City of Stevenson
Grant # G1200-044

STEVENSON
SHORELINE MASTER PROGRAM UPDATE

FIRST DRAFT

INVENTORY & CHARACTERIZATION REPORT

TASK 2.2

PREPARED BY STEVENSON PLANNING DEPARTMENT

JULY 2015

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Acknowledgements

City Council

Frank Cox, Mayor
Scott Anderson
Monica Masco
Julie Mayfield
Robert Muth
Amy Weissfeld

Planning Commission

Paul Hendricks, Chair
Karen Ashley
Valerie Hoy-Rhodehamel
Glenn Morris
Shawn Van Pelt

Advisory Committee

Ramona Bennett
Brian Birkenfeld
Joe Birkenfeld
Gerald Doblie
Eran and Gloria Howell
John McSherry
Scott Pineo
Mary Repar
Tim Todd
Bernard Versari
Ken Wieman

City Staff

Nick Hogan, City Administrator
Ben Shumaker, Planning Director, Primary Author

Consultant Support

Dustin Day
Scott Keillor
Ethan Spoo

BergerABAM
210 East 13th Street, Suite 300
Vancouver, Washington 98662-3231

State Staff

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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 shorelines located outside of existing City boundaries, which the City chose 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 Shoreline Management Program (SMP) revision process required of the City through the Shoreline Management Act (SMA), Revised Code of Washington (RCW) 90.58, and WAC 173-26, and Washington State Department of Ecology (Ecology) Grant G1200-044. 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 while describing 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. 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, including 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 designations based on existing land uses, zoning, 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 shoreline environment designations; preparing draft SMP goals, policies, and regulations; developing a restoration plan to take advantage of restoration opportunities in the City's shoreline jurisdiction; and anticipating cumulative impacts of the program's implementation.

1.1 Study Area Boundary (Shoreline Jurisdiction)

The City's preliminary shoreline jurisdiction is identified in Map 1. 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 "shorelines of statewide significance," "shorelines of the state," and "shorelands" in Stevenson, as are further described below. This report also includes information on the Columbia River, Rock Creek, 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. 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 Ashes Lake, the Columbia River, Rock Cove, and Rock Creek based on the definitions and standards established by the state in the SMA.

Shorelines of the State – The SMP update process begins with the identification of "shorelines of the state" and associated "shorelands," which comprise the baseline geographic area where the SMA applies within a local jurisdiction. The SMA applies to the following:

- 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.
- Shorelands adjacent to these waterbodies.

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

Shorelines of Statewide Significance – The SMA provides special emphasis on certain categories of shorelines in addition to those described above. 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.

Shorelands – The term "shorelines of the state" applies to 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 choose to include certain optional areas as well. The most common cases involve the inclusion of the critical areas (aquifer recharge areas, frequently flooded areas, geologic hazard areas, habitat areas, and wetlands) now required to be regulated under the Growth Management Act (GMA). Extending the shoreline jurisdiction to these areas streamlines the permitting process and minimizes confusion about what and how many regulations apply within shoreline areas.

1.1.2 Preliminary Shoreline Jurisdiction

Stevenson's preliminary shoreline jurisdiction is depicted in Map 1 and is based on the minimum jurisdiction under shorelines of statewide significance (Columbia River), shorelines of the state (Ashes Lake , Rock Cove & Rock Creek), and shorelands (areas within 200 feet of the OHWM of these waterbodies). Optional areas associated with wetlands 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

[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.

this report and the will of the public as it is identified during the update will help guide the decision about the inclusion of the optional areas.[3]

1.2 Relationship to Other Plans and Programs

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

1.2.1 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 – The City of Stevenson 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

[3] *Recommendation #1-3 for SMP Update:* Evaluate and consider extending shoreline jurisdiction during later stages of the SMP update.
[4] *Recommendation #1-4 for SMP Update:* SMP update should include a list of desirable comprehensive plan changes to bring the two documents into close alignment. Specific recommendations should be made regarding the 1975 SMP's references in Chapter 2 and Goal 4A.

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. This means that the City may either refer to the existing critical areas code in the SMP or adopt specific critical areas provisions when they exist in shoreline areas.[6]

1.2.2 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. Alphabetically, state and federal regulations and programs that intersect with Stevenson's SMP update include the following.

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, and improve and enhance water quality,, irrigation, fish and wildlife habitat, recreation, and navigation on the Columbia River and some of its tributaries. Bonneville Dam, located 6 miles west from Stevenson, is the most downstream of a system of 31 hydropower dams generating power which the BPA distributes throughout the Pacific Northwest region. 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 CWA requires projects obtain certification from Ecology regarding compliance with the state's 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 the state 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

[5] *Recommendation #1-5 for SMP Update:* Evaluate and consider inclusion of the shorelines 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.
[6] *Recommendation #1-6 for SMP Update:* Evaluate the benefits of adopting critical areas regulations that would apply exclusively to shoreline areas.

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 ofStevenson's size and location, its stormwater system is currently exempt from MS4 regulation.

Columbia River Gorge National Scenic Area Act – Congress passed the Columbia River Gorge National Scenic Area 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 GMA, which applies across the state, establishes urban growth areas that are expected to continually expand to meet the population management demands of projected 20-year growth, this federal act has established urban areas within which all of the NSA's industrial development and most commercial and residential development are expected to occur. Minor revisions to urban areas 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 uses and growth 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 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 projects 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."

Hydraulic Project Approval (HPA) – The 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 protects, the Magnuson-Stevens Act seeks to maintain stocks of the species it protects to ensure optimum ongoing yields for human consumption. Many species, such as salmon, are protected by both acts.

Migratory Bird Treaty Act – Originally adopted in 1918 after 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 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 State Environmental Policy Act, tribal agreements and case law, Watershed Planning Act, Water Resources Act, and the Salmon Recovery Act.

1.3 Methodology

Ecology provided the City with guidance for conducting this inventory and characterization through meetings, correspondence, and written handbooks. In this guidance, Ecology lists the elements that can be addressed in shoreline inventories. This list was refined and prioritized by the Shorelines Local Advisory Committee as part of efforts to address those important and salient elements of Stevenson shorelines. These inventory elements include physical components such as flooding and floodplain issues, stream aggradation, channel migration, streambank erosion, and sediment transport; biological components such as priority habitats, the loss of riparian vegetation, preservation, and restoration; and more anthropocentric components such as archaeological sites, existing land uses, development potential, altered shoreline and shoreland conditions, and public access sites.

1.3.1 Data Sources

The data used in the overview of key processes and trends that affect the City's shorelines comes from existing reports, site visits, and remote sensing. A number of state and federal agency data sources and City records, maps, aerial photos, and technical reports were compiled as the basis for the shoreline inventory. Section 7.0 lists the data sources. These 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)
- 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)
- Rock Cove Environmental Evaluation and Comprehensive Plan (Fishman Environmental Services, 1997)

1.3.2 Shoreline Reaches

This report is organized around seven relatively homogeneous segments of the City's shoreline. These distinct segmentsaid understanding and will assist future efforts to plan and manage shoreline areas. The segments are categorized generally according to the level of ecological functions they provide and by existing and projected land uses. Map 1 locates these segments visually. The report classifies them as Columbia River reaches and Rock Creek reaches and divides them further as shown in Table 1.

Table 1.3-2 – Shoreline Reaches

Waterbody	Reach Name	Location	Approximate Length
Columbia River	Reach 1 - East Urban Area (predesignation)	Columbia River from Stevenson Cemetery to Cascade Boat Launch/Kanaka Creek	5,555 LF
	Reach 2 - Downtown Waterfront	Columbia River from Cascade Boat Launch/Kanaka Creek to SR 14 Bridge	4,170 LF
	Reach 3 - West Urban Area (predesignation)	Columbia River from SR 14 Bridge to Ashes Lake	8,000 LF
Rock Creek	Reach 1	Rock Creek from SR 14 boundary to Ryan Allen Road (within city limits)	3,240 LF
	Reach 2 (predesignation)	Rock Creek between Vancouver Avenue and Rock Cove (predesignated areas outside City limits)	4,485 LF
Rock Cove		Rock Cove, including north side of SR 14/railroad berm	11,460 LF
Ashes Lake		Extreme east end of Ashes Lake	415 LF

1.4 Summary of Recommendations from Section 1

[To be compiled in later draft after public review]

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 left behind. 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, especially 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.

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

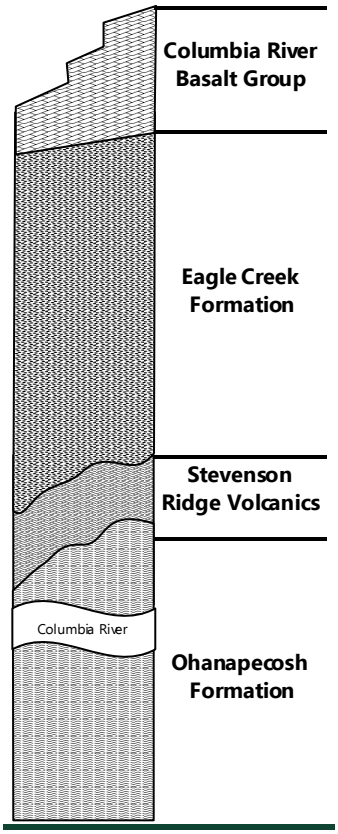


Figure 2.1-1 Generalized Stratigraphic Column

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

Columbia River and in cuts for BNSF 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.

