pressure gradient—from high to low/cool to warm—it accelerates and the strongest winds are observed at the gap’s exit. This flow is well known to wind-based recreationalists whose preferred launch spot could be anywhere along the length of the Gorge depending on the wind direction. On west-wind days, thrill seekers will travel east towards Hood River and The Dalles to capture the intense wind near the gap’s exit. East winds will draw them to Stevenson and other launches on the west end of the Gorge.

¹¹ *Recommendation #2-XX for SMP Update:* Develop tools to accommodate the unique uses related to wind-based recreation and position Stevenson to corner the emerging markets associated with these forms of water-dependent shoreline recreation.



Figure 2.2-3 Wind Recreation on the Columbia River
Left Photo: Windsurfers rig their sails at Bob's Beach.
Right Photo: Kiteboarders carve into the wind, sharing tight spaces on the water.
Photo Credits: Left, Dawn Nielson (2008) Right, Carol Bolstad (2008)

2.2.3 Precipitation^[A6]

Seasonal variations in temperature also interact with the air's moisture content to produce differing patterns of precipitation on each side of the Cascades. To the west, the consistently moist maritime air is most noticeable in the wintertime when temperatures are far below the point when water vapor saturates the air ([high humidity?](#)). The result involves persistent stretches of clouds and more than 65 percent of the approximately 50 inches of annual precipitation falling between November and March. The opposite is largely true during the warm summer months, when higher temperatures rarely fall below the point when the water vapor in the air coalesces ([low humidity?](#)), and rain is infrequent.

The higher altitudes of the Cascade Range also affect the air's moisture content, causing most of it to fall out before it reaches the Columbia Basin to the east. The limited precipitation that does fall on the eastside amounts to only approximately 8 inches, and, with only 60 percent of the annual rain falling between November and March, it is spread more evenly over the year than on the west side.

Due in part to Stevenson's location along the Cascade crest and in part to the air mass interactions facilitated by the Columbia River Gorge, Stevenson's annual precipitation, measured at the Bonneville Dam, is greater than the precipitation falling on the surrounding regions. At the Bonneville Dam, 5 miles downstream of Stevenson, the 30-year average annual precipitation is approximately 78 inches, 70 percent of which falls in the five months between November and March.¹²^[A7]



Figure 2.2-2 Freezing Rain: Beautiful, Dangerous

Photo Credit: Dawn Nielson (2005).

¹² *Recommendation #2-XX for SMP Update:* Consider how this amount and timing of precipitation impacts the City's stormwater system as it outlets to shoreline areas and whether this impact can be lessened.

Wintertime interactions between the neighboring climatic regimes are of special note for the Stevenson area because of the potential dangers involved. High-level atmospheric snows falling through a layer of moist, warm Pacific air often melt into rain before falling through the cold air mass from the Columbia Basin. If the Columbia Basin air mass is thick, this mixture will refreeze as sleet before it reaches ground level, but often it will fall as super-cooled water and refreeze when it reaches a cold surface or solid object. The glaze of ice that results from these “silver thaws” threatens to down trees and overhead utility lines and makes pedestrian and vehicular travel dangerous.¹³ [A8]

2.3 Hydrology

As the regional climatic patterns deposit rain and snow from above, Stevenson’s geologic setting transmits them downstream to form the structures of Stevenson’s shorelines. Ashes Lake, Rock Cove, Rock Creek, and the Columbia River are formed through the various groundwater and surface water hydrological processes described here.

2.3.1 Groundwater

Specific studies on aquifers and groundwater movement have not been conducted in the Stevenson area, but previous studies made several general observations based on the geology of the basin.¹⁴ These studies describe three general types of groundwater, including perched water tables (small aquifers trapped by clay-rich layers between rock units), artesian wells (including warm or hot springs), and the Bonneville Landslide aquifer.

The Bonneville Landslide aquifer is one of the more important groundwater features because of its relationship to Stevenson’s municipal water supply and influence on Rock Creek. The high permeability of ground above this aquifer allows the ready percolation of precipitation through the landslide’s jumbled deposits. Through the not-always-intuitive connectedness of ground and surface waters, these waters travel along the margin of the landslide and its underlying rock units to emerge as springs and supply the base flow for a Rock Creek tributary. Surface waters are drawn from this tributary—and also from Rock Creek during certain flows—for treatment and delivery to the taps of the homes and businesses connected to the City’s municipal system. Those not served by this system draw their water from wells drilled into or springs originating from perched water tables—with varying degrees of reliability. To overcome unreliable sources,

¹³ *Recommendation #2-XX for SMP Update:* Consider methods to increase resiliency during winter storm events, including burying overhead utility lines in shoreline areas and the voluntary or assisted replacement of downed vegetation.

¹⁴ *Recommendation #2-XX for SMP Update:* Consider future studies of aquifers and groundwater in the Rock Creek basin similar to those conducted by the U.S. Geological Survey for the basins in Hood River and Wasco counties.

surface and ground water withdrawals are expected to continue along Stevenson's shoreline areas, especially within the Rock Creek watershed.¹⁵

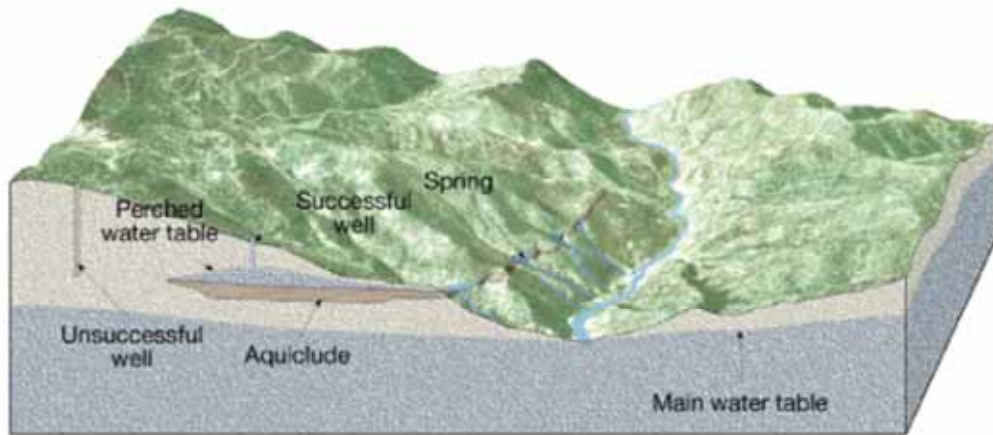


Figure 2.3-1 Perched Water Tables, Springs, and Unsuccessful Wells

If deep, wells in the Stevenson area are likely hydrologically connected to the Columbia River. Springs and shallow wells are likely connected to perched water tables in the Rock Creek basin.

Figure Credits Tarbuck, et. al. (2005)

Groundwaters in the Stevenson area also engage in a complex interrelationship with the local climate and geology. By building up a thick deposit of ice glaze on all exposed surfaces, wintertime icing affects the infiltration of water into the ground. By freezing the outlet of springs, winter temperatures reduce the discharge of groundwater into streams and cause temporary rises in the groundwater table and increased hydrostatic pressure within the soils. The reduced stability of slopes during states of high hydrostatic pressure increases the likelihood of landslides.¹⁶ Ground movement creates new or expanded fractures affecting the location, recharge, and/or presence of perched water tables and springs.

2.3.2 Ashes Lake

Ashes Lake is an approximately 57-acre backwater of the Columbia River created behind a railroad berm when the Bonneville Pool inundated a lowland. While the waters of the lake lie outside the Stevenson urban area, a portion of its shorelands are included within the area the City may annex in the future. It is included here to allow the City to predesignate shoreline environments within the Stevenson urban area.

¹⁵ Recommendation #2-XX for SMP Update: Consider private and municipal water supply needs when developing allowed uses in shoreline areas.

¹⁶ Recommendation #2-XX for SMP Update: Consider developing voluntary restoration activities and regulatory standards that decrease or avoid increased hydrostatic pressures within shoreline soils, potentially including the impacts of stormwater control facilities, on-site septic systems, and other land uses and developments.

2.3.3 Rock Cove

Previously known as Stevenson Lake and the Hegewald Mill Pond, Rock Cove is an approximately 75-acre backwater of the Columbia River which, like Ashes Lake, was created behind a railroad berm when the Bonneville Pool inundated a lowland (approximately 75 feet above sea level). Prior to completion of the Bonneville Dam, the area that is now Rock Cove was pasture and agricultural bottomland composed of the deltaic deposits from Foster and Rock creeks (See Section 4.6.). Today, this same area is fed by Foster Creek on its western side, but the small stream does little to affect hydrology or water levels in the cove. Instead, water levels can fluctuate daily by several feet based on decisions made by the USACE and BPA at the Bonneville Dam.¹⁷ Deep-water areas of the cove are typically between 10 and 15 feet below the water's surface.

2.3.4 Rock Creek

The Rock Creek watershed is more than 43 square miles in area with a dendritic drainage pattern. The stream runs generally from the northwest to the southeast over its 15-mile course. Elevations in the watershed range from nearly 4,000 feet above sea level at the headwaters of the creek on Lookout Mountain to near 80 feet at its outlet into the Columbia River in Stevenson. Approximately 90 percent of the watershed lies in the rain-dominated and rain-on-snow precipitation zones described by the Washington Department of Natural Resources (DNR). Less than 1.5 miles of this course lies within the Stevenson urban area, and all of the watershed within the urban area is in the rain-dominated category.

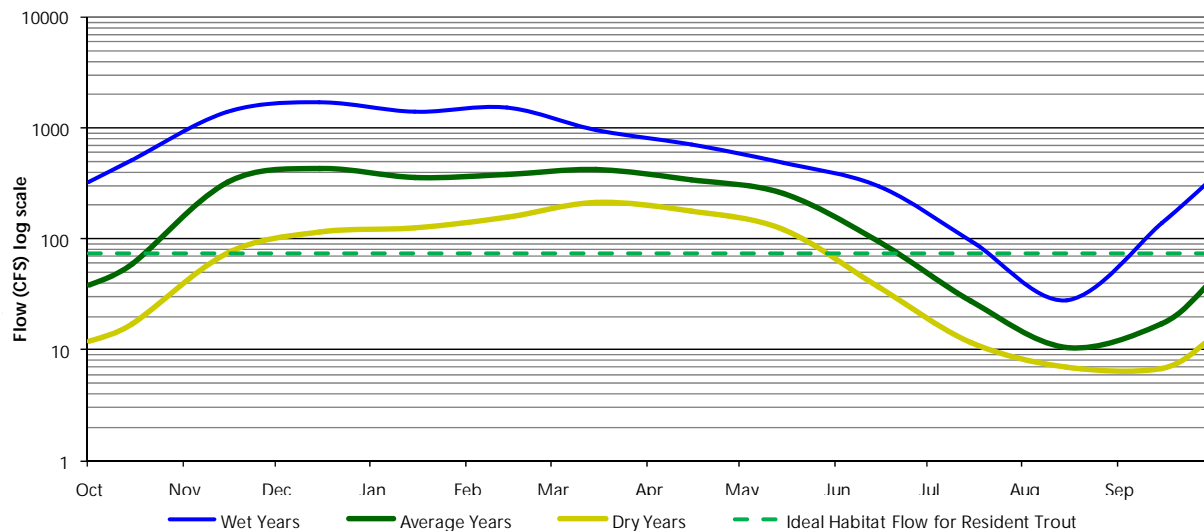


Figure 2.3-2 Rock Creek Hydrograph

Water years synthesized via monthly regression with Wind River daily flows.

Figure Credits Ben Shumaker (2015) after Jim Pacheco (2014)

Figure 2.3-2 shows the extreme variation in flows expected in this stream, which can range from approximately 1,700 cfs in the wettest months of the wettest years (blue line) to only 7 cfs in the driest

¹⁷ *Recommendation #2-XX for SMP Update:* Acknowledge the City's lack of control over water levels and flow regimes in the SMP's goals and regulations for Rock Cove shorelines.

months of the driest years (yellow line). Even in average years (solid green line), Rock Creek's flow can vary between 430 cfs and 10 cfs depending on the time of year.

The lack of snow-dominated areas in the watershed is also apparent in this hydrograph, which does not display the delayed increase in flows typically expected of such watersheds in the early summer when snowmelt supplements precipitation. This situation will insulate Rock Creek from many predictable effects associated with the current warming trends, though the hydrograph may show decreased runoff in May and June if less snow occurs in the higher portions of the watershed. Even if such decreases become notable in the future, the City does not anticipate the mean annual flow dropping below the 20 cfs threshold for consideration as a shoreline of the state.¹⁸

2.3.5 Columbia River

The Columbia River watershed is a behemoth by comparison. Draining an area nearly the size of Texas (approximately 260,000 square miles), the stream travels more than 1,200 miles between its headwaters in the Rocky Mountains of British Columbia and its mouth at the Pacific Ocean. The fourth-largest river by volume in North America, flows at the river's mouth range between approximately 100,000 cfs in the low flow months of September and October (when rainfall and snowmelt runoff are low) to approximately 500,000 cfs during the high flow months between April and June (when snowmelt runoff is at its greatest), averaging approximately 260,000 cfs over the course of a full year. Prior to regulation of flows by dams, flows at the mouth experienced greater extremes, with low flows of 79,000 cfs, high flows of over 1,000,000 cfs, and average flows of approximately 273,000 cfs. Figure 2.3-3 puts these giant numbers into perspective, showing how dams and urbanization have moderated high and low flows over the course of the year.

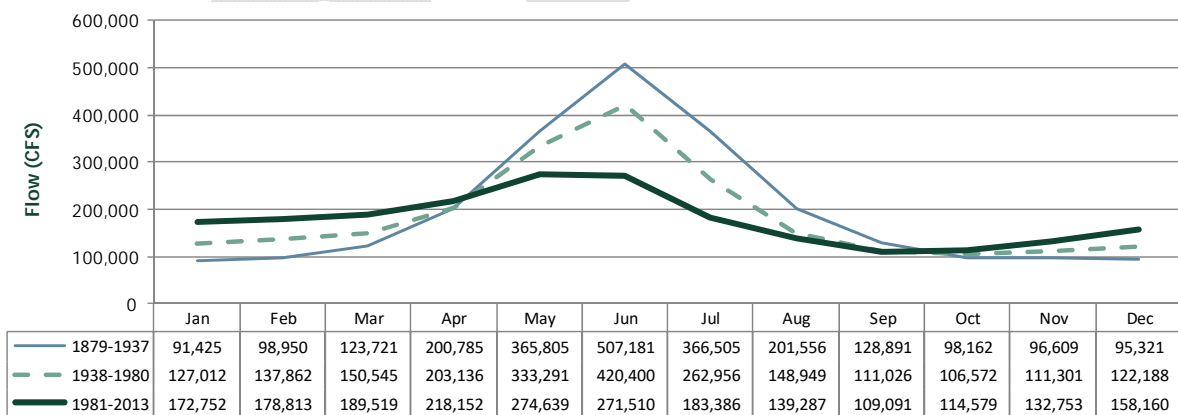


Figure 2.3-3 Columbia River Hydrograph through Time

Three representative hydrographs as measured below The Dalles Dam. Time periods reflect hydrograph before completion of the Bonneville Dam, between completion and expansion of the Bonneville Dam, and since expansion.

Figure Credits: Ben Shumaker (2015) with data from USGS National Water Information System.

More locally, the Columbia Gorge subbasin (the watersheds between the Bonneville and The Dalles dams) is a drainage area of 3,300 square miles and contributes approximately 3.9 percent of the river's powerful discharge through Bonneville Dam. Elevations within this subbasin range from more than 150 feet below

¹⁸ Recommendation #2-XX for SMP Update: Evaluate ongoing monitoring efforts and activities to ensure Rock Creek remains a shoreline of the state.

mean sea level (the deepest riverbed elevation in the Bonneville Reservoir) to over 4,000 feet in the mountainous headwaters bordering the river. The Stevenson urban area contains approximately 3.5 miles of Columbia River shoreline. Water depths adjacent to this area follow a shallow gradient over the dam-inundated historic floodplain before a rapid drop-off into the approximately 80-foot-deep navigation channel.

2.4 Bonneville Dam

Roll on, Columbia, roll on. Your power is turning our darkness to dawn... At Bonneville now there are ships in the locks, the waters have risen and cleared all the rocks, shiploads of plenty will steam past the docks, roll on, Columbia, roll on.
--Woody Guthrie, 1941

Penned while the famous folksinger was employed by the Bonneville Power Administration, Washington's official folk song speaks for the chorus of boosters who engineered opportunity from a narrow bottleneck of the Columbia River. With a few lines of lyrics, Woody Guthrie's "Roll On Columbia" captures the mid-twentieth century's belief in its ability to create improvements that benefit many and harm no one through massive alterations of the environment. The river's power could be harnessed and transported to provide electricity to industries and homes, unproductive lands could be watered to grow crops, barriers to navigation could be cleared to allow goods to flow to and from new ports of call, a new empire could arise, and the river that created it would just roll on as if nothing had changed. History, however, has sung a different song. In this new song, the benefits of the Bonneville Dam are in disharmony with its drawbacks, and the dam has become an ecosystem-wide process unto itself. This section discusses the physical and legal influences of this massive structure on Stevenson's shoreline areas.

2.4.1 Physical Influences: Not a River/Not a Lake

Built at the same location as the Cascades Landslide Complex, the Bonneville Dam's influence on the Columbia River has mimicked the influence of the legendary Bridge of the Gods. Its relative permanence in comparison to that earlier river blockage sets this structure apart and requires constant human management to ensure the river's force passes through the dam's turbines without overtopping or breaching its concrete walls. The ecosystem-wide processes associated with this management result in water levels and flows having characteristics of a lake, a reservoir, an inland river, and a tidally influenced river.

The Bonneville Dam is the last of 18 on the mainstems of the Columbia and Snake rivers, and the decisions about water levels and flow rates behind each dam are made well in advance of a wide variety of anticipated events within the Columbia River's highly interconnected and rationalized system. Anticipation of a large rain-on-snow event in the Idaho Rockies will trigger a drawdown of the Grand Coulee Dam, whose waters are then distributed behind the dams lower in the system; forecasts of extended heavy rains in the Willamette Valley will trigger the storage of waters behind upstream dams to eliminate any flood threat to the Portland-Vancouver area; predictions of unusually dry summers will result in longer-term storage of irrigation waters behind the dams of the Columbia Basin; scheduled maintenance of The Dalles Dam will result in the drawdown of both The Dalles and the Bonneville pools for worker safety.

The list of interconnections goes on, but human decisions have rationalized the Columbia's ecosystem processes to ensure that management decisions balance regional needs of power generation, navigation, flood control, irrigation, and fisheries management. Managing the system at a regional level, however, can often appear irrational in relation to processes experienced at the local level. Water levels in the Bonneville Pool may hold steady for weeks at a time; then, within the course of a few days, may rise or fall by up to 12.5 feet. Balancing other needs, operational decisions made at the dam do not consider the impact of fluctuating water levels to the erosion or protection of riparian shorelines.¹⁹ Decisions establishing the normal pool elevation have been made without consideration for its impact on tributary streams, whose pre-dam sediment fallout curves have been drastically altered.²⁰ Changes to the rate of the river's flow alter water currents at local shoreline eddies.

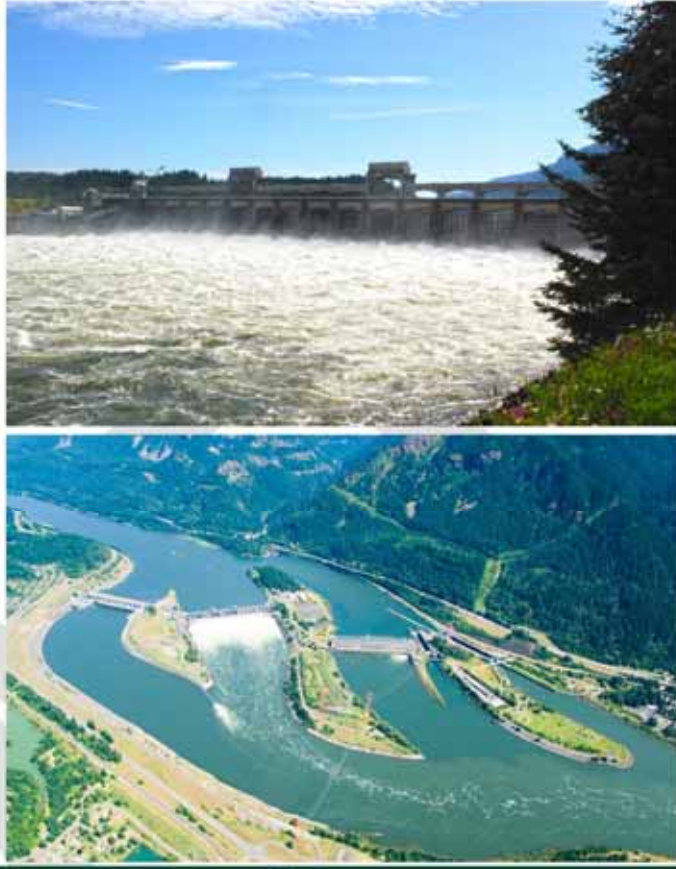


Figure 2.5-1 The Bonneville Dam
Turbulent waters emerge from the river-altering Bonneville Dam.

Figure Credits: David Hamilton (2014), Washington State Department of Ecology (2007)

¹⁹ **Recommendation #2-XX for SMP Update:** Consider shoreline use and modification policies that incorporate solutions for shoreline protective works similar to those being developed for coastal areas expecting sea level rises.

²⁰ **Recommendation #2-XX for SMP Update:** Consider costs and benefits of ongoing sediment management efforts, such as dredging, when developing Environment designations and shoreline use and modification policies.

2.4.2 Legal Influences: Flowage Easements^[A9]

To facilitate the maintenance of artificial water levels, the federal government initiated a phase of land acquisition associated with the original construction of the Bonneville Dam and navigation lock in 1938 and the addition of a second powerhouse in 1981. Beginning in 1936 and concluding in 1980, this land acquisition was accomplished largely through the voluntary purchase of “flowage easements,” though the federal government had, and used, the authority to force the matter through court-sanctioned “declarations of taking.” The specific provisions of these easements changed over the course of time and varied slightly according to the demands of the individual property owners selling the easements. Early granters of the easement only sold:

... the full and perpetual right, power, privilege and easement to overflow...all that portion of [the owner's] land lying below [a specific elevation's] contour line...together with the right to go upon the land...from time to time to remove therefrom the timber and other natural growth, and any accumulations of brush, trash or driftwood...

More typically, however, these easements granted to the United States of America contained a longer list of encumbrances on the underlying properties. The key provisions regarding the control of water levels and the maintenance of vegetative growth and/or accumulation were included when these owners granted:

The perpetual right, power, privilege and easement permanently to overflow, flood and submerge the land...and the continuing right to clear and remove any brush, debris and natural obstructions which...may be detrimental to the [Bonneville Lock and Dam] project, together with all right, title and interest in and to the timber, structures and improvements situate on the land...

