



# City of White Salmon

## Shoreline Inventory, Analysis, and Characterization Report

January 2015



# **White Salmon Shoreline Inventory, Analysis, and Characterization**

**Prepared for**

**City of White Salmon  
White Salmon, Washington**

**January 2015**

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**CITY OF WHITE SALMON  
SHORELINE INVENTORY, ANALYSIS, AND CHARACTERIZATION**

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## **ACRONYMS AND ABBREVIATIONS**

<b>City</b>	<b>City of White Salmon</b>
<b>Ecology</b>	<b>Washington State Department of Ecology</b>
<b>FEMA</b>	<b>Federal Emergency Management Agency</b>
<b>GIS</b>	<b>geographical information system</b>
<b>Guidelines</b>	<b>Shoreline Master Program Guidelines</b>
<b>LF</b>	<b>linear feet</b>
<b>LWD</b>	<b>large woody debris</b>
<b>NPCC</b>	<b>Northwest Power Conservation Council</b>
<b>NWI</b>	<b>National Wetland Inventory</b>
<b>OHWM</b>	<b>ordinary high water mark</b>
<b>PHS</b>	<b>Priority Habitats and Species</b>
<b>RCW</b>	<b>Revised Code of Washington</b>
<b>RD</b>	<b>Riverfront District</b>
<b>SMA</b>	<b>Shoreline Management Act</b>
<b>SMP</b>	<b>Shoreline Master Program</b>
<b>SR</b>	<b>State Route</b>
<b>USA</b>	<b>United States of America</b>
<b>USCB</b>	<b>United States Census Bureau</b>
<b>WAC</b>	<b>Washington Administrative Code</b>
<b>WDFW</b>	<b>Washington Department of Fish and Wildlife</b>
<b>WRIA</b>	<b>Water Resource Inventory Area</b>
<b>WSMC</b>	<b>White Salmon Municipal Code</b>
<b>WSU</b>	<b>Washington State University</b>

# **WHITE SALMON SHORELINE INVENTORY, ANALYSIS, AND CHARACTERIZATION**

## **1.0 INTRODUCTION**

### **1.1 Background and Purpose**

The City of White Salmon, Washington (City) is conducting a comprehensive Shoreline Master Program (SMP) update with grant assistance from the Washington State Department of Ecology (Ecology). Substitute Senate Bill 6012, which was passed in 2003 by the Washington State Legislature, requires cities and counties to amend their local SMP consistent with the Shoreline Management Act (SMA), Revised Code of Washington (RCW) 90.58, and Washington Administrative Code (WAC) 173.26.

In 1984, the City adopted the Klickitat County SMP, and this inventory and characterization is the City's first planning effort devoted to regulating shoreline uses, development, and activities, under an SMP for the City.

The purpose of this report is to provide a basis for 1) an update of the City's shoreline management goals, policies, and regulations, and 2) the identification of opportunities for public access to the City's shorelines and for restoration. This report will be used in the next steps of the SMP update – the development of shoreline environmental designations; the preparation of draft SMP goals, policies, and regulations; and the development of a plan to take advantage of restoration opportunities within the City's shoreline jurisdiction.

### **1.2 Shoreline Jurisdiction**

The SMA defines shoreline jurisdiction by stating that shorelines include certain waters of the state plus their associated "shorelands," which comprise the geographic area where the SMA applies in a local jurisdiction. The City's SMA applies to:

- Upland shorelands that extend 200 feet landward from the edge of these water bodies';
- And the following when associated with the above:
  - 100-year floodplains, including all wetlands within the 100-year floodplain
  - Associated wetlands and river deltas.

The SMA also gives special recognition and more specific use preferences to areas that meet the definition of a "shoreline of statewide significance" as defined in RCW 90.58.030. The Columbia River has a flow of more than 1,000 cubic feet per second and meets the definition of a shoreline of statewide significance. Therefore, the City's shoreline adjacent to the River is a shoreline of statewide significance.

It should be noted that two parcels within the City's shoreline jurisdiction were created under treaty agreements with the federal government and tribal nations. One parcel is located west of the Hood River-White Salmon Interstate Bridge and was established as a treaty fishing access site; the second parcel is located east of the bridge and is a Native American tribal ice house used by tribal nations. Neither parcel is subject to state or local regulation and, therefore, neither is included in this inventory, analysis, and characterization report.

### **1.3 Study Area**

The City is located in Klickitat County, Washington on the north bank of the Columbia River and is a designated Urban Area within the Columbia River Gorge National Scenic Area. The City encompasses approximately 1.24 square miles (U.S. Census Bureau 2014). The City is surrounded by rural residential and agricultural lands, with the City of Bingen bordering the southeast corner of the City.

The study area for this report includes all shorelines and shorelands within the City's existing boundary extending only 200 feet landward from the ordinary high water mark of the Columbia River as well as associated wetlands, and does not include land currently within Klickitat County's jurisdiction (Figure 1; see the appendix for all figures). The total area subject to the updated SMP is approximately 29 acres and encompasses 1.2 miles of shoreline. No other streams, lakes, or wetlands within the City are considered part of its shoreline jurisdiction.

### **1.4 Methodology**

A preliminary step in the SMP update is to inventory and characterize the City's shoreline. The inventory and characterization were conducted in accordance with Ecology's SMP guidelines as established by WAC 173-26. The analysis was conducted on all lands within the City's 200-foot shoreline jurisdiction along the Columbia River, except for tribal trust lands discussed above in section 1.2 of this report. .

Following an inventory of existing data and information, BergerABAM distributed a list of proposed information sources to the City and Ecology. Collected information was augmented with additional resources from the City, scientific literature, personal communications, aerial photographs, data available on the internet, and an on-site inventory of the City's accessible shoreline.

After completing the inventory, BergerABAM prepared a characterization of the ecosystem-wide and local shoreline processes, functions, and opportunities for restoration, public access, and shoreline use.

This report describes the existing conditions of the shoreline and characterizes ecological functions in the City's shoreline jurisdiction. The characterization will serve as the baseline against which the impacts of future development actions in shoreline jurisdiction will be measured.