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.

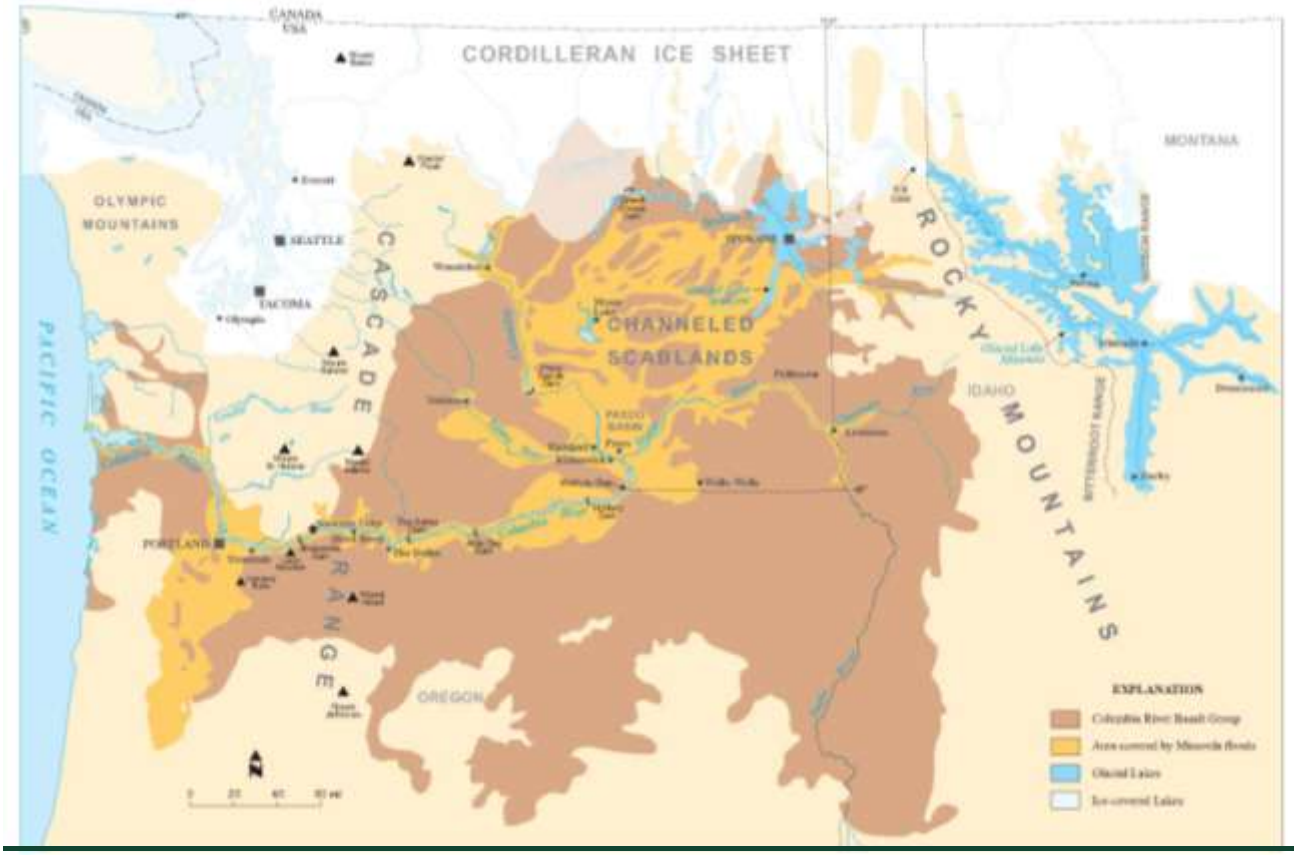


Figure 2.1-2 Columbia River Basalt Group & Missoula Floods

Figure Credit: Norman & Roloff (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 its way to the Pacific Ocean, this flowing, liquid 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 more dramatic, with discrete change-inducing events occurring relatively frequently.

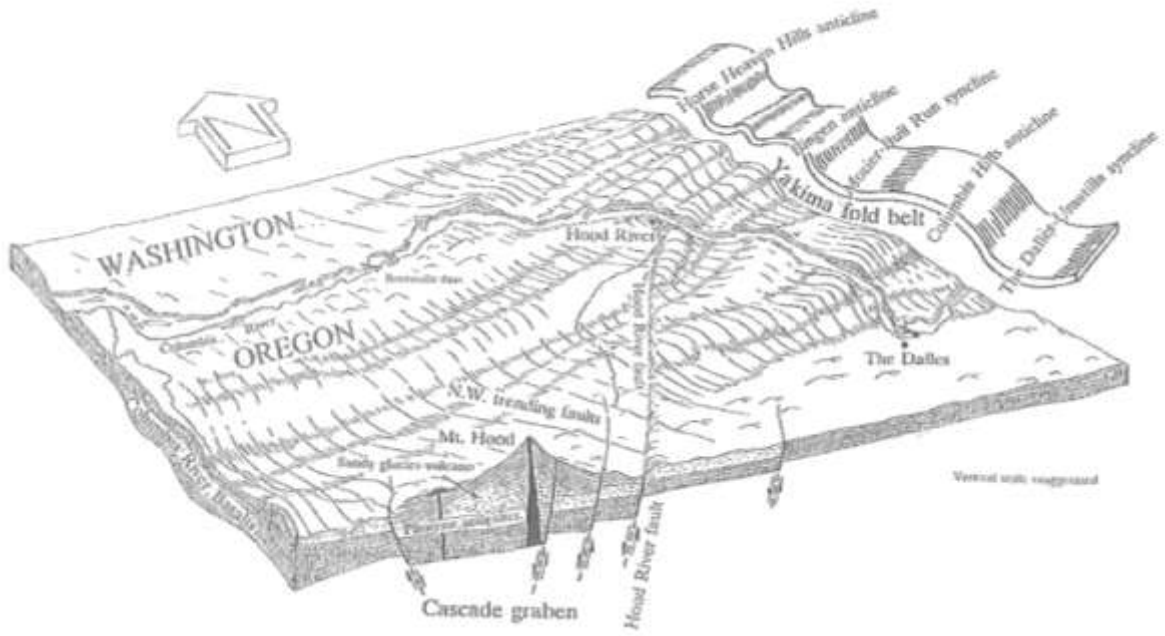


Figure 2.1-3 Yakima Fold Belt

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 has 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 near-vertical cracks). 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 the Columba River's erosive power have ensured 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 on 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.[7]

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 of these legends tells of two brothers, Wy'East (Mount Hood) and Pahto (Mount Adams), battling over the love of Loowit (Mount St. Helens). When

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

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, forever separating the land on each side of the river.

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 Native American accounts, which instead of relying on "myth time" or "the time before memory." describe a time when *their* ancestors traveled by canoe between the Pacific Ocean and Celilo Falls without obstruction.

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 (high enough to submerge the bottom 2 feet of the supermarket's checkout counters) and stretched more than 70 miles upstream and, when they overtopped and breached the land bridge, they left observable marks as floodwaters sloshed nearly 100 feet up the slopes at Troutdale, Oregon.

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 determined by 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.

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.[8] 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.

[8] *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 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 (2009)

2.2.3 Precipitation

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. 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, and rain is infrequent.

Figure 2.2-2 Freezing Rain: Beautiful, Dangerous

Photo Credit: Dawn Nielson (2005).

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 is greater than the precipitation falling on the surrounding regions. At 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.[9]

[9] *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 supercooled 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.[10]

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.[11] 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

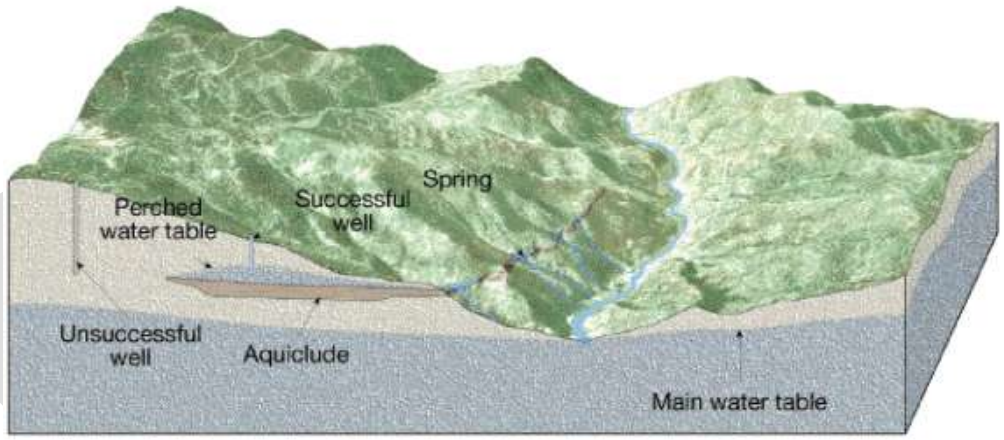


Figure 2.3-1 Perched Water Tables, Springs, and Unsuccessful Wells
If deep, wells in the Stevenson area are likely hydrologyically connected to the Columbia River. Springs and shallow wells are likely connected to perched water tables in the Rock Creek basin.

Figure Credits: Tarbuck, et. al. (2005)

[10] *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.
[11] *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.

aquifer.