But these later granters also sold their rights to construct buildings or conduct land-filling activities within these easements,²¹ providing:

*... that no structures for human habitation shall be constructed or maintained on the land, that no other structures shall be constructed or maintained on the land except as may be approved in writing by the representative of the United States in charge of the project, and that no excavation shall be conducted and no landfill placed on the land without such approval as to the location and method of excavation and/or placement of landfill...*²²

Beyond the monetary compensation the owners received for these easements—which could range into the thousands of dollars—the easement declarations concluded with the palliative statement that the landowners, their heirs, and assigns reserved:

... all such rights and privileges as may be used and enjoyed without interfering with the use of the [Bonneville Lock and Dam] project...or abridging the rights and easement...acquired;

²¹ *Recommendation #2-XX for SMP Update:* Consider the reduced likelihood of development within areas covered by flowage easements when crafting allowed uses and development standards in shoreline environments.

²² *Recommendation #2-XX for SMP Update:* Evaluate administrative mechanisms related to coordination with the USACE and other governmental regulators during the review and issuance of permits under the SMP.

provided further that any use of the land shall be subject to Federal and state laws with respect to pollution.

400 While the rights granted to facilitate the massive Bonneville Dam project have had sweeping effects on the property owners' ability to use and develop portions of their properties, the easements have been largely effective in preventing damages from flooding. Repetitive flood losses for properties along Stevenson's shorelines are minimal, largely because of the consistent overlap of these areas.^{23, 24}

2.5 Summary of Recommendations from Section 2

405 [To be compiled in later draft after public review]

²³ Recommendation #2-XX for SMP Update: Consider shoreline use and modification policies that continue to minimize flood losses for shoreline property owners.

²⁴ Recommendation #2-XX for SMP Update: Consider incorporating a floodplain management plan into the restoration plan to better reflect the actual risk to floodplain property, thereby reducing owners' insurance costs.

3.0 Shoreline Ecological Functions

Ecological functions are the services performed when physical, chemical, and biological ecosystem-wide processes interact. Ecological functions occur at discrete locations along shoreline areas. Because the SMA and the SMP guidelines attribute value to the services performed through ecological functions, local jurisdictions are required to evaluate the baseline level of service these functions provide to their shoreline areas. These functions are typically grouped into categories related to water quality, water quantity, and habitat.

This section of the shoreline inventory and characterization report describes water quality, water quantity, and habitat functions occurring along Stevenson's shorelines. The characterizations below provide a necessary link between the ecosystem-wide processes of Section 2.0 and the indicators that will be used to more fully characterize specific shoreline reaches in Section 4.0.

3.1 Water Quality Functions

The water making its way past Stevenson's shorelines includes a complex mixture of sediments, nutrients and toxics, and temperatures that interact with local shoreline morphology. During these interactions, the water's overall quality is either improved or diminished when the ecological functions of sediment transport, nutrients and toxics filtration, and temperature regulation are performed. For most water quality functions, the City can rely on characterizations performed by Ecology and the EPA through the CWA 303(d) list and its 5-point scale for water quality concerns.

3.1.1 Sediment Transport

Sediment transport is an important ecological function because of its ability to influence shoreline morphology and because of its interaction with ecological functions related to habitat. Commonly described in terms of "sources and sinks," sediment transport occurs differently over the course of a waterway. In a large stream system like the Columbia, common sources of sediments are soil erosion from overland flow, streambank erosion, wind deposition, and tree fall. In a forested mountainous stream system like Rock Creek, these sediment sources are dwarfed by in-channel erosion and the landslides and mass wasting events discussed above. In an urbanized watershed like Rock Cove, runoff from buildings and transportation corridors plays a bigger role in the supply of sediment.

PROCESS	Geologic Processes, Climate Processes, Hydrologic Processes, Bonneville Dam Processes
FUNCTION	—Sediment Transport—
INDICATORS	Riparian Vegetation, Shoreline Stabilization, Impervious Surface Area, Urban Runoff, Permanently Protected Areas, 303(d) List, Floodplain Area, Wetland Acreage

Regardless of the source, a waterbody uses any of several methods to transport the sediments downstream. Larger sediments roll, slide, or skip along the stream bed pushed by higher flows. Smaller sediments are either dissolved or suspended in the water itself. All sediments will continue migrating downstream until flow velocities (largely a function of flow rates, channel widths, and channel gradients) decrease to the point where sediments settle out and deposit or sink to form new and ever-changing shoreline morphological features.

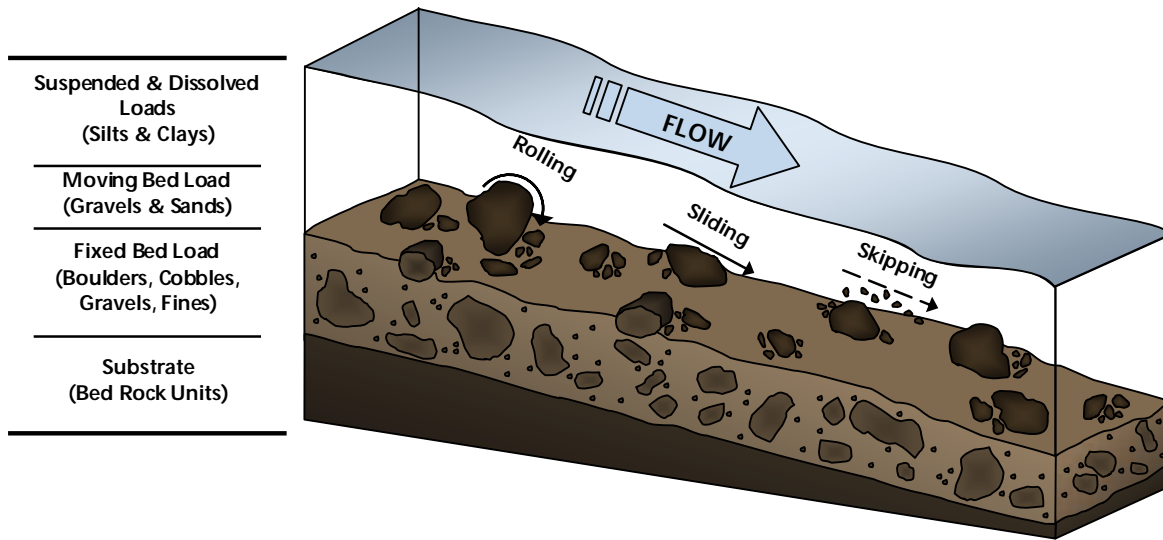


Figure 2.3-3 Sediment Transport Processes

Figure Credit: Ben Shumaker

The factors controlling sediment inputs and flow velocity are variable along a stream's course and over the course of time, **seasonally and long-term**. Though no stream system has a continually balanced management of sediment sources and sinks, unimpaired shorelines generally manage the input and throughput of sediments on an annual basis. Impaired sediment transport occurs when sources of sediment are cutoff from a stream or when sources of sediment overwhelm a stream's ability to move it through the system. Stevenson's shorelines areas—**especially Lower Rock Creek and Rock Cove**—mostly serve as sediment sinks and areas of the Columbia River, Rock Cove and Rock Creek are particularly impaired through rapid accretion.

3.1.2 Nutrient and Toxic Filtration

Nutrient and toxic filtration is an ecological function closely related to sediment transport, habitat functions and **can also affect** public health. Specific nutrients and toxins include heavy metals (lead, zinc, mercury), nitrogen, pathogens (**disease causing bacteria, virus, or microorganisms**), pesticides and herbicides, and phosphorous. Nutrients & toxins are contributed to waterways by naturally occurring metals **in the soil** and biotic sources, "point sources" (factories and wastewater treatment plants), and "nonpoint sources" (acid rain, agriculture, contaminated groundwater, and urban runoff). Filtration of nutrients and toxins is performed through biotic uptake, adsorption to other elements or particles, chemical interactions and changes, and—in the case of pathogens like bacteria and protozoa—death **of the organism**.

PROCESS	Hydrologic Processes, Bonneville Dam Processes
FUNCTION	—Nutrient & Toxic Filtration—
INDICATORS	Riparian Vegetation, Shoreline Stabilization, Impervious Surface Area, Urban Runoff, Permanently Protected Areas, 303(d) List, Floodplain Area, Wetland Acreage

Impaired nutrient and toxic filtration occurs when sources of nutrients and toxins overwhelm the capacity of a shoreline system, when shoreline waterbodies are cutoff from floodplains or associated wetlands, and when sedimentation of adsorbed nutrients and toxins pollutes a river bottom. These functions along Stevenson's shoreline areas are at risk of impairment but largely operating within the expectations of the CWA **water quality standards**.

3.1.3 Temperature Regulation

Important to the lifecycle needs of fish and wildlife and the maintenance of other water quality functions, temperature regulation varies according to climate processes based on diurnal (daily) and annual cycles, but can also be heavily influenced by geologic processes (hot springs), shoreline morphology, and vegetative cover.

PROCESS	Geologic Processes, Climate Processes, Bonneville Dam Processes
FUNCTION	—Temperature Regulation—
INDICATORS	Riparian Vegetation, Impervious Surface Area, Urban Runoff, Permanently Protected Areas, 303(d) List, Floodplain Area

The temperature regulation function is often considered impaired when shade-producing vegetative cover is removed from a shoreline or when point sources, hot springs, and/or urban runoff increase ambient stream temperatures. The Columbia River, Rock Cove, and Rock Creek systems demonstrate higher than normal temperatures for shorelines of their type as indicated in section 4.

3.2 Water Quantity Functions

Water quantity functions deal with the supply of water provided by climate and hydrological processes.

Water quantity functions are valued because they moderate the distribution of the water supply over time. Reducing peak flood levels during high flows and maintaining streamflow and water availability during low flows.

Water storage occurs in depressional wetlands, lakes, floodplains, and in subsurface aquifers along or under shoreline systems. Water storage is valued as a shoreline ecological function because of its ability to regulate flows, maintain lifecycle needs for habitat, moderate flood risks to human life, and provide water for consumptive purposes.

PROCESS	Geologic Processes, Climate Processes, Hydrologic Processes, Bonneville Dam Processes
FUNCTION	—Water Storage & Flow Regulation—
INDICATORS	Riparian Vegetation, Impervious Surface Area, Urban Runoff, Permanently Protected Areas, Floodplain Area, Wetland Acreage

Water storage and flow regulation functions vary greatly depending on the underlying geologic, and hydrologic processes and some areas are naturally unsuited for the storage of water. Areas with naturally permeable soils, connected floodplains and associated wetlands, and few impervious surfaces are considered well suited to water storage and flow regulation functions. Impairment occurs when these types of natural conditions are not present or are diminished. The Stevenson's Rock Creek shoreline areas contains some complex stream bottom, plunge pit, and snags of large woody debris (LWD), these shoreline reaches are largely ill-suited for water storage and flow regulation functions. The Bonneville Dam places a daily demand on the water storage functions of the Columbia River and Rock Cove shorelines. This process creates a well-functioning flow regulation, but partially impairs the interrelated water storage function of these shorelines as a result.

3.3 Habitat Functions

The rocks, soils, sediments, and waters of Stevenson's shorelines host a number of terrestrial, aquatic, and amphibious plant and animal species. Some of these species attract flocks of visiting bird watchers, some are

a boon for backyard naturalists, some spark the imagination of the city's children, some are a veritable nuisance to area vegetable gardens, and some are afforded special protection by the state and federal governments.

Habitats are occupied by species demonstrating varying degrees of responsiveness and/or sentience in the selection of preferred sites. Because of this selectivity, the characterization of habitat functions goes into greater detail than the characterizations above. Descriptions of sensitive species are provided and followed by the ecological functions related to the input of organics and LWD and the connectivity and structures suitable for lifecycle needs.

3.3.1 In-water Habitat and Anadromous Fish

Anadromous fish are fish that are born and reproduce in freshwater habitats and then migrate to saltwater for a portion of their lifecycle. These species include salmon, trout, and lamprey. Anadromous species are among the most important species to consider when planning for the future of Stevenson's shorelines



Figure 2.4-2 Chinook Salmon
A female Chinook spawns in clean gravels free of fine sediments.
Photo Credit: City of Seattle (2013).

because of the decline in their numbers that has been observed over time.

Chinook Salmon (*Oncorhynchus tshawytscha*) is the largest of the Pacific salmon with the most diverse and complex lifecycle strategies, including distinct fall and spring migratory runs that evolved over thousands of years. Lower Columbia Chinook were listed as a threatened species under the ESA on March 24, 1999 and the designation was reaffirmed on June 28, 2005. Critical habitat for Lower Columbia Chinook was designated on September 2, 2005, and includes the Columbia River and Rock

Creek.

Chum Salmon (*Oncorhynchus keta*) is the most widespread species of Pacific salmon, with production extending along the Pacific Rim from southern California to Korea as well as many tributaries to the Arctic Ocean. Prior to the species' decline, chum salmon are believed to have been the most abundant of the salmonids in the Pacific Ocean. Lower Columbia chum were listed as a threatened species under the ESA on March 25, 1999 and the designation was reaffirmed on June 28, 2005. Critical habitat for Columbia River chum was designated on September 2, 2005, and includes the Columbia River.

Coho Salmon (*Oncorhynchus kisutch*) is a widespread species of Pacific salmon, with production in most river basins around the Pacific Rim from central California to Korea and Japan. The decline of Columbia River coho abundance began in the mid-1800s due to the impacts of Euro-American activities in the region. Lower Columbia coho were listed as a threatened species under the ESA on June 28, 2005, and critical habitat documentation for the Stevenson area is still being developed.

Eulachon or Smelt (*Thaleichthys pacificus*) is a small anadromous fish inhabiting rivers and streams from central California to the Bering Sea. Eulachon is a forage fish occupying an important link in the food chain between zooplankton and larger organisms. Eulachon were listed as a threatened species under the ESA on March 18, 2010 and critical habitat was designated on October 20, 2011. This critical habitat includes the Columbia River and its tributaries downstream of Bonneville Dam, but does not extend to Stevenson's shoreline areas.

Pacific Lamprey (*Lampetra tridentate*) is an anadromous species of eel-like fish with great cultural importance to the tribes of the Columbia River Basin. Information on lamprey abundance is limited and does not exist for the Columbia River or its tributaries above Bonneville Dam. However, based on declining trends measured at the dam, the decline of Pacific lamprey has become a significant regional concern. A 2003

petition for ESA listing was determined insufficient to evaluate the species' status, but it is possible that Pacific lamprey will again be petitioned for ESA listing if their numbers continue to decline.



Figure 2.4-3 Pacific Lamprey
Pacific Lamprey cling to the fish window at Bonneville Dam during return-migration.
Photo Credit: Randy Rasmussen, *The Oregonian* (2013).

Steelhead Trout

(*Oncorhynchus mykiss*) has the greatest diversity of lifecycle patterns of all Pacific salmonids, including individuals and populations that do not migrate to saltwater and survive multiple spawning and ocean migration cycles. Resident (non-anadromous) varieties are called rainbow trout, and anadromous varieties are called steelhead, which are further classified by their summer and winter migratory runs. Despite their flexible lifecycles and spawning patterns, Lower Columbia steelhead populations have declined. Originally listed as a threatened species under the ESA on March 19, 1998, Lower Columbia Steelhead's threatened status was reaffirmed on June 28, 2005 and critical habitat was designated on September 2, 2005. Along Stevenson's shorelines, this critical habitat includes the Columbia River.

The primary avoidable human contributions to the natural population's declining abundance include reduction of tributary and estuary habitat, dam construction and operation, fishing, fish hatcheries, and predation by other animals. Because Stevenson's shorelines do not contain estuaries or fish hatcheries, and because the City exerts no control over the operations of the Bonneville Dam or enforcement of fish harvesting laws, the City's ability to contribute effectively to the recovery of anadromous fish is limited to the preservation and restoration of habitat areas suitable for spawning, rearing, and cold water refuge.

Figure 2.4-1 displays the lifecycle characteristics of anadromous species, including substrate conditions necessary for spawning and their rearing and migration timelines. For species protected under the ESA, the

federal government has designated habitat ranges important to each species and the primary constituent elements (PCE) of these ranges that are important to the survival of the species. For salmonids, these

Figure 2.4-1 Lifecycle Characteristics of Anadromous Fish

	Spawning Substrates	Incubation	Freshwater Rearing Duration	Saltwater Rearing Duration	Out-Migration	Return-Migration
Fall Chinook Salmon	Clean gravel w/ good subgravel flow (irrigation)	60-150 days	3-8 months	1-5 years	April to August	July to November
Spring Chinook Salmon	Clean gravel w/ good subgravel flow (irrigation)	30-60 days	2-6 months	1-5 years	March to June (Peak) ¹	January to May
Chum Salmon	Gravel w/subgravel flow (temperature)	30-120 days	1-5 months	3-6 years	January to May	October to December
Coho Salmon	Stable, clean gravel	30-180 days	8-12 months	1-2 years	August to March	August to January
Eulachon (Smelt)	Sandy gravel	21-40 days	1-7 months	3-5 years	January to July	January to June
Pacific Lamprey	Fine gravels & silts	14-21 days	4-7 years	2-3 years	February to July	March to October
Summer Steelhead Trout	Clean gravel w/ well aerated flow	30-180 days	2-3 years	1-3 years	March to June	May to October
Winter Steelhead Trout	Clean gravel w/ well aerated flow	30-210 days	2-3 years	2-3 years	March to June	November to April

Data Credit: Ben Shumaker (2014) after Lower Columbia Fish Recovery Board (2010)

¹Some spring Chinook begin out-migration immediately upon emergence from the egg. Year-round out-migration has been observed.

PCEs include rearing habitat in side sloughs, side channels, wetlands and other areas along stream margins. These preferred cold- and quiet-water areas often contain woody debris and overhead cover to aid in food and nutrient (allochthonous) inputs and provide protection from predators. Lamprey require a different substrate than salmonids, residing in muddy/silty areas and filtering microscopic plants and animals from passing water. Once more developed, the sucker-like mouth is used to attach to other host fish where they feed, parasitically, on body fluids. Mature anadromous species require habitat connectivity to return to suitable spawning areas.

3.3.2 Additional Protected Habitats and Species

The shoreline functions important to anadromous fish are also important to other species and the maintenance of those functions will increase the habitat available for them. The species listed below are of particular concern, and other species such as the Ring-necked Snake (*Diadophis punctatus*) and Sand Roller (*Percopsis transmontana*) are monitored by WDFW and concern may grow if monitoring reveals a decline in species health.



Figure 2.4-4 Bald Eagle
A Bald Eagle perches on an abandoned pilings in the
Columbia River near Stevenson
Photo Credit: John McSherry (2012).

210

Bald Eagle (*Haliaeetus leucocephalus*), one of America's symbols of freedom, is also a symbol of the success of the ESA. Beginning in the late 1940s, bald eagle populations began a precipitous decline based on the accelerated use of organochloride pesticides like DDT, and by the 1960s, less than 700 breeding pairs were estimated to exist in the lower 48 states. This decline led to the eagle's listing as endangered under the ESA in 1978. The protections associated with this listing and the ban of DDT have allowed bald eagle populations to double every 7 to 8 years. In 1995, the species' designation was changed from endangered to threatened, and by 2007, its recovery was deemed so successful that it was delisted throughout its range. Despite this delisting, bald eagles are still protected under the Bald and Golden Eagle Protection and **the** Migratory Bird Treaty acts, which prevent the killing, capturing, and commodification of eagles or their products (feathers, eggs, nests, etc.), including any nests along Stevenson's shorelines.

Bull Trout (*Salvelinus confluentus*) was fairly recently differentiated as an independent species of trout. Previously confused with the Dolly Varden, genetic studies of these fish have shown bull trout to be more closely associated with char **than with** the Dolly Varden it resembles. Bull trout in the Lower Columbia are a freshwater migratory

species, although Puget Sound populations are known to be anadromous. Bull trout were listed as a threatened species under the ESA on November 1, 1999, a designation that was reaffirmed on April 25, 2008. Current critical habitat for the Lower Columbia was designated on October 18, 2010 and includes the Columbia River mainstem.

Migratory Birds visit Stevenson's shorelines at various times throughout the year, including birds of prey (hawks, osprey, owls, etc.), ducks (bufflehead, mallard, scaup, widgeon, etc.), geese (Canada, greater white-fronted, snow, etc.), seabirds (cormorants, gulls, mergansers, etc.), and smaller birds. While many of these bird species are not at significant risk of extinction, they are still protected under the Migratory Bird Treaty Act and various state and federal population management efforts. **Notably, the WDFW protections for Canada geese do not apply in urban areas like Stevenson, though conflicts between these and other migratory birds are reduced through protections related to in-water habitat and anadromous fish.**

225 **Oregon Spotted Frog** (*Rana pretiosa*) is an almost entirely aquatic frog and leaves wetlands only occasionally and for a short time. This species was recently differentiated as independent from the Columbia spotted frog, a common, thriving species. The Oregon spotted frog was designated as threatened on August 29, 2014 and critical habitat is still being developed. The current draft of the proposed critical habitat does not include any units along or near Stevenson or its shorelines.

230 **Oregon White Oak Woodlands** are priority habitats in Washington because of the abundance of mammals, birds, reptiles, amphibians, and invertebrates inhabiting their stands. The Oregon white oak (*Quercus garryana*) is Washington's only native oak, and the already limited distribution of this habitat type has been declining based on the removal of oaks for urban development and the encroachment of conifers in remaining stands. Along Stevenson's shorelines, the Washington Department of Fish & Wildlife considers
235 **Oregon white oak woodlands a priority habitat** if the stand is at least 1 acre in size and oaks make up at least 25 percent of the canopy cover. **Though none have yet been officially designated**, stands, or **even** single oaks, found to be particularly valuable to fish and wildlife (i.e., they contain many cavities, have a large diameter at breast height, are used by priority species, or have a large canopy) may also be considered priority habitats along Stevenson's shorelines.

240 Management recommendations for priority Oregon white oak woodlands include reducing/eliminating the removal of oaks unless necessary for habitat enhancement purposes, thinning encroaching conifers, planting oak seedlings, and maintaining aerial pathways for sensitive species like the western gray squirrel.²⁵

Pacific Northwest Sasquatch (*Gigantanthropus crypticus*) is a humanoid species of great cultural importance to local, regional, national, and international interests. Responding to this perceived importance,
245 Skamania County (through ordinances 1969-1 and 1984-2) has formally declared a Sasquatch Refuge which is "coextensive with the boundaries of Skamania County" and adopted felony and misdemeanor punishments for "the premeditated, willful, or wanton slaying of Sasquatch."

Information on Sasquatch, its lifecycle, range, and abundance, is limited and cannot be quantified for Stevenson's shoreline areas, but because of the significance of the species, the protections that have been
250 put in place are necessary. The City concurs with Skamania County's designation of a Sasquatch Refuge and has determined these conservation measures to be adequate for the future protection of Sasquatch populations in the vicinity.

Western Pond Turtle (*Clemmys marmorata*) is a species of highly aquatic turtle residing in streams, ponds, lakes, and wetlands. The historic range of the Western pond turtle extended from the Puget Sound to Baja
255 California, but by the early 1990s, populations in Washington were reduced to two sites in Skamania and Klickitat counties. The species received protection in 1992 as an endangered species under the Washington ESA, but populations in other parts of its range remained healthy, and a petition for federal listing was denied in 1993. Washington's recovery plan calls for the establishment of healthy populations at seven sites

²⁵ **Recommendation #3-XX for SMP Update: Evaluate greater prioritization of Oregon White Oak trees when considering vegetation retention/removal/replanting policies.**

statewide, four of which are in the Columbia Gorge. Surveys conducted between 1990 and 1994 found 39 turtles at 14 different sites, but none of the sites are along or near Stevenson's shorelines.