## **2.0 REGULATORY OVERVIEW**

### **2.1 City of White Salmon**

The SMA was passed by the state legislature in 1971 and adopted by the voters in 1972. The overarching goal of the SMA is “to prevent the inherent harm in an uncoordinated and piecemeal development of the state’s shorelines” (Ecology 1971). The SMA is also intended to balance development regulations and shoreline resource protection by encouraging water-dependent or water-oriented uses while conserving or enhancing shoreline ecological functions and values. SMPs are based on Ecology’s guidelines, but should be tailored to the particular conditions and needs of the local community.

The City adopted the Klickitat County SMP in 1984, and this inventory and characterization is a first step to regulating shoreline uses, development, and activities, and to developing a City of White Salmon SMP.

The City’s critical areas (Chapter 18.10) regulations as well as its comprehensive plan, municipal code, the International Building Code, and various other provisions of City, state, and federal laws regulate most uses, development, and activities in shoreline jurisdiction. Any applicant must comply with all applicable laws prior to the start of any use, development, or activity in shoreline jurisdiction. The City ensures uniformity between the SMP and other City codes, plans, and programs by reviewing each for consistency during periodic updates of the City’s comprehensive plan as required by state statute.

### **2.2 State and Federal Regulations**

State and federal regulations most relevant to development in City shoreline jurisdiction include the federal Clean Water Act, the federal rivers and Harbors Appropriation Act of 1899, the federal Endangered Species Act, the SMA, the state Growth Management Act, and the state Hydraulic Code. Additional relevant federal laws include the National Environmental Policy Act, Anadromous Fish Conservation Act, Clean Air Act, and the Migratory Bird Treaty Act. Additional state laws that address shoreline issues include the State Environmental Policy Act, Watershed Planning Act, Water Resources Act, Salmon Recovery Act, Water Quality Protection Act, and tribal agreements and case law.

State and federal regulations can play an important role in the design and implementation of a shoreline project depending on the nature of the proposed development. These regulations can ensure that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. Ensuring consistency between City regulations and state and federal requirements is one purpose of the SMP update.

## **3.0 REGIONAL OVERVIEW**

The City is located in Klickitat County in the transition from the West Cascade region to the East Cascade region, and contains shorelines associated with state Water Resource Inventory Area (WRIA) 29, Wind-White Salmon. The City’s shoreline is located within the White Salmon River subbasin, which originates in the Gifford Pinchot National

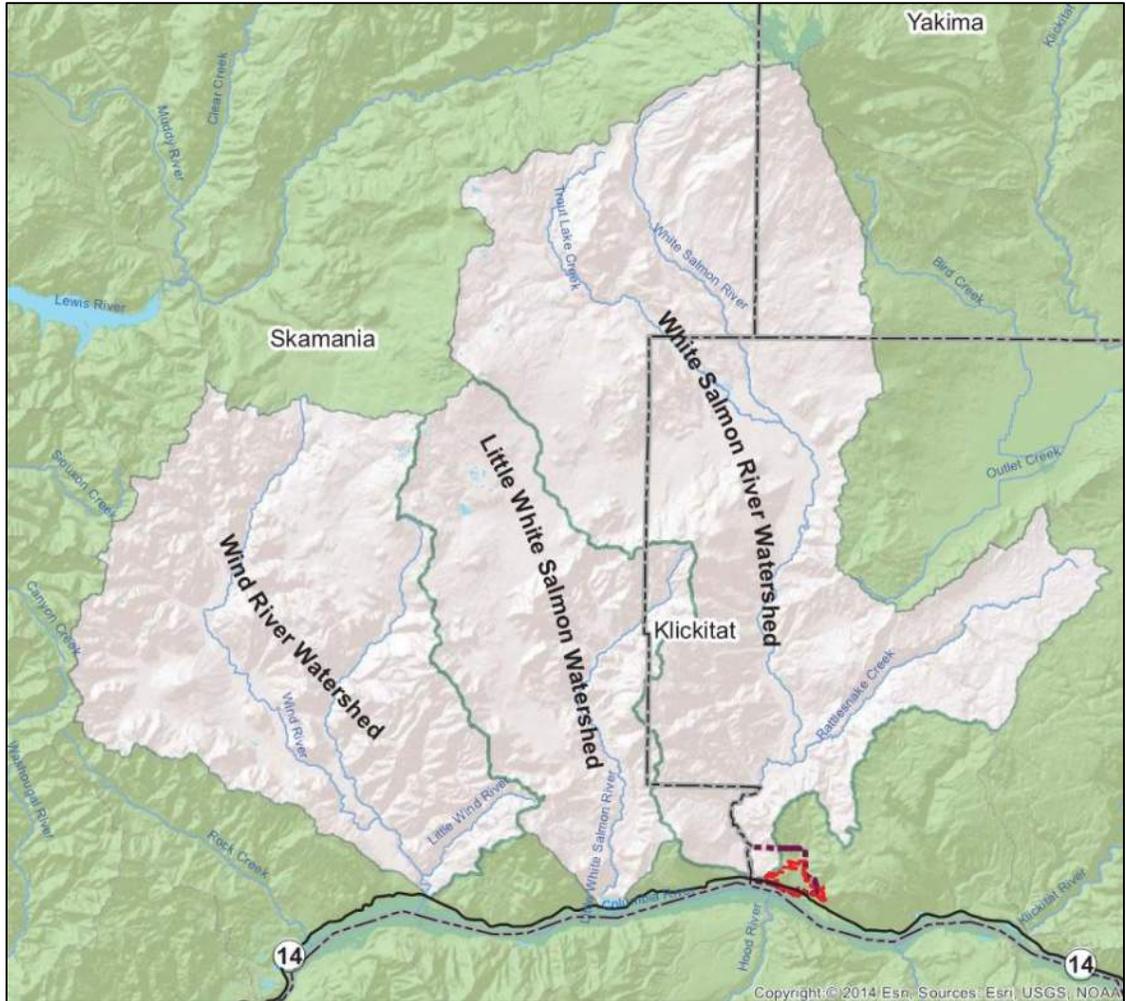
Forest on the south flanks of Mount Adams (Northwest Power Conservation Council [NPCC] 2004).

