

City of Hoquiam Planning Department
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SHORELINE INVENTORY AND CHARACTERIZATION REPORT

FOR
THE CITIES OF ABERDEEN, COSMOPOLIS,
AND HOQUIAM

TASK 5

October 23, 2014

Prepared by
Herrera Environmental Consultants, Inc.
AHBL



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from the Washington Department of Ecology.



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AND HOQUIAM

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LIMITATIONS

As with any report, there are limitations (inherent or otherwise) that must be acknowledged. This report is limited to the subjects covered, materials reviewed, and data available when the report was prepared. The authors and reviewers have sincerely tried to provide accurate and thorough information using the most current and complete information available and their own best judgment. If you have questions regarding the content of this report, please contact the City of Hoquiam Planning Department.

GLOSSARY

Anthropogenic – Caused either directly or indirectly by human activity.

Bedrock – Bedrock is a general term that includes any of the generally indurated or crystalline materials that make up the earth's crust.

Channel Migration Zone – The area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surroundings.

Ditch – An artificial channel that is designed to convey water and drain perennially or seasonally wet areas.

Dike – A raised berm to prevent marine inundation of landward areas.

Ecological functions or shoreline functions – The work performed or role played by the physical, chemical, and biological processes that contribute to the maintenance of the aquatic and terrestrial environments that constitute the shoreline's natural ecosystem.

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

Fill – The addition of soil, sand, rock, gravel, sediment, earth-retaining structure, or other material to an area waterward of the OHWM, in wetlands, or on shorelands in a manner that raises the elevation or creates dry land.

Hyporheic – A region beneath some floodplain areas and alongside streambeds, where there is mixing of shallow groundwater and surface water.

Levee – A raised berm or embankment placed, typically parallel to stream channel, to prevent riverine inundation.

Management Area – A management area is an area of shoreline typically distinguished by similar characteristics relating to the relative intensity of land use, the physical landscape, critical hydrogeomorphic or biological processes, and political boundaries. Management areas are comprised of smaller units called reaches.

Ordinary High Water Mark – On all lakes, streams, and tidal water is that mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that

condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with permits issued by a local government or the department: provided, that in any area where the ordinary high water mark cannot be found, the ordinary high water mark adjoining salt water shall be the line of mean higher high tide and the ordinary high water mark adjoining fresh water shall be the line of mean high water.

Planform – The outline of an object (water body) as seen from above.

Reach – A segment of shoreline that has a similar land use, geomorphic, or ecological context used for characterizing the shoreline and assessing ecological conditions. Reaches are smaller units that comprise the management areas.

Shoreline armoring – Placing a fixed, immobile structure along the shoreline to protect uplands from current- and wave-induced erosion. Armoring can include, but is not limited to, bulkheads and placed rock (riprap).

Shoreline modifications – Those actions that modify the physical configuration or qualities of the shoreline area, usually through the construction of a physical element such as a dike, breakwater, pier, weir, dredged basin, fill, bulkhead, or other shoreline structure. They can include other actions, such as clearing, grading, or application of chemicals.

Surge plain – A unique area where tidal salt water surges or pushes fresh water out over wetlands.

Water-dependent use – A use or portion of a use that cannot exist in a location that is not adjacent to the water and which is dependent on the water due to the intrinsic nature of its operations.

Water-enjoyment use – A recreational use 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 fosters shoreline enjoyment.

Water-oriented use – A use that is water-dependent, water-related, or water-enjoyment, or a combination of such uses.

Woody Wetlands – A land cover classification in the National Land Cover Database defined as “Areas where forest or shrub land vegetation accounts for greater than 20 percent of the cover and the soil or substrate is periodically saturated with or covered with water.”

LIST OF ACRONYMS AND ABBREVIATIONS

CAO	Critical Areas Ordinance
cfs	Cubic Feet per Second
Cities	Cities of Aberdeen, Cosmopolis, and Hoquiam
CMZ	Channel Migration Zone
USACE	US Army Corps of Engineers
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information Systems
GMA	Growth Management Act
LWD	Large Woody Debris
NLCD	National Land Cover Data
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OHWM	Ordinary High Water Mark
PCB	Polychlorinated Biphenyl
PHS	Priority Habitats and Species
PUD	Public Utility District
RCW	Revised Code of Washington
RGP	Regional General Permit
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
SR	State Route

SSURGO	Soil Survey Geographic Database
UGA	Urban Growth Area
USDA	US Department of Agriculture
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Watershed Resource Inventory Area
WSDOT	Washington State Department of Transportation

EXECUTIVE SUMMARY

This Shoreline Inventory and Characterization Report supports the Comprehensive Shoreline Master Program (SMP) update for the cities of Aberdeen, Cosmopolis, and Hoquiam (referred to as the Cities).

Washington's Shoreline Management Act (SMA) of 1971 and its implementing state guidelines adopted in 2003 require periodic updates to SMPs. Under these Guidelines, the Cities must base their master program provisions on an analysis of the most relevant and accurate scientific and technical information (WAC 173-26-201(3)(c) and (d)). This includes meeting the mandate of "no net loss" of shoreline ecological functions and providing mechanisms for restoration of impaired shoreline functions. The Shoreline Inventory and Characterization Report is not a binding regulatory document but is meant to help inform the SMP update process by compiling relevant technical information about the existing shoreline conditions.

The Cities' SMP update is a multi-year process, which begins with an inventory and characterization of existing environmental and land use conditions. The report contains an inventory of a variety of elements, including land use, landscape processes, and ecological functions. These elements are spatially catalogued using a Geographic Information System (GIS), where possible, and are presented in a Map Folio (Appendix A) covering all the Cities. Together, these elements define the present day condition, help inform the review of current shoreline regulations, and highlight areas where changes may be necessary to meet shoreline management goals for water dependent uses, public access, and protecting natural resources.

Key information provided in this report includes:

- Characterization of existing ecological functions through an analysis of both physical and biological processes
- Analysis of existing land uses, shoreline modifications, land capacity, public access, and areas under public ownership or preserved holdings
- Evaluation of current shoreline environment designations, their purpose and criteria
- Recommendations for the updated SMP to help meet the state guidelines; and preliminary discussion of the required restoration plan.

1. INTRODUCTION

1.1. Background and Purpose

This Shoreline Master Program (SMP) update covers the cities of Aberdeen, Cosmopolis, and Hoquiam (Cities). The Cities' SMP update requires a shoreline inventory and characterization report that serves as a foundation for the SMP update process (WAC 173-26-201(3)(c) and (d)). This document was prepared to fulfill that requirement and serves to:

- Inform the review of current shoreline regulations required by the update process
- Highlight areas where shoreline resources protection measures and shoreline use designations could be improved to meet shoreline management goals

Information provided includes existing physical conditions as well as data and descriptions of watershed and shoreline attributes that pertain to the shoreline jurisdiction of the Cities. In addition, existing ecosystem shoreline processes, land uses, and development patterns are characterized. Descriptions of shoreline functions and opportunities for restoration, public access, and shoreline use are also provided.