3.3.3 Inputs of Organics and Large Woody Debris

The inputs of organics and LWD are important ecological functions contributing to the food supply and complexity of shoreline systems. Organics include insects and vegetative deposits, which are important sources of nutrients for shoreline species. Standing LWD creates nesting sites for migratory birds and overhead cover to protect anadromous species from airborne predators. Fallen LWD creates channel complexity to moderate flow rates and provide refuge from water- and land-based predators. The shoreline functions important to anadromous fish are also important to other species, and the maintenance of those functions will increase the available habitat for other protected species.

PROCESS	Geologic Processes, Climate Processes, Hydrologic Processes, Bonneville Dam Processes
FUNCTION	—Input of Organics & LWM—
INDICATORS	Riparian Vegetation, Shoreline Stabilization, Impervious Surface Area, Permanently Protected Areas, Floodplain Area, Wetland Acreage

Impaired input of organics and LWD functions occurs when LWD cannot reach streams from adjacent riparian areas or when mass wasting events contribute LWD at a rate that exceeds the stream's capacity to move the materials through the system. These impairments then impact the suitability of streams as habitat areas or can lead to further impairments of other shoreline ecological functions, such as reduced water storage and flow regulation. This function varies from impaired to well-functioning depending on the shoreline considered in the Stevenson area.

3.3.4 Connectivity to Habitat Structures Suitable for Lifecycle Needs

Habitats along Stevenson's shorelines depend on the ecological functions of connectivity to preferred and/or critical habitat structures. Connectivity includes stream passage for anadromous fishes, flight corridors for migratory birds, and riparian areas for land animals and amphibians. Habitat structure suitable for lifecycle needs include the LWD and sediment transport described above, but also rely on other structural features like undercut banks, (protection from predators), cliff faces (nesting), and wetlands (rearing and refuge).

PROCESS	Geologic Processes, Climate Processes, Bonneville Dam Processes
FUNCTION	—Connectivity to Structure Suitable for Lifecycle Needs—
INDICATORS	Riparian Vegetation, Shoreline Stabilization, Piers/Docks/Floats, Road Crossings, Impervious Surface Area, Permanently Protected Areas, Priority Habitats & Species List, Floodplain Area

When impaired, connectivity between structures suitable for lifecycle needs prevents fish and wildlife from reaching suitable structures or reduces the quantity or quality of suitable structures. Specific impairments to these functions are considered in more detail in section 4 and include culvert passage²⁶, Rock Creek's waterfalls, and inundated floodplains within the Columbia River and Rock Cove systems.

²⁶ Recommendation #3-XX for SMP Update: Evaluate methods to remove/rehabilitate/replace existing culverts within shoreline areas that decrease habitat connectivity.

3.4 Summary of Recommendations from Section 3

[To be compiled in later draft after public review]

DRAFT

4.0 Reach Level Characterization

This chapter builds on the information in chapters 2 and 3 and describes conditions adjacent to individual shoreline reaches. According to the state shoreline guidelines (WAC 173-26-201(3)(c)), local governments are required to inventory and report available information at the shoreline reach scale as follows:

- Shoreline and adjacent land use patterns and transportation and utility facilities, including the extent of existing structures, impervious surfaces, vegetation, and shoreline modifications within shoreline jurisdiction;
- Critical areas, including wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas, geologically hazardous areas, and frequently flooded areas;
- Degraded areas and sites with potential for ecological restoration;
- Areas of special interest, such as priority habitats, developing or redeveloping harbors and waterfronts, previously identified toxic or hazardous material clean-up sites, dredged material disposal sites, or eroding shorelines;
- Conditions and regulations in shoreland and adjacent areas that affect shorelines, such as surface water management and land use regulations;
- Existing and potential shoreline public access sites, including public rights-of-way and utility corridors;
- General location of channel migration zones (CMZs) and floodplains; and
- Known cultural, historical, and archaeological resources

This section describes shorelines based on their performance on 12 indicators of ecological functions for 7 reaches along Ashes Lake, Columbia River, Rock Cove, and Rock Cove. The Physical Environment of each reach is characterized based on Available Floodplain Areas (including Channel Migration Zones), Riparian Vegetation, Shoreline Stabilization, and Wetland Acreage. Fish-Blocking Culverts, Priority Habitat & Species (PHS) Listings, and Permanently Protected Areas are used to characterize the Biological Resources of each shoreline reach. Altered Conditions within each reach are characterized based on Ecology's determination of water quality through their 303(d) Listings, Impervious Surface Area, Overwater Roads & Structures, Setbacks to OHWM, and Urban Runoff. Performance is gauged bays on a 5-point scale as shown in Figure 4.0-1.



Excellent



Good



Fair



Poor



Very Poor

Figure 4.0-1 Qualitative Scale for Indicators of Ecological Function
A 5-point, Harvey Ball scale.

Figure Credit: Ben Shumaker (2017) after Consumer Reports.

Table 4.0-1 – Characterization Maps & Attributes^[A10]

Reach-scale Attribute	Description	Map Number
Preliminary Shoreline Jurisdiction	Approximate extent of SMP jurisdiction (current), approximate extent of SMP jurisdiction (predesignation), approximate extent of areas considered for optional jurisdiction	1
Physical Environment		
Land Cover	USGS gap analysis program (GAP) data showing forested, shrub-covered, grass-covered, non-vegetated, and water areas	2
Soil	USGS Soil Survey Geographic Database (SSURGO) and US Forest Service soil data	3
Contours	LiDAR-derived 10- and 100-foot contours as provided by Skamania County GIS	4
Liquefaction Hazards		5
Geologic Hazards	Stevenson Critical Areas Hazard Map showing potentially unstable slopes, landslide hazard areas, scarps, and unstable soils as identified by PBS Engineering in 2007	5A
Floodplains	FEMA FIRM, Zone A on Map 530161 A, Panels 01-02 (Red) and Map 530160, Panel 425 (Yellow)	6
Biological Resources		
PHS Data	WDFW Priority Habitat and Species (PHS) Wildlife GIS data	7
Wetlands	USFWS National Wetlands Inventory and Stevenson Critical Areas Wetland Map showing potential wetlands as identified by JD White and Associates in 2007	8
Land Use & Altered Conditions		
Existing Land Use	County parcel data using Department of Revenue (DOR) codes (derived and categorized from Skamania County Assessor's database)	9
Zoning	Zoning data developed by Skamania County GIS based on County and City zoning	10
Archeology/Historic Resources	Washington State Department of Archaeology and Historic Preservation (DAHP) sensitive information	14
Public Access		
Public Ownership	Public land includes all land owned by federal, state, or local government agencies. "Rights-of-way" were not classified as "Public". Areas not covered by parcel dataset (i.e., large portion of the Columbia River) were classified as "Public". Specific recreation areas also noted	11
Restoration Opportunities		
Impervious Surfaces	County data was used to calculate impervious area (square feet) and linear distance of impervious surface (feet)	12
Rooftops	County data for rooftops within shoreline area and measuring distance of rooftop to shoreline	13
Armoring/Stabilization	Aerial photo-derived data by Skamania County GIS	15

4.1 Columbia River Reach 1 – East Urban Area



Figure 4.1-1 Columbia River Reach 1
Bedrock outcroppings and railroad berms characterize shoreline structure
Photo Credits: Department of Ecology (2007), Ben Shumaker (2013), Department of Ecology (2007).

The physical shoreline of Columbia River Reach 1 is located entirely within Skamania County and east of the City's downtown waterfront. However, some small areas of shorelands and 2 associated wetlands from this reach extend into inside city limits. The shorelands occur along the Kanaka Creek Underpass road, and the wetlands are located on the north side of SR 14, affecting 3 properties having commercial, stormwater utility, and residential uses. Beyond these areas, the City has elected to predesignate the shorelines of this reach that are located outside existing City boundaries. In total, this comprises ~5,555 linear feet of Columbia River shoreline and 256 acres of shoreline jurisdiction area, 26.1 acres of which are shorelands above the OHWM. The reach starts at the eastern urban growth boundary line at Nelson Creek and ends downstream at the eastern city limits and Kanaka Creek. This reach is a shoreline of statewide significance.

Table 4.1-1 – Columbia River Reach 1 Land Use Trends

Future Land Use						
	Low Density Residential	High Density Residential	Low Intensity Trade	High Intensity Trade		Total
	5%	2%	92%	1%		100%
Current Zoning						
	Residential	Public	Resource	Commercial	Industrial	Total
	7%	0%	0%	93%	0%	100%
Existing Land Use						
Undeveloped	Residential	Public	Resource	Commercial	Industrial	Total
3%	24%	62%	0%	10%	0%	100%
Shoreline Preferred Uses						
	Undeveloped	Single –Family Residential	Water-Oriented	Non-Water Oriented		Total
	3%	17%	11%	69%		100%
Land Ownership						
	Private	Local Government	State or Federal Government			Total
	67%	20%	13%			100%

The projected land uses of this reach primarily involve commercial uses, however almost 25% of the reach is currently used for residential purposes. While 62% is devoted to public uses, 69% of the reach's development

is Nonwater-Oriented. Since only 3% of land in this reach is undeveloped, and 2/3rds of the land is privately owned, opportunities to expand commercial uses or shoreline preferred uses are minimal.

Known archaeological, cultural, or historical resources within the reach include one public cemetery.

4.1.1 Summary of Ecological Functions

Indicators of Ecological Functions

		Physical Environment			Biological Environment			Altered Conditions				Overall		
		Available Floodplain Area	Riparian Vegetation	Shoreline Stabilization	Fish-Blocking Culverts	Permanently Protected Areas	PHS Listings	Wetland Acreage	303(d) Listings	Impervious Surface Area	Overwater Roads & Structures	Setbacks to OHWM	Urban Runoff	
Water Quality	Sediment Transport		🟢	🟡	🟡	🟡		🟢	🔴	🟢			🟠	🟡
	Nutrient & Toxic Filtration	🔴	🟢			🟡		🟢	🔴	🟢		🔴	🟠	🔴
	Temperature Regulation		🟢			🟡	🟢		🔴			🔴	🟠	🔴
Water Quantity	Water Storage & Flow Regulation	🔴	🟢		🟡			🟢		🟢	🟢		🟠	🟢
Habitat	Input of Organics & LWM	🔴	🟢	🟡		🟡	🟢			🟢				🟢
	Connectivity to Suitable Habitat		🟢	🟡	🟡	🟡	🟢	🟢		🟢	🟢	🔴		🟢

4.1.2 Physical Environment

↓ **Available Floodplain Areas-** The available floodplain for the Columbia River has been inundated by, and is fully controlled by operations at, the Bonneville Dam. The US Army Corps of Engineers maintains flowage easements for all properties in the reach. The Department of Ecology's Preliminary Channel Migration Zone Map for this reach was developed at a very coarse-scale, and recommends reliance on the Flood Insurance Rate Maps and/or site-specific delineations to more adequately determine the existence of channel migration zones (CMZs). The "Very Poor" aspects of this reach relate to the Corps' current inundation of the floodplain and its authority to further inundate the properties of this reach.

↑ **Riparian Vegetation-** Riparian vegetation covers 73% of the land in this reach, with forest cover accounting for 41% of all land areas. This vegetative cover is similar to the Rock Cove Reach and among the most vegetated of all reaches characterized. Vegetation on shorelands includes deciduous lowland riparian forest and westside lowland confiner-hardwood forest. The lowland riparian forest cover overhangs the shoreline edge and help transfer terrestrial nutrients and energy to the aquatic system by adding organic debris, leaf litter, and insects (allochthonous inputs). The forested areas are a source of large woody debris (LWD) recruitment. However, degraded vegetative cover exists along the berms for the BNSF railroad track SR 14 and provide the main reason why this indicator is deemed "Good" rather than "Excellent".

Table 4.1-2 – Columbia River Reach 1 Land & Water Areas

Land Cover						
Forested	Riparian Vegetation		Vegetated Subtotal	Non-Vegetated Land	LAND TOTAL	Water
	Shrub	Grass				
10.6 ac	2.6 ac	5.8 ac	19.0 ac	7.1 ac	26.1 ac	229.9 ac
40.6%	10.0%	22.2%	72.8%	27.2%	100%	-

360 **Shoreline Stabilization-** The “Fair” rating has been applied to this shoreline reach, which is characterized by a mix of rock outcroppings and fill slopes for the BNSF railroad. The reach’s soil types include differing slope categories of Skamania and Stevenson soils. Skamania soils offer a very fine sandy loam which is Well Drained and has a Moderate availability of water storage. Stevenson soils are loams which are also Well Drained, but offer a High availability of water storage. In most cases these soil types are not subject to high erosion hazards, however, when Stevenson loams exist on very steep slopes—as they do in limited areas in the center of this reach—their erosion hazard is Severe.

365 Knowledge of Geologic Hazard Areas in this reach is less robust than in other reaches within city limits. However, the City’s Geologic Hazards Map includes coverage of some key hazard types. Known soils with severe erosion hazard are detailed above, debris flow hazards are identified at the outlet of Kanaka Creek, and potentially unstable slopes (slopes greater than 25%) can be found along the shoreline (Figures 4 and 5A). Despite the presence of railroad berms similar to Columbia River Reach 3, liquefaction potential is considered Bedrock and subject to minimal concern.

4.1.3 Biological Environment

375 **Fish-Blocking Culverts-** Culverts flank this reach on the east and west. Both the culvert/fish passage on the western edge and the culvert on the eastern edge are considered 100% passable by WDFW. A 100% passable culvert is also identified at the outlet of Vallett Creek. Local reconnaissance also identifies culverts at Vallett Creek and Lutheran Church Road and connecting the wetlands in the center of this reach with the Columbia River. Fish passage through these culverts is unknown. Though passability is a lesser concern, the sheer number of culverts in this reach justifies the “Fair” rating.


380 **Permanently Protected Areas-** No areas in this reach are subject to permanent protective covenants or environmentally protective deed restrictions, though the Port of Skamania is seeking to protect “Slaughterhouse Point” as mitigation for nearby development. Cemetery District ownership provides some protection of the shoreline along Stevenson Cemetery. Of the privately owned properties in this reach, only a small portion is subject to the conservation covenant developed for the Chinidere Mountain Estates subdivision (2017). The remainder of the reach is privately owned and not subject to permanent conservation covenants. While this reach is rated as “Fair” currently, this reach could be considered “Good” if the Port includes protections for Slaughterhouse Point.

390 **Priority Habitat & Species-** The PHS priority habitat types within the reach include one lacustrine littoral habitat at the outlet of Kanaka Creek and two palustrine wetlands as discussed above. The PHS species within the reach include salmonids (Chinook, Coho, Dolly Varden, Chum, Pink Salmon, Coastal

Cutthroat, Sockeye, and Steelhead), white sturgeon (*Acipenser transmontanus*), northern spotted owl (*Strix occidentalis caurina*). The monitored non-PHS species within the reach includes the sand roller (*Percopsis transmontana*). The condition of these habitat and species types has not been evaluated, but their presence is a positive ecological indicator and rate this reach as "Good".

395  **Wetland Acreage-** A total of five wetlands are mapped within the reach for a total of 1.72 acres of NWI and local inventory wetlands. All of these wetlands are palustrine forested wetlands. Three are located between SR 14 and the BNSF tracks and two are located north of SR 14. All of these wetlands drain to the Columbia River and are considered associated wetlands. While the condition of each wetland has not been evaluated their presence is positive and carries a "Good" rating.

400 4.1.4 Altered Conditions

 **303(d) Listings-** The Columbia River within this reach has a Category 5 listing for temperature and the EPA is developing total maximum daily load (TMDL) protocols to address the water quality deficiency. This reach is also subject to pollution from Dioxin as a Category 4A pollutant subject to a TMDL from the EPA. The Columbia is also a Category 2 water of concern for pH, PCBs, Chlorodane, and 4,4'-DDE. The "Very Poor" rating results from these multiple listings.



405  **Impervious Surface Area-** The 1.6 ac total impervious surface coverage in this reach is comparatively low and makes up only 6.2% of its land area. The "Good" rating of the reach is based on its relative lack of impervious coverage and the comparatively low average coverage of the individual lots.

Table 4.1-3 – Columbia River Reach 1 Impervious Surface Comparison

Impervious Surface Areas				
	Total Impervious Area	% Land Covered by Impervious Surfaces	Mean Impervious % of Developed Lots	Median Impervious % of Developed Lots
Reach	1.6 ac	6.2%	16.4%	10.9%
Total Jurisdiction	29.4 ac	14.4%	46.3%	36.2%

410  **Overwater Roads & Structures-** Two private overwater structures are associated with the residential development in the eastern portion of this reach (Figure 15). These 2 structures cover ~1,000 sf of the water's surface. There are no overwater roads, and pilings in this "Good" reach are limited to a concrete river height gage.


415  **Setbacks to OHWM-** Of the 19 total parcels in this reach, only 8 have been developed with structures and only 3 have buildings in shoreline jurisdiction. The average distance of structures from the OHWM is ~30 ft and ~40 ft for buildings (Figure 13). Structures in this context means any building with a rooftop identified within Skamania County's GIS, any parking area, road, or railroad. The setbacks in this reach are narrow relative to other portions of Stevenson's shoreline jurisdiction and the presence of buildings within shoreline jurisdiction justifies this reach's rating of "Very Poor".

Table 4.1-4 – Columbia River Reach 1 Development Proximity to OHWM

Setbacks to OHWM				
	% of Lots with Construction	Smallest Setback	Mean Setback	Median Setback
Buildings	16.7%	1 ft	54 ft	24 ft
Any Structure	38.9%	1 ft	39 ft	24 ft

Urban Runoff- This reach contains only 11% of the total linear footage of shorelines in the Stevenson area, but also contains the outlets of Kanaka, Vallett, and Nelson creeks as well as stormwater outfalls. Together these outlets contribute stormwater runoff from 54% of the Urban Area. Treatment levels for this stormwater range from the recent engineered solution for the Chinidere subdivision to natural filtration along the streams to no treatment. While this reach is the most degraded of all the reaches, the relative lack of dense development in most of the areas draining to this reach spares it from the “Very Poor” designation.

4.1.5 Public Access



Figure 4.1-2 Pebble Beach
A visual and physical access point in Columbia River Reach 1
Photo Credits: Ben Shumaker (2013), BergerABAM (2015)

The reach includes access to the Columbia River from the Port's Pebble Beach. This small park is part of the larger Class IV – Sacred Place described in the Stevenson Comprehensive Plan and includes informal parking areas located in Columbia River Reach 1, approximately 0.1 miles of gravel trails, a picnic table, and park bench with views of the river. Physical access to the middle portion of the reach is difficult because of the active operations along the BNSF tracks and the Stevenson Cemetery in the eastern end of the reach. Public visual access to the shoreline is partially present in this reach by travelling SR 14 and smaller public roads, however the immediate near shore view is obstructed by the elevated rail bed and no formal waysides or viewpoints are present.

4.1.6 Degraded Areas & Restoration Opportunities

Degraded conditions in this reach include:

1. Bonneville impoundment of the Columbia River and inundation of floodplains.
2. Character and coverage of riparian vegetation.

3. Rip rap armoring of the shoreline for the BNSF/SR 14 berm.
4. Culverts under railroad/highway berm and Lutheran Church Road.
5. Unknown character of PHS listings.
6. Unknown character and functions of wetlands.
7. Ecosystem-wide water quality concerns.
8. Proximity of nonwater-oriented structures to OHWM.
9. Quantity & unknown quality of stormwater runoff.

Specific opportunities to restore these degraded conditions will be dealt with in detail in the Restoration Plan and may include replacing culverts, assessing habitat and wetland areas, preserving and enhancing canopy cover, etc.

4.2 Columbia River Reach 2 – Downtown Waterfront



Figure 4.2-1 Columbia River Reach 2
Downtown Stevenson's urbanized waterfront area

Photo Credits: Department of Ecology (2007).

Columbia River Reach 2 is located in the city and includes the downtown waterfront and ~4,175 linear feet of Columbia River shoreline. The reach starts at the eastern limits of the city at Kanaka Creek, and ends downstream at its western limits on the Columbia River, at the center of the BNSF railroad bridge over Rock Creek. There are 222 acres of total land and water area in this reach and 35 acres of land above the OHWM.

Public agencies own 63% of land in this reach and 38% of shorelands are used by the public for recreational purposes. Commercial/industrial uses account for an additional 35% of land use, and the remainder is evenly split between undeveloped and residential. The reach includes two roads in addition to the BNSF tracks—Cascade Avenue and Leavens Street. Nineteen structures and their associated parking add to the impervious surfaces within the reach. Only 30% of the land is developed with Water-Oriented uses.

There are no known archaeological, cultural, or historical resources within the reach.

Table 4.2-1 – Columbia River Reach 2 Land Use Trends

Future Land Use						
	Low Density Residential	High Density Residential	Low Intensity Trade		High Intensity Trade	Total
	0.0%	10%	19%		71%	100%
Current Zoning						
	Residential	Public	Resource	Commercial	Industrial	Total
	11%	32%	0%	40%	17%	100%
Existing Land Use						
Undeveloped	Residential	Public	Resource	Commercial	Industrial	Total
14%	14%	38%	0%	27%	8%	100%
Shoreline Preferred Uses						
		Undeveloped	Single –Family Residential	Water-Oriented	Non-Water Oriented	Total
		14%	10%	30%	47%	100%
Land Ownership						
			Private	Local Government	State or Federal Government	Total
			37%	63%	0%	100%

4.2.1 Summary of Ecological Functions

Indicators of Ecological Functions										
Physical Environment			Biological Environment				Altered Conditions			
Available Floodplain Area			Riparian Vegetation	Shoreline Stabilization	Fish-Blocking Culverts	Permanently Protected Areas	PHS Listings	Wetland Acreage	303(d) Listings	Impervious Surface Area
Overall			Urban Runoff	Setbacks to OHWM	Overwater Roads & Structures	Temperature Regulation	Water Storage & Flow Regulation	Input of Organics & LWM	Connectivity to Suitable Habitat	
Water Quality	Sediment Transport	Water Quality	Water Quantity	Habitat						
	Nutrient & Toxic Filtration									
	Temperature Regulation									
Water Quantity	Water Storage & Flow Regulation									
	Input of Organics & LWM									
Habitat	Connectivity to Suitable Habitat									

4.2.2 Physical Environment

Available Floodplain Areas- The available floodplain for the Columbia River has been inundated by, and is fully controlled by operations at, the Bonneville Dam. The US Army Corps of Engineers maintains flowage

easements for all properties in the reach. The Department of Ecology's Preliminary Channel Migration Zone Map for this reach was developed at a very coarse-scale, and recommends reliance on the Flood Insurance Rate Maps and/or site-specific delineations to more adequately determine the existence of channel migration zones (CMZs). The "Very Poor" aspects of this reach relate to the Corps' current inundation of the floodplain and its authority to further inundate the properties of this reach.