The climate patterns of WRIA 29 are controlled by marine-influenced air masses from the Pacific Ocean and continental air masses from eastern Washington. Summers are warm and dry, while winters are usually wet and mild (NPCC 2004). Annual precipitation ranges from 140 inches per year in the Cascade Mountains to 20 inches per year along the Columbia River (Ecology 2012). Precipitation in the City amounts to 42.5 inches of rain and 49.0 inches of snow per year (USA.com 2014).

The geology of WRIA 29 is dominated by past volcanic activity and glaciation. Soils in the area are the result of volcanism, glaciation, and erosional processes. Soils in the lower portions of the WRIA are generally shallow and less porous (Haring 2003 *in* NPCC 2004)

Elevation ranges from 12,280 feet at the summit of Mount Adams to 72 feet at the Columbia River shoreline (NPCC 2004). The City's topography varies from rugged mountains to rolling hills and from steep, narrow stream valleys to flat valley floors.

The vegetation of WRIA 29 reflects the transitional location and is a mix of East and West Cascade forests dominated by Douglas-fir, western hemlock, western red cedar, grand fir, ponderosa pine, and Oregon white oak (National Marine Fisheries Service 2013). The land uses are predominantly rural in nature, with forested/natural uses dominating; they total 94.6 percent of the WRIA with the remaining uses characterized by 3.6 percent pasture, 0.6 percent hay, 0.5 percent rural residential, and 0.7 percent other uses (NPCC 2000).



**Regional Map of WRIA 29 – Wind/White Salmon**

The construction of railroads and roads (i.e., State Route [SR] 14) has altered the lower reaches of tributaries to the Columbia River. In addition, the operation of Bonneville Dam and other Columbia River dams upstream of the City have altered the natural flow regime. These activities have resulted in a limited amount of functioning low gradient floodplain along the Columbia River.

**4.0 WHITE SALMON BIOLOGICAL RESOURCES AND CRITICAL AREAS**

This section describes biological resources and critical areas of state and local concern, which are intended to be protected and preserved because they perform many valuable social and ecological functions. They help relieve the burdens of urban development, including congestion, noise and odors, air pollution, and water quality degradation to name a few functions. The five critical areas within the shoreline jurisdiction are discussed in detail below.

#### 4.1 Fish and Wildlife Habitat Conservation Areas

The purpose of the fish and wildlife habitat conservation areas designation is to preserve and protect those areas with which anadromous fish, threatened and endangered species, and species of local importance have a primary association. Such areas include the documented presence of species listed by the federal government or the state as endangered, threatened, and sensitive species; sites containing and located within 300 feet of habitat for priority habitat species as listed and mapped by the Washington Department of Fish and Wildlife (WDFW); priority habitats mapped by WDFW; all streams that meet the criteria for streams set forth in WAC 22-16-030 and WAC 22-16-031; and heritage tree sites.

According to the habitat map (see the appendix), there are several habitat types and documented observation points of state or federally listed species within the City’s shoreline jurisdiction. The habitat types mapped include mule and black-tail deer concentrations, cliffs/bluffs, talus slopes, and waterfowl concentrations. Table 1 below details wildlife species that may occur within the City’s shoreline jurisdiction, but is not an exhaustive list.

**Table 1. Species that may occur in White Salmon Shoreline Jurisdiction**

Species Name		ESU or DPS*	Listing Status
Common Name	Scientific Name		
Chinook Salmon	<i>(Oncorhynchus tshawytscha)</i>	Lower Columbia River ESU	Federally Threatened
		Upper Columbia River spring-run ESU	Federally Endangered
		Snake River spring/summer-run ESU	Federally Threatened
		Snake River fall-run ESU	Federally Threatened
Chum Salmon	<i>(Oncorhynchus keta)</i>	Columbia River ESU	Federally Threatened
Coho Salmon	<i>(Oncorhynchus kisutch)</i>	Lower Columbia River ESU	Federally Threatened
Sockeye Salmon	<i>(Oncorhynchus nerka)</i>	Snake River ESU	Federally Endangered
Steelhead	<i>(Oncorhynchus mykiss)</i>	Lower Columbia River DPS	Federally Threatened
		Middle Columbia River DPS	Federally Threatened
		Upper Columbia River DPS	Federally Endangered
		Snake River Basin DPS	Federally Threatened
Bull Trout	<i>(Salvelinus confluentus)</i>	Columbia River DPS	Federally Threatened
Pacific Eulachon	<i>(Thaleichthys pacificus)</i>	Southern DPS	Federally Threatened
Sand Roller	<i>(Percopsis transmontana)</i>	Not Applicable	State Monitored
Cutthroat Trout	<i>(Oncorhynchus clarki)</i>	Not Applicable	Not Applicable
White Sturgeon	<i>(Acipenser transmontanus)</i>	Not Applicable	Not Applicable
Bald Eagle	<i>(Haliaeetus Leucocephalus)</i>	Not Applicable	State Sensitive
Osprey	<i>(Pandion haliaetus)</i>	Not Applicable	Not Applicable
Vaux’s Swift	<i>(Chaetura vauxi)</i>	Not Applicable	State Candidate
Yellow-billed Cuckoo	<i>(Coccyzus americanus)</i>	Not Applicable	Federally Threatened
Western Gray Squirrel	<i>(Sciurus griseus)</i>	Not Applicable	State Threatened

<b>California Mountain Kingsnake</b>	<i>(Lampropeltis zonata)</i>	Not Applicable	State Candidate
<b>Oregon Spotted Frog</b>	<i>(Rana pretiosa)</i>	Not Applicable	Federally Threatened

\*ESU =Evolutionarily Significant Unit; DPS=Distinct Population Segment  
Source: Washington Department of Fish and Wildlife

#### 4.2 Geologically Hazardous Areas

Geological hazard areas that pose a threat to the health and safety of citizens when incompatible development is sited in areas of significant hazard have been designated to reduce such threats. These geologic hazards include erosion hazards, landslide hazards, seismic hazards, and other geological events such as mass wasting, debris flows, rock falls, and differential settlement. Additionally, slopes greater than or equal to 40 percent are considered unbuildable and development is not allowed. According to the seismic and geologic hazards map (see the appendix), there are steep slopes mapped in both portions of the City’s shoreline jurisdiction. The steep slopes mapped in the western portion of the shoreline jurisdiction are associated with the basalt cliffs upslope of SR 14. The steep slopes mapped in the eastern portion of the shoreline are associated with the fill prism for the railroad and rock outcroppings near the shoreline. No other geologically hazardous areas are mapped within shoreline jurisdiction.