The Shoreline Inventory and Characterization Report:

- Provides supporting information for determining updated environmental designations. This includes an analysis of existing ecological functions and a detailed inventory of existing physical and biological conditions per WAC 173-26-201 (3)(c).
- Establishes the baseline for "no net loss" of ecological conditions and informs current and future policy development, land use planning, and regulatory effectiveness
- Identifies opportunities for protection, improving public access, and supporting water dependent uses
- Identifies degraded areas and restoration opportunities for incorporation into a separate comprehensive restoration plan

1.2. Regulatory Framework

This section describes state, federal, and regional regulations relevant to the Cities' SMPs. Additional information on local regulations is within the discussions for each City.

1.2.1. *Shoreline Management Act*

To manage the Shorelines of the State, the state legislature passed the SMA in 1971 and citizens of the state adopted it by referendum 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." There are three basic policy areas to the SMA: shoreline use,

environmental protection, and public access. The SMA emphasizes accommodation of reasonable and appropriate uses, protection of shoreline environmental resources, and protection of the public's right to access and use the state shorelines (see Revised Code of Washington (RCW) 90.58.020).

Under the SMA, each city and county with Shorelines of the State must adopt an SMP, based on state laws and regulations, but tailored to the specific geographic, economic, and environmental needs of the community. Cities and counties are the primary regulators. The Department of Ecology (Ecology) acts primarily in a support and review capacity, but must approve certain kinds of permits, such as shoreline conditional use permits and variances, and must approve new or amended SMPs.

In 2003, the Shoreline Master Program Approval/Amendment Procedures and Master Program Guidelines (Chapter 173-26 WAC) were adopted. The guidelines require that development within areas regulated under the SMA does not result in net loss of shoreline ecological function and that mechanisms for restoration of impaired shoreline function be provided. In addition, the 2003 guidelines stipulate that when local SMPs are updated, the new standards, setbacks, and buffers do not apply retroactively to existing development. Additionally, the SMP Guidelines allow repair and maintenance of existing structures, subject to building requirements imposed separately by local jurisdictions.

1.2.1.1. Shoreline Environment Designations

For areas under SMA jurisdiction, the intent of shoreline environment designations is to encourage uses that will protect or enhance the current or desired character of a shoreline. WAC 173-26-211(2)(a) requires that SMPs classify all shoreline areas into specific environment designations based on "... existing use pattern, the biological and physical character of the shoreline, and the goals and aspirations of the community as expressed through comprehensive plans ..."

For urban areas, the SMP Guidelines recommend using the five environment designations below. The purposes are defined in WAC 173-26-211(5).

1. **High Intensity** - The purpose of the High Intensity environment is to provide for high-intensity water-oriented commercial, transportation, and industrial uses while protecting existing ecological functions and restoring ecological functions in areas that have been previously degraded.
2. **Shoreline Residential** - The purpose of the Shoreline Residential environment is to accommodate residential development and appurtenant structures that are consistent with this chapter. An additional purpose is to provide appropriate public access and recreational uses.
3. **Urban Conservancy** - The purpose of the Urban Conservancy environment 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.

4. **Natural** - The purpose of the Natural environment is to protect those shoreline areas that are relatively free of human influence or that include intact or minimally degraded shoreline functions intolerant of human use. These systems require that only very low-intensity uses be allowed in order to maintain the ecological functions and ecosystem-wide processes. Consistent with the policies of the designation, local government should include planning for restoration of degraded shorelines within this environment.
5. **Aquatic** - The purpose of the Aquatic environment is to protect, restore, and manage the unique characteristics and resources of the areas waterward of the OHWM.

Once each environment designation is established, management policies and regulations specific to the environmental designations will be prepared as part of Task 6 of the SMP. The management policies and regulations will reflect the purpose and intent of each environment designation.

These policies and regulations will apply to all uses allowed within each environment designation. They establish what kind of uses will be permitted outright, need a shoreline conditional use permit, or are prohibited in that part of the shoreline jurisdiction. They also establish bulk and dimensional regulations for each environmental designation. Similar to a zoning code, these regulations can include maximum heights, setbacks, maximum lot coverage, maximum impervious surface coverage, as well as specific regulations that, for example, address site development, vegetation, and public access.

1.2.2. Grays Harbor Estuary Management Plan

In response to the increasing number of demands placed on the Grays Harbor Estuary by an expanding economic base and growing population and the overlapping local, state, and federal plans and regulations that govern the land and water resources of Grays Harbor, the Grays Harbor Regional Planning Commission formed an Estuary Planning Task Force in late 1975. In September 1976, the Task Force, through the Regional Planning Commission and Ecology, received federal funds to prepare a Grays Harbor Estuary Management Plan. The Estuary Management Plan was prepared over an 11-year period by the Estuary Planning Task Force.

The Grays Harbor Estuary Management Plan did not eliminate or modify any of the laws, regulations, or policies, which governed the actions' and decisions of local, state, or federal agencies. The plan improved the interpretation and implementation of those laws and regulations. The plan attempted to meld the authorities and concerns into unified estuary-wide guidelines for both protection and development of the area's economic and natural resources. Since the plan was prepared by participating local, state, and federal agencies with recognition of legal and policy constraints on each, it helped avoid piecemeal decision making in the permit process.

The area covered by the Estuary Management Plan included the Grays Harbor Estuary area from the end of the harbor entrance jetties, up the Chehalis River to its junction with the Wynoochee River south of Montesano. The plan boundaries are described in each

management unit. The portions of the Estuary Management Plan applicable to the cities of Aberdeen, Cosmopolis, and Hoquiam are included in their respective SMPs.

1.2.3. Background on Existing SMPs

The City of Aberdeen (Aberdeen) originally adopted its SMP in 1975 and codified it in the Aberdeen Municipal Code originally as Chapter 11.08. It was later re-codified as Chapter 16.20. In 1988, the City incorporated the Grays Harbor Estuary Management Plan into its SMP.

The City of Cosmopolis (Cosmopolis) SMP was originally adopted in 1974 and codified in the Cosmopolis Municipal Code as Chapter 15.08 by Ordinance 639 §1 in 1976. Minor amendments to Chapter 15.08 were completed in 1995 and 1997 and were related to substantial development permit fees and the duties of the administrator of the chapter. The City adopted the Grays Harbor Estuary Management Plan, dated January 1986, as an amendment to the City's SMP and Chapter 15.08 and as Chapter 15.12 by Ordinance 882 §1 in 1988.