Riparian Vegetation- Riparian vegetation covers only 52% of land in the Downtown Waterfront reach, with forest cover accounting for only 20% of all land areas. Most of the shoreline vegetation is found within the Port of Skamania's park areas and along the residential shorelines. This reach contains the least vegetative cover of all reaches analyzed and has been deemed "Very Degraded". The limited vegetation within the shoreline jurisdiction is characterized by deciduous lowland riparian forest, which overhangs the shoreline edge providing allochthonous nutrient and energy inputs. The trees along the shoreline are a source of LWD recruitment. Specific degraded areas include the commercial/industrial areas operated by the Port of Skamania, Cascade Avenue and the BNSF railroad berm.

Table 4.2-2 – Columbia River Reach 2 Land & Water Areas

Land Cover						
Riparian Vegetation				Non-Vegetated Land	LAND TOTAL	Water
Forested	Shrub	Grass	Vegetated Subtotal			
7.0 ac	3.5 ac	7.9 ac	18.4 ac	16.9 ac	35.3 ac	186.3 ac
19.8%	10.0%	22.5%	52.2%	47.8%	100%	-

Shoreline Stabilization- A mix of natural shoreline and armored slopes characterizes this "Good" reach, with the armoring occurring mostly along the industrial/manufacturing area of the eastern portion. As their name implies, the soils of this reach are Stevenson soils having different slope categories. Stevenson soils are loams which are Well Drained, but offer a High availability of water storage. These soil types are not subject to high erosion hazards, and the erosion occurring along the Port of Skamania's properties is a result of persistence wave action, not because of the soils inherent quality.


The terrain of this reach generally has minimal slope within shoreline jurisdiction (Map 4). The reach is not subject to liquefaction concerns (Figure 5). According to the Stevenson Critical Areas and Geologic Hazards Map (Figure 5A), there are no High Hazard geologic areas within the reach, however there are Moderate Hazard areas associated with the potentially unstable slopes (slopes greater than 25%) immediately adjacent to the OHWM.


4.2.3 Biological Environment

Fish-Blocking Culverts- One culvert is identified by WDFW in this reach at the eastern border and potentially just outside of shoreline jurisdiction. This culvert is categorized as a culvert/fishway and is considered 100% passable however many additional barriers exist further up Kanaka Creek. This reach is rated as "Good" as a result.


Permanently Protected Areas- Ownership in this "Good" rated reach is dominated by the City and the Port of Skamania County. As mitigation for a nearby dredging project ~0.22 miles of the shoreline area is

required to be stabilized and restored and will be subject to ongoing protective agreements between the Port and the City. The remainder of the reach is privately owned and not subject to permanent conservation covenants.

510 **Priority Habitat & Species-**  A lacustrine littoral habitat at the outlet of Kanaka Creek borders this reach on the east and habitat supporting waterfowl concentrations borders the western edge. PHS species within this reach include the salmonids of the Columbia River, white sturgeon, and northern spotted owl. Monitored non-PHS species within the reach include the ring-necked snake and sand roller. The condition of these habitat and species types has not been evaluated, but their presence is a positive ecological indicator, and, like the other Columbia River reaches, justify a "Good" rating.

515 **Wetland Acreage-**  There is one wetland from the local inventory in this reach; it is adjacent to Cascade Avenue, totals 0.21 acres, drains to the Columbia River, and is considered an associated wetland. The presence of this wetland is a positive ecological indicator and justifies the "Good" rating of this reach.

4.2.4 Altered Conditions

520 **303(d) Listings-**  The Columbia River within this reach has a Category 5 listing for temperature and the EPA is developing total maximum daily load (TMDL) protocols to address the water quality deficiency. This reach is also subject to pollution from Dioxin as a Category 4A pollutant subject to a TMDL from the EPA. The Columbia is also a Category 2 water of concern for pH, PCBs, Chlorodane, and 4,4'-DDE. The "Very Poor" rating results from these multiple listings.



525 **Impervious Surface Area-**  This reach is the most urbanized and the most degraded ("Very Poor") in terms of impervious surfaces. The 7.7 ac of impervious land cover is the most of any reach, and the average coverage of this reach's small lots is also greater than any other reach or the Stevenson's overall shoreline jurisdiction.

Table 4.2-3 – Columbia River Reach 2 Impervious Surface Comparison

Impervious Surface Areas				
	Total Impervious Area	% Land Covered by Impervious Surfaces	Mean Impervious % of Developed Lots	Median Impervious % of Developed Lots
Reach	7.7 ac	21.9%	60.6%	74.8%
Total Jurisdiction	29.4 ac	14.4%	46.3%	36.2%

530 **Overwater Roads & Structures-**  The Port of Skamania County maintains 5 overwater structures in this reach (Figure 15). Stevenson Landing at Russell Street is the biggest of these its flanking dolphins provides access for tourboats on the river. The remaining 2 structures are located at the Cascade Avenue boatlaunch, and one of them is removed on a seasonal basis to protect it from wave action caused by the winter's high east winds. While some cosmetic upgrades have been proposed for Stevenson Landing, no structural or in-water work is currently being considered. This reach also contains a number of old pilings, some of which are programmed for removal during the Port's waterfront restoration project. Until that time, the reach will remain in "Poor".

540 **Setbacks to OHWM-** Though more urbanized in terms of impervious surfaces, this reach has surprisingly large setbacks for buildings and other structures. The “Good” rating is based on average building setbacks of approximately 120 ft from the OHWM. Structures such as roads, parking areas and other development are typically located closer to the shoreline, but still nearly 100 ft away. A trend toward larger setbacks is similar to other reaches within city limits, which are typically larger than those of the reaches that have been predesignated.

545 **Table 4.2-4 – Columbia River Reach 2 Development Proximity to OHWM**

Setbacks to OHWM				
	% of Lots with Construction	Smallest Setback	Mean Setback	Median Setback
Buildings	35.4%	20 ft	113 ft	121 ft
Any Structure	59.5%	0 ft	98 ft	87 ft

550 **Urban Runoff-** This reach makes up only 8% of the total linear footage in this report and accepts an even smaller amount of the Stevenson Urban Area’s stormwater (1%). Most recent development in this area uses vegetated swales to control and treat stormwater before it enters the Columbia, but some direct runoff and/or untreated runoff still occurs, most notably at the Cascade Avenue boat launch. The reach has been rated as “Good” because it is affected by the stormwater entering via Kanaka Creek and is downstream from a degraded reach.

4.2.5 Public Access

555 This reach is categorized as a Class IV – Sacred Place by the 2013 Stevenson Comprehensive Plan and contains six public access points to the river as well as approximately 0.5 miles of trail which connects all of the access facilities and meanders along the riverfront. This trail was developed as part of a coordinated system (Figure 4.6-2) and is subject to active erosion issues which the Port of Skamania hopes to fix as part of a large restoration project which will also add paved accessibility and pedestrian amenities. The six physical access points, listed from east to west, are described in detail below.



Figure 4.2-2 Downtown Stevenson Public Access, Eastern Access Points
Motorized and nonmotorized access for recreation on the Stevenson Waterfront.

Photo Credits: Port of Skamania County (Unknown)

Cascade Boat Ramp is located at the east end of the reach and includes a public boat launch (concrete ramp), restrooms with a changing cabana, picnic tables, a grass lawn area, parking, a floating dock, and a gravelly beach for physical access to the water. Informational signage educates visitors of the area's history and enhances the visual access opportunity. Kanaka Creek, a non-SMA stream, enters the Columbia at the upstream edge of this park.

East Point Kite Beach is located immediately downstream from the boat launch and is a favorite with kiteboarders. This visual and physical access point is a dedicated launch site, gives safe, easy access to the river, provides additional parking with broad views, and is located near the restroom and changing cabana which also serves the Cascade Boat Ramp. Physical access is limited to those able to traverse steep, rugged terrain to the water.

Leaven's Point is set between Stevenson Landing and East Point Kite Beach. This small park features river views and picnic opportunities close to the river. Physical access is limited to those able to traverse steep, rugged terrain to the water.

Leavens Point is the location for a large access improvement and restoration project planned by the Port of Skamania County....

Stevenson Landing is cruise ship pier from which passengers access the city. The pier is located on the Columbia River at river mile 150, in the Russell Street right-of-way. The pier is open to the public year-round for views of the Columbia River.

Teo Park is located in downtown Stevenson on the Columbia River at the southern terminus of Russell Street, just upland of Stevenson Landing. This park includes picnic tables, restrooms, and a grassy lawn on the riverbank with views of the river and the Gorge. An informational kiosk and a kinetic sculpture public art installation enhance the visitor experience.

Bob's Beach is a dedicated access for windsurfing on the Columbia River. The park is located in downtown Stevenson west of Teo Park and Stevenson Landing and features a gently sloped grass lawn, covered changing cabana, a spacious, easy launching area, gravel parking area, benches, picnic tables, and a water fountain. The park offers views and easy physical access to the water.



Figure 4.2-2 Downtown Stevenson Public Access, Central Access Points
Leavens Point, Stevenson Landing & Bob's Beach provide visual, motorized and nonmotorized access.

Photo Credits: BergerABAM (2015), BergerABAM (2015), Ben Shumaker (2013)

4.2.6 Degraded Areas & Restoration Opportunities

Degraded conditions in this reach include:

1. Bonneville impoundment of the Columbia River and inundation of floodplains.
2. Aggradation at the mouth of Rock Creek.
3. Character and coverage of riparian vegetation.
4. Rip rap armoring of shorelines.
5. Active shoreline erosion along Port holdings.
6. Culverts and passage for Kanaka Creek.
7. Unknown character of PHS listings.
8. Unknown character and functions of wetland.
9. Ecosystem-wide water quality concerns.
10. Paved coverage of Cascade Avenue, Kanaka Creek Underpass, and parking areas.
11. Proximity of nonwater-oriented structures to OHWM.
12. Sheet pile at Leavens Point.
13. Abandoned pilings.
14. Quantity & unknown quality of stormwater runoff.

Specific opportunities to restore these degraded conditions will be dealt with in detail in the Restoration Plan and may include dredging aggraded areas, incorporating soft armoring along river banks, preserving and enhancing canopy cover, assessing habitat and wetland areas, completing the Port/County Stevenson Waterfront Restoration & Enhancement Project, removing heritage piles, improving stormwater collection and treatment, etc.

4.3 Columbia River Reach 3 – West Urban Area



Figure 4.3-1 Columbia River Reach 3
Former industrial and transportation corridor

Photo Credits: Ben Shumaker (2015), Department of Ecology (2007), Ben Shumaker (2015).

Columbia River Reach 3 is located south of Rock Cove and west of the downtown waterfront. It includes ~8,000 linear feet of the Columbia River shoreline and 396 acres of predesignated shoreline area, 34 acres of which are located above the OHWM. The reach is located outside the city limits and begins at the western boundary of Columbia River Reach 2 at the bridge over Rock Creek and ends downstream at the eastern boundary of Ashes Lake. The reach includes SR 14, BNSF tracks, and privately owned properties. This reach is a shoreline of statewide significance.

Projected land use and existing zoning in this reach involve commercial or industrial trade uses, however, no shorelands are currently devoted to those uses. Based in large part on the 2007 fire at the abandoned Co-Ply

mill, more than 1/3rd of this reach is undeveloped (36%) and no land is currently devoted to Water-Oriented uses.

There are no known archaeological, cultural, or historical resources within the reach.

Table 4.3-1 – Columbia River Reach 3 Land Use Trends

Future Land Use							
	Low Density Residential	High Density Residential	Low Intensity Trade		High Intensity Trade	Total	
	0%	0%	91%		9%	100%	
Current Zoning							
	Residential		Public	Resource	Commercial	Industrial	Total
	0%		0%	4%	31%	65%	100%
Existing Land Use							
Undeveloped	Residential		Public	Resource	Commercial	Industrial	Total
36%	0%		39%	25%	0%	0%	100%
Shoreline Preferred Uses							
			Undeveloped	Single –Family Residential	Water-Oriented	Non-Water Oriented	Total
			36%	0%	0%	64%	100%
Land Ownership							
				Private	Local Government	State or Federal Government	Total
				86%	1%	13%	100%

4.3.1 Summary of Ecological Functions

Indicators of Ecological Functions

		Physical Environment			Biological Environment			Altered Conditions				Overall	
		Available Floodplain Area	Riparian Vegetation	Shoreline Stabilization	Fish-Blocking Culverts	Permanently Protected Areas	PHS Listings	Wetland Acreage	303(d) Listings	Impervious Surface Area	Overwater Roads & Structures		Setbacks to OHWM
Water Quality	Sediment Transport		➤	┃	⬅	➡		┃	➡	➤		⬅	➤
	Nutrient & Toxic Filtration	➡	➤			➡		┃	➡	➤		⬅	➡
	Temperature Regulation		➤			➡	⬅		➡			⬅	➡
Water Quantity	Water Storage & Flow Regulation	➡	➤		⬅			┃		➤	┃	⬅	➤
Habitat	Input of Organics & LWM	➡	➤	┃		➡	⬅			➤			➡
	Connectivity to Suitable Habitat		➤	┃	⬅	➡	⬅	┃		➤	┃	➤	➤

4.3.2 Physical Environment

Available Floodplain Areas- The available floodplain for the Columbia River has been inundated by, and is fully controlled by operations at, the Bonneville Dam. The US Army Corps of Engineers maintains flowage easements for all properties in the reach. The Department of Ecology's Preliminary Channel Migration Zone Map for this reach was developed at a very coarse-scale, and recommends reliance on the Flood Insurance Rate Maps and/or site-specific delineations to more adequately determine the existence of channel migration zones (CMZs). The "Very Poor" aspects of this reach relate to the Corps' current inundation of the floodplain and its authority to further inundate the properties of this reach.

Riparian Vegetation- Riparian vegetation nearly two-thirds of the land in this reach, but forested lands make up only 28% of the land cover. This composed of deciduous lowland riparian forest, which can be a source allochthonous inputs and for recruitment of LWM. However, this coverage is on the lower end of when compared to the other reaches of this report and is "Degraded". Specific degraded areas include former and/or sparsely used industrial sites and the berm supporting the BNSF railroad and SR 14.

Table 4.3-2 – Columbia River Reach 3 Land & Water Areas

Land Cover						
Forested	Riparian Vegetation			Non-Vegetated Land	LAND TOTAL	Water
	Shrub	Grass	Vegetated Subtotal			
9.6 ac	6.9 ac	5.6 ac	22.1 ac	12.1 ac	34.2 ac	396.7 ac
28.2%	20.1%	16.4%	64.6%	35.4%	100%	-

Shoreline Stabilization- A mix of natural shoreline and armored slopes characterizes the reach, with the armoring occurring mostly along the BNSF railroad/highway berm and in select locations of the industrial/manufacturing area at the far west of the reach. The reach's soil types include Arents and Steever soils. Arents soils are composed of gravelly sandy loams and Steever soils are stony or gravelly clay loams. These soils both are Well Drained, and have Moderate availability of water storage.

Geologic hazards have not been mapped for many areas of this reach which are outside of city limits, but the areas of the reach with slopes greater than 25% have Moderate Hazard potentially unstable slopes (Figure 5A) and the terrain is a result of the Cascade Landslide Complex. The railroad/highway berm has a High liquefaction potential in the event of earthquakes (Figure 5). The relative lack of concerns in comparison to the other reaches characterized justifies the "Fair" rating.

4.3.3 Biological Environment

Fish-Blocking Culverts- There are no culverts identified on the WDFW inventory within this reach and an "Excellent" rating is easily justified.

Permanently Protected Areas- This reach is rated as "Very Poor" because there are no areas subject to permanent protective covenants or environmentally protective deed restrictions and because the entirety of this reach is under private ownership.

Priority Habitat & Species- The PHS priority habitat supporting waterfowl concentrations are located in this reach. PHS species within it Columbia River salmonids, white sturgeon, and northern spotted owl. The only monitored non-PHS species within the reach is the ringneck snake. The condition of these habitat and species types has not been evaluated, but their presence is a positive ecological indicator, and, like the other Columbia River reaches, justify a "Good" rating.

Wetland Acreage- The "Fair" rating applies to this reach which contains no mapped local inventory or NWI wetlands (Figure 8).

4.3.4 Altered Conditions

303(d) Listings- The Columbia River within this reach has a Category 5 listing for temperature and the EPA is developing total maximum daily load (TMDL) protocols to address the water quality deficiency. This reach is also subject to pollution from Dioxin as a Category 4A pollutant subject to a TMDL from the EPA. The Columbia is also a Category 2 water of concern for pH, PCBs, Chlorodane, and 4,4'-DDE. The "Very Poor" rating results from these multiple listings.

Impervious Surface Area- Large areas of the formerly industrial sites in this reach contain impervious surfaces, which cover 6.6 ac in total. A comparison of developed lot coverage is not available for this reach or the Ashes Lake reach based on the aggregation of certain data used in the analysis. However, visual reconnaissance indicates that impervious coverage in this reach is similar to the Rock Cove reach and has been rated as "Poor".

Table 4.3-3 – Columbia River Reach 3 Impervious Surface Comparison

Impervious Surface Areas				
	Total Impervious Area	% Land Covered by Impervious Surfaces	Mean Impervious % of Developed Lots	Median Impervious % of Developed Lots
Reach	6.6 ac	19.3%	??	??
Total Jurisdiction	29.4 ac	14.4%	46.3%	36.2%

Overwater Roads & Structures- A private ~1,000 sf dock is located in the western portion of this reach (Figure 15). The aquatic area of the shoreline also includes a number of pilings at various locations in this reach. There are no overwater roads and this reach has been rated as "Fair".

Setbacks to OHWM- No properties in this reach have buildings in shoreline jurisdiction, but nearly half are developed with roads, parking areas or other structure types. This predesignated reach has the closest average setback to the OHWM at 20 ft. The "Poor" rating of the reach reflects the proximity of structures to the OHWM and lack of buildings.

Table 4.3-4 – Columbia River Reach 3 Development Proximity to OHWM

Setbacks to OHWM

	% of Lots with Construction	Smallest Setback	Mean Setback	Median Setback
Buildings	0%	-	-	-
Any Structure*	42.9%	0 ft	24 ft	15 ft

*Based on data aggregated with Ashes Lake Reach. Average setbacks for structures include the proximity of Ash Lake Road and SR 14 to the OHWM of Ashes Lake.

Urban Runoff- While containing 15% of the linear footage of shorelines in the Stevenson Urban Area, this reach only accepts stormwater from 2% of that area. Separated from uphill drainage by the state highway and the railroad, the runoff entering the Columbia River in this reach comes only from shoreline properties. A "Very Good" rating for this reach is not justified because treatment of stormwater for these former industrial properties and transportation corridors is minimal and the reach is downstream from more degraded runoff areas.

4.3.5 Public Access

Physical and visual access to the Columbia River waterfront is limited because of the continuous presence of the elevated rail bed of the BNSF tracks and SR 14 and private ownership. The reach does not include any park benches, boat launches with access to the river, or trails.. At the June 8, 2015 community vision workshop, attendees recommended improved shoreline access to the Columbia River waterfront with a preference for continued public access along the shoreline. The scope and style of this access will largely depend on the type of development that occurs along this reach. Development with a commercial or tourist focus should result in greater public physical and visual access, including a marina if the property owners wish to pursue opportunities for the best site identified in a 1995 study covering the mid-Columbia Gorge region. Development with an industrial focus may result in shoreline public access that is limited to viewpoints, overlooks, or other forms of visual access.

4.3.6 Degraded Areas & Restoration Opportunities

Degraded conditions in this reach include:

1. Bonneville impoundment of the Columbia River and inundation of floodplains.
2. Aggradation at the mouth of Rock Creek.
3. Character and coverage of riparian vegetation.
4. Rip rap armoring of shorelines.
5. Unknown character of PHS listings.
6. Ecosystem-wide water quality concerns.
7. Paved coverage of roads and former industrial site.
8. Proximity of nonwater-oriented structures to OHWM.
9. Abandoned pilings.
10. Quantity & unknown quality of stormwater runoff.

Specific opportunities to restore these degraded conditions will be dealt with in detail in the Restoration Plan and may include dredging aggraded areas, incorporating soft armoring along river banks, preserving and

enhancing canopy cover, assessing habitat areas, removing heritage piles, improving stormwater collection and treatment, etc.

4.4 Rock Creek Reach 1



Figure 4.4-1 Upper Rock Creek
Bedrock stream channel of Rock Creek above First and Second Falls

Photo Credit: BergerABAM (2015).

Rock Creek Reach 1 includes the shoreline jurisdictional area associated with Rock Creek within the City's boundaries. On the east/south side of this stream, this reach covers the area within city limits at the approximate extension of Lasher Street downstream to the BNSF railroad trestle. This reach runs along the west/north side of the stream from Ryan Allen Road at the upstream end to the BNSF railroad trestle at the downstream end. The southwester boundary of this reach between and the Rock Cove reach is hard to define, running southward over the Creek's deltaic deposits toward the trestle. This reach includes ~10,375 linear feet of shoreline, 44 acres of shorelands, and 4 acres of water within shoreline jurisdiction. This reach is not a shoreline of statewide significance.

A data collection error prevents full reporting of existing and projected land uses similar to other reaches. Visual reconnaissance indicates that most of the upper portion of this reach is undeveloped or developed with residential uses. Public uses dominate the lower portion of the reach, where the majority of the reach's Water-Oriented uses occur. In terms of zoning, the reach is primarily zoned as suburban residential, followed by smaller areas of multi-family residential, public use and recreation, and commercial zoning. There is both private and public land ownership within the reach.

745 Some of the roads within the reach include SW Rock Creek Drive, First Falls View Road, HH Ave, Holly Street, NW Still Cove Lane, Stevenson Transfer Site Road, Neyland Road, Bounty Way, and Ryan Allen Road.

The only known archaeological, cultural, or historical resource within the reach is the cemetery.

4.4.1 Summary of Ecological Functions

Indicators of Ecological Functions														
		Physical Environment			Biological Environment				Altered Conditions				Overall	
		Available Floodplain Area	Riparian Vegetation	Shoreline Stabilization	Fish-Blocking Culverts	Permanently Protected Areas	PHS Listings	Wetland Acreage	303(d) Listings	Impervious Surface Area	Overwater Roads & Structures	Setbacks to OHWM		Urban Runoff
Water Quality	Sediment Transport		🟢	🔴	🟡	🟢		🟡	🔴	🔴		🔴	🟡	
	Nutrient & Toxic Filtration	🟡	🟢			🟢		🟡	🔴	🔴	🟢	🔴	🟡	
	Temperature Regulation		🟢			🟢	🟡		🔴		🟢	🔴	🟢	
Water Quantity	Water Storage & Flow Regulation	🔴	🟢		🟡		🟡		🔴	🔴		🔴	🔴	
Habitat	Input of Organics & LWM	🔴	🟢	🔴		🟢	🟡			🔴			🟡	
	Connectivity to Suitable Habitat		🟢	🔴	🟡	🟢	🟡	🟡		🔴	🔴	🟢	🟡	

4.4.2 Physical Environment

750 **Available Floodplain Areas-** The floodplain for lower Rock Creek is subject to much of the same inundation and flowage easements as the Columbia River. This inundation causes the sediments of Rock Creek to sink prior to its confluence with the Columbia River. The stream's bed has risen since construction of the Bonneville Dam and with it, the stream's capacity to hold floodwaters has been diminished. The capacity of the floodplain has been further reduced by the presence of dredge spoils deposited in the floodplain after the Piper Road Landslide of 2007. The available floodplain for upper Rock Creek has not been impacted by the Bonneville Dam or the flowage easements of the USACE. The rating for this indicator is "Poor", reflecting the balance between the differing dynamics of the upper and lower stream. The Department of Ecology's Preliminary Channel Migration Zone Map for this reach identifies the potential existence of CMZs and recommends better delineation of potential CMZs at the site-specific level.