The Bonneville Landslide aquifer in one of the more important groundwater features because of its relationship to Stevenson's municipal water supply. 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, surface and ground water withdrawals are expected to continue along Stevenson's shoreline areas, especially within the Rock Creek watershed.[12]

Groundwaters in the Stevenson area also engage in a complex interrelationship with the local climate and geology. Wintertime icing builds up on exposed ground surfaces and 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.[13] 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.

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

[12] *Recommendation #2-XX for SMP Update:* Consider private and municipal water supply needs when developing allowed uses in shoreline areas.
[13] *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.

Bonneville Dam.[14] 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 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 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.

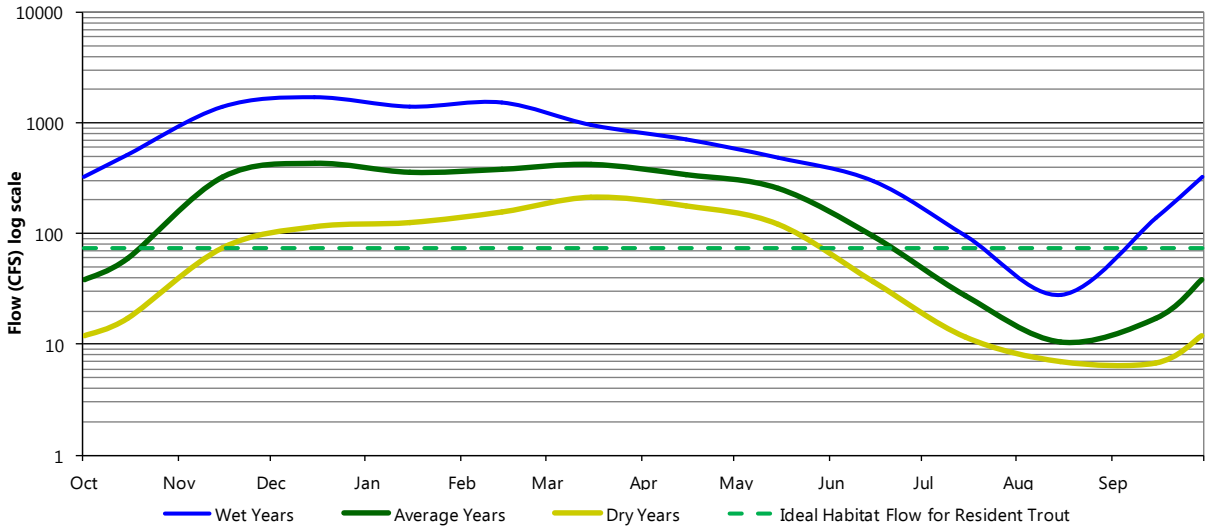


Figure 2.3-2 Rock Creek Hydrograph
Water years synthesized via monthly regression with Wind River daily flows.

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

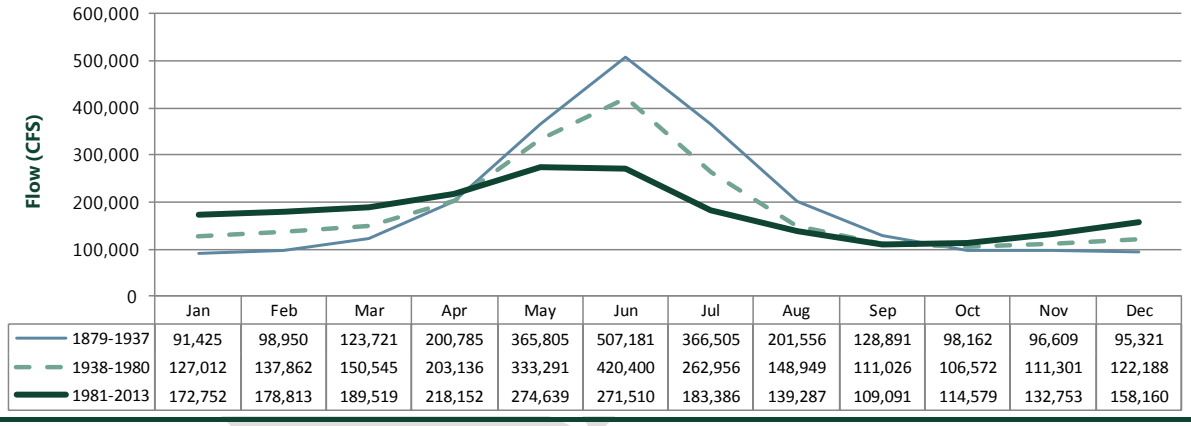
The lack of snow-dominated areas in the watershed is also apparent in this hydrograph, which does not display the delayed increase in runoff typically expected of such watersheds in the early summer. This situation will insulate Rock Creek from many predictable effects associated with the current warming trends, though the hydrograph may show decreased runoff in May and June if less snow occurs in the higher

[14] *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.

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.[15]

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 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.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1879-1937	91,425	98,950	123,721	200,785	365,805	507,181	366,505	201,556	128,891	98,162	96,609	95,321
1938-1980	127,012	137,862	150,545	203,136	333,291	420,400	262,956	148,949	111,026	106,572	111,301	122,188
1981-2013	172,752	178,813	189,519	218,152	274,639	271,510	183,386	139,287	109,091	114,579	132,753	158,160

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 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 dropoff into the approximately 80-foot-deep navigation channel.

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

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

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)

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.[16] 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.[17] Changes to the rate of the river's flow are made independently of any thought as to how the flows might alter eddies.

2.4.2 Legal Influences: Flowage Easements

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*

[16] *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.
[17] *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.

> *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,[18] 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…*[19]

Beyond the compensation the owners received for these easements—which could range into the thousands—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; provided further that any use of the land shall be subject to Federal and state laws with respect to pollution.*

While the rights granted to facilitate the massive Bonneville Dam project have had sweeping effects on the property owners' ability to use and develop 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.[20, 21]

2.5 Summary of Recommendations from Section 2

[To be compiled in later draft after public review]

[18] *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.
[19] *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.
[20] *Recommendation #2-XX for SMP Update:* Consider shoreline use and modification policies that continue to minimize flood losses for shoreline property owners.
[21] *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 structures. During these interactions, the water's overall quality is either improved or diminished when the ecological functions of sediment management, nutrients and toxics filtration, and temperature regulation are performed.

3.1.1 Sediment Management

Sediment management is an important ecological function because of its ability to influence shoreline structures and because of its interaction with ecological functions related to habitat. Commonly described in terms of "sources and sinks," sediment management 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 Management—
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. 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.

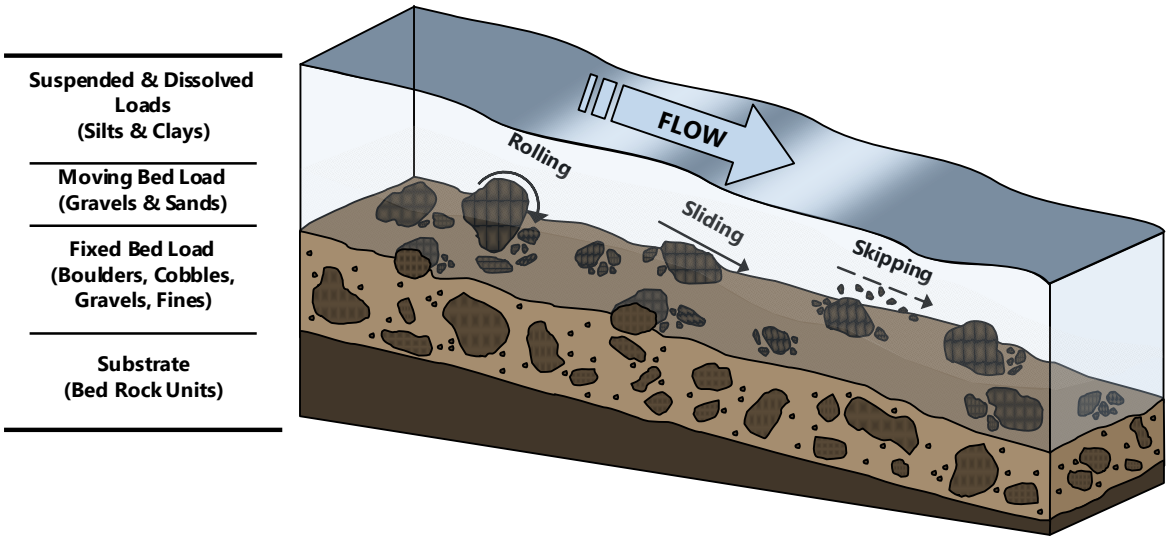


Figure 2.3-3 Sediment Transport Processes
Figure Credit Ben Shumaker

The factors controlling sediment inputs and flow velocity are variable along a stream's course and over the course of time. 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 management 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. As will be discussed in more detail by reach, Stevenson's shorelines areas 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 management, habitat functions and public health. Specific nutrients and toxins include heavy metals (lead, zinc, mercury), nitrogen, pathogens, pesticides and herbicides, and phosphorous. Nutrients & toxics are contributed to waterways by naturally occurring metals 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.

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 toxics 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.

3.1.3 Temperature Regulation

Important to the lifecycle needs of fish and wildlife and the maintenance of other water quality functions, temperature regulation is an ecological function characterized by reach in section 4. Water temperature varies according to climate processes based on diurnal and annual cycles, but can also be heavily influenced by geologic processes (hot springs), shoreline structure, 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 modify ambient stream temperatures. The Columbia River, Rock Cove, and Rock Creek systems demonstrate higher than normal temperatures for shorelines of their type for specific reasons discussed 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 overtime by 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 areas are considered as areas well suited to water storage and flow regulation functions. Impairment occurs when these types of natural conditions are not present or diminished. Though further described in section 4, 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

The rocks, soils, sediments, and waters of Stevenson's shorelines host a number of terrestrial, aquatic, and amphibious 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 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 because of the decline in their numbers that has been observed over time.