The City of Hoquiam (Hoquiam) SMP was originally adopted in 1976 and codified in the Hoquiam Municipal Code as Chapter 11.04 by Ordinance 2757 §1. Minor amendments were made to Chapter 11.04 subsequently in 1980 by Ordinances 2915 §1 and 2931, in 1985 by Ordinance 85-2 §1, in 1991 by Ordinance 91-35 §1, and in 2008 by Ordinance 08-11 §1. The City adopted the Grays Harbor Estuary Plan, dated January 1986, as an amendment to the Chapter 11.04 by Ordinance 87-21 §1 in 1987.

1.2.4. Local Comprehensive Plans and Applicable Regulations

The cities in Grays Harbor County are not required to plan under GMA, outside of critical areas regulations and resource planning.

1.2.4.1. Aberdeen

Aberdeen updated and amended its 1971 Comprehensive Plan in 2001. The 2001 Comprehensive Plan included several policies supporting the integration of the SMP and the Grays Harbor Estuary Management Plan with the City's other policies and regulations as well as policies related to shoreline development. Some examples of these policies included establishing a Waterfront Development area to encourage the redevelopment of under-utilized and vacant waterfront areas suitable for a mix of uses. The 2001 Comprehensive Plan recognized unique opportunities provided by access to shorelines of statewide significance and included special provisions to encourage compatibility among these various uses. The Aberdeen 2001 Comprehensive Plan also addressed the development of aquaculture resources.

The City's critical areas regulations are found in Aberdeen Municipal Code (AMC) 14.100 and were last updated in 2009 (Ordinance 6474). AMC 14.100 addresses critical aquifer recharge areas, wetlands, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservations areas. The City updated its critical areas regulations in 2009. In general, protection of critical areas is provided through survey, analysis, and reporting requirements; regulating certain activities; requiring buffers, setbacks, and critical area tracks; and by requiring mitigation for unavoidable impacts. In AMC 14.100.550, Type S

Water, which are all waters that are defined as “Shorelines of the State” under the jurisdiction of the SMA are assigned buffers of 150 feet. The stream buffers for other types of streams range from 50 to 150 feet. In AMC 14.100.554, other types of fish and habitat conservation area buffers are based on type of area and, depending upon the type of area, recommendations by Washington Department of Fish and Wildlife (WDFW) PHS Program, site managers, or on a case-by-case basis with the City coordinating with the WDFW and other state, federal, or tribal experts.

The City regulates clearing and grading in frequently flooded areas under the flood damage prevention section of the municipal code found in AMC 15.52 (last amended in 2008 by Ordinance 6463). The City’s storm and surface water management regulations are found in AMC 13.70 (Ordinance 6503, 2010). The next update to AMC 13.70 will be to respond to the 2013-18 Phase II Western Washington Municipal Stormwater Permit due June 30, 2018.

1.2.4.2. Cosmopolis

Cosmopolis adopted a Comprehensive Development Plan in the early 2000s. Similar to the Aberdeen Comprehensive Plan, it included several policies supporting the integration of the SMP and the Grays Harbor Estuary Management Plan with the City’s other policies and regulations as well as policies related to shoreline development, such as provisions for waterfront development and aquaculture. The Comprehensive Development Plan also noted that waterfront development within the City should be consistent with the Port of Grays Harbor’s most current Industrial Properties Master Plan, the Washington State Department of Transportation’s (WSDOT) most current Washington Coastal Corridor Master Plan, and the most current Revitalization Potentials on the Grays Harbor Waterfront report.

According to the Department of Commerce, as of April 4, 2014, the City of Cosmopolis had not completed the required update of its Critical Areas Ordinance; and, from our records, it does not appear that the City has a Critical Areas Ordinance that designates or regulates critical areas.

The Grays Harbor Estuary Management Plan was adopted under Cosmopolis Municipal Code (CMC) 15.12 (Ordinance 882, added 1988); and if its regulations conflict with the adopted SMP, the more restrictive regulations will be followed. The CMC provides development guidelines and public works standards that would be applicable to development in the shoreline jurisdiction, such as standards related to tideland street ends and storm drainage (CMC Title 12). The City regulates flood damage prevention in CMC 18.48 (Ordinance 910, 1989). The City’s storm drainage regulations are found in CMC 12.12 (Ordinance 1090, added 2000). It is not clear how the City regulates fill and grade activities, outside of State Environmental Policy Act (SEPA) review.

1.2.4.3. Hoquiam

Hoquiam adopted a Comprehensive Plan in 2009. The City also adopted the Downtown Hoquiam Historic Preservation Plan in 2010 that addresses the preservation of structures within the shoreline jurisdiction along the Hoquiam River. As part of this SMP update, policies related to integration of the SMP with the City’s Comprehensive Plan will likely be added to the Comprehensive Plan.

The City's critical areas regulations are found in Hoquiam Municipal Code (HMC) 11.06 (Ordinance 08.21§1, 2008). HMC 11.06 addresses wetlands, geologically hazardous areas, fish and wildlife habitat conservation areas, and frequently flooded areas. In HMC 11.06.260, Type S Waters are assigned buffers of 150 feet. The stream buffers for other types of streams range from 50 to 150 feet.

The City regulates the floodplain district in HMC 11.06 (Ordinance 00-10§1, 2000). The City's storm and surface water management regulations are found in HMC 8.14 (Ordinance 05-24§1, 2005). The City regulates fill and grade activities via SEPA review.

1.2.5. State Agencies and Regulations

Aside from the SMA, state regulations most pertinent to development in the City's Shorelines of the State include SEPA, Section 401 of the Clean Water Act (CWA), State-Owned Aquatic Lands Act, the Watershed Planning Act, the Hydraulic Code, the Water Pollution Control Act, Salmon Recovery Act, and the Growth Management Act (GMA). A number of state agencies implement these regulations or may own shoreline areas. Besides Ecology's oversight of particular aspects of the SMP, other agency reviews of shoreline developments are triggered by in- or over-water work, discharges of fill or pollutants into the water, or substantial land clearing.

Depending on the proposed development, state regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts on shoreline functions and values are avoided, minimized, or mitigated. During the SMP update, the Cities will consider other state regulations to ensure consistency feasibility with the goal of streamlining the shoreline permitting process. A summary of some of the key state regulations and/or state agency responsibilities follows.