#### 4.3 Flood Hazard Areas

Flood hazard areas have been designated to protect public health, safety and welfare from harm caused by flooding and to maintain important hydrologic function of aquatic habitats. “Flood hazard areas” applies to areas identified in the City by Federal Emergency Management Agency (FEMA) flood insurance rating maps. These areas are typically mapped as the 100-year floodplain. In the City, a narrow band of 100-year floodplain is mapped within the portion of the City’s shoreline jurisdiction that is located along the Columbia River. Because of the Bonneville Dam and other dams along the Columbia River, floodwaters are managed to reduce flooding risks. Additionally, the Bonneville Reservoir created by the Bonneville Dam has effectively eliminated any floodway and channel migration zones within the river by reducing overbank flooding. Development potential exists within the floodplain along the Columbia River in the City but is subject to, FEMA, shoreline, and local critical areas ordinance restrictions.

#### 4.4 Critical Aquifer Recharge Areas

According to the City’s critical areas ordinance, there are no known aquifer recharge areas within city limits. The City’s water supply is sourced from Buck Creek, located south of White Salmon and outside of the City’s shoreline jurisdiction.

#### 4.5 Wetland Critical Areas

Wetlands are designated as critical areas within the City. Mapped wetlands in the shoreline jurisdiction include those identified in the National Wetland Inventory (NWI) maps created by the U.S. Fish and Wildlife Service, which identify five wetlands in the 200-foot shoreline jurisdiction. NWI maps are a preliminary resource and do not represent the full extent of all wetland areas, and there may be additional or fewer

wetlands located within the shoreline jurisdiction. Any future development or land use activities will require a complete wetland inventory on a project-by-project basis to determine if wetlands which are regulated by the City or other agencies are present. The precise extent of shoreline jurisdiction (which includes associated wetlands) would, thus, be determined at the time wetland delineations are completed by property owners, the City, or development applicants.

**5.0 SHORELINE REACH INVENTORY AND ANALYSIS**

SMP provisions are to be examined to ensure the adopted regulations provide no net loss of shoreline ecological functions. To confirm that no net loss of shoreline ecological function will occur, a shoreline inventory is required that records the existing or baseline conditions. At a minimum, local jurisdictions must gather the inventory elements listed in Ecology’s guidelines to the extent information is accessible and pertinent. Table lists the relevant inventory elements, the information collected for each element, and the data source. Data gaps are listed in section 5.2. The appendix contains the figures that depict the various inventory elements listed in Table 2.

**Table 2. Summary of Shoreline Inventory Elements**

<b>Inventory Element</b>	<b>Information Gathered</b>	<b>Data Source</b>	<b>Map Location</b>
Zoning	<ul style="list-style-type: none"> <li>• Zoning</li> </ul>	City	A - 2
Land Uses	<ul style="list-style-type: none"> <li>• Current land uses</li> </ul>	Ecology	A - 3
Impervious Surfaces	<ul style="list-style-type: none"> <li>• General Impervious surface from aerial photo interpretation</li> </ul>	Ecology	A - 4
Public Ownership	<ul style="list-style-type: none"> <li>• Parks and open space</li> </ul>	Ecology	A - 5
Soils	<ul style="list-style-type: none"> <li>• Soil types</li> </ul>	WDNR	A - 6
Floodplain & Potential Wetlands	<ul style="list-style-type: none"> <li>• 100-year floodplain</li> <li>• Potential wetlands</li> </ul>	Ecology	A - 7
Seismic & Geologic Hazards	<ul style="list-style-type: none"> <li>• Fault lines, volcanic vents, and landslides</li> </ul>	WDNR	A - 8
Priority Habitats	<ul style="list-style-type: none"> <li>• Priority habitats</li> <li>• Documented species locations</li> </ul>	WDFW	A - 9
Vegetation	<ul style="list-style-type: none"> <li>• Vegetation type and percent cover</li> </ul>	WDFW	A - 10
Contours	<ul style="list-style-type: none"> <li>• 10-ft contours</li> </ul>	Washington State University GIS Data Portal	A - 11

**5.1 Reach Units**

Based on the definition for shoreline jurisdiction as stated in Section 1.2 above, the Columbia River is a shoreline of the state with annual flows of more than 20 cubic feet per second. Therefore, the Columbia River and the associated “shorelands” comprise the geographic area where the SMA applies in the City. To assess the physical and biological resources of the shoreline of the Columbia River, the inventory and characterization broke it into manageable units based on geographic location.

- Reach 1: Columbia River shoreline from the boundary between White Salmon and Bingen downstream to the western edge of the White Salmon city limit.
- Reach 2: Downstream of Reach 1 at the western end of the White Salmon city limit.

**5.1.1 Columbia River Reach 1**

Reach 1 is the main section of shoreline within the City and is approximately 4,750 linear feet (LF) (Figure 1A, see the appendix). This reach includes the area east and west of the Hood River-White Salmon Interstate Bridge. The reach is characterized by a non-linear natural shoreline that includes alcoves and areas that extend out into the river. The area landward of the shoreline is characterized by two ecosystems – a lowland riparian deciduous forest and a dry mesic oak-pine forest community. Land uses within the 200-foot shoreline jurisdiction include agriculture, open space, commercial, and transportation (bridge and railroad). Zoning in Reach 1 is Riverfront District. Table summarizes the reach inventory.