760 **Riparian Vegetation-** With 91% total coverage and 63% forest cover, this reach provides "Excellent" vegetative cover. The westside lowlands conifer-hardwood and deciduous lowland riparian forested shorelands are a source of allochthonous inputs and LWD recruitment. Where degraded areas exist in this reach they occur at the lower end of Rock Creek where City and County public works and service facilities occur on shorelands, where the BNSF and SR 14 berms enter into downtown Stevenson.

Table 4.4-1 – Rock Creek Reach 1 Land & Water Areas

Land Cover						
Forested	Riparian Vegetation		Vegetated Subtotal	Non-Vegetated Land	LAND TOTAL	Water
	Shrub	Grass				
27.3 ac	6.6 ac	5.7 ac	39.6 ac	3.9 ac	43.5 ac	4.0 ac
62.7%	15.2%	13.2%	91.1%	8.9%	100%	-

Shoreline Stabilization- The lower portion of this reach is armored, while the portions above Vancouver Avenue are more natural. Arents, Skamania, Steever and Stevenson soils all exist along this reach, with Steever's stony clay loams and Stevenson's loams as the primary soil types. All soils in this reach are Well Drained. The Stevenson soils have a High availability of water storage compared to the Moderate availability of the other reaches. Based on their slop the Steever soils of this reach present a High erosion hazard.

Many portions of this reach are categorized as High Hazard areas based on the Debris Flow Hazard and Landslide areas, and Unstable Soils (Fibure 5A). The areas of the reach with slopes greater than 25% present a Moderate Hazard. The northern portion of the reach was adjacent to the Piper Road Landslide of 2007 and might be expected to be destabilized based on the changes in the watercourse of Rock Creek downstream of the 70' waterfall. The lower portions of this reach have been overwhelmed by the amount of sediment that has entered the system as a result of the landslide, and the "Very Poor" rating is easily understood.

4.4.3 Biological Environment

Fish-Blocking Culverts- The WDFW inventory for this reach identifies the highway bridge as a passable crossing. Neither the railroad nor the Rock Creek Drive bridges are identified by WDFW, but both are passable. The reach is subject to an identified natural passage barrier for migrating Chinook and steelhead based on the dramatic 70' waterfall located ~0.85 miles upstream from the Columbia River. There are no culverts identified on the WDFW inventory within this reach. This combination of passable manmade barriers and impassable natural barriers justifies the "Fair" rating for this reach.

Permanently Protected Areas- The full shoreline jurisdiction of the Angel Heights subdivision (2005) is covered by a conservation easement benefitting the City. This ~0.33 mile stretch of Rock Creek is allows only 2 specific types of uses while 19 are prohibited as inconsistent with the easement. Much of the lower portion of this reach is under City and County ownership providing some confidence in responsible stewardship. The remainder of this "Excellent" reach is subject to private ownership without conservation covenants.

Priority Habitat & Species- The PHS priority habitat type within the reach includes palustrine aquatic habitat. PHS species within it include northern spotted owl and residential coastal cutthroat and rainbow trout, as well as migratory Chinook and steelhead. The monitored non-PHS species within the reach is the ringneck snake. Having fewer overall listings than the Columbia River reaches, this reach carries a "Fair" rating. Future assessment of the condition of these habitat and species types may lead to a change of this indicator's rating.

Wetland Acreage- The "Fair" rating applies to this reach which contains no mapped local inventory or NWI wetlands (Figure 8).

4.4.4 Altered Conditions

303(d) Listings- The lower portion of this reach below Rock Creek Drive is subject to the same Category 5 temperature listing as the Columbia River. The EPA has not yet developed total maximum daily load (TMDL) protocols to address this water quality deficiency. This listing does not include the upper portion of the reach, and there are no other types of 303(d) listings occur within this reach.

Impervious Surface Area- This highly urbanized reach contains 6.6 ac of total impervious surfaces, which exist at a higher proportion than the overall shorelines reviewed in this report. However, individual developed lots have less impervious surfaces when compared to the shorelines of the entire Stevenson Urban Area. Impervious surfaces are concentrated near and south of the bridge at Rock Creek Drive. The reach has been rated "Poor".

Table 4.4-2 – Rock Creek Reach 1 Impervious Surface Comparison

Impervious Surface Areas				
	Total Impervious Area	% Land Covered by Impervious Surfaces	Mean Impervious % of Developed Lots	Median Impervious % of Developed Lots
Reach	6.6 ac	15.1%	22.1%	17.3%
Total Jurisdiction	29.4 ac	14.4%	46.3%	36.2%

Overwater Roads & Structures- This "Very Poor" reach has the most overwater roads & structures in Stevenson's shoreline jurisdiction. The Rock Creek Drive bridge, a pedestrian-only bridge and the SR 14 bridge are joined by a private deteriorating dock (Figure 15). Additionally, the BNSF railroad bridge marks the southern extent of this reach. In total, these structures cover ~14,000 sf of the stream. The Rock Creek Drive and SR 14 bridges both have piers placed in the water. The City intends to replace the Rock Creek Drive bridge with a freespan structure. The BNSF bridge is proposed for replacement and preliminary designs indicate a removal of the piers that constitute a portion of the OHWM. The replacement project may also provide for the removal of some pilings and other dilapidated structures in the vicinity.

Setbacks to OHWM- Nearly half of the properties in this reach are developed in some fashion and most of the developed lots contain some type of building. The average location of these buildings is nearly 100 ft from the OHWM, and structures are typically located slightly closer. This reach is rated as "Good" and contrasts interestingly with the development setback trends of Rock Creek Reach 2 which has a lesser rating.

Table 4.4-3 – Rock Creek Reach 1 Development Proximity to OHWM

Setbacks to OHWM				
	% of Lots with Construction	Smallest Setback	Mean Setback	Median Setback
Buildings	40.4%	11 ft	93 ft	87 ft
Any Structure	47.4%	6 ft	88 ft	77 ft



Urban Runoff- The shoreline for this reach of Rock Creek accounts for 20% of shoreline linear footage and accepts stormwater runoff from 9% of the Stevenson Urban Area. The runoff it does accept has minimal treatment. While WSDOT's engineered system treats stormwater from the state highway, far more untreated runoff is entering this reach. Within shoreline jurisdiction, this happens directly from parking lots. Of most concern is the lack of treatment of runoff entering at Vancouver Avenue, which drains a large section of Stevenson's historic residential core. This reach has been rated as "Very Poor" based on these trends.

4.4.5 Public Access

The reach is part of a Class IV – Sacred Place described in the Stevenson Comprehensive Plan and includes visual public access from the Mill Pond Trail and pedestrian walkways along the SW Rock Creek Drive Bridge, which provides views of Rock Creek. The County Fairgrounds are located on the west side of Rock Creek, south of SW Rock Creek Drive and provides informal physical access to the stream. There is a pedestrian bridge implemented as part of a coordinated pedestrian circulation plan (Figure 4.6-2) to connect the Fairgrounds with downtown Stevenson.



Figure 4.4-2 Rock Creek Reach 2
A potential public access site and pedestrian bridge on lower Rock Creek
Photo Credits: Michelle Rusek (2012), Ben Shumaker (2015).

At the June 8, 2015 community vision workshop conducted for the update, stakeholders stated that sedimentation from the Piper Road Landslide is causing scenic enjoyment issues for recreationalists and visitors. The attendees also discussed how during low flows or low dam levels, this sedimentation prevents fishers and kayakers from travelling between Rock Creek to the Columbia River. Additionally, stakeholders suggested improving the surfacing and amenities offered along the trails near Rock Creek and providing continuous public access along the shoreline. Access to the Rock Creek Falls is described below. Potential visual access could be developed on the Angel Heights Park site. Other projects considered include development of a public physical access and picnic site at the location of the dilapidated tug boat dock between the SR14 and railroad bridges.

4.4.6 Restoration Opportunities



Figure 4.4-3 Potential Restoration Opportunities, Rock Creek Reach 1
Dilapidated structures and City-owned facilities present opportunities for restoration.

Photo Credits: Benjamin AM (2015), Ben Shrumaker (2013), Ben Shrumaker (2013)

4.4.6 Degraded Areas & Restoration Opportunities

Degraded conditions in this reach include:

1. Bonneville impoundment of the Columbia River and inundation of floodplains.
2. Aggradation of lower Rock Creek.
3. Shoreline instability near the Piper Road Landslide.
4. Character and coverage of riparian vegetation along lower Rock Creek.
5. Rip rap armoring of shorelines.
6. Presence of piers in Rock Creek for the SR 14 and Rock Creek Drive bridges.
7. Unknown character of PHS listings.
8. Ecosystem-wide water quality concerns.
9. Paved coverage of roads and parking areas.
10. Proximity of nonwater-oriented and abandoned structures to OHWM, including abandoned residential and former transportation structures.
11. Abandoned pilings.
12. Quantity & unknown quality of stormwater runoff.
13. Quality of stormwater entering from Vancouver Avenue stormwater outfall.

Specific opportunities to restore these degraded conditions will be dealt with in detail in the Restoration Plan and may include dredging aggraded areas, incorporating soft armoring along river banks, preserving and enhancing canopy cover, assessing habitat areas, removing heritage piles, improving stormwater collection and treatment, etc. Additional solutions will be based in part on the June 8, 2015 community vision workshop where it was stated that infrastructure at the mouth of Rock Creek constrains natural processes such as stream flow/mobility.

4.5 Rock Creek Reach 2

Rock Creek Reach 2 includes shoreline jurisdictional area associated with the north/east bank of Rock Creek in the unincorporated Urban Area. This includes the area ~5,325 linear feet from the City boundary at about Lasher Street to the urban area boundary just north of Ryan Allen Road. The reach 30 acres of land and 7 acres of water. The City is choosing to predesignate this reach. This reach is not a shoreline of statewide significance.

Projected land uses in this reach have a residential focus. However, currently only 25% of the land is used for residential purposes. County ownership of 37% of this reach will likely preclude future residential

880 **development.** None of the land in this reach is used for Water-Oriented purposes. There are no known archaeological, cultural, or historical resource within the reach.

Table 4.5-1 – Rock Creek Reach 2 Land Use Trends

Future Land Use						
	Low Density Residential	High Density Residential	Low Intensity Trade		High Intensity Trade	Total
	93%	0%	3%		3%	100%
Current Zoning						
	Residential	Public	Resource	Commercial	Industrial	Total
	100%	0%	0%	0%	0%	100%
Existing Land Use						
Undeveloped	Residential	Public	Resource	Commercial	Industrial	Total
41%	25%	20%	14%	0%	0%	100%
Shoreline Preferred Uses						
		Undeveloped	Single-Family Residential	Water-Oriented	Non-Water Oriented	Total
		41%	25%	0%	33%	100%
Land Ownership						
			Private	Local Government	State or Federal Government	Total
			61%	37%	1%	100%

4.5.1 Summary of Ecological Functions

Indicators of Ecological Functions													
		Physical Environment			Biological Environment				Altered Conditions				Overall
		Shoreline Stabilization	Riparian Vegetation	Available Floodplain Area	Fish-Blocking Culverts	Permanently Protected Areas	PHS Listings	Wetland Acreage	303(d) Listings	Impervious Surface Area	Overwater Roads & Structures	Setbacks to OHWM	
Water Quality	Sediment Transport	🔴➡	🟢➡➡		🔴➡	🟡	🟡		🟢➡	🟢➡		🟢➡	🟢➡
	Nutrient & Toxic Filtration		🟢➡	🟢➡		🟡	🟡	🟢➡	🟢➡		🟡	🟢➡	🟢➡➡
	Temperature Regulation		🟢➡			🟡	🟠➡	🟢➡			🟡	🟢➡	🟢➡➡
Water Quantity	Water Storage & Flow Regulation		🟢➡	🟢➡	🔴➡		🟡		🟢➡	🟢➡		🟢➡	🟢➡➡
Habitat	Input of Organics & LWM	🟢➡	🟢➡	🔴➡		🟡	🟠➡			🟢➡			🟢➡
	Connectivity to Suitable Habitat		🟢➡	🔴➡	🔴➡	🟡	🟠➡	🟡		🟢➡	🟢➡	🟡	🟡

4.5.2 Physical Environment

Available Floodplain Areas- The floodplain for the very southern portion of this reach of Rock Creek is subject to much of the same inundation and flowage easements as the Columbia River. This inundation causes the sediments of Rock Creek to sink prior to its confluence with the Columbia River. The stream's bed has risen since construction of the Bonneville Dam and with it, the stream's capacity to hold floodwaters has been diminished. The available floodplain for upper Rock Creek has not been impacted by the Bonneville Dam or the flowage easements of the USACE. The rating for this indicator is "Good", reflecting the limited coverage of lower Rock Creek in this reach. The Department of Ecology's Preliminary Channel Migration Zone Map for this reach identifies the potential existence of CMZs and recommends better delineation of potential CMZs at the site-specific level.

Riparian Vegetation- The most vegetated of all reaches, the "Excellent" vegetative cover adds up to 94% of all land, with 75% covered by forest. These forests are westside lowlands conifer-hardwood and deciduous lowland riparian, and they provide a source of LWD recruitment and allochthonous inputs. Degraded areas in this reach are localized to the area affected by the Piper Road Landslide.

Table 4.5-2 – Rock Creek Reach 2 Land & Water Areas

Land Cover						
Forested	Riparian Vegetation		Vegetated Subtotal	Non-Vegetated Land	LAND TOTAL	Water
	Shrub	Grass				
22.6 ac	1.3 ac	4.7 ac	28.6 ac	1.8 ac	30.4 ac	6.5 ac
74.4%	4.2%	15.5%	94.1%	5.9%	100%	-

Shoreline Stabilization- Shoreline armoring is not evident in this reach. Steeple soils predominate, with very small pockets of Stevenson soils at the very upper and very lower portions. The Steeple soils are Well Drained stony and gravelly clay loams. They have a Moderate availability of water storage and present a Severe erosion hazard because of the steep slopes that are present.

A large portion of the center of this reach was part of the Piper Road Landslide of 2007 and is still subject to some scarp toppling and slow rotational ground movement. This area is the best known, and highest hazard area characterized in this report and the landslide has deposited an overwhelming amount of sediment into the reach. This "Very Poor" reach also includes Debris Flow Hazards, Unstable Soils and other High Hazard areas as well as Moderate Hazard areas having slopes greater than 25% (Figure 5A).

4.5.3 Biological Environment

Fish-Blocking Culverts- This reach is subject to an identified natural passage barrier based on the 70' waterfall located ~0.85 miles upstream from the Columbia River. There are no culverts identified on the WDFW inventory within this reach; however the natural barriers of this reach justify its "Very Poor" rating.

Permanently Protected Areas- No areas in this reach are subject to permanent protective covenants or environmentally protective deed restrictions. County ownership provides some protection of the area near

the 2007 Piper Road landslide. However, Skamania County has recently sold property within this reach to private owners, and it is unknown whether this trend will continue and the "Fair" rating is appropriate.

Priority Habitat & Species- No PHS priority habitat types are designated within the reach. PHS species within it include resident coastal cutthroat, winter steelhead, rainbow trout, and northern spotted owl. The comparative lack of PHS listings in this reach is interpreted as a negative ecological indicator, as reflected in the "Poor" rating.

Wetland Acreage- The "Fair" rating applies to this reach which contains no mapped local inventory or NWI wetlands (Figure 8).

4.5.4 Altered Conditions

303(d) Listings- There are no 303(d) listings within this "Excellent" reach.

Impervious Surface Area- In terms of both total coverage (1.1 ac) and reach-wide percentage of coverage (3.6%), this reach has less overall pavement, gravel, or rooftops than any other. The larger lot size of the properties in this reach contributes to the average impervious coverage that less than half of the next closest reach. The "Excellent" rating reflects the lack of comparable reaches within in this analysis.

Table 4.5-3 – Rock Creek Reach 2 Impervious Surface Comparison

Impervious Surface Areas				
	Total Impervious Area	% Land Covered by Impervious Surfaces	Mean Impervious % of Developed Lots	Median Impervious % of Developed Lots
Reach	1.1 ac	3.6%	7.9%	4.5%
Total Jurisdiction	29.4 ac	14.4%	46.3%	36.2%

Overwater Roads & Structures- Ryan Allen Road crosses Rock Creek at the westernmost portion of this reach. Its freespan from bank to bank covers ~2,000sf and is located ~30 ft above water level. No other roads or structures have been constructed over the waters of this "Good" reach.

Setbacks to OHWM- Only a quarter of the properties in this reach are developed with buildings, but with an average of approximately 75 ft, these buildings' location is closer to the OHWM than the other Rock Creek reach. More than half of the properties contain some kind of developed structures, and the average setback increases to nearly 100 ft. The reach has a "Fair" rating overall.

Table 4.5-4 – Rock Creek Reach 2 Development Proximity to OHWM

Setbacks to OHWM				
	% of Lots with Construction	Smallest Setback	Mean Setback	Median Setback
Buildings	23.0%	71 ft	77 ft	74 ft
Any Structure	61.5%	0 ft	95 ft	89 ft



Urban Runoff- Unlike most others, this reach drains a proportionate amount of the Stevenson Urban Area (13%) compared to its linear footage (10%). While engineered treatment systems are relatively infrequent, the lack of density of the areas draining to this reach makes this a lesser concern and the “Good” designation is appropriate.

4.5.5 Public Access

Despite the large amount of public ownership in this reach, there is limited public access. Visual public access is limited to the Ryan Allen Road bridge. Physical public access does not currently exist.



Figure 4.5-1 Upper & Lower Rock Creek Falls
Upper Falls as seen from Rock Creek Reach 1, Lower Falls showing inaccessibility and mass wasting based on the Piper Road Landslide
Figure Credit: Turnniss Tippel (2008), Department of Transportation (2007).

Rock Creek Falls, especially Upper Rock Creek Falls, is identified as a potential Class IV – Sacred Place in the Comprehensive Plan. Development of amenities at this location has been debated in the past and often declined to keep this hidden wonder a locals-only amenity. At the June 8, 2015 community vision workshop conducted for the update, stakeholders suggested improving the trails near Rock Creek waterfalls. If developed as a visual public access site, the County-owned property in this reach could be considered for parking, access trails, and a picnic area. Physical access to this reach is likely to remain difficult.

4.5.6 Degraded Areas & Restoration Opportunities

Degraded conditions in this reach include:

1. Bonneville impoundment of the Columbia River and inundation of floodplains.
2. Aggradation of lower Rock Creek.
3. Shoreline instability near the Piper Road Landslide.
4. Character and coverage of riparian vegetation near the Piper Road Landslide.
5. Unknown character of PHS listings.
6. Proximity of nonwater-oriented structures to OHWM.
7. Quantity & unknown quality of stormwater runoff.

Specific opportunities to restore these degraded conditions will be dealt with in detail in the Restoration Plan and may include dredging aggraded areas, preserving and enhancing canopy cover, increasing connectivity between sections of Rock Creek, assessing habitat areas, improving stormwater collection and treatment, etc.

4.6 Rock Cove



Figure 4.6-1 Rock Cove
An aerial photo showing early sedimentation impacts from the Piper Road landslide
Figure Credit: Department of Ecology (2002)

970 The Rock Cove reach includes the waterbody otherwise known as the Stevenson Mill Pond, Stevenson Lake, Rock Creek Pond, or Hegewald Mill Pond. Rock Cove is located in the city and connected to Rock Creek Reach 1 to the north of Columbia River Reach 3. The reach includes all of Rock Cove, the northern fill slope of SR 14, and western portions of the Skamania County Fairgrounds, the Columbia Gorge Interpretive Center, other County-owned properties, and three residential properties. Including the islands in the cove, there are
975 ~18,800 linear feet of shoreline, 69 acres of water, and 35 acres of shorelands. This reach is not a shoreline of statewide significance.

More than 60% of land in this reach is owned by public agencies and 82% of the land is developed with some type of use. The majority of land (56%) is used for commercial purposes, and 54% of land use is Water-Oriented. Projected land uses focus on adding commercial and public uses.

980 Outside of the resources curated by the Interpretive Center, there are no known archaeological, cultural, or historical resources within the reach.

Table 4.6-1 – Rock Cove Land Use Trends

Future Land Use						
	Low Density Residential	High Density Residential	Low Intensity Trade		High Intensity Trade	Total
	0%	2%	98%		0%	100%
Current Zoning						
	Residential	Public	Resource	Commercial	Industrial	Total
	14%	55%	0%	30%	0%	100%
Existing Land Use						
Undeveloped	Residential	Public	Resource	Commercial	Industrial	Total
18%	10%	16%	0%	56%	0%	100%
Shoreline Preferred Uses						
		Undeveloped	Single –Family Residential	Water-Oriented	Non-Water Oriented	Total
		18%	4%	54%	25%	100%
Land Ownership						
			Private	Local Government	State or Federal Government	Total
			39%	55%	6%	100%

4.6.1 Summary of Ecological Functions

Indicators of Ecological Functions

		Physical Environment			Biological Environment			Altered Conditions				Overall	
		Available Floodplain Area	Riparian Vegetation	Shoreline Stabilization	Fish-Blocking Culverts	Permanently Protected Areas	PHS Listings	Wetland Acreage	303(d) Listings	Impervious Surface Area	Overwater Roads & Structures		Setbacks to OHWM
Water Quality	Sediment Transport		🟢	🟢	🟢	🟢		🟢	🟡	🟡		🟡	🟢
	Nutrient & Toxic Filtration	🔴	🟢			🟢		🟢	🟡	🟡	🟢	🟡	🟡
	Temperature Regulation		🟢			🟢	🟢		🟡		🟢	🟡	🟢
Water Quantity	Water Storage & Flow Regulation	🔴	🟢		🟢		🟢		🟡	🟡	🟡	🟡	🟡
Habitat	Input of Organics & LWM	🔴	🟢	🟢		🟢	🟢			🟡			🟢
	Connectivity to Suitable Habitat		🟢	🟢	🟢	🟢	🟢	🟢		🟡	🟡	🟢	🟢

4.6.2 Physical Environment

⬇ **Available Floodplain Areas-** The available floodplain for Rock Cove has been inundated by, and is fully controlled by operations at, the Bonneville Dam. The US Army Corps of Engineers maintains flowage easements for all properties in the reach. The sedimentation of Rock Creek impacts Rock Cove as well, and

990 the lake's capacity to hold floodwaters has been diminished. Rock Cove is a lake and not subject to channel
migration. The "Very Degraded" aspects of this reach relate to the Corps' current inundation of the floodplain
and its authority to further inundate the properties of this reach.