1.2.5.1. State Environmental Policy Act

SEPA was adopted in 1971 (Chapter 43.21C RCW) to ensure that environmental values were considered during decision-making by state and local agencies. The environmental review process in SEPA works with other regulations to provide a comprehensive review of a development proposal. Most regulations focus on particular aspects of a proposal, while SEPA requires the identification and evaluation of probable impacts on all elements of the built and natural environment. Combining the review processes of SEPA and other laws reduces duplication and delay by combining study needs; combining comment periods and public notices; and allowing agencies, applicants, and the public to consider all aspects of a proposal at the same time.

1.2.5.2. Section 401 Water Quality Certification

Section 401 of the federal CWA allows states to review, condition, and approve or deny certain federal permitted actions that result in discharges to state waters, including wetlands. In Washington, Ecology is the state agency responsible for conducting that review, with their primary review criteria of ensuring that state water quality standards are met. Actions within streams, lakes, or wetlands within the shoreline jurisdiction that require a Section 404 permit must also be reviewed by Ecology.

1.2.5.3. State-Owned Aquatic Lands

The Washington Department of Natural Resources (WDNR) protects and manages use of state-owned aquatic lands. Toward that end, water-dependent uses waterward of the ordinary high water mark (OHWM) require review by WDNR to establish whether the project is on state-owned aquatic lands. Certain project activities, such as single-family or two-party joint-use residential piers, on state-owned aquatic lands are exempt from these requirements. WDNR recommends that all proponents of a project waterward of the OHWM contact them to determine jurisdiction and requirements. State ownership of aquatic lands is decided by WDNR on a site-by-site basis, and ultimately may need to be determined by the US Supreme Court. WDNR is assessing and documenting the navigability of the state's lakes, streams, and rivers.

1.2.5.4. Watershed Planning Act

The Watershed Planning Act (Chapter 90.82 RCW) was passed in 1998 to encourage local planning of local water resources. It recognizes there are citizens and entities in each watershed that "... have the greatest knowledge of both the resources and the aspirations of those who live and work in the watershed; and who have the greatest stake in the proper, long term management of the resources." The law provides a process that allows citizens in a watershed to assess the status of the water resources in their watershed and determine how best to manage them. The plans must balance competing resource demands. They must address water quantity by undertaking an assessment of water supply and use within the watershed. This includes recommending long-term strategies to provide water in sufficient quantities to satisfy minimum instream flows and to provide water for future out-of-stream needs. Optional elements that may be addressed in the plan include instream flow, water quality, and habitat.

1.2.5.5. Hydraulic Code

The Hydraulic Code (Chapter 77.55 RCW) gives the WDFW the authority to review, condition, and approve or deny "... any construction activity that will use, divert, obstruct, or change the bed or flow of State Waters." These activities may include stream alteration, culvert installation or replacement, pier and bulkhead repair or construction, among others. WDFW can condition projects to avoid, minimize, restore, and compensate adverse impacts through a Hydraulic Project Approval also known as an HPA.

1.2.5.6. Water Pollution Control Act

The Water Pollution Control Act (Chapter 90.48 RCW) establishes the state's policy "... to maintain the highest possible standards to ensure the purity of all waters of the state consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the State, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the State of Washington." Ecology is charged with creating and implementing rules and regulations under this legislation.

1.2.5.7. Salmon Recovery Act

Repeated attempts to improve salmonid fish runs throughout Washington have failed to avert listings of salmon and steelhead runs as threatened or endangered under the federal Endangered Species Act (ESA) (16 U.S.C. Sec. 1531 et seq.). These listings threaten the sport, commercial, and tribal fishing industries and the economic wellbeing and vitality of vast areas of the state. Therefore, the state legislature began activities required for the recovery of salmon stocks soon in the interest of the citizens of the state. The Salmon Recovery Act calls for the state to retain primary responsibility for managing its natural resources, rather than abdicating those responsibilities to the federal government. It calls for the state to integrate local and regional recovery activities into a statewide salmon recovery strategy.

The legislation specifically requires that salmon habitat restoration be coordinated within a structure that allows for integrated delivery of federal, state, and local assistance to communities for habitat projects that will assist in the recovery and enhancement of salmon stocks.

1.2.6. Federal Regulations

Federal regulations most pertinent to development in the shorelines of the cities include the ESA, Section 404 of the CWA, and Section 10 of the Rivers and Harbors Appropriation Act. The ESA is administered by US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). The US Army Corps of Engineers (USACE) administers Section 404 of the CWA and Section 10 of the Rivers and Harbors Appropriation Act. A review of shoreline development by these agencies would be triggered usually by in- or over-water work, or excavation or discharges of fill or pollutants into the water.

Depending on the proposed development, federal regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts on shoreline functions and values are avoided, minimized, and/or mitigated. During the SMP update, the Cities will ensure they follow federal regulations and are consistent with the goal of streamlining the shoreline permitting process. A summary of some of the key federal regulations and/or federal agency responsibilities follows.

1.2.6.1. Endangered Species Act

The ESA provides for the conservation of species endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. Section 9 of the ESA prohibits “take” of listed species. Take has been defined in Section 3 as “... harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” The take prohibitions of the ESA apply to everyone, so any action that results in a take of listed fish or wildlife would violate the ESA and is strictly prohibited. Per Section 7 of the ESA, activities with potential to affect federally listed or proposed species and that either require federal approval, receive federal funding, or occur on federal land must be reviewed by the NMFS or USFWS using a process called “consultation.” These interagency consultations, or Section 7 consultations, assist federal agencies in fulfilling their duty to ensure federal actions do not jeopardize the continued existence of a species or destroy or adversely modify critical habitat.

1.2.6.2. Section 404 – Clean Water Act

Section 404 of the CWA establishes a program to regulate the discharge of dredge or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and mining projects. Section 404 requires a permit before dredging or filling within waters of the United States including discharges, unless the activity is exempt from Section 404 regulation, such as certain farming and forestry activities. Key agencies with responsibilities include the USACE and the US Environmental Protection Agency (USEPA).

1.2.6.3. Rivers and Harbors Appropriation Act Section 10

Section 10 of the Rivers and Harbors Appropriation Act of 1899 provides the USACE with authority to regulate activities that may affect navigation of “navigable” waters. Designated “navigable” waters in the cities include Grays Harbor, Chehalis River, Hoquiam River, East Fork Hoquiam River, and Wishkah River. Proposals to construct new or modify existing over-water structures (including bridges); to excavate or fill, or to “... alter or modify the course, location, condition, or capacity of ...” navigable waters must be reviewed and approved by the USACE.