**5.1.2 Columbia River Reach 2**

Reach 2 is located downriver of Reach 1 and, at approximately 1,600 LF, is smaller (Figure 1B, see the appendix). The reach itself is not located within city limits, but the 200-foot shoreline jurisdiction extends into the city adjacent to the reach. The city limits are separated from the physical shoreline by SR 14 and the BNSF tracks. The shoreline is generally linear with armored rock placed to protect the BNSF tracks from the erosive forces of the Columbia River. The shoreline slopes up steeply from the railroad to SR 14, which was cut into the hillside. The slope continues upward steeply to the edge of the 200-foot shoreline jurisdiction. The area landward of the shoreline is characterized by a dry mesic oak-pine forested community with shallow soils and exposed bedrock. Current land uses in the shoreline area include open space and transportation (SR 14 and BNSF tracks). Current zoning designations include R-1 Single Family Residential. Table 3 summarizes the reach inventory.

**Table 3. Summary of Reach Elements**

Inventory Element		Reach 1	Reach 2
Reach Length		4,750 LF	1,600 LF
Reach Area		21.8 acres	7.3 acres
Land Use Patterns	Zoning	Riverfront District	R-1 Single Family Residential
	Comprehensive Plan	Riverfront Plan District	Residential District
	Current Land Uses	Agriculture, Commercial, Transportation, & Open Space	Residential & Open Space
Public Accesses		3.89 acres	None
Shoreline Armoring		60 LF	1,600 LF
Over Water Coverage		0%	0%
Critical Areas	Fish & Wildlife Habitat	Waterfowl concentrations Palustrine wetland	Oak woodland Talus slopes

Inventory Element		Reach 1	Reach 2
	Geological Hazards	Slopes 0-14%	Slopes 15-39%
	Flood Hazard Areas	100-year floodplain	None
	Critical Aquifer Recharge Areas	None	None
	Wetlands	Palustrine wetland	None

## 5.2 Data Gaps

While the City’s comprehensive plan identifies and maps slope hazards, future transportation plans, existing water distribution, and wastewater collection, electronic copies of some essential data were not available for inclusion in the mapping efforts discussed above.

## 6.0 ECOSYSTEM PROCESSES AND SHORELINE FUNCTIONS

### 6.1 Analysis of Existing Ecosystem Processes

This analysis of ecosystem processes provides the context for the management of the City’s shoreline area. The analysis follows the Ecology guidelines and evaluates the functions of the shoreline at a reach scale. Conceptually, ecosystem functions are those aspects of the ecosystem that are beneficial either biologically, economically, or aesthetically.

Ecosystem processes are defined as “...the suite of naturally occurring physical and geological processes of erosion, transport, and deposition; and specific chemical processes that shape landforms within a specific shoreline ecosystem and determine both the types of habitat and the associated ecological functions” (WAC 173-26-020-12).

The City sits within the White Salmon River and the Jewett Creek subbasins of the Mid-Columbia River Basin. Hydrologic processes have been significantly altered in the basin with the installation of dams in the main channel and the Snake River dams. Jewett Creek has been significantly altered as it runs through the City, and it is piped under SR 14 and through the SDS Lumber mill site to the Columbia River. However, the White Salmon River has had hydrologic processes restored with the recent removal of the Condit Dam, which was built for hydropower in the early 20th century at river mile 3.1.

Most of the White Salmon River watershed is forested, but agriculture and forestry practices have affected the ecosystem processes of the movement of sediment within the watershed by increasing erosion, increasing the movement of toxins from the application of pesticides and herbicides and the movement of nutrients from fertilizers, and reducing the movement of large woody debris (LWD) by installing culverts for farm and logging roads.

Dams on the Columbia River have had significant effects on the ecological functions along the City’s shoreline by disconnecting the natural flood from the river, which causes a loss of wetlands, loss of floodplain storage, loss of opportunities for nutrient cycling, and loss of sediment storage. Table 4 summarizes the ecosystem-wide processes, functions, and impairments.

**Table 4. Summary of Ecosystem-wide Processes, Functions, and Impairments**

<b>Ecosystem-wide Process</b>	<b>Ecological Function Group</b>	<b>Ecological Function</b>	<b>Impairment</b>
Hydrologic movement of surface and subsurface water	Water quantity functions	Storage of surface water in floodplains and depressional wetlands	Water withdrawals for irrigation
Movement of sediment, toxics, nutrients, and pathogens	Water quality functions	Removal of sediment, toxics, nutrients, and pathogens	Steep watershed with little floodplain/wetlands to remove toxins, toxins in Columbia River
Movement of water, sediment, and LWD	Habitat functions	Provision of aquatic habitat for invertebrates, native fish, amphibians, birds, and mammals	Dams hold sediments behind them and limit transfer of sediment

## 6.2 Analysis of Shoreline Functions

Shoreline functions pertain to rivers in the City’s shoreline jurisdiction. The assessment of each function is based on the quantitative data that results from the shoreline inventory described in section 5.0 above and on a qualitative assessment based on aerial photography and field inventory. The analysis divided the shoreline of the Columbia River into two reaches based on their geographic location and physical characteristics. In the ensuing sections, each reach is assessed and given an overall qualitative rating for ecological functions. Ratings were completed using a five-tier scoring scale:

- Low
- Low/Moderate
- Moderate
- Moderate/High
- High

The assessment of functions and processes for each reach is followed by recommended measures for protecting existing functions and processes or restoring impaired functions and processes at the ecosystem-wide scale and at the shoreline scale.

### 6.2.1 Columbia River Reach 1

Reach 1 is located on the Columbia River and extends 4,750 linear feet from the City of Bingen downstream past the Hood River-White Salmon Interstate Bridge to the edge of the White Salmon city limits (Figure 1A, see the appendix). The shoreline south of the

railroad consists mostly of undeveloped areas, except the westernmost parcel that is used for agriculture and is in private ownership. Vegetation within the shoreline jurisdiction is characterized by deciduous lowland riparian forest and dry, mesic mixed deciduous and coniferous forest. The lowland riparian forest cover overhangs the shoreline edge providing allochthonous energy inputs. The forested area between the ordinary high water mark (OHWM) and the railroad is a source of LWD recruitment as evident by several large alder and cottonwood trees that have fallen on the shoreline.



**Photo 1. Photograph depicting overhanging vegetation and LWD inputs**

The width of the upland forest between the OWHM and the railroad varies from less than 40 feet to more than 200 feet. There are no streams within the reach, but in several locations along the streambank, groundwater was observed discharging to the river in the form of natural springs or seeps. The water from the springs is colder than the river water and may provide some thermal regulation of stream temperatures.