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

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 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 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 and rearing.

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)
[1]Some 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 quiet-water areas often contain woody debris and overhead cover to aid in food and nutrient 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 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.

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).

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 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 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.

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.

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, Oregon white oak woodlands are considered 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. Stands, or 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.

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.

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, 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 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 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 statewide, four of which would be 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 protection 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 habitat 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 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. Structure suitable for lifecycle needs include the LWD and sediment management described above, but also on other structures like undercut banks, (protection from predators), cliff faces (nesting), and wetlands (rearing).

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 to 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 passage, Rock Creek's waterfalls, and inundated floodplains within the Columbia River and Rock Cove systems.

3.4 Summary of Recommendations from Section 3

[To be compiled in later draft after public review]

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 pertinent information for planning area reaches for Rock Creek, Rock Cove, Ashes Lake, and the Columbia River. In accordance with WAC 173-26-150, the City has elected to predesignate the shorelines of urban growth areas that are located outside existing City boundaries.

Based on the definition of shoreline jurisdiction (see section 1.1), the Columbia River and Rock Creek are shorelines of the state with annual flows of more than 20 cfs. Rock Cove and Ashes Lake are waterbodies greater than 20 acres. Therefore, the Columbia River, Rock Creek, Rock Cove, and Ashes Lake and their associated "shorelands" comprise the geographic area where the SMA applies in the City. To assess the physical and biological resources of the shorelines of these waterbodies, the inventory and characterization broke them into manageable units based on geographic location as described in section 1.3. The reaches are described in detail below.

Table 4.0-1. Attributes and Map Locations

Reach-scale Attribute	Additional Information	Figure Number
Preliminary Shoreline Jurisdiction	Approximate extent of *SMP jurisdiction (current)* and approximate extent of *SMP jurisdiction (predesignation)*	1
Physical Characteristics		
Land cover	USGS gap analysis program (GAP)	2
Soil Type(s)	USGS Soil Survey Geographic Database (SSURGO) and US Forest Service soil data.	3
Critical Areas		
PHS Data	WDFW Priority Habitat and Species (PHS) Wildlife GIS data	4
Geologic Hazards	Information from Stevenson Critical Areas and Geologic Hazards Map	5
Contours	Skamania County GIS	6
Floodplain	FEMA FIRM, Zone A (original and Updated)	7
Wetlands	USFWS National Wetlands Inventory (NWI), Local Wetland Inventory	8
Land Use		
Zoning	Zoning data developed by Skamania County; is a compilation of County and City zoning.	9
Existing Land Use	County parcels using Department of Revenue (DOR) code (derived from Assessor's TerraScan database).	10
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."	11
Impervious Surfaces (gravel, paved or concrete, and rooftop),	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 areas	13
Shoreline Armoring/Stabilization	County	14
Archaeology/Historic	Washington State Department of Archaeology and Historic Preservation (DAHP) sensitive information	15

4.1 Columbia River Reach 1 – East Urban Area

Columbia River Reach 1

Photo Credit: Washington Department of Ecology (2007)

Columbia River Reach 1 is located in Skamania County, east of the City's downtown waterfront. It includes approximately 5,555 linear feet of Columbia River shoreline and 256 acres of shoreline jurisdiction area, including wetlands and the Columbia River to the state line. The reach starts at the eastern urban growth boundary line and ends downstream at the eastern city limits of the riverfront. This reach includes five residential properties, the Stevenson Cemetery, the BNSF tracks, SR 14, and Port of Skamania properties, including Pebble Beach Park. This reach is a shoreline of statewide significance.

4.1.1 Physical Environment

Vegetated cover within the reach is composed of 40.6 percent forest, 27.1 percent non-vegetated areas, 22.4 percent grassland, and 10 percent shrubland. The shoreline south of the railroad consists mostly of undeveloped areas, except the easternmost parcels used for residential uses and the Stevenson Cemetery. Vegetation within the shoreline jurisdiction is characterized by deciduous lowland riparian forest and westside lowland confiner-hardwood forest. The lowland riparian forest cover overhangs the shoreline edge providing allochthonous energy inputs. The forested area between the OHWM and the railroad is a source of large woody debris (LWD) recruitment.

The shoreline is characterized by a mix of rock outcroppings and fill slopes for the BNSF railroad. The reach's soil types include Skamania and Steever soils. The shoreline in this reach includes areas of known unstable soils, debris flow hazards, and potentially unstable slopes (slopes greater than 25 percent) (Figure 5). The reach is also mapped as part of the 100-year FEMA floodplain associated with the Columbia River.

4.1.2 Biological Resources

The PHS priority habitat types within the reach include one lacustrine littoral habitat and two palustrine wetlands. The PHS species within the reach include northern spotted owl (*Strix occidentalis caurina*), white sturgeon (*Acipenser transmontanus*), pink salmon (*Oncorhynchus gorbuscha*), coho, Chinook, steelhead, and bull trout. The monitored non-PHS species within the reach includes the sand roller (*Percopsis transmontana*).

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.

4.1.3 Land Use and Altered Conditions

This reach has approximately 1 mile of shoreline under shoreline jurisdiction and 25 acres of shoreline jurisdictional area. The existing land use within this reach is 62.1 percent public assembly, 16.9 percent single-family residential, 10.3 percent tourism industry, 7.3 multi-family percent residential, and 3.4 percent undeveloped. In terms of zoning, the reach is 91.6 percent community commercial, 5.0 percent single-family residential, 2.4 percent multi-family residential, and 1.0 percent commercial.

The land ownership is 66.9 percent by private owners, 12.2 percent by the state, 10.3 percent by the Port, 10.2 percent by cemeteries, and less than 1 percent by the federal government. In terms of water-oriented uses, the reach is 69.0 percent non-water oriented, 16.9 percent single-family, 10.4 percent water enjoyment, 3.4 percent undeveloped, and less than 1 percent water-dependent.

Along with the BNSF tracks, there are several roads within the reach: SR 14, Kanaka Creek Underpass, Gray Road, and Snug Harbor Drive. In addition, six structures add to the impervious surfaces within the reach. There are no bridges or dams within the reach, but several segments include armoring associated with the BNSF railroad.

Known archaeological, cultural, or historical resources within the reach include one cemetery. There are no 303(d) listings associated the Columbia River or its tributaries within the reach.

4.1.4 Public Access

The reach includes access to the Columbia River from the Port's Pebble Beach. This park includes approximately 0.1 miles of trails, a picnic table, and park bench with views of the river. Access to the middle portion of the reach is difficult because of the presence of the BNSF tracks and of the Stevenson Cemetery in the eastern end of the reach.

Port of Skamania County Pebble Beach

4.1.5 Restoration Opportunities

Restoration opportunities within Columbia River Reach 1 are limited by the location of the BNSF tracks parallel to the Columbia River as well as the presence of dams on the Columbia River that have altered natural ecosystem processes. However, replacing the culverts beneath SR 14 and the BNSF tracks to increase fish passage could increase accessible spawning and rearing habitat for salmonids.

4.2 Columbia River Reach 2 – Downtown Waterfront

Columbia River Reach 2

Photo Credit: Washington Department of Ecology (2007)

Columbia River Reach 2 is located in the city and includes the downtown waterfront and approximately 4,170 linear feet of Columbia River shoreline. The reach starts at the eastern limits of the city and ends downstream at its western limits on the Columbia River, at the BNSF railroad bridge over Rock Creek. This reach includes eight private properties, BNSF railroad properties, and Port properties, including light industrial, restaurant, commercial, and park uses. This reach is a shoreline of statewide significance. Shoreline Analysis conducted/submitted

4.2.1 Physical Environment

Vegetated cover within the reach is composed of 47.8 percent non-vegetated areas, 22.5 percent grassland, 19.8 percent forested, and 10 percent shrubland. The shoreline within the downtown waterfront consists mostly of residential and light industrial developed areas with several parks. Most of the shoreline vegetation is found within the park areas and along the residential shorelines. The limited vegetation within the shoreline jurisdiction is characterized by deciduous lowland riparian forest, which overhangs the shoreline edge providing allochthonous energy inputs. The trees along the shoreline are a source of LWD recruitment.

A mix of natural shoreline and armored slopes characterizes the shoreline, with the armoring occurring mostly along the eastern portion of the reach. The reach's soil types include Arents and Steever soils. According to the Stevenson Critical Areas and Geologic Hazards Map (Figure 5), there are no geologic hazards within the reach. It is mapped as part of the 100-year FEMA floodplain associated with the Columbia River.

4.2.2 Biological Resources

No PHS priority habitat types are mapped within the reach, but these PHS species are mapped within it: northern spotted owl, coho, Chinook, steelhead, white sturgeon, pink salmon, and bull trout. There are no monitored non-PHS species within the reach.

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.