995 **Riparian Vegetation-** Similar in character to the Columbia River reach east of Stevenson, this "Good"
rated reach provides vegetative cover over 77% of the land in this reach and 37% of the land is forested. The
forested areas along the Cove and on its islands are a source of allochthonous nutrient and energy inputs
and LWD recruitment. Similar to other reaches, these forested areas include westside lowlands conifer-
hardwood forest and deciduous lowland riparian forest. This reach is unique from the other reaches of this
characterization based on the County Fairgrounds and Columbia Gorge Interpretive Center which increases
grass covered lands to 28%. Degradation exists along the transportation corridors of Rock Creek Drive and
1000 SR 14, and at a former industrial site on the west end of the Cove.

Table 4.6-2 – Rock Cove Land & Water Areas

Land Cover						
Forested	Riparian Vegetation		Vegetated Subtotal	Non-Vegetated Land	LAND TOTAL	Water
	Shrub	Grass				
12.6 ac	4.1 ac	9.7 ac	26.4 ac	8.1 ac	34.6 ac	4.0 ac
36.5%	12.0%	27.9%	76.5%	23.5%	100%	-

1005 **Shoreline Stabilization-** A mix of natural shoreline and armored slopes are present in this reach, with the
natural areas located primarily along the islands and the Columbia Gorge Interpretive Center property. The
reach's soil types include Arents, Bonneville and Steever soils. Arents soils are composed of gravelly sandy
loams. Bonneville soils are stony sandy loams. Steever soils are stony or gravelly clay loams. Arents and
Steever soils both are Well Drained, and have Moderate availability of water storage. Bonneville soils are
Somewhat Excessively Drained, have a Very Low availability of water storage, and a Slight erosion hazard.
The Rock Cove reach is rated as "Good" and has limited Geologic Hazards. The slopes greater than 25%
1010 present a Moderate Hazard as potentially unstable slopes (Figure 5A). The greatest hazard in the reach is the
High liquefaction potential of the railroad/highway berm if an earthquake were to occur.

4.6.3 Biological Environment

1015 **Fish-Blocking Culverts-** There are no culverts identified on the WDFW inventory within this reach,
however, local reconnaissance identified a culvert in the western portion of this reach for Foster Creek. The
ability of fish to pass through this culvert is unknown. The presence of this culvert is all that prevents
application of the "Excellent" rating.

1020 **Permanently Protected Areas-** Ownership in this reach is shared by Columbia Gorge Interpretive Center,
Skamania County, and WSDOT. These public and non-profit entities will ensure that a degree of responsible
stewardship for shoreline use and development within this "Good" rated reach; however, no areas in this
reach are subject to permanent protective covenants or environmentally protective deed restrictions.

Priority Habitat & Species- The PHS priority habitat types within the reach support waterfowl concentrations and palustrine aquatic habitat. The PHS species within the reach include northern spotted owl, Canada goose, Chinook, steelhead, and resident and rainbow trout and coastal cutthroat. The only monitored non-PHS species within the reach is the ringneck snake. This reach shares the "Good" rating with the Columbia River reaches which also serve several species and habitat purposes.

Wetland Acreage- A 0.03-acre local inventory wetland is mapped in a northern portion of the reach and a 0.27 acre emergent wetland is mapped in the western portion of shoreline jurisdiction. Neither is identified on the NWI maps (Figure 8). The presence of this wetland is a positive ecological indicator and justifies the "Good" rating of this reach.

4.6.4 Altered Conditions

303(d) Listings- This reach is subject to the same Category 5 temperature listing as the Columbia River. The EPA has not yet developed total maximum daily load (TMDL) protocols to address this water quality deficiency. No other 303(d) listings occur within this reach.

Impervious Surface Area- A total of 5.7 ac of impervious areas are located in this reach which has a higher proportion of such surfaces than that of the overall jurisdiction characterized in this report. However, the proportion of each developed lot that is covered by impervious surfaces is less than the overall proportion, a difference is explained in part by the reach's comparatively large lot sizes. The "Poor" designation of this reach reflects its similarity to Columbia River Reach 3 and Rock Creek Reach 1.

Table 4.6-3 – Rock Cove Impervious Surface Comparison

Impervious Surface Areas				
	Total Impervious Area	% Land Covered by Impervious Surfaces	Mean Impervious % of Developed Lots	Median Impervious % of Developed Lots
Reach	5.7 ac	16.5%	25.3%	21.9%
Total Jurisdiction	29.4 ac	14.4%	46.3%	36.2%

Overwater Roads & Structures- Two apparently communal overwater structures are located adjacent to each other in the northern portion of this in this reach (Figure 15). The total surface area of these 2 structures is ~1,000 sf. Rock Cove also contains numerous pilings driven in during its history as a mill pond. There are no overwater roads and this reach has been rated as "Fair".

Setbacks to OHWM- Nearly half of the properties in this reach contain buildings, and their setbacks average nearly 100 ft from the OHWM. Roads and other structures are even more ubiquitous and, though the closest structure is only 15 ft away, the average setback is still nearly 100 ft from the OHWM. The "Good" rating of this reach reflects the larger setbacks and the larger trend separating city reaches from predesignated reaches.

Table 4.6-4 – Rock Cove Development Proximity to OHWM

Setbacks to OHWM

	% of Lots with Construction	Smallest Setback	Mean Setback	Median Setback
Buildings	45%	71 ft	108 ft	96 ft
Any Structure	80%	15 ft	88 ft	92 ft

Urban Runoff- Rock Cove receives runoff from 17% of the Stevenson Urban Area while making up 36% of shoreline linear footage. Runoff enters primarily from Foster Creek and from storm systems along SR 14 and Rock Creek Drive. Treatment levels for this runoff are mixed. The Angel Heights & Hidden Ridge subdivisions maintain engineered systems, as does the City for some transportation corridors. Natural filtration is relied on within Foster Creek, and limited amounts of untreated runoff enter the Cove. While on the cusp of “Fair,” the “Poor” rating is more appropriate for this reach based on the density of development in the drainage area.

4.6.5 Public Access

The entire Rock Cove reach is considered a Class IV – Sacred Place in the Stevenson Comprehensive Plan. This Sacred Place includes visual and physical access to Rock Cove from the Columbia Gorge Interpretive Center, Rock Creek Park, and the Skamania County Fairgrounds. The reach includes interpretive signs, park benches with views of the river, an informal nonmotorized boat launch with access to the water on the western side of Rock Cove, walkways, and the Mill Pond Trail.

Figure 4.6-2 Pedestrian & Bicycle Links for Rock Cove, Columbia River Reach1, & Columbia River Reach 2
A plan from 1991, partially implemented
Figure Credit: WalkerMacy (1991).

The multi-use trail along the Cove is a result of a long term effort to connect Skamania Lodge to downtown Stevenson, and easement exists to provide additional pedestrian pathways along the western, county-owned property. The Comprehensive Plan describes potential enhancements for this area, including landscaping plans for publicly owned areas and dredging of sediments deposited after the Piper Road Landslide.

Stakeholders at the June 8, 2015 community vision workshop recommended public access improvements such as: (1) improving the existing boat launch, which is in a state of disrepair; (2) improving access for recreational activities including fishing, boating, swimming, and kayaking; and (3) improving shoreline access

to the Columbia River waterfront, with a preference for **continuous** public access along the City's shoreline rather than **disconnected** segments **of differing surfacing and amenity levels.**

4.6.6 Restoration Opportunities



Figure 4.6-3 Potential Restoration Opportunities, Rock Cove
Pilings and other relics of Rock Cove's industrial past.

Photo Credits: BergerABAM (2015), Ben Shumaker (2013)

4.4.6 Degraded Areas & Restoration Opportunities

Degraded conditions in this reach include:

1. Bonneville impoundment of the Columbia River and inundation of floodplains.
2. Aggradation from Rock Creek.
3. Character and coverage of riparian vegetation.
4. Rip rap armoring of shorelines.
5. Culvert for Foster Creek.
6. Unknown character of PHS listings.
7. Unknown character and functions of wetland.
8. Ecosystem-wide water quality concerns.
9. Paved coverage of roads and parking areas.
10. Proximity of nonwater-oriented and abandoned structures to OHWM, including abandoned and former industrial fences and concrete structures.
11. Abandoned pilings.
12. Quantity & unknown quality of stormwater runoff.

Specific opportunities to restore these degraded conditions will be dealt with in detail in the Restoration Plan and may include dredging aggraded areas, replacing the culvert for Foster Creek under Rock Creek Drive, incorporating soft armoring along banks, preserving and enhancing canopy cover, assessing habitat and wetland areas, removing heritage piles, removing former industrial fences and structures, improving stormwater collection and treatment, etc.

4.7 Ashes Lake

The Ashes Lake reach includes **only** the extreme eastern portion of Ashes Lake, **two** road rights-of-way (Ash Lake and Mallicott), and **small** portions of privately owned properties. This reach is located within the **Stevenson Urban Area**, west of Skamania Lodge and north of SR 14, and is being predesignated. **The**

Columbia River frontage south of the highway and railroad is part of Columbia River Reach #3, previously described. The shoreline jurisdictional area of this reach includes all lands extending landward for 200 feet from the OHWM and landward floodplains within 200 feet. This reach is not a shoreline of statewide significance.

1105 Land uses in this reach are projected to involve commercial trade, though 63% of the reach is currently undeveloped. The primary existing land use within this reach is road right-of-way, with smaller areas that are undeveloped and private/commercial forest. The reach includes no known archaeological, cultural, or historical resources.

Table 4.7-1 – Ashes Lake Land Use Trends

Future Land Use							
	Low Density Residential	High Density Residential	Low Intensity Trade		High Intensity Trade	Total	
	0%	0%	100%		0%	100%	
Current Zoning							
	Residential		Public	Resource	Commercial	Industrial	Total
	0%		0%	37%	63%	0%	100%
Existing Land Use							
Undeveloped	Residential		Public	Resource	Commercial	Industrial	Total
63%	0%		0%	37%	0%	0%	100%
Shoreline Preferred Uses							
			Undeveloped	Single –Family Residential	Water-Oriented	Non-Water Oriented	Total
			63%	0%	0%	37%	100%
Land Ownership							
				Private	Local Government	State or Federal Government	Total
				100%	0%	0%	100%

1110

4.7.1 Summary of Ecological Functions

Indicators of Ecological Functions		Indicators of Ecological Functions											
		Physical Environment			Biological Environment			Altered Conditions				Overall	
		Available Floodplain Area	Riparian Vegetation	Shoreline Stabilization	Fish-Blocking Culverts	Permanently Protected Areas	PHS Listings	Wetland Acreage	303(d) Listings	Impervious Surface Area	Overwater Roads & Structures		Setbacks to OHWM
Water Quality	Sediment Transport		»	«	«	«			«	»			«
	Nutrient & Toxic Filtration	»	»			«			«	»	»		»
	Temperature Regulation		»			«			«		»		
Water Quantity	Water Storage & Flow Regulation	»	»		«					»	«		
Habitat	Input of Organics & LWM	»	»	«		«				»			»
	Connectivity to Suitable Habitat		»	«	«	«				»	«	»	«

4.7.2 Physical Environment

» **Available Floodplain Areas-** The available floodplain for Ashes Lake has been inundated by, and is fully controlled by operations at, the Bonneville Dam. The US Army Corps of Engineers maintains flowage easements for all properties in the reach. Ashes Lake is a lake and not subject to channel migration. The “Very Degraded” aspects of this reach relate to the Corps’ current inundation of the floodplain and its authority to further inundate the properties of this reach.

» **Riparian Vegetation-** Specific percentages of vegetative cover have not been developed for this reach, based on its small size. However, the land is primarily non-vegetated based on the presence of Ash Lake and Mallicott roads. Where vegetation exists in this “Very Poor” reach, it includes westside lowlands conifer-hardwood forest, deciduous lowland riparian forest, and some shrub and grass lands. The forested area along Ashes Lake is a source of LWD recruitment and allochthonous inputs.

◀ **Shoreline Stabilization-** The stony and gravelly clay loam Steever soils of this reach are partially armored along this reach. These soils are well drained and have Moderate ratings for both available water storage and erosion hazards. Stevenson’s 2008 Critical Areas Map does not cover this reach, but areas with slopes greater than 25 percent may be potentially unstable.

Knowledge of Geologic Hazard Areas in this reach is less robust than in other reaches within city limits. However, areas with slopes greater than 25% present a Moderate geologic hazard, and other factors affecting shoreline stabilization are expected to be similar to Rock Cove, a similar road-constricted impoundment of the Columbia River backwaters. These reaches share the “Good” rating.

4.7.3 Biological Environment

Fish-Blocking Culverts- There are no culverts identified on the WDFW inventory within this reach and an "Excellent" rating is easily justified.

Permanently Protected Areas- No permanently protected areas have been identified in this reach. However, the "Good" rating reflects the public stewardship of the Ash Lak Road and SR 14 rights-of-way along the water's edge provide some assurance of responsible shoreline development.

Priority Habitat & Species- The PHS priority habitat types within the reach support waterfowl concentrations. The PHS species within the reach include northern spotted owl and the ringneck snake, a monitored species. Since this reach supports fewer priority species than the Rock Cove reach, it carries a "Fair" rating.

Wetland Acreage- The "Fair" rating applies to this reach which contains no mapped local inventory or NWI wetlands (Figure 8).

4.7.4 Altered Conditions

303(d) Listings- There are no 303(d) listings within this "Excellent" reach.

Impervious Surface Area- A comparison of full percentages of impervious surface coverage in this reach is not available at this time. However, the reach is characterized as "Very Poor" based on the presence of the paved Ash Lake Road and the graveled Mallicott Road which cover 1.6 ac of this small reach.

Table 4.7-2 – Ashes Lake Impervious Surface Comparison

Impervious Surface Areas				
	Total Impervious Area	% Land Covered by Impervious Surfaces	Mean Impervious % of Developed Lots	Median Impervious % of Developed Lots
Reach	1.6 ac	??	??	??
Total Jurisdiction	29.4 ac	14.4%	46.3%	36.2%

Overwater Roads & Structures- This "Excellent" reach contains no overwater roads or structures.

Setbacks to OHWM- No buildings are located in this reach, and the closest structure on any lot within the reach is 106 ft from the OHWM. However, the method of data collection combined the roads of this reach with Columbia River Reach 3. Visual reconnaissance confirms that both Ash Lake Road and SR 14 are located closer than 106 ft to the OHWM, and justify its "Poor" rating.

Table 4.7-3 – Ashes Lake Development Proximity to OHWM

Setbacks to OHWM

	% of Lots with Construction	Smallest Setback	Mean Setback	Median Setback
Buildings	0%	-	-	-
Any Structure*	33.3%	106 ft	106 ft	106 ft

*Based only on lots, road data is aggregated with Columbia River Reach 3 and located closer to the OHWM than 106 ft.

1 Urban Runoff- Though it only contains 1% of the total shoreline linear footage of the area, this reach accepts Stormwater from 5% of the Stevenson Urban Area. There is a relatively lack of development within that drainage area and most runoff occurs from gravel roads with some natural filtration. The "Fair" rating is appropriate at this time.

4.7.5 Public Access

The Ashes Lake reach includes very limited public access to Ashes Lake and the Columbia River. The Ash Lake-Mallicott road corridor functions as an informal portion of the Trail of the Gods between Stevenson and the Bridge of the Gods. There are no boat ramps, interpretive signs, or parks. There is a small area along Ash Lake Road that some may use as a pull-off for viewing the lake, but sight lines are limited. Ashes Lake is also visible from the SR 14 travel corridor.

4.7.6 Degraded Areas & Restoration Opportunities

Degraded conditions in this reach include:

1. Bonneville impoundment of the Columbia River and inundation of floodplains.
2. Character and coverage of riparian vegetation.
3. Rip rap armoring of shorelines.
4. Unknown character of PHS listings.
5. Unknown character and functions of wetland.
6. Paved coverage of roads.
7. Proximity of nonwater-oriented structures to OHWM.
8. Abandoned pilings.
9. Quantity & unknown quality of stormwater runoff.

Specific opportunities to restore these degraded conditions will be dealt with in detail in the Restoration Plan and may include incorporating soft armoring along banks, preserving and enhancing canopy cover, assessing habitat areas, removing heritage piles, improving stormwater collection and treatment, etc.

4.8 Summary of Recommendations from Section 4

[To be compiled in later draft after public review]

5.0 Use Analysis

The SMA and the state's shoreline guidelines (WAC 173-26-176) acknowledge and support increased human use of shoreline properties. This use, according to the state legislature, is subject to "ever increasing pressures of additional uses," which must be managed through increased coordination so as to avoid "the inherent harm [of] an uncoordinated and piecemeal development of the state's shorelines." In short, the state wants to see shorelines put to their highest and best use. As the shoreline guidelines state (WAC 173-26-201(2)(d)), the preferences and priorities for shoreline uses involve:

- Reserve appropriate areas for protecting and restoring ecological functions to control pollution and prevent damage to the natural environment and public health.
- Reserve shoreline areas for water-dependent and associated water-related uses.
- Reserve shoreline areas for other water-related and water-enjoyment uses that are compatible with ecological protection and restoration objectives.
- Locate single-family residential uses where they are appropriate and can be developed without significant impact to ecological functions or displacement of water-dependent uses.
- Limit nonwater-oriented uses to those locations where the above described uses are inappropriate or where nonwater-oriented uses demonstrably contribute to the objectives of the SMA.

This section of the inventory and characterization report discusses the current uses of Stevenson's shorelines, whether current uses are preferred or water-oriented, analyzes potential future uses of shoreline areas, and provides recommendations for accommodating such uses in the future.

5.1 Land Ownership

Ownership trends are markedly different between the areas within Stevenson's existing city limits and the urban expansion area (i.e., predesignated) considered in this report. Within the City's jurisdiction, ownership is split, with 53.9% private and 46.1% public. However, in the urban expansion area, private ownership increases to 70.0%. Skamania County—holding 22.1% of all shoreline areas considered in this report—is the single largest public shorelines landowner for both city and county jurisdiction areas. The largest private landholding within the City belongs to the nonprofit Columbia Gorge Interpretive Center, which encompasses approximately 65.4 acres for the museum's grounds and the waters of Rock Cove. The largest private landholding outside city limits is the approximately 70-acre site of the old Co-Ply plywood mill. Map Figure 11 and Error! Reference source not found. below present ownership type by jurisdiction within the City's shoreline jurisdiction.

Table 5.1-1 – Existing Ownership by Jurisdiction

Ownership Type			City Jurisdiction		County Jurisdiction (Predesignated)		Combined	
Public		Acreage	Percent	Acreage	Percent	Acreage	Percent	
	Cemetery	0.6	0.6%	2.7	2.7%	3.3	1.6%	
	City	8.7	8.2%	0.0	0.0%	8.7	4.2%	
	County	28.2	26.8%	16.9	17.1%	45.1	22.1%	
	Federal	-	-	0.5	0.5%	0.5	0.2%	
	Port	8.2	7.8%	2.7	2.7%	10.9	5.3%	
	State	2.9	2.7%	6.8	6.9%	9.7	4.7%	
Private		56.9	53.9%	68.9	70.0%	125.8	61.7%	
Total		105.5	100%	98.4	100%	204.0	100%	

5.2 Land Use and Water Dependency

5.2.1 Future Land Use & Zoning

The existing land uses within the City's shoreline jurisdiction are dominated by undeveloped lands which make up 33.7% of shoreline jurisdiction. As accounted for in the 2013 Stevenson Comprehensive Plan, the remaining land usage involves public uses—city, county, state, and federal uses—at 26.9%, tourism uses are 15.5%, 12.8% are single-family residential, 6.3% are timber related, 2.6% involve multi-family residential, 1.3% manufacturing, and only 0.8% are other types of commercial uses.

The 2013 Stevenson Comprehensive Plan also projects land usage in the City and urban expansion area, defining 4 broad categories of land use and an "Urban Reserve" concept for lands that should be reserved for uses those categories but which cannot yet be developed as such. These Future Land Use designations act as umbrellas for different categories of zoning districts. Table 5.2-1 provides the summary of these different designations as they apply to the areas reviewed by this report.

Table 5.2-1 – Future Land Use and Zoning Designations

Future Land Use Designation	City Jurisdiction		County Jurisdiction (Predesignated)		Combined	
	Acreage	Percent	Acreage	Percent	Acreage	Percent
Low Density Residential	26.7	0.6%	38.3	38.9%	65.0	31.9%
High Density Residential	11.5	8.2%	-	-	11.5	5.7%
Urban Reserve: High Density Residential	0.6	26.8%	-	-	0.6	0.3%
Low Intensity Trade	41.4	0.0	10.5	10.7%	51.9	25.4%
Urban Reserve: Low Intensity Trade	0.2	7.8%	25.0	25.4%	25.2	12.3%
High Intensity Trade	25.2	2.7%	-	-	25.2	12.3%
Urban Reserve: High Intensity Trade	-	-	24.7	25.1%	24.7	12.1%
Total	105.5	100%	98.4	100%	204.0	100%

Zoning Types	City Jurisdiction		County Jurisdiction (Predesignated)		Combined	
	Acreage	Percent	Acreage	Percent	Acreage	Percent
Low Density Residential Districts	30.2	28.6%	-	-	30.2	14.8%
High Density Residential Districts	14.2	13.4%	40.4	41.0%	54.5	26.7%
Public Districts	30.4	28.8%	-	-	30.4	14.9%
Low Intensity Trade Districts	10.5	9.9%	35.9	36.5%	46.4	22.8%
High Intensity Trade Districts	20.3	19.2%	22.1	22.5%	42.4	20.8%
Total	105.5	100%	98.4	100%	204.0	100%

5.2.2 Preferred and Water-Dependent Uses

55 Highest and best utilization of shoreline areas involves accommodating water-oriented uses while discouraging non-water-oriented uses.

Water-oriented uses include varying degrees of reliance on and connection to shorelines of the state.

- "Water-Dependent Use" means a use or portion of a use which cannot exist in a location that is not adjacent to the water and which is dependent on the water by reason of the intrinsic nature of its operations (WAC 173-26-020(39)).
- "Water-Related Use" means a use or portion of a use which is not intrinsically dependent on a waterfront location but whose economic viability is dependent upon a waterfront location because:

- The use has a functional requirement for a waterfront location such as the arrival or shipment of materials by water or the need for large quantities of water; or
- The use provides a necessary service supportive of the water-dependent uses and the proximity of the use to its customers makes its service less expensive and/or more convenient (WAC 173-26-020(43)).

- “Water-Enjoyment Use” means a recreational or other use that facilitates public access to the shoreline as a primary characteristic of the use, or a use that provides for recreational use or aesthetic enjoyment of the shoreline for a substantial number of people as a general characteristic of the use and which, through location, design, and operation, ensures the public’s ability to enjoy the physical and aesthetic qualities of the shoreline. In order to qualify as a water-enjoyment use, the use must be open to the public and the shoreline-oriented space within the project must be devoted to the specific aspects of the use that foster shoreline enjoyment (WAC 173-26-020(40)).

“Non-Water-Oriented Uses,” then, are uses that are not water-dependent, water-related, or water-enjoyment, and might include baseball fields, doctor’s offices, vacuum repair shops, or box factories. Non-water-oriented uses may be vital contributors to the local economy or provide important services for local residents, but they are discouraged in shoreline areas because they do not rely on a shoreline location for their operation.