1.3. Scope and Organization of Shoreline Inventory and Characterization

This inventory and characterization covers all Shorelines of the State as defined by RCW 90.58.030 within the cities. This includes all land:

- Within 200 feet of the ordinary high water mark along marine shorelines
- Within 200 feet of the ordinary high water mark of rivers and streams with over 20 cubic feet per second mean annual flow
- Within 200 feet of the ordinary high water mark of lakes and reservoirs greater than 20 acres in area
- In the floodway
- In the contiguous floodplain extending 200 feet landward from the floodway
- In associated wetlands. A wetland is associated if any part of it lies within the area 200 feet from the ordinary high water mark or within the floodplain 200 feet landward of the floodway, or are in proximity to and either influence or are influenced by tidal waters or a lake or stream subject to the SMA.

The extent of each City’s shoreline jurisdiction is shown on Figures 1.1 through 1.4 in Appendix A: Map Folio.

This report provides information on:

- Study methods (Section 2)
- Overview of the Cities’ shoreline ecosystems (Section 3)

- Discussions on individual shoreline planning areas, called management areas, and reaches (Section 4)
- Data gaps that would be helpful to close for future planning (Section 5)
- Recommendations for incorporating the analysis contained in this report into each City's SMP, specifically shoreline management environmental designations for each City (Section 4), as well as general policies, and regulations (Section 6)

First, a general overview profiles larger scale ecosystem processes observed in the cities, including physical constraints such as climate, topography, geology, key processes related to shoreline ecosystem functions and the habitats and species present, land use, historic and cultural resources, and typical shoreline modifications. Next, the general overview section is followed by detailed sections for each management area (i.e., City) that characterize physical and biological conditions in shoreline reaches, existing land uses, future uses, shoreline modifications, and public access potential. Included within these sections is an analysis of shoreline land capacity, ecological functions, recommended environment designations, and identification of potential restoration opportunities. Finally, data gaps and shoreline management recommendations are provided at the end of this report to guide future changes or additions to the Cities' existing SMPs.

2. INVENTORY & CHARACTERIZATION METHODS

2.1. Inventory Data and Information Sources

Analysis and conclusions in this report were based on a review of existing information including published studies, private and agency authored technical reports and databases, GIS-based information and mapping, aerial and oblique photography of the cities' shorelines.

The shoreline inventory records the existing or baseline conditions upon which the development of shoreline master program provisions are examined to ensure the adopted regulations provide no net loss of shoreline ecological functions. Table 2.1 lists those inventory elements for which data were available and used in this report. It includes all data elements required by WAC 173-26-201(3)(c). Maps depicting many of the inventory elements in Table 2.1 are in Appendix A: Map Folio. Note that not all inventory elements in Table 2.1 are in the map folio.

2.2. Determination of Management Areas and Reaches

Under Ecology guidance, the planning area may contain a nested system of management areas and reaches (Ecology 2010a). Since each jurisdiction is fairly small, ranging from 16.5 square miles to 1.5 square miles, and hydrogeomorphically similar, management areas were selected based on the Cities' jurisdiction boundary. The Cities are therefore synonymous with management areas. As Grays Harbor County is not required to plan under the GMA, management areas do not include Urban Growth Areas (UGAs). The Cities are entirely within WRIA-22 (Lower Chehalis).

The shorelines within each city are divided into reaches to inventory shorelines and analyze functions. Reaches are grouped by water body. The cities are at the intersection of many water bodies due to geologic history. Each of these water bodies, none of which is extensive (long) in any of the individual jurisdictions, typically has a similar geomorphic and land use character, consistent with Ecology guidance on the selection of reaches. In two instances, the reach selected for the inventory and characterization is further divided into subreaches for the purpose of the functional assessment. This is due to visually apparent differences in land use within the reach. Shoreline functions are evaluated based on the subreach, but other shoreline characteristics are described for the entire reach. Subreaches are in the Chehalis River in Cosmopolis and the Hoquiam River in Hoquiam. Formal delineation of reaches and subreaches followed the nearest parcel lines within these hydrologic groupings. Table 2.2 provides a list of reaches and subreaches within each city. Reaches, subreaches, and city boundaries are shown on Figure 9 in Appendix A.

Table 2.1. Required Shoreline Inventory Elements and Data Sources.

Inventory Element	Information Used	Data Sources	Map No.	Aberdeen	Cosmopolis	Hoquiam
Shoreline Jurisdiction			1	1.2 and 1.3	1.4	1.1
Reach Breaks			9	9.2 and 9.3	9.4	9.1
Shoreline and Adjacent Land Use Patterns	Public Lands/Ownership	Grays Harbor County	12	12.2 and 12.3	12.4	12.1
	Planned Land Use	City of Hoquiam, City of Aberdeen, City of Cosmopolis	14	14.2 and 14.3	14.4	14.1
	Current Land Use	2011 USGS	4	4.2 and 4.3	4.4	4.1
Transportation	Highways	Washington State Department of Transportation	No Map	-	-	-
Surface Water Systems	Lakes and Streams	Washington State Department of Ecology (2011)	2	2.2 and 2.3	2.4	2.1
	Floodway and Floodplains	FEMA 2013 Preliminary DFIRM	2	2.2 and 2.3	2.4	2.1
Soils		2012 USDA NRCS SSURGO Database	3	3.2 and 3.3	3.4	3.1
Geology and Geologic Hazards	Liquefaction, Seismic Hazards	Washington State Department of Natural Resources (2007, 2010)	15	15.2 and 15.3	15.4	15.1
	Landslide Hazards	Washington State Department of Natural Resources (2010)	15	15.2 and 15.3	15.4	15.1
Land Cover/Vegetation	Land and Vegetation Cover	National Land Cover Database (USGS 2011)	4	4.2 and 4.3	4.4	4.1
	Nearshore Vegetation	Washington State Department of Natural Resources (2001)	11	11.2 and 11.3	11.4	11.1
Critical Areas	Wetlands	2011 National Wetland Inventory (NWI) (USFWS 2011)	2	2.2 and 2.3	2.4	2.1
	Floodplain	FEMA 2013 Preliminary DFIRM	2	2.2 and 2.3	2.4	2.1
Habitats and Species	Species Observations (points)	WDFW Priority Habitat and Species (PHS) Database (WDFW 2014a)	10	10.2 and 10.3	10.4	10.1
	Species Observations (areas)	WDFW PHS Database (WDFW 2014a)	10	10.2 and 10.3	10.4	10.1
	Fish Distribution	WDFW PHS Database (2014b)	8	8.2 and 8.3	8.4	8.1

Table 2.1. Required Shoreline Inventory Elements and Data Sources.