4.2.3 Land Use and Altered Conditions

This reach has approximately 0.8 miles of Columbia River shoreline jurisdiction. The existing land use within this reach is 38.3 percent public assembly, 24.6 percent tourism industry, 13.8 percent undeveloped, 9.6 percent single-family residential, 7.6 percent undefined, 3.9 percent multi-family residential, and 2.2 percent commercial. In terms of zoning, the reach is 40.3 percent commercial, 31.9 percent public use, 16.5 percent light industrial, and 11.2 percent multi-family residential.

The land ownership is 37.1 percent private owner, 26.9 percent County, 23.3 percent Port, and 12.7 percent City. In terms of water-oriented uses, the reach is 46.6 percent non-water oriented, 25.2 percent water-enjoyment, 13.8 percent undeveloped, 9.6 percent single-family residential, 3.9 percent water-dependent, and 1 percent water-related.

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. Overwater structures include the BNSF bridge over the confluence of the Columbia River with Rock Creek, heritage piles, the pier and dolphins at Stevenson Landing (approximately 3,500 square feet), and the floating dock at the Cascade Boat Ramp (approximately 1,742 square feet). In addition, the reach includes armoring associated with the Port's light industrial complex near Stevenson Landing, and the residential properties.

There are no known archaeological, cultural, or historical resources within the reach. There are no 303(d) listings associated with the Columbia River within the reach.

4.2.4 Public Access

The reach contains six public access points to the river as well as approximately 0.5 miles of trail which connects all of the public accesses and meanders along the riverfront. The six access points are described in detail below.

Port of Skamania County's Cascade Boat Ramp

Cascade Boat Ramp is located at the east end of the reach and includes a public boat launch, restrooms with a changing cabana, picnic tables, a grass lawn area, parking, a floating dock, and a gravelly beach for access to the water.

East Point Kite Beach

Photo credit: Port of Skamania County

East Point Kite Beach is located immediately downstream from the boat launch and is a favorite with kiteboarders. This access point is a dedicated launch site, gives safe, easy access to the river, and has access to the Port's restroom and changing cabana shared with the Cascade Boat Ramp.

Leaven's Point is set between Stevenson Landing and East Point Kite Beach. This small park features picnic opportunities close to the river.

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.

Leaven's Point

Teo Park is located in downtown Stevenson on the Columbia River at the southern terminus of Russell Street. This park includes picnic tables, restrooms, and a grassy lawn on the riverbank with views of the river and the Gorge.

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 grass lawn, covered changing cabana, a spacious, easy launching area, picnic tables, and a water fountain.

Stevenson Landing

Access to River at Bob's Beach

4.2.5 Restoration Opportunities

Restoration opportunities within Columbia River Reach 2 are limited because of the presence of dams on the Columbia River that have altered natural ecosystem processes. However, the Columbia River shoreline could be restored by removing bank armoring and planting native vegetation, water quality could be improved by improving stormwater collection and treatment, and heritage piles could be removed from the shoreline.

4.3 Columbia River Reach 3 – West Urban Area

Western Half of Columbia River Reach 3

Photo Credit: Washington State Department of Ecology (2007)

Columbia River Reach 3 is located south of Rock Cove and west of the downtown waterfront. It includes approximately 7,300 linear feet of the Columbia River shoreline and 1,488,840 square feet of shoreline jurisdictional areas, including wetlands and the Columbia River to the state line. The reach is located outside the city limits and begins at the western boundary of Columbia River Reach 2 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. The City has elected to predesignate the shorelines of this reach, which is located outside existing City boundaries.

4.3.1 Physical Environment

Vegetated cover within the reach is composed of 91.4 percent water, 3.0 percent non-vegetated, 2.4 percent forest, 1.7 percent shrubland, and 1.4 percent grassland. Vegetation within the shoreline jurisdiction is characterized by deciduous lowland riparian forest.

The reach's soil types include Arents and Steever soils, which are not classified as hydric. The areas of the reach with slopes greater than 25 percent may have potentially unstable soils and unstable slopes (Figure 5). The reach is also mapped as part of the 100-year FEMA floodplain associated with the Columbia River.

4.3.2 Biological Resources

The PHS priority habitat type within the reach includes waterfowl concentrations and the PHS species within it include northern spotted owl, coho, Chinook, winter steelhead, white sturgeon, pink salmon, and bull trout. The only monitored non-PHS species within the reach is the ringneck snake. No NWI or local inventory wetlands are mapped within the reach.

4.3.3 Land Use and Altered Conditions

The existing land use within this reach is 38.7 percent public assembly, 35.8 percent undeveloped, and 25.5 percent timber industry. In terms of zoning, the reach is 64.7 percent industrial, 31.3 percent commercial recreational, 2.4 percent large woodland, and 1.6 percent water. The land ownership is 85.9 percent private ownership, 12.6 percent by Washington, and 1.5 percent by the County. In terms of water-oriented uses, the reach is 64.2 percent non-water oriented and 35.8 percent undeveloped.

There are approximately 0.77 miles of roads within the reach, including SR 14. Some of the structures that add to the impervious surfaces within the reach include gravel and concrete impervious surfaces at the former Co-Ply plywood mill and the BNSF railroad. There are no bridges or dams within the reach. The BNSF trestle bridge is adjacent to the eastern boundary of the reach.

There are no known archaeological, cultural, or historical resources within the reach, and no 303(d) listings are associated with it.

4.3.4 Public Access

Access to the Columbia River waterfront is difficult because of the presence of SR 14 and the BNSF tracks, and over 85 percent of the reach is in private ownership. The reach does not include any park benches, boat launches with access to the river, or trails. Some pull-off areas along SR 14 are used as viewing areas. 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 City's shoreline.

4.3.5 Restoration Opportunities

Restoration opportunities within Columbia River Reach 3 may include creating, restoring, and enhancing riparian buffers, improving stormwater treatment on existing impervious surfaces, addressing sedimentation concerns, vegetating the riprap along the Columbia River and the BNSF railroad, and increasing the amount of habitat available for salmonids.

4.4 Rock Creek Reach 1

Rock Creek Just South of Ryan Allen Road Bridge.

Rock Creek Reach 1 includes the shoreline jurisdictional area associated with Rock Creek within the City's boundaries between the BNSF trestle bridge and Ryan Allen Road. This reach is not a shoreline of statewide significance.

4.4.1 Physical Environment

Vegetated cover within the reach is composed primarily of forest, followed by non-vegetated, and smaller amounts of grassland and shrubland. Vegetation within the shoreline jurisdiction is characterized by westside lowlands conifer-hardwood forest and deciduous lowland riparian forest. The forested areas between the OHWM and Rock Creek are a source of LWD recruitment.

The reach's soil types mostly include primarily Steever soils, followed by Stevenson soils, and smaller amounts of Skamania and Arents soils. The areas of the reach with slopes greater than 25 percent may have potentially unstable soils and unstable slopes, and much of this reach is at risk for landslides (Figure 5). The northeastern portion of the reach was part of the Piper Road Landslide of 2007. The reach is also mapped as part of the 100-year FEMA floodplain.

4.4.2 Biological Resources

The PHS priority habitat type within the reach includes palustrine aquatic habitat and PHS species within it include residential coastal cutthroat, fall Chinook, winter steelhead, rainbow trout, and northern spotted owl. First Falls, located in the middle of the reach, is a fish passage barrier to migrating Chinook and steelhead. The monitored non-PHS species within the reach is the ringneck snake.

No local inventory or NWI wetlands are mapped within the reach.

4.4.3 Land Use and Altered Conditions

The existing land use within this reach is primarily undeveloped, followed by open space and services-government, and smaller amounts of private/commercial forest. In terms of zoning, the reach is primarily zoned as suburban residential, following 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.

Some of the roads within the reach include a pedestrian-only bridge crossing Rock Creek, SW Rock Creek Drive, including the bridge that crosses Rock Creek, as well as NW Angel Heights Road, First Falls View Road, HH Ave, Holly Street, NW Still Cove Lane, Stevenson Transfer Site Road, Neyland Road, Bounty Way, and Ryan Allen Road, of which a portion is a bridge that crosses Rock Creek. Some of the structures that add to the impervious services within the reach include residences, the Iman Cemetery, the Skamania County Public Transportation building, commercial businesses, and parking lots. There are no dams within the reach.

The only known archaeological, cultural, or historical resource within the reach is the cemetery. There are no 303(d) listings within the reach.

4.4.4 Public Access

The reach includes pedestrian walkways along the SW Rock Creek Drive Bridge, which provides views of Rock Creek. In addition, the County fairgrounds are located on the west side of Rock Creek, south of SW Rock Creek Drive, and access to the stream is provided here. There is a pedestrian bridge over Rock Creek that provides access to County property on the east side of Rock Creek and there is an informal swimming hole located between the SR 14 bridge and the BNSF trestle bridge over the mouth of Rock Creek.

Pedestrian Bridge over Rock Creek

Lower portion of Rock Creek with SR 14 bridge in background.

At the June 8, 2015 community vision workshop conducted for the update, stakeholders discussed how sedimentation in Rock Creek is an issue for fishers and kayakers are prevented from travelling from Rock Creek to the Columbia River. The attendees stated that sedimentation is causing scenic enjoyment issues for recreationalists and visitors. Additionally, stakeholders suggested improving the trails near Rock Creek.

4.4.5 Restoration Opportunities

Restoration opportunities within Rock Creek Reach 1 may include enhancing/restoring riparian buffers, collecting and treating stormwater from impervious surfaces, addressing sedimentation concerns, and creating additional riparian areas that are interspersed between developed areas. As noted above, stakeholders at the June 8, 2015 community vision workshop stated that infrastructure at the mouth of Rock Creek constrains natural processes such as stream flow/mobility.