**Photo 2. Photograph depicting natural springs or seeps**

Most of the shoreline in Reach 1 is in a semi-natural condition with the exception of a 60-foot section where one of the bridge footings is located and a 760-foot section that appears to have been filled when the railroad was constructed. The segment along the railroad has become vegetated and provides some natural shoreline functions. All of the streambanks within the shoreline appear to be stable.



**Photo 3. Photograph of bridge footing at the edge of the shoreline**



**Photo 4. Photograph of shoreline filled for BNSF**

The WDFW priority habitats and species (PHS) database identifies a waterfowl concentration area along the eastern portion of Reach 1. No upland habitats are mapped in Reach 1. Ecology has identified the Columbia River as an impaired water for temperature along this reach. Table 5 summarizes the ecological functions within Reach 1.

**Table 5. Reach 1 Ecological Functional Assessment Summary**

<b>Shoreline Function</b>	<b>Alteration and Assessment of Functions</b>	<b>Function Score</b>
<b>Hydrologic Functions</b>		
Transport water and sediment across the natural range of flow variability	Construction of upstream and downstream dams has altered water and sediment transport resulting in water and sediment storage in the Bonneville Reservoir.	Low
Attenuating flow energy	Shoreline functions for attenuating flow energy have been impaired by the construction of mainstem Columbia River dams; however, dams have slowed velocities and reduced erosive forces.	Low
Developing pools, riffles, gravel bars	Construction of dams has altered natural stream processes of pool, riffle, and gravel bar development	Low
Nutrient flux	Nutrient fluxes have been altered by increased irrigation run-off and wastewater discharges.	Low – moderate
Recruitment and transport of LWD and other organic matter	Transport of LWD has been altered by construction of dams and transportation system that parallel river and have disconnected floodplain, limiting amount of LWD available to floodwaters. However, existing forested area has provided and continues to provide LWD recruitment.	Low – moderate
Temperature	Construction of dams has resulted in reservoirs where surface temperatures increase with slower moving water and increased surface area. Top water release of water yields increases temperatures downstream.	Low
<b>Shoreline Vegetation Functions</b>		
Maintaining temperature	Streamside vegetation has limited ability to maintain stream temperatures in large river systems like the Columbia River. Additionally, the streambank is south-facing, further reducing vegetation's ability to maintain temperatures. Any alteration of vegetation would have a negligible effect.	N/A
Removing excessive nutrients and toxic compounds	Vegetative width varies along shoreline. Full 200-foot shoreline jurisdiction is vegetated in middle of reach, but is a narrow vegetated strip adjacent to agriculture and rail uses reduces shoreline's ability to remove nutrients and toxins.	Low-moderate
Sediment removal and stabilization	Narrow vegetated strip adjacent to agriculture and rail uses reduces ability to remove sediment and stabilize soils. Heavily vegetated middle section of reach provides sediment removal and stabilization functions.	Moderate
Attenuation of high stream flow energy	Due to dam construction, high stream flow energy has been negated and the opportunity for streamside vegetation to perform attenuation function has been lost.	N/A
Provision of woody debris and other organic matter	Middle section of shoreline reach has mature forest coverage that provides opportunity for LWD recruitment and organic debris inputs. Vegetation removal and	Moderate

Shoreline Function	Alteration and Assessment of Functions	Function Score
	shoreline development reduce opportunities for LWD and organic input.	
<b>Hyporheic Functions</b>		
Removing excessive nutrients and toxic compounds	Region's natural geology has shallow soils on bedrock. Hyporheic zone has limited ability to remove excessive nutrients and toxins. Construction of dams and Bonneville Reservoir has altered exchange of water to and from hyporheic zone.	Low
Water storage	Region's natural geology has shallow soils on bedrock. Hyporheic zone has limited ability to store water. Additionally, loss of floodplain area from dam construction eliminates additional water storage in hyporheic zone.	Low
Support of vegetation	Several seeps/springs were observed in middle section of reach that provide water in dry months and help support streambank vegetation.	Moderate – high
Maintenance of base flows	Region's natural geology has shallow soils on bedrock. Hyporheic flows observed have limited ability to contribute to base flows.	Low – moderate
<b>Habitat Functions</b>		
Space or conditions for life history stages	Change in water levels from hydropower systems can create unstable habitat conditions that can be disrupting to juvenile fishes (Freeman <i>et al.</i> 2001).	Low
Resting, cover, and migration	Shoreline contains alcoves with overhanging vegetation that may provide resting and cover opportunities for migrating fish. Construction of dams has resulted in simplification and homogenization of habitat and created slow-moving water that causes juvenile salmonids to expend more energy and a semi-lentic environment.	Low – moderate
Primary productivity, food production and delivery	In general, primary production has shifted from a periphyton community to floating algae community due to creation of Bonneville Reservoir. Benthic community also shifts from a lotic to lentic community that may have implications for food web. However, overhanging vegetation in reach provides allochthonous energy inputs.	Low – moderate
<b>Overall Function Score</b>		<b>Low – Moderate</b>

### 6.2.2 Columbia River Reach 2

Reach 2 is located on the Columbia River, downstream of Reach 1, and is approximately 1,600 linear feet in length. In this reach, the shoreline itself is not within city limits, but a small portion of the 200-foot shoreline jurisdiction extends into the city limits and constitutes Reach 2 (Figure 1B, see the appendix). The shoreline consists of filled slopes with armoring south of the railroad, steep slopes (between 15 and 39 percent) between the railroad and SR 14, and extremely steep slopes (40 percent and greater) north of SR 14. The latter are located within the city limits. Vegetation within the City's shoreline jurisdiction is characterized by dry, mesic mixed deciduous and coniferous forest.

Because of the steep slopes, highway, and railway, this area was not traversed and aerial photography was used to assess it.