As these definitions apply to Washington’s shorelines, a ferryboat dock would be considered a water-dependent use, and the ticketing office and/or vehicle waiting areas would be considered water-related. A dockside restaurant or boardwalk souvenir shop would be considered water-enjoyment, but a gas station for ferried vehicles would be a non-water-oriented use. In an industrial scenario, a harbor and crane transferring raw materials or goods from truck to barge would be considered a water-dependent use. A grain silo or warehouse storing the goods prior to transshipment would be a water-related use. A green space providing visual access to the water would be a water-enjoyment use, but a warehouse or factory for goods that are not shipped by water would be a non-water-oriented use.

In a Stevenson-specific scenario, the tour boat landing could be considered a water-dependent use. A retail operation selling or renting sails or kites would be considered water-related, while the windsurfing or kiteboarding launch site would be considered a water-dependent use. A restaurant open to the public with a view of the water would also be considered water-enjoyment, but a drive-through savings bank, even with a similar view, would be a non-water-oriented use.

Table 5.2-2 – Existing Water-Oriented Uses

Land Areas (Excluding Water)				
Status	Preferred Use	Acreage	% Developed Land	% Developed & Undeveloped Land
Developed Land	Water-Dependent	1.5	1.1%	0.7%
	Water-Related	0.3	0.3%	0.2%
	Water-Enjoyment	30.3	22.4%	14.9%
	Single-Family	26.1	19.3%	12.8%
	Non Water-Oriented	76.9	56.9%	37.7%
	<i>Subtotal</i>	135.2	100%	n/a
Undeveloped Land	<i>Subtotal</i>	68.8	n/a	33.7%
	Total	204.0	100%	100%

Though preferred under the SMA, water-oriented uses are relatively absent along Stevenson's shorelines. The majority of developed lands are not developed with uses preferred by the SMA and 19.3% of developed lands are used as single-family residences. This leaves only 23.8% of land used for water-oriented purposes and a shocking 1.1% (1.5 acres) of all developed land is dependent on its shoreline location.

5.3 Projected Shoreline Use and Potential Use Conflicts

The SMA requires that jurisdictions analyze future demand for shoreline space and ensure that the uses are consistent with the SMA. The City's shoreline jurisdictional area includes an urban waterfront with intensive transportation and commercial uses, and so it is required to coordinate with DNR and Port authorities to ensure consistency with harbor area statutes and regulations as well as with port plans. The City must also identify measures and strategies to encourage appropriate use of these shoreline areas in accordance with the SMA and the Stevenson comprehensive plan, while also determining allowable uses, resolving potential use conflicts, and planning for the restoration of ecosystem-wide processes and shoreline ecological functions over time.

The Planning Director of the City of Stevenson provided information about several shoreline development opportunities and potential shoreline use conflicts within the City during a June 2, 2015 teleconference with BergerABAM staff^[A11]. These development opportunities consider balanced development of industrial, commercial, residential, recreational, and other uses, while also aiming to incorporate solutions for shoreline protection and the preservation of ecological processes and functions. Table 5.3-1 – Projected Shoreline Uses and Potential Conflicts

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	P O
Columbia River	CR-1 (predesignated)	Stevenson Cemetery	Non Water-Oriented, Cemetery	Limited potential for changes of use. Current use unlikely to conflict with adjacent parcels. Normal maintenance and repair of existing structures not anticipated to conflict with shoreline preferred uses.	P p a
	CR-1 (predesignated)	Slaughterhouse Point (small bump –out in center of reach)	Undeveloped	Port has expressed a desire for possible water access/ recreational use and/or habitat mitigation site for downtown Port development. Future development unlikely to conflict with adjacent parcels, but may conflict with SMA preference to protect and enhance ecological functions.	P p a c
	CR-1 (predesignated)	Pebble Beach	Water-Dependent/ Enjoyment, recreation site	Port has had some discussion about providing improved or additional recreation. Presence of BNSF railroad creates potential use conflicts at this site, and development could conflict with shoreline protection and enhancement goals.	P p in
	CR-2	East Point Launch, Port Industrial Site	Water-Dependent/ Related, Non Water-Oriented, recreation site and industrial buildings	Water access at this area is a motorized boat launch and the main kiteboarding site. Port is permitted to restore the Columbia River shoreline in the western part of this site which would extend the OHWM ~ 60'. Use conflicts exist between recreational users and industrial users for parking spaces and traffic operations. A 1995 fatal flaw analysis identified this area for a possible marina. Expansion of existing cidery with restaurant and tasting room has been considered. This would add a preferred Water-Enjoyment use, but present potential conflicts related to parking and industrial traffic operations. Future development of this site could conflict with preference for protecting and enhancing shoreline ecological functions if the Columbia River restoration project is not completed.	P p E e in tr re

provides some information on the various shoreline development opportunities and potential conflicts within the City grouped by waterbody and reach. Projected shoreline uses and potential use conflicts are summarized below for all reaches within the City and predesignated areas, with the exceptions of Rock Creek Reach 2 and Ashes Lake, where no development opportunities were identified.

120

Table 5.3-1 – Projected Shoreline Uses and Potential Conflicts

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	Public Access Opportunities
Columbia River	CR-1 (predesignated)	Stevenson Cemetery	Non Water-Oriented, Cemetery	Limited potential for changes of use. Current use unlikely to conflict with adjacent parcels. Normal maintenance and repair of existing structures not anticipated to conflict with shoreline preferred uses.	Publicly-owned, potential for visual access improvements
	CR-1 (predesignated)	Slaughterhouse Point (small bump-out in center of reach)	Undeveloped	Port has expressed a desire for possible water access/recreational use and/or habitat mitigation site for downtown Port development. Future development unlikely to conflict with adjacent parcels, but may conflict with SMA preference to protect and enhance ecological functions.	Publicly-owned, potential water-only access to picnic or camping area
	CR-1 (predesignated)	Pebble Beach	Water-Dependent/ Enjoyment, recreation site	Port has had some discussion about providing improved or additional recreation. Presence of BNSF railroad creates potential use conflicts at this site, and development could conflict with shoreline protection and enhancement goals.	Publicly-owned, potential to expand/improve amenities
	CR-2	East Point Launch, Port Industrial Site	Water-Dependent/ Related, Non Water-Oriented, recreation site and industrial buildings	Water access at this area is a motorized boat launch and the main kiteboarding site. Port is permitted to restore the Columbia River shoreline in the western part of this site which would extend the OHWM ~60'. Use conflicts exist between recreational users and industrial users for parking spaces and traffic operations. A 1995 fatal flaw analysis identified this area for a possible marina. Expansion of existing cidery with restaurant and tasting room has been considered. This would add a preferred Water-Enjoyment use, but present potential conflicts related to parking and industrial traffic operations. Future development of this site could conflict with preference for protecting and enhancing shoreline ecological functions if the Columbia River restoration project is not completed.	Publicly-owned, potential for Water-Enjoyment business expansion, improvement of the trail and addition of recreational amenities

Table 5.3-1, Continued

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	Public Access Opportunities
Columbia River	CR-2	Narrow, Port-owned outparcels	Water-Enjoyment/Related, Non Water-Oriented	Port has discussed redevelopment of this site and removal of the water-related maintenance building and vacant residence. Restaurant building likely to remain. Port is permitted to restore the Columbia River shoreline adjacent to this site, add a non-motorized physical access point, move the OHWM ~80' south and prevent active erosion which threatens the foundation of the restaurant building. Future development of this site could conflict with preference for protecting and enhancing ecological functions and could limit existing visual access to the shoreline from Cascade Avenue.	Publicly-owned, potential for Water-Oriented business expansion, improvement of the trail and addition of recreational amenities
	CR-2	Stevenson Landing	Water-Dependent/Enjoyment	Site is used as a park. Port would like to redevelop a portion of this for water-oriented businesses, and improve aesthetics of the pier at the landing. This site is the western terminus of the permitted restoration project and will change the location of the OHWM. Teo Park to the west of the landing is unlikely to change use. Conflicts (noise, wind shadow) with adjacent uses are exist when tourboats are docked at Stevenson Landing. Future development could conflict with visual access from Cascade Avenue and the SMA preference for protection and enhancement of ecological functions.	Publicly-owned, potential for Water-Oriented business addition, improvement of the trail and addition of recreational amenities
	CR-2	Hotel site (12 units)	Water-Enjoyment	Based on assumed profitability, potential for redevelopment is low. Site is subject to easement for public trail along the shoreline which connects Stevenson Landing to Bob's Beach. Parking conflicts exist and may increase between this site and Bob's Beach.	Privately-owned, potential to improve trail surfacing in public easement

Table 5.3-1, Continued

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	Public Access Opportunities
Columbia River	CR-2	Bob's Beach, Port Office	Water-Dependent/Related	<p>Site is the main windsurfing location. Change of use is unlikely, but Port has discussed adding amenities to the site, including expanded rigging areas, additional physical access, a bathroom and paved parking. Port has discussed demolishing and rebuilding on the site of an abandoned garage adjacent to a wetland and adding a deck to the office building as potential use for weddings.</p> <p>Parking conflicts exist and may increase between this site and the adjacent hotel. Some wind shadow conflicts are possible when a tourboat is docked at Stevenson Landing. Some conflicts may arise with residential properties west of this site.</p> <p>Future development could conflict with SMA preference for protecting and enhancing shoreline ecological functions.</p>	Publicly-owned, potential for new physical access at western edge of site, improvement and addition of recreational amenities
	CR-2	Residential Properties	Single-Family Residential, undeveloped	<p>Future Land Use and Zoning maps were recently changed to designated these properties as residential. Change in use is unlikely, though development of vacant sites is assumed. Sedimentation at the mouth of Rock Creek is changing the character and may lead to unanticipated requests for changes of use</p> <p>Use conflicts may occur on the eastern edge of this site and with recreationalists on the water searching for a convenient respite site.</p> <p>Future development may conflict with ecological function preferences of the SMA and public visual access from Cascade Avenue.</p>	Privately-owned, potential to preserve visual access from Cascade Avenue. Unknown potential for physical access may develop based on sedimentation trends near Rock Creek

Table 5.3-1, Continued

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	Public Access Opportunities
Columbia River	CR-3 (predesignated)	Former industrial sites, including site of former Co-Ply mill	Non Water-Oriented, undeveloped	Sites are zoned by county as industrial. Private owners may be interested in annexation if development requires water and/or sewer. Future Land Use map would permit either industrial or commercial zoning. Potential future uses include industrial development and reestablishment of barge dock for shipment of goods. The western portion of the site contained the fewest barriers for development of a regional marina based on a 1995 study of the Oregon and Washington shorelines of the mid-Columbia River, but current owners have stated development of a marina is unlikely. Site access conflicts may develop with the BNSF railroad, but conflicts with other adjacent uses is unlikely. Future development may conflict with shoreline preferred uses, including protection and enhancement of ecological functions and water-orientation of uses.	Privately-owned, nature and scope of access opportunities will depend on character of future development. Continuous public pedestrian access unlikely if developed for industry
	RC-1	Trailer Park Site	Water-Dependent (abandoned), Non Water-Oriented	This site involves the greatest likelihood for changes of use from the existing mobile home park (upland area) and abandoned barge dock. Owners have expressed a desire to sell the property for redevelopment. BNSF has expressed a desire to replace the bridge of Rock Creek at the southwestern edge of this site. Noise conflicts may occur between this site and the BNSF and SR 14 corridors, but conflicts with other adjacent uses is unlikely. Future development could conflict with water-orientation and ecological function preferences of the SMA.	Privately-owned, potential for new physical access at abandoned barge dock and pedestrian trail access from/under SR 14 and/or BNSF line depending on current sedimentation trends from Rock Creek.
Rock Creek					

Table 5.3-1, Continued

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	Public Access Opportunities
Rock Creek	RC-1	Lower Rock Creek, east bank	Water-Enjoyment, Non Water-Oriented, undeveloped	<p>Development and change of use is highly likely. The Future Land Use designation of these properties is High Intensity Trade. Commercial development is expected on the undeveloped site. The County-owned site includes a pedestrian bridge over Rock Creek and non-water oriented utility uses which may be redeveloped for commercial purposes. This area also includes Rock Creek Drive bridge, which is scheduled for replacement by the City with a freespanning structure with greater freeboard.</p> <p>This area is subject to uncertainty regarding the location of the OHWM based on dredging and the placement of materials dredged after the 2007 Piper Road Landslide.</p> <p>Use conflicts may occur with neighboring residential properties and between vehicular and pedestrian traffic. Future development could conflict with preferred uses from the SMA, including protection and enhancement of ecological functions and water-orientation of uses.</p>	Publicly- and Privately-owned, opportunities exist to provide continuous pedestrian access along Rock Creek with a potential connection under SR 14. Expanded and new public amenities could be added near the bridges, including improved visual and physical access.
	RC-1	Middle Rock Creek, east bank	Single-Family Residential	<p>Change of use is likely for one abandoned, city-owned home, which could be used for transportation and/or stormwater management purposes, unlikely otherwise. Changes to traffic patterns present the most likely use for this area depending on the location for the replacement of Rock Creek Drive Bridge. Future development may conflict with the SMA preference to protect and enhance shoreline ecological functions.</p>	Publicly- and Privately-owned, opportunities exist to provide additional visual and physical access at city-owned residential
	RC-2	Piper Road Landslide Area	Undeveloped	<p>Change of use unlikely.</p> <p>Use conflicts may occur based on sedimentation from landslide area or stormwater intrusion into unstable area from uplands.</p>	Publicly- and Privately-owned, limited potential for visual or physical access

Table 5.3-1, Continued

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	Public Access Opportunities
Rock Creek	RC-2	Upper Rock Creek Falls	Undeveloped	Low-to-moderate likelihood of land use change. If changes occur, it could generate use conflicts between neighboring residences, the County Transfer Station on uplands, and shoreline preferred uses, especially if an overlook or picnic site is developed at Upper Rock Creek Falls. Site has a Future Land Use Designation as Urban Reserve High Intensity Trade, which would facilitate continued use of the Transfer Station and development of an industrial park adjacent to it.	Publicly- and Privately-owned, opportunities exist to provide public visual access to Upper Rock Creek Falls.
	RC-1 & 2	Upper Rock Creek, both banks	Single-Family Residential, cemetery, undeveloped	Residential subdivision and expanded single-family residential uses are likely. Use conflicts with adjacent properties may develop around the County Transfer Station and Upper Rock Creek Falls. Future development may conflict with the preference for to protect and enhance shoreline ecological functions.	Publicly- and Privately-owned, opportunities exist to provide additional visual and physical access at city right-of-way for Iman Cemetery Road
	RC-1	Angel Heights Conservation Area	Single-Family Residential, Undeveloped	Change of use and use conflicts are unlikely based on conservation covenant. Some development is possible to enhance the undeveloped park property owned by the homeowner's association.	Privately-owned, limited potential private visual access improvement
	RC-1	Food Bank Building	Non Water-Oriented	County has considered selling property for reuse or redevelopment. Use conflicts may occur depending on traffic pattern changes for replacement of Rock Creek Drive bridge.	Publicly-owned, potential for improved physical & visual access
	RC-1	City Wastewater Treatment Plant	Water-Related	Expansion of treatment works expected without change of use. Use conflicts likely based on odors and other aesthetics. Traffic operations for waste hauling may conflict with neighboring Fairgrounds operations. Other repair of existing structures is not anticipated to conflict with shoreline preferred uses	Publicly-owned, potential for new physical access, enhancement of pedestrian amenities and visual access

Table 5.3-1, Continued

Waterbody	Reach	Site	Existing Use	Potential Use Change/Conflicts	Public Access Opportunities
Rock Cove & Rock Creek	RC-2, Rock Cove	Skamania County Fairgrounds	Water- Dependent/ Enjoyment, Non Water-Oriented	Low likelihood of land use change. Site may possibly accommodate water-oriented shoreline recreational expansion. Use conflicts are limited but may be affected by noises, odors, and traffic from adjacent transportation and utility uses by the City, state, and railroad.	Publicly-owned, opportunities exist to resurface the trail and enhance recreational amenities and non-motorized physical access to the shoreline
		Old Hegewald Mill Site	Undeveloped	County is actively working to sell this property for redevelopment through a possible public-private partnership. Public visioning performed by the County indicated a preference for water-oriented business along with public access improvements. Phase I and II environmental site assessments have been performed and indicate clean-up of contaminants is unnecessary. Use conflicts with adjacent properties are unlikely, but future development may conflict with SMA preferences for to protect and enhance shoreline ecological functions.	Publicly-owned, potential to develop a trail within the existing easement, enhance physical access and develop Water-Oriented businesses with provide additional visual and physical access
Rock Cove		Assisted Living Facility	Non Water- Oriented	Site is unlikely to redevelop. There is an existing easement along the water and the southern edge of the site, but the owner is discouraging access for the safety of the facility's residents. Use conflicts are unlikely and repair of existing structures is not anticipated to conflict with shoreline preferred uses	Publicly-owned, potential to develop a trail within the existing easement and/or enhance visual access on south side of site
		Interpretive Center	Water- Enjoyment, Non Water-Oriented	Site is open to expanding recreational uses on property, including concessionaire for watercraft rentals. Owner is seeking access directly to SR 14. Use conflicts unlikely.	Publicly-owned, potential for improved physical & visual access
Ashes Lake		Ash Lake Road, SR 14	Non Water- Oriented	Use changes and conflicts unlikely.	Publicly-owned, route for Trail of the Gods

5.4 Summary of Recommendations from Section 5

[To be compiled in later draft after public review]

DRAFT

6.0 Shoreline Environment Designations

This section is an overview of shoreline environment designations in accordance with Ecology guidelines (WAC 173-26-211). The Ecology guidelines state that master programs must contain a system that classifies shoreline areas into specific designations that take into account existing land use, the biological and physical character of the shoreline, and the goals and aspirations of the community. The shoreline environment designations should be assigned in such a way that existing shoreline ecological functions are protected (i.e., no net loss) with the proposed patterns and intensity of development and should be consistent with policies for restoration of degraded shorelines and the local comprehensive plan. The six shoreline environmental designations developed by Ecology are listed here in order from most restrictive to least restrictive:

- Aquatic;
- Natural;
- Rural conservancy;
- Shoreline residential
- Urban conservancy; and
- High intensity.

These WAC designations are different from what is currently in effect in the City and County. In order to comply with Washington requirements, the City will need to update its shoreline environment designations to be consistent with WAC 173-26-211. The six environment designations are described below.

Aquatic

The purpose of the “aquatic” designation is to protect, restore, and manage the unique characteristics and resources of the areas waterward of the ordinary high-water mark. Uses may include new over-water structures only for water dependent uses, public access, or ecological restoration. The use of over-water facilities should be encouraged in order to reduce the impacts of shoreline development and increase effective use of water resources, multiple. All developments and uses on navigable waters or their beds should be located and designed to minimize interference with surface navigation, to consider impacts to public views, and to allow for the safe, unobstructed passage of fish and wildlife, particularly those species dependent on migration. Uses that adversely impact the ecological function of freshwater habitats should not be allowed, except when necessary to achieve the objectives of RCW 90.58.020, and if their impacts are mitigated according to WAC 173-26-201.

Natural

The purpose of the “natural” environment designation is to protect shoreline areas that are intact or minimally degraded and are relatively free of human influence. Only very low intensity uses will be allowed in order to maintain ecological functions and ecosystem-wide processes. The management policies for this designation would restrict any use that would substantially degrade the ecological functions or natural character of the shoreline area such as commercial, industrial, non-water oriented recreation, roads, utility corridors, parking areas, significant vegetation removal, or shoreline modification.

The following uses may be allowed if they are consistent with the purpose of this environmental designation:

- Commercial forestry that meets the conditions of the State Forest Practices Act
- Agricultural uses of a very low intensity
- Some single-family residential development with a density and intensity that are limited as necessary to protect ecological functions
- Scientific, historical, cultural, educational research uses, and low-intensity water-oriented recreational access uses.

Rural Conservancy

The purpose of the "rural conservancy" designation is intended for areas outside of cities and their urban growth areas and protects ecological functions, conserves existing natural resources and valuable historic and cultural areas in order to provide for sustained resource use, achieve natural floodplain processes, and provide recreational opportunities. Uses for this environment may include low-impact outdoor recreation, timber harvesting on a sustained-yield basis, aquaculture, low intensity residential development, and other natural resource-based low intensity uses. The following uses may be allowed if they are consistent with the purpose of this environmental designation:

- Low-intensity, water-oriented commercial and industrial uses in areas that are located in the past or at unique sites in rural communities that possess shoreline conditions and services to support the use.
- Water-dependent and water-enjoyment recreation facilities that do not deplete the resource over time, such as boating facilities, angling, hunting, wildlife viewing trails, and swimming beaches, provided significant adverse impacts to the shoreline are mitigated.
- Mining and related activities may be an appropriate use within the rural conservancy environment when conducted in a manner consistent with the environment policies and the provisions of WAC 173-26-241 (3)(h), RCW 36.70A.170, and WAC 365-190-070.
- Construction of new structural shoreline stabilization and flood control works where there is a documented need to protect an existing structure or ecological functions and mitigation is applied.

Shoreline Residential

The purpose of the "shoreline residential" designation is to accommodate residential development, appurtenant structures, and appropriate public access and recreational uses that are consistent with maintaining ecological functions and ecosystem-wide processes. Local governments may establish two or more different "shoreline residential" environments to accommodate different shoreline densities or conditions. Multi-family and multi-lot residential and recreational developments should provide public access and joint use for community recreational facilities. Access, utilities, and public services should be available and adequate to serve existing needs and/or planned future development. Commercial development should be limited to water-oriented uses.

Urban Conservancy

The purpose of the “urban conservancy” designation is to protect and restore ecological functions of open space, floodplain, and other sensitive lands where they exist in urban and developed settings while allowing a variety of compatible uses. Potential uses should preserve the natural character of the area or promote the preservation of open space, floodplain, or sensitive lands directly or over the long term. Uses that result in the restoration of ecological functions should be allowed if the use is otherwise compatible with the purpose of the environment and the setting. Public access and public recreation objectives should be implemented whenever feasible and significant ecological impacts can be mitigated. Water-oriented uses should be given priority over non-water-oriented uses. For shoreline areas adjacent to commercially navigable waters, water-dependent uses should be given highest priority. Mining and related activities may be an appropriate use within the urban conservancy environment when conducted in a manner consistent with the environment policies and the provisions of WAC 173-26-241 (3)(h), RCW 36.70A.170, and WAC 365-190-070.

High Intensity

The purpose of the “high-intensity” environment is to allow high-intensity water-oriented commercial, transportation, and industrial uses while protecting existing ecological functions and restoring ecological functions in previously degraded areas. First priority should be given to water-dependent uses, while second priority should be given to water-related and water-enjoyment uses. Non-water-oriented uses should not be allowed except as part of mixed-use developments or in limited situations where they do not conflict with or limit opportunities for water-oriented uses or where there is no direct access to the shoreline. Full utilization of existing urban areas should be achieved before further expansion of intensive development is allowed. Consideration should be given to the potential for displacement of non-water-oriented with water-oriented uses when analyzing full utilization of urban waterfronts. Where feasible, visual and physical public access should be required. Aesthetic objectives should be implemented by means such as sign control regulations, appropriate development siting, screening and architectural standards, and maintenance of natural vegetative buffers.