4.5 Rock Creek Reach 2

Photo – Rock Creek south of Ryan Allen Road bridge; left bank is Rock Creek Reach 2

Rock Creek Reach 2 includes shoreline jurisdictional area associated with the north bank of Rock Creek within the City's urban growth boundary. This includes the area between Lasher Street and just north of Ryan Allen Road. The City is choosing to predesignate this reach. This reach is not a shoreline of statewide significance.

4.5.1 Physical Environment

Vegetated cover within the reach is primarily composed of forest, followed by shrubland and grassland, and undeveloped land. Vegetation within the shoreline jurisdiction is characterized by westside lowlands conifer-

hardwood forest and deciduous lowland riparian forest. The forested area between the OHWM and Rock Creek is a source of LWD recruitment.

The reach's soil types include primarily Steever soils, followed by Stevenson soils, and smaller amounts of Arents soils. The areas of the reach with slopes greater than 25 percent may have potentially unstable soils and unstable slopes, and much of this reach is at risk for landslides (Figure 5). A large portion of the reach was part of the Piper Road Landslide of 2007. The reach is also mapped as part of the 100-year FEMA floodplain.

4.5.2 Biological Resources

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. No local inventory wetlands or NWI are mapped within the reach.

4.5.3 Land Use and Altered Conditions

The existing land use within the reach is primarily composed of open space and undeveloped land, followed by smaller amounts of services-government and single-family residential land uses. In terms of zoning, the reach is entirely residential. There is both private and public land ownership within the reach.

Some of the roads within the reach include Piper Road, two unnamed roads, a gravel road, and Ryan Allen Road. Some of the structures that add to the impervious services within the reach include residences and their parking lots/driveways. There are no dams within the reach.

There are no known archaeological, cultural, or historical resource within the reach. There are also no designated 303(d) listings.

4.5.4 Public Access

The reach includes some trails leading to Rock Creek and its waterfalls. At the June 8, 2015 community vision workshop conducted for the update, stakeholders suggested improving the trails near Rock Creek and Rock Creek waterfalls.

4.5.5 Restoration Opportunities

Restoration opportunities within Rock Creek Reach 2 may include enhancing/restoring riparian buffers, addressing sedimentation concerns, and creating additional riparian areas that are interspersed between developed areas. Increasing connectivity between sections of Rock Creek within the reach could be a potential restoration action.

4.6 Rock Cove

Rock Cove

Photo Credit: Washington State Department of Ecology (2007)

The Rock Cove reach is otherwise known as the Stevenson Mill Pond, Stevenson Lake, Rock Creek Pond, or Hegewald Mill Pond. Rock Cove is located in the city, north of Columbia River Reach 3 and west of Rock Creek Reach 2. Rock Cove has approximately 1,504,895 square feet of shoreline jurisdictional area. The reach includes all of Rock Cove, the fill slope of SR 14, and portions of the Skamania County Fairgrounds, the Columbia Gorge Interpretive Center, other County-owned properties, and three residential properties. This reach is not a shoreline of statewide significance.

4.6.1 Physical Environment

Vegetated cover within the reach is composed of 66.6 percent water, 12.2 percent forest, 9.3 percent grassland, 7.9 percent non-vegetated, and 4.0 percent shrubland. Vegetation within the shoreline jurisdiction is characterized by westside lowlands conifer-hardwood forest and deciduous lowland riparian forest. The forested area between the OHWM and Rock Cove is a source of LWD recruitment.

The reach's soil types include Arents, Steever, and Bonneville soils, which are not classified as hydric. The areas of the reach with slopes greater than 25 percent may have potentially unstable soils and unstable slopes (Figure 5). The reach is also mapped as part of the 100-year FEMA floodplain associated with the Columbia River.

4.6.2 Biological Resources

The PHS priority habitat types within the reach include waterfowl concentrations and palustrine aquatic habitat. The PHS species within the reach include northern spotted owl, Canada goose, coho, Chinook, winter steelhead, white sturgeon, pink salmon, and bull trout. The only monitored non-PHS species within the reach is the ringneck snake. A 0.03-acre local inventory wetland is mapped in a northern portion of the reach's shoreline jurisdiction. The NWI indicates that reach is mapped as a lake.

4.6.3 Land Use and Altered Conditions

The existing land use within this reach is 53.9 percent tourist industry, 17.5 percent undeveloped, 16.2 percent public assembly, 5.9 percent multi-family residential, 3.9 percent single-family residential, and 2.5 percent commercial. In terms of zoning, the reach is 55.3 percent public use and recreation, 30.4 percent commercial recreational, 10.2 percent suburban residential, and 4.1 percent multi-family residential.

The land ownership is 44.6 percent by Skamania County, 39.2 percent by private ownership, 10 percent by the City, and 6.2 percent by the state. In terms of water-oriented uses, the reach is 53.9 percent water enjoyment, 24.6 percent non-water oriented, 17.5 percent undeveloped, and 3.9 percent single family residential.

The approximately 1.3 miles of roads within the reach include portions of SW Rock Creek Drive, SW Skamania Lodge Way, SW Attwell Road, and SR 14. Some of the structures that add to the impervious surfaces within the reach include residences, the Columbia Gorge Interpretive Center, the Rock Cove Assisted Living Facility, and parking lots. There are no bridges or dams within the reach.

There are no known archaeological, cultural, or historical resources within the reach. No 303(d) listings are associated with the reach.

4.6.4 Public Access

The reach includes access to Rock Cove from the Columbia Gorge Interpretive Center, Rock Creek Park, and the Skamania County Fairgrounds. The reach includes interpretive signs, public art, park benches with views of the river, a boat launch with access to the water on the western side of Rock Cove, walkways, and the Mill Pond Trail.

Rock Cove Interpretive Signs and Mill Pond Trail.

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 continued public access along the City's shoreline rather than segments of varying styles.

4.6.5 Restoration Opportunities

Restoration opportunities within the Rock Cove reach may include enhancing/restoring riparian buffers, addressing sedimentation concerns, dredging for fish and habitat enhancement, creating additional riparian areas that are interspersed between developed areas, and vegetating the riprap along Rock Cove and SR 14. Restoration opportunities for connecting the reach to the Columbia River are limited by the location of SR 14 and the BNSF railroad.

Potential restoration area in the northwest corner of Rock Cove where Foster Creek enters Rock Cove.

4.7 Ashes Lake

The Ashes Lake reach includes the extreme eastern portion of Ashes Lake, road rights-of-way, and 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 shoreline jurisdictional area of the 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.

4.7.1 Physical Environment

Vegetated cover within the reach is primarily composed of non-vegetated cover, followed by forest cover, shrubland, and smaller amounts of grassland. Vegetation within the shoreline jurisdiction is characterized by westside lowlands conifer-hardwood forest and deciduous lowland riparian forest. The forested area between the OHWM and Ashes Lake is a source of LWD recruitment.

The reach's soil types include Arents and Steever soils, which are not classified as hydric. The areas of the reach with slopes greater than 25 percent may have potentially unstable soils and unstable slopes (Figure 5). A southern portion of the reach is also mapped as part of the 100-year FEMA floodplain associated with the Columbia River.

4.7.2 Biological Resources

The PHS priority habitat types within the reach include waterfowl concentrations. The PHS species within the reach include northern spotted owl, coho, Chinook, winter steelhead, white sturgeon, pink salmon, and bull trout. The only monitored non-PHS species within the reach is the ringneck snake. No local inventory or NWI wetlands are mapped within the reach.

4.7.3 Land Use and Altered Conditions

The primary existing land use within this reach is road right-of-way, with smaller areas that are undeveloped and private/commercial forest. In terms of zoning, the reach is zoned as commercial recreational north of the SR 14. The northern portions of the reach are privately owned, while the road rights-of-way are publicly owned.

The reach has approximately 0.10 miles of roads, which includes portions of Ash Lake Road, SR 14, Mallicott Road, and a BNSF railroad. The reach includes no dams or bridges, no known archaeological, cultural, or historical resources, and no 303(d) listings.

4.7.4 Public Access

The Ashes Lake reach includes very limited public access to Ashes Lake and the Columbia River. There are no trails, 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.

4.7.5 Restoration Opportunities

Restoration opportunities within the Ashes Lake reach may include enhancing/restoring riparian buffers, creating additional riparian areas, removing heritage piles, and replacing any SR 14 and BNSF culverts to improve fish passage and increase the amount of habitat available for salmonids.

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 the 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, the general policy goals involved in determining the highest and best uses are:

- The use of shorelines for economically productive uses that are particularly dependent on shoreline location or use.
- The use of shorelines and the waters they encompass for public access and recreation.
- Protection and restoration of the ecological functions of shoreline natural resources.
- Protection of the public right of navigation and corollary uses of waters of the state.
- The protection and restoration of buildings and sites having historical, cultural, and educational value.
- Planning for public facilities and utilities correlated with other shorelines uses.
- Prevention and minimization of flood damages.
- Recognizing and protecting private property rights.
- Preferential accommodation of single-family uses.
- Coordination of shoreline management with other relevant local, state, and federal programs.