Inventory Element	Information Used	Data Sources	Map No.	Aberdeen	Cosmopolis	Hoquiam
Shoreline Modifications	Levees	Washington State Department of Ecology (2010b)	5	5.2 and 5.3	5.4	5.1
	Dams	Washington State Department of Fish and Wildlife (2013a)	5	5.2 and 5.3	5.4	5.1
	Tide Gates	City of Aberdeen, City of Hoquiam, Washington State Department of Fish and Wildlife (2013b)	7	7.2 and 7.3	7.4	7.1
Water Quality	303d Listed Waters	Washington State Department of Ecology (2012)	6	6.2 and 6.3	6.4	6.1
Ecology Permitted Sites	Toxic Sites (State Cleanup Sites, Active Underground Storage Tanks)	Washington State Department of Ecology (2013a)	13	13.2 and 13.3	13.4	13.1
Historical and Cultural Resources	Sites and Structures on the Washington State Heritage Register	Department of Archaeology and Historic Preservation	No Map	-	-	-

Table 2.2. List of Management Areas and Reaches.

Management Area	Reaches
City of Aberdeen	Aberdeen Lake Reach
	Charley Creek Reach
	Chehalis River Reach – Aberdeen
	Fry Creek Reach – Aberdeen
	Grays Harbor North Bank Reach
	Grays Harbor South Bank Reach
	Newskah Creek Reach
	Wedekind Confluence Reach
	Wishkah River Reach
City of Cosmopolis	Chehalis River Reach – Cosmopolis (Includes north and south subreaches for functional assessment)
	Mill Creek Reach
City of Hoquiam	East Hoquiam River Reach
	Fry Creek Reach – Hoquiam
	Grays Harbor Reach
	Hoquiam River Reach (Includes west and east subreaches for functional assessment)
	Little Hoquiam River Reach

2.3. GIS Methods

GIS analysis was conducted to analyze shoreline functions and to create the Map Folio of inventory data. Shoreline functions are analyzed for the broader shoreline management areas and in more detail at the reach scale. Analysis was conducted to determine areas of intersect between reaches and the applicable datasets, such as priority habitats and species, wetlands, land use, and zoning. Areas of intersection were calculated in acres or linear feet, based on the characteristics of the dataset.

The Map Folio displays a wide range of land use, environmental, and ecological functions along the shoreline jurisdiction. The Map Folio is in Appendix A. Datasets in Table 2.1 were used to create the inventory maps.

2.4. Approach to Characterizing Ecosystem-Wide Processes and Shoreline Functions

Ecosystem-wide processes are the suite of naturally occurring physical and geologic processes that include erosion, transport, and deposition as well as chemical processes that shape landforms within a shoreline ecosystem. These processes determine both the habitat and associated ecological functions (WAC 173-26-020). Ecosystem-wide processes are

characterized based on the information provided by reviews of the inventory of data and sources listed in Table 2.1.

In addition to broad scale ecosystem processes, shoreline functions are identified and evaluated as part of this inventory and characterization. Shoreline functions are characterized using the processes and functions described in Ecology’s *Comprehensive Process to Prepare or Amend Shoreline Master Programs* (WAC 173-26-201) for marine shorelines, streams, lakes, and wetlands, which are present in the Cities’ shoreline jurisdiction. Categories of functions include hydrologic, water quality, and habitat, consistent with the ecological function groups identified in Ecology’s SMP Handbook (Ecology 2010a). Functions identified for the Cities’ shorelines are summarized in Table 2.3.

Hydrologic	Water Quality	Habitat
<ul style="list-style-type: none"> • Floodwater storage / flood protection • Support of base flow and groundwater 	<ul style="list-style-type: none"> • Maintaining temperature • Removing excessive nutrients and toxic compounds • Sediment removal and stabilization 	<ul style="list-style-type: none"> • Sediment/bank stabilization and shoreline protection • Attenuation of wave energy • Physical space and conditions to support aquatic and shoreline-dependent species and life history stages; reproduction; resting, hiding and migration • Provision and redistribution of woody debris and organic materials • Food production and delivery

In the shoreline jurisdiction, wetlands can be associated with estuarine shorelines, streams and their floodplains, and lake shorelines; thus, they occur in a variety of reaches throughout the cities. Wetland presence or absence influences the overall functions of each reach; therefore, wetland functions are scored within the context of the specific estuarine, stream, floodplain, and lake reaches in which they occur. This is to avoid double counting the same functional benefit.

Functions are assessed based on the ecological processes, structure, conditions, and stressors present within individual reaches. The information inventoried for the shoreline jurisdiction is used to determine the relative performance of each reach and its potential to provide shoreline functions.

In assessing shoreline functions, it is important to consider different processes associated with different types of water bodies. For example, unlike streams, lakes and wetlands tend to store water and sediment instead of transporting it. In addition, shoreline physical structure and vegetation may contribute to attenuation of wave energy in large lakes and estuaries, but do not generally influence flow energy as they would in streams where flow is a more

dominant factor. In contrast, functions related to flow energy such as the transport of nutrients, organic material, woody debris, and sediment would only apply to rivers and streams. These flow-related functions lead to channel formation and in-stream structure such as pools, riffles, and gravel bars that are important to fish and other animals that require diverse and complex habitats.

In lake and wetland environments, hydrologic functions include floodwater storage, which provides protection from flooding by reducing peak flows and downstream flood levels. Lakes and wetlands work like a “sponge” in the landscape to support seasonal surface-water base flows and groundwater sources. These functions are generally not associated with marine shorelines. However, hydrologic processes including those occurring at the convergence of freshwater and saltwater, and along marine shorelines, have implications for other functions related to water quality and habitat. Marine shoreline conditions influence the shoreline’s capacity to buffer upland areas and protect the shoreline from storm surges. Hydrologic processes include water and sediment transport or storage, and distribution of wood and other organic material that may be important habitat features or play a role in food production and delivery for a wide range of species.

Water quality functions for all water bodies include removal of excessive nutrients and toxic compounds. Hydrologic conditions and processes such as tidal mixing, and groundwater and surface water exchange, can influence water quality functions. Water transport and storage, including groundwater and surface-water exchange, support vegetation growth, which in turn also influences water quality. The physical structure of the shoreline together with vegetation—the amount and types of plants present—influence functions such as the removal of toxic compounds, excessive nutrients, and sediment. Shoreline vegetation also provides shade to moderate and maintain temperature regimes important to a variety of species.

Habitat functions are influenced by geomorphic, hydrologic, water quality, and vegetation conditions. Habitat is valued based on the space and conditions to support aquatic and shoreline-dependent species and life history stages; reproduction; resting, hiding, and migration; and food production and delivery. Depending on the physical processes and shoreline structure, habitat functions along the shoreline include sediment removal or accumulation to provide suitable conditions for various species, as well as bank stabilization that protects shorelines from excessive erosion. Attenuation of wave energy in lake and estuarine shorelines also helps to protect shorelines and maintain habitat. Additional habitat functions include provision of organic material, and food production and delivery.