6.1 Recommended Shoreline Environmental Designations

Using the shoreline environment designations defined by the Ecology guidelines (WAC 173-26-211), preliminary shoreline environment designations were developed for each shoreline reach within the City and predesignated for the two reaches within Skamania County. The City’s original shorelines management master program (1973) does not include predesignated areas and designates only urban, conservancy, and natural shoreline environments.

The preliminary recommendations for reaches in the City are shown in **Table 6.0-1 – Reach Summary and Recommended Shoreline Environment Designations**

6.0-1. In cases where multiple shoreline environment designations are recommended for a given shoreline reach, the table shows specifications for each designation. The recommendations take into account the existing land use(s), the biological and physical characteristics of the shoreline, the existing shoreline environment designations, and the goals and aspirations of the City. The attributes that were considered included the following:

- 115
- Existing Land Use: percent land use type by reach
 - Future Land Use: percent future land use designation by reach
 - Zoning: percent zoning type by reach
 - Ecological Functions: overall performance by reach
 - Existing Shoreline Environment Designation: City of Stevenson, 1973
- 120
- In general, water areas were designated as “Aquatic”, areas subject to active landslides and conservation covenants as “Natural”, residential areas as “shoreline residential,” and commercial or industrial use areas as “Urban Conservancy” or “High Intensity”. The “Rural Conservancy” shoreline environment designation was generally avoided as unnecessary complicated for Stevenson’s small shoreline jurisdiction.

Table 6.0-1 – Reach Summary and Recommended Shoreline Environment Designations

Waterbody	Reach	Factors Used to Recommend Designations				1973 Shoreline Environment Designation	Recommended Shoreline Environment Designations
		Existing Land Use	Future Land Use	Existing Zoning	Ecological Functions		
Columbia River	CR-1 East Urban Area (predesignated)	Public, Residential	LIT, LDR	CCO	Poor (Very Poor to Good)	Urban	Shoreline Residential (residential areas), Urban Conservancy (all other areas)
	CR-2 Downtown Stevenson	Public, Commercial,	HIT, LIT, HDR	CO, ID, R3	Very Poor (Very Poor to Good)	Urban	High Intensity (CO & ID areas), Shoreline Residential (R3 areas)
	CR-3 West Urban Area (predesignated)	Public, Undeveloped, Resource	LIT, HIT	ID, CR	Very Poor (Very Poor to Poor)	Urban	High Intensity (ID areas), Urban Conservancy (all other areas)
Rock Creek	RC-1 Lower Rock Creek & Upper w/i city	Public, Residential, Undeveloped	LDR, HIT, LIT	PR, SR, R3, CO	Poor (Very Poor to Fair)	Natural, Conservancy, Urban	High Intensity (CO & PR areas), Natural (conservation covenant & hazard areas) Shoreline Residential (all other areas)
	RC-2 Upper Rock Creek w/i county (predesignated)	Undeveloped, Residential, Public	LDR, HIT	R1	Excellent (Fair to Excellent)	Natural, Conservancy	Natural (Hazard areas), Shoreline Residential (all other areas)
Rock Cove		Commercial, Undeveloped, Public	LIT	PR, CR, SR, R3	Good (Poor to Good)	Urban	High Intensity (CR areas), Shoreline Residential (R3 areas), Natural (islands)
Ashes Lake		Undeveloped, Resource	LIT	CR, ID	Very Poor (Very Poor to Good)	Conservancy	Urban Conservancy
Key: <div> <div> Future Land Use LDR-Low Density Residential LIT-Low Intensity Trade </div> <div> HDR-High Density Residential HIT-High Intensity Trade </div> <div> Existing Zoning SR-Suburban Residential PR-Public Use & Recreation CR-Commercial Recreation ID-Manufacturing </div> <div> R1-Single-Family Residential CCO-Community Commercial CO-Commercial </div> </div>							

6.2 Summary of Recommendations from Section 6

[To be compiled in later draft after public review]

DRAFT

7.0 References

To keep this Inventory and Characterization report readable and accessible to broad audiences, [A12]the authors avoided providing specific citations within the text unless a passage was quoted or a figure used to illustrate a concept. To compensate for the lack of citations, this bibliography is organized to correspond with the sections of the report that were informed by the sources.

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A.0 Glossary of Terms

As used in this report, the words **and acronyms** below have the meaning given here unless the context clearly dictates otherwise. When words or phrases are not specifically defined below, they shall be interpreted so as to give them the meaning they have in common usage and to give this report its most reasonable interpretation and application.

A.1 Abbreviations and Acronyms

BPA – Bonneville Power Administration

cfs – cubic feet per second

City – City of Stevenson

County – Skamania County

CWA – Clean Water Act

DNR – Washington State Department of Natural Resources

Ecology – Washington State Department of Ecology

EPA – Environmental Protection Agency

ESA – Endangered Species Act

FEMA – Federal Emergency Management Agency

FIRM – Flood Insurance Rate Maps

GMA – Growth Management Act

MS4s – municipal separate storm sewer systems

NMFS – National Marine Fisheries Service

NSA – National Scenic Area

NWI – National Wetland Inventory

NPDES – National Pollutant Discharge Elimination System

OHWM – ordinary high water mark

PCE – primary constituent element

PHS – Priority Habitats and Species

RCW – Revised Code of Washington

SMA – Shoreline Management Act

SMP – Shoreline Management Program

USACE – U.S. Army Corps of Engineers

USFWS – U.S. Fish and Wildlife Service

USGS – U.S. Geological Survey

WAC – Washington Administrative Code

WRIA – Water Resource Inventory Area

35 **A.2 Words and Phrases**^[A13]

Cumulative Impact—The impact on the environment that results from the incremental impact of a development or use of a shoreline area when added to impacts from other past, present, and reasonably foreseeable developments and uses of that shoreline area. For the purposes of Stevenson's Shoreline Management Program, cumulative impacts do not include impacts from development and uses outside of shoreline jurisdiction.

Shoreline Environment Designation—Analogous to zoning districts in a conventional zoning ordinance, shoreline environment designations divide shoreline jurisdiction into distinct areas where different sets of allowable use provisions, environmental protection measures, and different development standards apply,

B.0 Interrelated Comprehensive Plan Policies

As the City's primary advisory planning document, the comprehensive plan serves as an "umbrella plan" for further planning endeavors, including the SMP. This appendix catalogues the statements, policies, objectives, and tactics of the 2013 Stevenson Comprehensive Plan in an effort to ensure that the comprehensive plan and its update provide consistent direction for the use of land within Stevenson. This catalogue includes only direct references to shorelines and waterfronts in Stevenson and should not be taken as a substitute for the full plan or its general policy statements.

B.1 Explanatory Statements

The first two chapters of the comprehensive plan contain the following statements related to the SMP. At the conclusion of the SMP update, some of these statements may need to be amended as anticipated in Recommendation 1-4 of this report.

B.1.1 Chapter 1

Page 1

Vision Statement. "Stevenson is a friendly, welcoming community that values excellent schools and a small town atmosphere. The natural beauty is enjoyed by residents and visitors through a network of recreational opportunities. The strength of Stevenson's economy is built upon high quality infrastructure and a vibrant downtown that provides for resident's daily needs. Stevenson takes advantage of our unique location on the Columbia River by balancing jobs, commerce, housing, and recreation along the waterfront."

Page 3

Cornerstone Principle. "Active Waterfront represents Stevenson's utilization of its waterfront assets. This includes use, restoration, and harmonization of the wide-ranging economic, scenic, recreational, ecological, and residential resource potentials of the Columbia River, Rock Cove, and Rock Creek areas."

B.1.2 Chapter 2

Pages 7-8

Area Plans. "Area Plans include goals and objectives for those areas that are not specifically addressed in detail in the current comprehensive plan. For this reason area plans can also be viewed as 'supplements' to the existing comprehensive plan. With Stevenson's 2013 comprehensive plan, the 1975 Skamania County Shoreline Management [Master] Program is folded into the Comprehensive Plan and will no longer be used as a stand-alone document."

B.2 Goals, Objectives, and Tactics

The third chapter of the comprehensive plan contains the following aspirations and action items related to the SMP. In order to help prioritize actions, each objective highlights which of the plan's four cornerstone principles it advances. All objectives and tactics related to Active Waterfront are listed below.

35 At the conclusion of the SMP update, some of these statements may need to be amended as anticipated in Recommendation 1-4 of this report.

B.2.1 Goal 1 – Community and Schools

Page 14

40 "1.3 - Ensure that the monitoring reports contained in Appendix D are submitted to the Council annually prior to budget adoption."

"1.4 - Develop a high level of coordination among all levels of government"

"1.5 - Ensure that the plans and actions related to land use by special districts, County, State, and federal agencies are consistent with the Stevenson Comprehensive Plan."

Page 15

45 "1.11 - Support the Columbia Gorge Interpretive Center, especially in their educational and children's programming efforts."

"1.12 - Develop and enhance cultural opportunities."

"1.12-1 - Facilitate and support development of a bricks-and-mortar performing arts center."

"1.12-2 - Develop a public art plan."

50 "1.12-3 - Install public art in key locations throughout the City, especially along the Columbia River waterfront."

"1.12-4 - Install interpretive signs in key locations through the City, especially highlighting Stevenson's unique relationship with the Columbia River."

Page 16

55 "1.17 - Provide a clean, visually attractive community."

"1.17-1 - Facilitate and support activities to beautify the community, such as a Community Beautification Day."

"1.17-2 - Establish a high enforcement area for nuisances in highly visited areas of the city, such as along Second and First streets, Cascade Avenue, and Rock Creek Drive."

60 "1.17-3 - Establish strategies to reduce noise and light pollution."

B.2.2 Goal 2 – Urban Development

Page 18

65 "2.2 - Preserve, protect, and enhance the functions and values of ecologically sensitive areas (habitat areas, wetlands) with special consideration given to anadromous fisheries, as required by the Growth Management Act."

"2.2-1- Regulate land use within and adjacent to ecologically sensitive areas while allowing for the reasonable use of private property."

"2.2-2 - Consider establishing a funding source to acquire ecologically sensitive areas."

"2.2-3 - Conduct an Urban Area-wide inventory of ecologically sensitive areas."

70 "2.2-4 - Encourage agreements that will preserve ecologically sensitive areas in appropriate proportions consistent with available resources. Provision of such open spaces should not reduce the density which can be achieved on the site."

"2.2-5 - Establish a stream corridor management plan and program."

"2.2-6 - Consider stream corridors for multiple use in conformance with other plans."

75 "2.2-7 - Regulate the use of fill in stream corridors."

"Maintain stream corridors in a natural state, preserving tree lines and vegetation wherever possible."

Page 20

"2.7 - Periodically review and revise the Future Land Use and Zoning maps to accommodate changes in community needs."

80 "2.7-1 - Consider designating areas not served by the public sewer and/or water systems as an "urban reserve" until such systems are made available."

"2.7-2 - Balance the availability of sufficient land for various uses when designating Future Land Use and Zoning districts."

85 "2.7-3 - Consider infill potential when designating Future Land Use and Zoning districts, especially with regard to multi-family housing."

"2.7-4 - Consider redesignating lands currently designated for industrial use which are unlikely or undesirable to be developed for such uses."

"2.7-5 - Consider location and suitability of land for urban uses and established need when designating Future Land Uses and Zoning districts."

90 "2.8- Establish policies to review annexation proposals."

"2.8-1 - Prefer annexation of developed areas abutting the city."

Page 21

"2.9 - Encourage the establishment of a subarea plan and land use regulations within the unincorporated Urban Area."

95 "2.9-1 - Encourage maintaining existing forest and farm uses within the unincorporated Urban Area."

"2.9-2 - Discourage development within the unincorporated Urban Area until suitable land within the City has been developed."

"2.9-3 - Ensure the highest and best use of riverfront properties within the unincorporated Urban Area by protecting them from development and redevelopment until urban utilities and services can be provided."

100 "2.13 - Establish standards for urban development that encourages mixtures of land uses and intensities."

"2.13-1 - Consider establishing incentives and/or special standards for infill projects."

B.2.3 Goal 4 – Downtown and Waterfront

Page 27

"The waterfront is an extension of the downtown core and a place where people live, work, and play."

105 The Columbia River, Rock Creek, and Rock Cove waterfronts are key components to improving the look and function of downtown Stevenson and are acknowledged here as a Sub-Goal. The availability of land on Stevenson's Columbia River waterfront is unique within the Gorge where railroads and highways either form barriers to waterfront property access or are the waterfront property owners themselves. The scenic assets of Rock Creek and Rock Cove add additional growth potential for development and redevelopment
110 on their abutting lands. This growth, development, and change can be managed to benefit current and future residents and visitors.

The Objectives and Tactics selected to achieve this Goal and Sub-Goal focus on developing Area Plans,

improving the appeal of the area through public and private activities, and ensuring the functionality of the area through property infrastructure and uses."

115 Page 28

"4.2 - Periodically review and revise the downtown commercial area boundary, basing the location, type and amount of commercial activity on community need."

"4.2-1 - Ensure the commercial area boundary encourages compactness and is pedestrian-oriented."

Page 29

120 "4.10 - Provide better connections between downtown and the waterfront."

"4.10-1 - Consider converting Russell Street into a pedestrian mall between Second and First streets."

"4.10-2 - Consider improving sidewalks and street crossings and installing public art and seating areas on Russell Street from downtown to the waterfront."

125 "4.11 - Consider establishing a Parking and Business Improvement Area to support downtown improvements, such as a rehabilitation grant or loan program for downtown buildings or provision of visitor amenities."

"4A.1 - Support development of improved river access in the Stevenson area."

"4A.1-1 - Improve waterfront access and control erosion through coordinated stabilization programs."

Page 30

130 "4A.2 - Establish a Shorelines Master Program to guide the balanced development of industrial, commercial, residential, recreational, and natural uses."

"4A.2-1 - Encourage the use of the riverfront for commercial, residential, recreation, and open space purposes consistent with the Shorelines Management Act."

135 "4A.2-2 - Protect, enhance, and maintain the natural, scenic, historic, architectural, and recreational qualities along the River."

"4A.2-3 - Support recreational activities on the public lands and waters of the Columbia River, Rock Cove, and Rock Creek."

"4A.3 - Manage lands abutting the Columbia River and Rock Creek for the benefit of the community."

140 "4A.3-1 - Review all proposals for shoreline use for compatibility with the goals and policies of the Skamania County Shoreline Management Master Program."

"4A.3-2 - Review development proposals located on or near banks and floodway of the River and creeks to maintain the recreation and open space potential while promoting healthy and visually attractive environments."

145 "4A.3-3 - Review land use policies to ensure compliance with the Shorelines Management Master Program."

"4A.4 - Reduce impediments to attracting waterfront investors."

"4A.4-1 - Enhance Cascade Avenue as the main waterfront street."

"4A.4-2 - Use various marketing techniques to attract waterfront investors, such as a "Come on in, the water's fine" slogan.

150 Page 31

"4A.5 - Consider repurposing the Tichenor Building for retail and lodging purposes."

"4A.6 - Encourage development of a landscaping plan for the fairgrounds."

"4A.7 - Support development of a large waterfront gathering place, such as a[n] amphitheater for community events."

B.2.4 Goal 6 – Tourism

Page 38

"6.3 - Facilitate and encourage Stevenson to become the year-round recreation and tourist destination center of the County and Central Gorge."

"6.3-1 - Provide visitor amenities such as long-term parking and restrooms."

"6.3-2 - Facilitate and encourage visitor amenities such as affordable and upscale overnight lodging (campsites, yurts, youth and adult hostels, boutique hotels, etc.), convention centers, a marina, and visitor oriented shops."

"6.3-3 - Facilitate and encourage visitor-oriented businesses such as kayak and bike rentals and guided activities."

"6.3-4 - Facilitate and support hospitality training as an economic benefit."

"6.4 - Encourage cross-promotion of visitor-oriented businesses and services."

"6.4-1 - Support establishment of incentive for tour boats that visit Stevenson's visitor attractions such as the Columbia Gorge Interpretive Center."

"6.6 - Provide access from the waterfront to other parts of town via safe, attractive, and convenient walkways."

Page 39

"6.8 - Establish a quiet zone at railroad crossings within the city."

B.2.5 Goal 7 – Transportation and Circulation

Page 41

"Multi-modal transportation options provide people and goods with safe, efficient, and convenient options."

"...Stevenson's existing transportation and circulation system has shifted modes and focuses over its long history. The original plat of Stevenson was a gridiron pattern that enabled easy internal circulation for pedestrian and horse traffic and focused on the Columbia River and Stevenson Landing as the primary mode of external transportation. When the railroad came through town, the focus shifted from the river uphill to where the rail line met dirt streets and boardwalks. As automobile use grew and the city expanded away from its riverside terrace, this gridiron pattern had to be altered to accommodate the steep Gorge slopes, the many creekside canyons and ravines cutting through these slopes, and the existing oddly intersecting logging roads on the then-periphery. With the continued dominance of the automobile, the focus again shifted uphill to the new paved state highway, cul-de-sacs and dead-ends became commonplace methods for dealing with the creekside ravines and canyons, and sidewalks waned in importance."

Page 43

"7.6 - Reduce the effects of through traffic in the downtown commercial area while minimizing any negative impact on local businesses."

"7.6-1 - Manage road construction projects to minimize construction-related impacts on local businesses."

"7.6-2 - Facilitate and encourage alternative routing and/or usage of Highway 14 by truck traffic."

"7.9 - Establish a quiet zone at railroad crossings within the city."

"7.10 - Facilitate and support rail service for future transportation and commerce needs."

195 "7.11 -Manage on-street parking to permit the safe and efficient operation of the transportation system."

"7.13 - Provide wayfinding signage to aid traveler navigation and guide visitors to Stevenson attractions and amenities, especially east- and west-bound travelers on I-84."

B.2.6 Goal 8 – Utilities and Services

Page 46

200 "8.3 - Periodically review and revise the capital facilities plan."

"8.4 - Identify and correct health and safety hazards within the Stevenson Urban Area."

"8.8 - Base the provision for future public facilities and utilities upon financial cost and adequacy of desired levels of service."

"8.8-1 - Consider providing public facilities and utilities in advance of need."

205 "8.8-2 - Coordinate urban development with private utility agencies to ensure the availability of services when needed."

"8.8-3- Continue to provide water and sewer services within the Urban Area."

B.2.7 Goal 9 – Parks and Recreation

Page 49

210 "As a Gorge town, some of the country's premier hiking, hunting, mountain climbing, fishing, kayaking, and wind sports surround Stevenson on all sides. Many residents enjoy these activities, and many more visitors are drawn to the area for these relatively solitary activities. Inside Stevenson, a different, more gregarious variety of recreational opportunities exists, including festivals, fairs, and organized or pick-up sporting events. Balancing and connecting these gregarious and solitary varieties of recreation are of
215 special importance to Stevenson. The Objectives and Tactics of this Goal seek to do so by ensuring the facilities we already have are properly maintained, that new lands, facilities, and funding are available, and that trails or pathways are developed as part of the park system."

Page 50

"9.2 - Preserve open space and recreational resources."

220 "9.2-1 - Establish cooperative agreements to ensure that recreation and open space lands and facilities will be provided."

"9.2-2 - Establish cooperative agreements to ensure that recreation and open space lands and facilities will be provided."

225 "9.2-3 - Encourage private enterprise and intergovernmental agreements that will provide open space for recreational lands and facilities. Provision of such open spaces should not reduce the density which can be achieved on the site."

"9.3 - Maintain parks and recreational lands and facilities."

"9.4 - Consider establishing a permanent funding source for the acquisition, development, and maintenance of park and recreation lands and facilities."

230 "9.5 - Develop a pathways and trails plan to highlight Stevenson's recreational, historical, and commercial

sites."

"9.5-1 - Consider using stream corridors as part of a parkway or greenway concept."

"9.5-2 - Include connections among the parks and trails of the City, its partner agencies, and private entities."

235 "9.5-3 - Include nature walks, scenic vistas, and connections to forests in the plan."

Page 51

"9.6 - Provide pathways and trails that highlight Stevenson's recreational, historical, and commercial sites."

"9.6-1 - Use stream corridors as part of a parkway or greenway concept."

"9.6-2 - Connect the parks and trails of the City, its partner agencies, and private entities."

240 "9.6-3 - Include nature walks, scenic vistas, and connections to forests in the system of pathways."

"9.7 - Develop a balanced system of recreation facilities, lands and programs that meets the recreation needs of residents and visitors alike."

"9.7-1 - Develop small parcels of land resulting from urbanization as mini-parks or landscaped areas."

245 "9.7-2 - Facilitate and encourage the installation of lights and other improvements at the Hegewald Skateboard Park."

"9.7-3 - Facilitate and support the development of major community recreation facilities for citizens, such as expanding the pool activity center, providing covered pavilion spaces, developing a youth center, and other spaces for recreation, physical fitness, and wellness classes."

250 "9.8 - Promote Stevenson's recreational opportunities through media such as websites, brochures, and signage."

"9.9 - Protect Rock Cove to improve habitat, water quality and ambiance."

Page 52

"9.10 - Facilitate and support appropriate development and services for the Rock Creek and Rock Cove lands."

255 "9.10-1 - Facilitate and encourage recreational activities in the Rock Creek and Rock Cove area, such as access for small watercraft."

"9.10-2 - Encourage relocation of the County shops at Rock Creek."

"9.10.3 - Encourage rehabilitation and/or repurposing of the Grange."

260 "9.10-4 - Facilitate and encourage enhancement of Rock Cove's habitat, water quality, and ambiance."

Appendix C Map Portfolio

General

Tabular data presented on map pages need to be better discussed in the text narrative.

Optional – add a cover page and/or table of contents with master list of the maps presented; Add 'Appendix C' to each page;

More intuitive to label each map as "Map" rather than 'Figure'

Reach boundaries are hard to see/missing from most maps;

Masking out areas outside jurisdiction is helpful;

City and Urban Area boundaries are often hard to see;

Preliminary Jurisdiction – OK to include preliminary jurisdiction, but ICR findings should help refine jurisdictional area based on current conditions so that SMP shows final proposed jurisdictional area;

Legend text – More intuitive to label 'Approximate Extent of SMP Jurisdiction (Current City)' and 'Approximate Extent... (Urban Area Predesignation)'; Identify 'associated' wetlands as required part of jurisdiction; could also identify other wetlands as optional jurisdictional area(s) – if any;

Land Cover – show reach boundaries and labels; Add black line and label to Legend for approximate extent of SMP Jurisdiction';

Soils – Parcel lines and City Limits seem too visually dominant impacting the display of the soils data;

Contours

Geological Hazards – add unstable slopes, landslide hazards;

6 – Floodplain – Add red & yellow shading and predesignated Urban Area with labels to Legend;

PHS Data -

Wetlands – 'SR 14' text label not clearly associated w/ mapped features at locations where local features are masked out;

Existing Land Use – Four shades of pink/purple and three shades of green are difficult to differentiate;

Zoning -

Public Ownership -

12 & 13. Impervious Surfaces and Rooftops – Not clear why both maps are needed when rooftops are shown in Impervious Surface map;

Archaeology/Historic

Armoring/Stabilization – this is the only map where the Rock Cove islands are numbered; Overwater structures are identified on map but yellow text labels and Legend is difficult to read/understand;

DRAFT