This section of the inventory and characterization report discusses the current uses of Stevenson's shorelines and whether these 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 percent private and 46.1 percent public. However, in the urban expansion area, private ownership is 70.0 percent, while the public ownership is only 30.0 percent. Skamania County is the single largest public shorelines landowner for both city and county jurisdiction areas, holding 22.1 percent of all shoreline areas considered in this report. 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. Table 5.1-1 below presents 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	
		Acreage	Percent	Acreage	Percent	Acreage	Percent
Public	Cemetery	0.6	0.6%	2.65	2.7%	3.30	1.6%
	City	8.7	8.2%	0.0	0.0%	8.7	4.2%
	County	28.2	26.8%	16.88	17.1%	45.13	22.1%
	Federal	0.0	0.0%	0.5	0.5%	0.50	0.2%
	Port	8.2	7.8%	2.68	2.7%	10.91	5.3%
	State	2.9	2.7%	6.79	6.9%	9.66	4.7%
Private		56.9	53.9%	68.93	70.0%	125.82	61.7%
	Total	***105.5***	***100.0%***	***98.4***	***100.0%***	***204.0***	***100.0%***

5.2 Land Use and Water Dependency

5.2.1 Existing and Future Land Use

The existing land uses within the City's shoreline jurisdiction comprise eight categories ranging from commercial to undeveloped lands. Undeveloped lands constitute the largest percentage of use at 33.7 percent. Public assembly uses, including city, county, state, and federal uses, amount to 26.9 percent. The remaining land uses are 15.5 percent tourism, 12.8 percent single-family residential, 6.3 percent timber industry, 2.6 percent multi-family residential, 1.3 percent manufacturing, and 0.8 percent commercial.

The 2013 Stevenson Comprehensive Plan projects land usage in the City and urban growth area, defining eight categories of land use. Projected future land uses within the shoreline jurisdiction include 31.6 low density residential, 25.4 percent low intensity trade (LIT), 23.3 percent urban reserve low intensity trade (UR-LIT), 12.2 percent high intensity trade (HIT), 5.4 percent high density residential (HID), and 2.0 percent urban reserve high intensity trade (UR-HIT).

5.2.2 Preferred and Water-Dependent Uses

A key component of the highest and best utilization involves accommodating water-oriented uses while discouraging non-water-oriented uses in shoreline areas.

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 the shoreline 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 factory processing 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, and the windsurfing or kiteboarding launch site would be considered a water-enjoyment use. A restaurant serving customers with a riverside but wind-protected view of the water would also be considered water-enjoyment, but a drive-through savings bank would be a non-water-oriented use

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Table 5.2-1. Current Water-Oriented Uses

Water-Orientation	Preferred Uses	Acreage	% Developed Land	% Developed and Undeveloped Land
Developed Land	Single-Family	50.0	8.3	4.7
	Water-Enjoyment	145.3	24.0	13.7
	Water-Related	0.3	0.1	0.0
	Water-Dependent	2.6	0.4	0.2
	Non-Water-Oriented	408.0	67.3	38.4
	Subtotal	*606.3*	*100.0*	*57.1*
Undeveloped Land	*Subtotal*	*455.9*	*NA*	*42.9*
	Total	**1,062.2**	**NA**	**100**

Non-water-oriented uses, which account for 408 acres or 67.3 percent of all developed land, dominate Stevenson's preliminary shoreline jurisdiction. Water enjoyment uses of shoreline areas total 145 acres or 24.0 percent of all developed areas while single-family residential uses make up another 50 acres or 8.3 percent. Water-related and water-dependent uses make up the balance of all developed land at 0.3 acre and 2.6 acres or 0.1 and 0.4 percent, respectively. Implementation of the SMP over time may change this distribution through some change in the use of previously developed land or by ensuring that the remainder of the undeveloped land in shoreline jurisdiction (456 acres or 42.9 percent) is developed as preferred uses.

5.3 Historic Development/Strategic Advantages

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's unique natural features. In 1805, during Lewis and Clark's westward journey, they observed peculiar submerged stumps within the river followed by the harrowing Cascade Rapids, or, as Captain William Clark called them, the "Great Shoote" (Figure 2.1-4). Later, the dangers of the 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 exploit these and later explorers as they attempted to avoid this dangerous stretch of water by using the already well-worn portage trail.

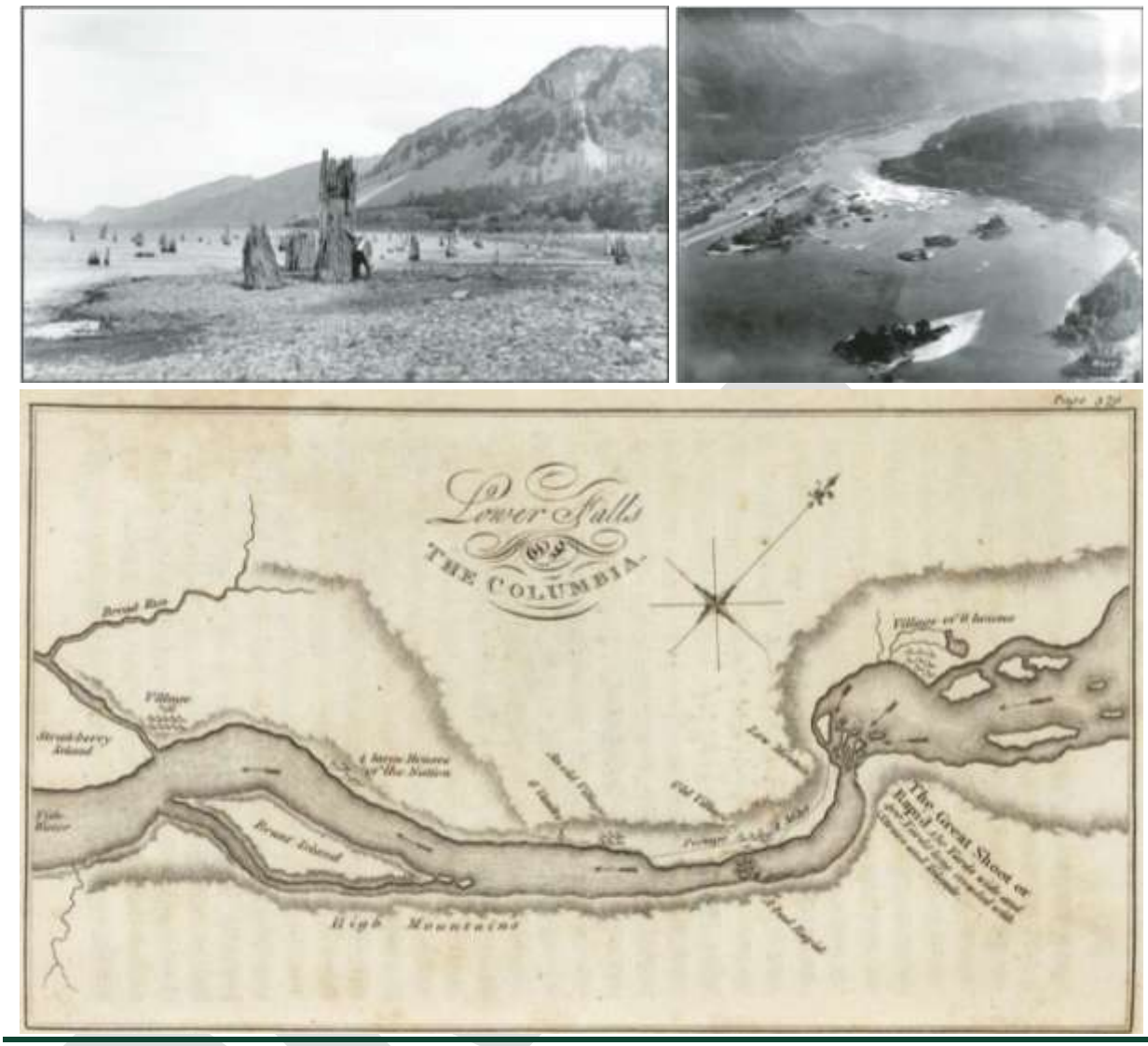

Figure 2.1-4 Early Observations of the Bonneville Landslide
Upper Left: Submerged tree stumps near Wind Mountain. Upper Right: Cascade Rapids and Cascade Locks.
Lower Map: 1815 Map of the Lower Falls of the Columbia, based on Captain William Clark's 1805 sketch.

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. In return, the trading practices and land settlement patterns of the European Americans were foreign to the Native American populations. Disagreements soon led to violence. The number of violent 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 forts Lugenbeel, Rains, and Cascades 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 near Fort Lugenbeel 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.[22]

5.4 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 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 individual 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. 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 5.4-1 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.

[22] *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.