The physical conditions in each reach are evaluated to determine if they are present, altered, or impaired and then scored according to the threshold criteria in Table 2.4. Not all functions are present in all types of water bodies. For example, estuarine shorelines (i.e., those along Grays Harbor) are rated partly based on the presence of nearshore estuarine vegetation, which would not be expected in freshwater streams and lakes. This is indicative of the additional functions and ecological benefits provided by estuarine shorelines that typically support a greater diversity of protected habitats and species compared to freshwater shorelines. The selected criteria represent key roles in ecological processes and functions on a regional scale.

Table 2.4. Reach-Scale Functional Assessment Threshold Criteria.

Function Category	Function	Criteria	3 (High)	2 (Moderate)	1 (Low)
Hydrologic	Floodwater storage/ flood protection (freshwater shorelines) and surge protection (marine shorelines)	1	Floodplain comprises > 50% of the shoreline area and is unobstructed by flood protection structures such as dikes or levees (< 10% of shoreline length)	Floodplain comprises 20% to 50% of the shoreline area or significant portions are obstructed by dikes or levees (10% to 30% of shoreline length)	Floodplain is small (< 20%) or largely disconnected from the floodway by dikes or levees (> 30% of shoreline length)
		2	> 75% of reach area is forest Historically forested areas are largely intact	25% to 75% of reach area is forest Historically forested areas have been converted to other uses	< 25% of reach area is forest Historically forested areas have been converted to other uses
		3	< 10% cover by medium- to high-density development in shoreland area	10% to 25% cover by medium to high density development in shoreland area	> 25% cover by medium to high density development in shoreland area
	Support of base flow and groundwater (freshwater shorelines)	4	Wetlands are present over > 50% of area and not separated from the stream or lake by armoring or levees	Few (10% to 50%) wetlands or backwaters present in area or are separated by levees	Wetlands are limited (< 10% of area), absent, or largely separated by levees
Water Quality	Maintaining temperature	5	Dense forest vegetation provides > 75% cover	25% to 75% forest vegetation cover OR Wetlands may be a significant source of cool groundwater discharge to other waters	< 25% forest vegetation cover
	Removing excessive nutrients and toxic compounds	6	Unimpaired water quality 303(d) Category 1, no problems	Moderately impaired water quality 303(d) Category 2, waters of concern OR Suspected sources of water quality concern	Impaired water quality 303(d) Category 4 – Impaired, does not require total maximum daily load (TMDL) OR 303(d) Category 5 – Impaired, requires TMDL
		7	Natural flow, surface and groundwater exchange, tidal exchange, and dilution patterns are present and unimpaired	Natural flow, surface and groundwater exchange, tidal exchange, and dilution patterns may be moderately impaired by shoreline modifications or function is naturally limited	Natural flow, surface and groundwater exchange, tidal exchange, and dilution patterns are significantly impaired by shoreline modifications or hydrologic function is naturally absent from the reach
	Sediment removal and stabilization	8	A broad (> 50 feet wide) band of vegetation is dominated by herbaceous wetland vegetation not separated by dikes or levees	Vegetation is dominated by moderate to dense herbaceous vegetation, but is generally equal to or less than 50 feet wide or separated by dikes or levees	Herbaceous vegetation is sparse to moderate density or is disturbed, or separated by dikes or levees
Habitat	Sediment/bank stabilization and shoreline protection	9	A broad band of dense vegetation separates uplands from shoreline Trees and shrubs stabilize banks In estuarine shorelines, large patches of native eelgrass, salt marsh, or dune grass vegetation is present	A narrow band of dense vegetation or a broad band of sparse vegetation or grass separates uplands from shoreline In estuarine shorelines, patchy or continuous marginal (i.e., fringe) native eelgrass, salt marsh, or dune grass vegetation is present	No vegetation or a narrow band of sparse vegetation separates uplands from shoreline In estuarine shorelines, native eelgrass, saltmarsh, dune grass, and nearshore or riparian vegetation is limited or absent
	Attenuation of flow and wave energy	10	In streams and lakes: large wetlands or backwaters present in > 50% of area In estuary shorelines: large areas of eelgrass or estuarine emergent vegetation present in > 50% of area	In streams and lakes: few (20% to 50%) wetlands or backwaters present In estuary shorelines few (20% to 50%) areas of eelgrass or estuarine emergent vegetation present in area	In streams and lakes: Few (< 20%) wetlands or backwaters present In estuary shorelines: few (< 20%) areas of eelgrass or estuarine emergent vegetation present in area

Table 2.4 (continued). Reach-Scale Functional Assessment Threshold Criteria.

Function Category	Function	Criteria	3 (High)	2 (Moderate)	1 (Low)
Habitat (continued)	Physical space and conditions to support aquatic or shoreline-dependent species and life history stages; reproduction; resting, hiding and migration	11	Broad band of moderate to dense multi-strata riparian vegetation	Narrow band of dense vegetation or broad band of sparse vegetation	Dense riparian vegetation is absent
		12	Multiple types of nearshore and riparian estuarine vegetation (native eelgrass, dunegrass, salt marsh) are present and cover at least 25% of the shoreline length	At least one type of nearshore and riparian estuarine vegetation (native eelgrass, dunegrass, salt marsh) is present and covers at least 10% of shoreline length	Nearshore and riparian estuarine vegetation (native eelgrass, dunegrass, salt marsh) is generally absent or covers < 10% of shoreline length
		13	High degree of habitat complexity in streams (e.g., channel sinuosity, pools, riffles, gravel bars, backwaters, and side channels) Complex physical structure of intertidal and back beach, or lake shoreline Diverse vegetation communities	Moderate habitat complexity and/or vegetation diversity	Low habitat complexity and/or vegetation diversity
		14	Priority habitat features > 50% of area or multiple species are present Habitats are relatively interconnected with corridors between habitats that are free from shoreline modifications, roads, and other development	Multiple priority species or habitat features are present Shorelines or floodplains exhibit moderate degree of alterations or shoreline modifications, development, or water quality impairments may reduce connectivity between habitats or inhibit habitat use by multiple species	Priority species or habitat features are generally absent or significantly reduced compared to historical presence due to anthropogenic alterations and land use Connections between habitats are generally absent or significantly degraded by barriers, major roads, or other development
	Provision and redistribution of woody debris and organic materials	15	Dense forest vegetation along > 50% of shoreline length In large streams and marine shorelines extensive LWD rafts are visually apparent in aerial images	Moderate to dense vegetation 25% to 100% of shoreline length May be composed of a combination of forest, shrub, and/or grass vegetation Patchy distribution of LWD is visually apparent in aerial images	Shoreline is sparsely vegetated or < 25% of shoreline length supports moderate to dense vegetation Little to no LWD is visually apparent in aerial images
		16	Majority (> 75%) of shoreline area is vegetated with dense forest, shrub, or emergent vegetation, and not impaired by bank armoring	Shoreline vegetation is moderate (25% to 75% cover), but majority of shoreline is not impaired by armoring or other development	Shoreline vegetation is limited (< 25% cover) and/or shoreline may be impaired by armoring, bulkheads, altered vegetation types, or other development