**Photo 5. Google Earth aerial photograph of Reach 2**

As mentioned above, most of the shoreline jurisdiction is located outside of the city limits. However, there is a small sliver of land in shoreline jurisdiction on the City’s western extent which is perhaps 30-50 feet wide and 800-900 feet long adjacent to SR 14. The portion of Reach 2 located outside of the city limits has been altered by the construction of the railroad and SR 14, and the streambanks are armored and appear to be stable. The WDFW PHS database identifies oak forest and talus slopes within the City’s shoreline jurisdiction, which are upland habitats in Reach 2. No aquatic priority habitats are identified in this reach. Ecology has identified the Columbia River as an impaired water for temperature along this reach. Table 6 summarizes the Ecological Functions provided by Reach 2.

**Table 6. Reach 2 Ecological Functional Assessment Summary**

Shoreline Function	Alteration and Assessment of Functions	Function Score
<b>Hydrologic Functions</b>		
Transport water and sediment across the natural range of flow variability	Construction of upstream and downstream dams has altered water and sediment transport resulting in water and sediment storage in Bonneville Reservoir.	Low
Attenuating flow energy	Shoreline functions for attenuating flow energy have been impaired by construction of mainstem Columbia River dams; however, dams have slowed velocities and reduced erosive forces.	Low
Developing pools, riffles, gravel bars	Construction of dams has altered natural stream processes of pool, riffle, and gravel bar development.	Low

<b>Shoreline Function</b>	<b>Alteration and Assessment of Functions</b>	<b>Function Score</b>
Nutrient flux	Nutrient fluxes have been altered by increased irrigation runoff and wastewater discharges.	Low – moderate
Recruitment and transport of LWD and other organic matter	Transport of LWD has been altered by construction of dams and transportation system that parallel river and have disconnected floodplain, limiting access of LWD to floodwaters.	Low
Temperature	Construction of dams has resulted in reservoirs where surface temperatures increase with slower-moving water and increased surface area. Top water release of water yields increased temperatures downstream.	Low
<b>Shoreline Vegetation Functions</b>		
Maintaining temperature	Streamside vegetation has limited ability to maintain stream temperatures in large river systems like the Columbia River. Additionally, the stream bank is south facing further reducing vegetation's ability to maintain temperatures. Any alteration of vegetation would have a negligible effect.	N/A
Removing excessive nutrients and toxic compounds	Shoreline has been bisected by the railroad and SR – 14, which has reduced the ability to remove nutrients and toxins.	Low
Sediment removal and stabilization	Fill slope with limited strip of vegetated adjacent rail uses has reduces the ability to remove sediment and stabilize soils.	Low
Attenuation of high stream flow energy	Due to dam construction high stream flow energy has been negated and the opportunity for streamside vegetation to perform the attenuation function has been lost	N/A
Provision of woody debris and other organic matter	Vegetation removal and shoreline development have reduced the LWD and organic input opportunities.	Low
<b>Hyporheic Functions</b>		
Removing excessive nutrients and toxic compounds	Region's natural geology has shallow soils on bedrock. Hyporheic zone has limited ability to remove excessive nutrients and toxins. Construction of dams and Bonneville Reservoir has altered exchange of water to and from hyporheic zone.	Low
Water storage	Region's natural geology has shallow soils on bedrock. Hyporheic zone has limited ability to store water. Additionally, loss of floodplain from dam construction eliminates any water storage in hyporheic zone.	Low
Support of vegetation	Filled slope for railroad construction has reduced opportunity to support vegetation.	Low
Maintenance of base flows	Region's natural geology has shallow soils on bedrock. Hyporheic flows expected to have limited ability to contribute to base flows.	Low
<b>Habitat Functions</b>		
Space or conditions for life history stages	Shoreline is linear fill slope with armor rock that does not provide ideal conditions for life history stages.	Low
Resting, cover, and migration	Construction of dams and railroad has resulted in simplification and homogenization of habitat, which creates slow-moving water that causes juvenile salmonids to expend more energy and created semi-lentic environment.	Low

Shoreline Function	Alteration and Assessment of Functions	Function Score
Primary productivity, food production and delivery	In general, primary production has shifted from periphyton community to floating algae community due to creation of Bonneville Reservoir. Benthic community also shifts from lotic to lentic community that may have implications for food web.	Low
<b>Overall Function Score</b>		<b>Low</b>

**6.3 Recommended Measures**

The following are recommended actions for translating the inventory and characterization findings into draft SMP policies, regulations, environment designations, and restoration strategies. The specific recommendations are intended for future development to improve ecosystem processes as both a holistic watershed approach and a site specific shoreline jurisdiction approach.

*Ecosystem-wide Measures*

- Improve water quality through improved stormwater management within the City and in future expansion areas.
- Improve water quality through improved wastewater treatment that exceeds state and federal discharge standards.
- Promote sustainable irrigation practices that reduce water consumption within the City and in future expansion areas.
- Protect the riparian areas of Jewett Creek, the White Salmon River, and seasonal tributaries.
- Promote the use of oversized or open-bottom culverts to restore stream functions.
- Other functions likely will never be restored unless upstream and downstream dams are removed.

*Shoreline Measures*

- Promote water-dependent and water enjoyment uses that maintain shoreline functions.
- Encourage preservation/protection of undeveloped riparian habitat at the County-owned site, the portion of the federally owned site along the river, the BNSF-owned site, and lands on the river that do not have a parcel number (Figure 1A - see the appendix).
- Encourage existing agricultural uses within the shoreline to use best management practices to reduce pollution.
- Promote stormwater treatment on existing uses within the shoreline, including the Hood River-White Salmon Interstate Bridge, to reduce pollution.
- Remove invasive species within the shoreline.

## 7.0 WHITE SALMON LAND USE ANALYSIS

### 7.1 Introduction

The preferred uses in the SMP (i.e., water-dependent, water-related, and water-enjoyment) can be identified through a land use analysis and are an important component of the SMP. Land uses adjacent to the water are also a factor in assigning environmental designations to sections of the shoreline. Additionally, potential land use changes and their effects on shorelines with respect to SMA objectives can be determined with an analysis of land use conditions. The existing land uses and the proposed provisions and boundaries of environment designations must be consistent with the City's comprehensive plan.