Table 5.4.1. Projected Shoreline Uses and Potential Conflicts

Waterbody	Reach	Site	Public Access/Potential Use Conflicts
Columbia River	Reach 1 - East Urban Area (predesignation)	Stevenson Cemetery	Site owned by cemetery district. There are not many development/ redevelopment opportunities at this site based on conversations with owner.
	Reach 1 - East Urban Area (predesignation)	Slaughterhouse Point-Small peninsula in river south of railroad tracks	Site is Port-owned. Port has expressed desire for possible water access/ recreational use, a mitigation site for downtown Port development, or a combination.
	Reach 1 - East Urban Area (predesignation)	Recreation site	Site is Port-owned and is currently a main kiteboarding site. There has been some discussion about providing improved or additional recreation. A 1995 fatal flaw analysis by The JD White Company, Inc., KPFF Consulting Engineers, and E.D. Hovee & Associates identified this area for a possible marina.
	Reach 2 - Downtown Waterfront	Riverpoint & Tichenor buildings-Main Port business site	Site is Port-owned and is an existing cidery. Port desires to expand with restaurant and tasting room with no footprint expansion, just tenant changes. Its current zoning designation (M1–Light Industrial), does not allow stand-alone restaurants or tasting rooms. The waterfront embankment adjacent to the road is eroding and Port has proposed/permitted for bank expansion 60-80 feet into river. It would require fill and Port would undertake restoration as part of this project.
	Reach 2 - Downtown Waterfront	Narrow, Port-owned outparcels	Site is Port-owned and contains a vacant residence, garage, and restaurant buildings. Port desires to redevelop these parcels.
	Reach 2 - Downtown Waterfront	Western portion of reach along Columbia River	Site is Port-owned and is a park. Port would like to redevelop it into a water-enjoyment use or could be water-dependent use.
	Reach 2 - Downtown Waterfront	Public park	Site is Port-owned; no current plans for redevelopment.
	Reach 2 - Downtown Waterfront	Hotel site (12 units)	Based on stability of business, profitability is assumed and potential for redevelopment is low.

Waterbody	Reach	Site	Public Access/Potential Use Conflicts
Columbia River	Reach 2 - Downtown Waterfront	Public park	Site includes main windsurfing location.
	Reach 2 - Downtown Waterfront	Port Office	Site converted an existing single-family house into an office. It may include expanded beach access or deck for private rental for weddings/events.
	Columbia River Reach 2 - Downtown Waterfront	Privately owned properties	One owner is member of advisory committee. Zoning changed from commercial to multi-family residential. Owners of undeveloped lands intend to build single-family residences, but timeline is unclear.
	Columbia River Reach 2 - Downtown Waterfront	Rock Creek Property West of creek and north of railroad tracks	Site of existing mobile home park (upland area) and barge dock (along the water). Owner has stated intent to develop or sell the site. Barge dock is a potential restoration opportunity. Access from this property under the BNSF bridge has been cited as a need for additional recreation access to Columbia.
	Columbia River Reach 3 - West Urban Area (predesignation)	Potential future industrial sites	Sites are zoned by the County as industrial. Owners may be interested in annexation. Sites have both City sewer and water service. A possible marina site may be located at the far west end of property.
Rock Creek	Rock Creek - Reach 1	Potential commercial site	Site zoned for public use and recreation, but its future land use map designation is commercial. Was used as dredge storage after landslide. Unclear if owner wants to do something with both the upland and lowland portions of the site.
	Rock Creek - Reach 1	"Likely" development site	Site zoned as public use and recreation, but could be rezoned commercial based on its future land use map designation of commercial. Existing uses are County road maintenance facilities (north of Rock Creek Drive) and County vehicle storage (south of Rock Creek Drive). Site extends north of Rock Creek Drive, which has the potential for bridge replacement and road realignment 150 feet north of existing location. Bridge has very little clearance

Waterbody	Reach	Site	Public Access/Potential Use Conflicts
			(6 ft.) due to sediment buildup post-dam installation.
Rock Creek	Rock Creek - Reach 1	Large parcel single-family residences	Site includes existing single-family residences on large lots. Potential for redevelopment with multi-family based on future land use map. Steep slopes may limit opportunities.
	Rock Creek - Reach 1	Far Northwest Rock Creek Parcels.	Site has potential for subdivisions.
	Rock Creek - Reach 1	Angel Heights Conservation	Site includes Angel Heights Development, which established 200-foot conservation easements.
	Rock Creek - Reach 1	County Rock Creek Drive Building	Site owned by County, which is looking to sell or redevelop it. Any realignment of Rock Creek Bridge could conflict with this parcel.
	Rock Creek - Reach 1	City sewer treatment plant	Potential expansion will occur to serve the growing city, but no redevelopment plans are made for this site.
Rock Cove and Rock Creek	Rock Cove and Rock Creek - Reach 1	County fairgrounds	Site may possibly accommodate shoreline recreational expansions.
Rock Cove		Former Hegewald Mill Site-Cove Peninsulas	Site owned by County, which is interested in selling. The critical areas ordinance constrains much of the site, but there are opportunities to allow water-oriented uses. The County is investigating (Phase I and II environmental site assessments) for contamination at this former mill site. County is exploring brownfield redevelopment tools, including market assessment and critical areas mitigation since the existing buffers are degraded.
		Assisted Living Facility	Site is unlikely to redevelop. There are existing 10-foot access easements along water, but owner is discouraging access.
		Gorge Interpretive Center	Site is open to expanding recreational uses on property. There is a possibility for a concessionaire to rent kayaks, canoes, etc., to tourists. Site would like access directly onto SR 14.

5.4 Summary of Recommendations from Section 5

[To be compiled in later draft after public review]

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 that are described in the Ecology guidance include:

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

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.

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:

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

Rural Conservancy

The purpose of the "rural conservancy" designation is to protect ecological functions, conserve 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.

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 shared use of over-water facilities should be encouraged in order to reduce the impacts of shoreline development and increase effective use of water resources. 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.

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.

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.

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.

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 three 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 6.1-1. 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:

- Existing Land Use: percent land use type by reach
- Zoning: percent zoning type by reach
- Future Land Use designations
- Ecological Functions: qualitative assessment by the presence of WDFW priority habitats, WDFW priority species, and WDFW sensitive data for fish presence, as well as aerial photography and impervious surface cover
- Existing Shoreline Environment Designation: City of Stevenson, 1973

In general, areas zoned for open space or wooded were designated as "natural," water areas as "aquatic," residential areas as "shoreline residential," and commercial or industrial use areas as "high intensity" or "urban conservancy," depending on the intensity of use. The "urban conservancy" and "rural conservancy" shoreline environment designations were generally applied to areas with existing development, while taking into consideration the ecological functions and goals and aspirations of the City for these particular areas.

Table 6.1-1. Reach Summary and Preliminary Shoreline Environmental Designations

Waterbody	Reach	Factors Used to Recommend Designations					Preliminary Shoreline Environment Designation
		Existing Land Use	Zoning	Ecological Function	Future Land Use Designations	Existing Designation (City, 1973)	
Columbia River	Reach 1 -East Urban	PA, SFR, TOI, CO, R, MFR	CCO, SFR, CO	Poor	UR – LIT	Urban	Shoreline Residential (SFR, R, and MFR areas), High Intensity (CO and CCO areas), Urban Conservancy (all other areas)
	Reach 2 - Downtown Waterfront	PA, TOI, UD, SFR, UDF, MFR, CO	CO, PU, LID, MFR	Poor	HIT, HDR	Urban	Shoreline Residential (SFR and MFR areas), High Intensity (CO and LID areas), Urban Conservancy (all other areas)
	Reach 3 - West Urban	PA, UD, TMI	ID, CR, LW, WT	Poor	LIT, UR – HIT	Urban	Natural (LW areas), High Intensity (ID areas), Urban Conservancy (all other areas), Aquatic (WT areas)
Rock Creek	Reach 1	UD, OS, SG, PCF	SR, MFR, PR, CO	Fair	HIT, LIT, HDR, LDR	Urban, Conservancy, and Natural	Natural (OS areas), Shoreline Residential (SR and MFR areas), High Intensity (CO areas), Rural Conservancy (PCF areas), Urban Conservancy (all other areas)
	Reach 2	OS, UD, SG, SFR	R, SFR, TFR	Fair	LDR, UR – HIT	Natural and Conservancy	Natural (OS areas), Shoreline Residential (R, SFR, and TFR areas), Urban Conservancy (all other areas)
Rock Cove		TOI, UD, PA, MFR, SFR, CO	PR, CR, SR, MFR	Fair	LIT	Urban	Shoreline Residential (MFR, SFR, and SR areas), High Intensity (CO areas), Urban Conservancy (all other areas)
Ashes Lake		UD, PCF	CR, ID	Fair	UR – LIT	None	Urban Conservancy (CR areas), High Intensity (ID areas), Rural Conservancy (all other areas)

Key

Existing Land Use
CO – commercial
MFR – multi-family residential
OS – open space
SG – services – government
TOI – tourist industry
TMI – timber industry

Zoning
CO – commercial
CCO – community commercial
CR – commercial recreational
PR – public use and recreation
PU – public use
R – residential

Future Land Use
LDR – Low Density Residential
HDR – High Density Residential
LIT – Low Intensity Trade

PA – public assembly
PCF – private/commercial forest
SFR – single-family residential
UD – undeveloped
UDF – undefined
ID – industrial
LID – light industrial
LW – large woodland
MFR – multi-family residential
SR – suburban residential
TFR – two-family residential
WT – water
HIT – High Intensity Trade
UR - LIT – Urban Reserve Low Intensity Trade
UR - HIT – Urban Reserve High Intensity Trade

5

6.2 Summary of Recommendations from Section 6

[To be compiled in later draft after public review]

7.0 References

To keep this Inventory and Characterization report readable and accessible to broad audiences, 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 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

A.2 Words and Phrases

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.

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

"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

"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."

"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

"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."

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

B.2.2 Goal 2 – Urban Development

Page 18

"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."

"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."

"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."

"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."

"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."

"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."

"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."

"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."

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 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."

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

"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."

"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 n the Stevenson area."

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

Page 30

"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."

"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."

"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."

"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.

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 patter 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."

"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

"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."

"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

"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 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."

"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."

"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."

"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."

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

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"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."

"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."

"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."

"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."

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

"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."

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