As previously mentioned, the Columbia River is a shoreline of statewide significance with preferences established by RCW 90.58.020 in the following order:

1. Recognize and protect the statewide interest over local interest;
2. Preserve the natural character of the shoreline;
3. Result in long-term over short-term benefit;
4. Protect the resources and ecology of the shoreline;
5. Increase public access to publicly owned areas of the shorelines;
6. Increase recreational opportunities for the public in the shoreline; and
7. Provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary.

The SMP update requires the shoreline to be classified into specific shoreline environment designations based on existing land use patterns, baseline inventory and analysis results, goals stipulated in the City's comprehensive plan, and Ecology criteria. The Ecology guidelines include six recommendations for shoreline environment designations. However, each jurisdiction may use alternate environment designations, as appropriate, as long as they provide equal or better protection than the standard. The Ecology-recommended and current City environment designations (White Salmon 1984) are listed below.

#### *Ecology Recommendations*

Natural  
Urban Conservancy  
Rural Conservancy  
Aquatic  
High Intensity  
Shoreline Residential

#### *City's Current Equivalent Designations*

Natural Environment  
Conservancy Environment  
Rural Environment  
Community Environment  
Urban/Industrial Environment

## **7.2 Current Land Use Analysis**

Currently, the shoreline for the City is underutilized with agricultural uses in the western portion of Reach 1 and natural open space in the remaining portions of Reach 1. The level of expected change in land use patterns in Reach 1 is high because the area is zoned Riverfront District. The allowable uses in this zone include planned development for recreational, commercial, light industrial, and limited residential uses, particularly those uses that are water-dependent or where the proximity to the Columbia River is necessary for the development (White Salmon Municipal Code [WSMC] 17.50.010).

### **7.2.1 Columbia River Reach 1**

The City comprehensive plan designates Reach 1 as Riverfront Planned Development. The BNSF tracks parallel the Columbia River for the length of the reach and will continue in use over the long term. The tracks limit access to the undeveloped portion of the reach and will likely continue to limit access in the future. Future uses may include public access to the shoreline, passive recreational trails, and interpretive markers as appropriate. There is informal use of the shoreline.

However, while the agricultural use in the western section of Reach 1 is likely to continue in the near term, it could present an opportunity for a land use change in the future. Potential recreational, commercial, light industrial, and limited residential uses could provide public access to the shoreline.

Parallel High Intensity and Urban Conservancy designations are candidate shoreline environments for the SMP update. The High Intensity designation would apply to the existing agricultural use and the commercial uses north of the railroad, and the Urban Conservancy designation would apply to the remaining areas with intact conditions.

### **7.2.2 Columbia River Reach 2**

Much of this reach is owned by BNSF (the tracks) and the Washington State Department of Transportation (SR 14). Both transportation uses run parallel to the shoreline and will continue in use over the long term. The steep topography of this reach makes significant changes to land use unlikely. In fact, slopes 40 percent and greater (as designated in the comprehensive plan for this area) are prohibited from development according to WSMC 18.10.412(D). This reach is likely to remain in a semi-natural condition with existing transportation infrastructure in place. There may be casual/informal use of the shoreline when accessed from the water, but BNSF allows no access from the land. Urban Conservancy is a candidate shoreline use environment for the SMP update for this reach.

## **8.0 ANALYSIS OF OPPORTUNITIES**

### **8.1 Public Access Opportunities**

Public access is a key component of the overall shoreline inventory and is an important consideration in the SMP planning process. Protecting public access to the shorelines of the state is one of the major policies of the SMA, which defines public access as offering

the general public the opportunity to “reach, touch, and enjoy the water’s edge, to travel on the waters of the state, and to view the water and the shoreline from adjacent locations” (WAC 173-26-221(4)).

Currently, the City owns and operates five parks, with several affording sweeping views of the City. However, no parks within city limits offer the public direct physical access to the shoreline of the Columbia River.

Although the presence of the railroad tracks limits potential options for public access, there is one public access opportunity along the Columbia River – the parcel in the middle of Reach 1 owned by Klickitat County. The City has targeted that parcel for public access to the river.

## **8.2 Restoration Opportunities**

An equally important component of the SMP update is the development of a restoration plan that identifies opportunities to restore impaired shoreline ecosystem functions. Areas identified for restoration must be consistent with WAC 173-26-201(2)(f), which requires the following:

1. Identification of degraded areas, impaired ecological functions, and sites with potential for ecological restoration.
2. Establishment of overall goals and priorities for the restoration of degraded areas and impaired ecological functions.
3. Identification of existing and ongoing projects and programs that are currently being implemented, or are reasonably assured of being implemented (based on an evaluation of funding likely in the foreseeable future), which are designed to contribute to local restoration goals.
4. Identification of additional projects and programs needed to achieve local restoration goals and of implementation strategies, including prospective funding sources, for the projects and programs.
5. Identification of timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals.
6. Providing mechanisms or strategies to ensure the implementation of restoration projects and programs according to plans, and to review, as appropriate, the effectiveness of the projects and programs in meeting the overall restoration goals.

Restoration opportunities within the City’s shoreline jurisdiction are limited by the location of the BNSF railroad parallel to the Columbia River and the construction of dams on the Columbia River, which have altered natural ecosystem processes. However, the County-owned parcel that is targeted as a park presents opportunities for restoration as well as public access. Potential restoration opportunities include:

1. Eradicating invasive species, including but not limited to Himalayan blackberry (*Rubus armeniacus*) and reed canarygrass (*Phalaris arundinacea*), and replanting with native trees and shrubs.
2. Removing armor stones west of the Hood River-White Salmon Interstate Bridge that are located in the terrestrial environment, but within the shoreline jurisdiction.
3. Removing the old fence line along the eastern boundary of the County-owned property to allow wildlife movement.
4. Addressing stormwater from the Hood River-White Salmon Interstate Bridge.
5. Patrolling the County-owned parcel to discourage the occupancy of makeshift camps erected by transient populations.

These restoration opportunities will be discussed in more detail in the restoration plan scheduled for development later in the SMP update process. Addressing the six areas for restoration listed above and outlining specific restoration activities as discussed above will ensure the consistency of the restoration plan with WAC 173-26-201(2)(f).

## 9.0 REFERENCES

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