The functional assessment threshold criteria establish a framework for identifying the condition of reaches, and their potential for development, restoration, or protection. In general, the higher the conditions score, the more functions the reach supports, and the more likely the site is suitable for protection. In contrast, reaches with low function scores, especially where there are minimal alterations to the landscape, are suitable for restoration. Development is typically most suited in areas with many alterations and low function scores.

It is important to note that relatively unimpaired or pristine reaches may not receive a high functions score in each category. Even reaches with undeveloped conditions can have a relatively low score for certain functions. This is because some ecological functions may naturally be absent based on the landscape characteristics and setting of a reach or reach segment. While a fully functioning shoreline from a physical perspective is possible, the reach may not have the opportunity to provide some functions, such as storage of water or sediment or habitat for some species due to its position within a landscape, and therefore will score lower. This may be the case and even likely for an ecologically rich reach. In fact, owing to the diverse needs of the different priority species, it is unlikely that a reach could score perfectly for all conditions.

The threshold criteria and ratings in Table 2.4 are based on conditions (e.g., land cover, vegetation, and shoreline modifications) that are used as surrogate indicators of functions. Shoreline functions are difficult to quantify given the limited data available. The criteria selected for the assessment of functions provides a snapshot of shoreline conditions and functions that are present. However, not all potential functions are captured in the assessment due to limitations of available data. For example, although cover by certain types of vegetation is mapped and indicates the potential for water quality benefits, it does not reflect water quality functions related to certain substrates and their ability to remove heavy metals, even in the absence of vegetation.

Anthropogenic modifications are known to impair certain functions and can be mapped with the existing data. Therefore, anthropogenic modifications represent key parameters in assessing shoreline ecological function. For example, to the extent that armored shorelines lose their natural ability to attenuate flow energy, wind-driven waves, and boat wakes, armoring is used herein as a surrogate for degree of loss of wave attenuation function, which natural shorelines provide.

In addition to the shoreline conditions and geographic position in the landscape influencing shoreline functions, the ecological benefits of a shoreline are influenced by whether there are stressors present. This is particularly so for water-quality-related functions. An overall unaltered or unimpaired reach may score relatively high but have a limited opportunity to provide water quality improvement if, for example, there are no existing water quality impairments or development stressors. On the other hand, a reach that scores low due to anthropogenic modifications, impairments, or stressors may have an important role in providing water quality functions if there are sources of pollution. Similarly, a low scoring reach may retain important habitat functions if it is a migration corridor, contains habitat features, or provides connectivity with other habitats. Recognizing that nearly all shoreline areas, even if substantially developed or degraded, retain key ecological functions, it is

important to apply policies and regulations for protecting and restoring functions across all shoreline areas, not just those that remain relatively unaltered.

2.5. Shoreline Land Capacity Analysis Methods

This section describes the methodology used in the Land Capacity Analysis for Aberdeen, Cosmopolis, and Hoquiam SMP updates. It is based in part on the land capacity analysis methods discussed in the Washington State Department of Commerce's *Urban Growth Area Guidebook: Reviewing, Updating and Implementing Your Urban Growth Area* published in 2012.

2.5.1. Geographic and Time Parameters

- **Base Point in Time** - The SMP map inventory using parcel data from June 2012 was used as the baseline for the Land Capacity Analysis.
- **Study Area Boundaries** - The boundaries of the study area were defined as those parcels either fully within or intersecting the SMPs shoreline jurisdiction. Parcels that were within associated wetlands but not in the shoreline jurisdiction were excluded.

2.5.2. Gross Developable Land Inventory

The following steps were taken to estimate Gross Developable Land within the Cities' shoreline jurisdictions. All parcels intersecting the shoreline jurisdiction were included. Both public and private lands in the Study Area Boundaries were included since all lands may have shoreline uses. Public or reserved lands were removed after Section 2.1.3.6, *Deduct Land Set Aside for Conservation Purposes*, as needed. Portions of parcels within the shoreline jurisdiction were deducted to account for critical areas, infrastructure and public purposes, and market factors. The gross developable land inventory provides an estimate of land available for development or redevelopment within the next 20 years.

Single-family and Commercial developable land analysis was not conducted for public or reserved lands. Parcels that spanned multiple density designations were assigned to the categories described in Sections 2.1.2.1, *Single-Family Residential Developable Land*, and 2.1.2.2, *Multi-Family, Commercial, and Industrial Developable Land*, in a case-by-case assessment.

1. Single-Family Residential Developable Land:

a. Vacant Land That Can Be Subdivided:

Vacant land was defined as parcels with a Grays Harbor County Assessor building value of less than \$10,000. This land then had density provisions in the Cities' codes applied after the deductions noted below in order to arrive at future development capacity.

b. Vacant Land Too Small for Subdivision:

Vacant land was defined as parcels with a Grays Harbor County Assessor building value of less than \$10,000. Parcels where the ratio of allowed density to

parcel size is more than 0.5 were considered not subdividable. Lots less than 2,500 square feet were not included in this category. After deducting lands as described in the sections below, the remainder of this category was used in Section 2.1.5.1, *Vacant Lands*, under the assumption that these properties have a legal right to develop, despite their non-conformance with density requirements.

c. Partially-Used Land:

Partially used land was defined as parcels with a Grays Harbor County Assessor building value of greater than or equal to \$10,000. Parcels where the ratio of allowed density to parcel size is less than or equal to 0.5 were considered subdividable and defined as only partially used. This land then had density provisions in the Cities' codes applied after the deductions noted below in order to arrive at future development capacity.

2. Multi-Family and Commercial Developable Land:

a. Under-Utilized:

Multi-Family and commercial designated parcels were defined as "under-utilized" if vacant, occupied by a single-family residential use as indicated by the assessor land use code; or if the ratio of building value to land value is less than 1.0.

This was applied to the following zones that allow a wider range of commercial uses but not single-family residential:

- Aberdeen: CG - General Commercial, CR - Commercial/Residential
- Cosmopolis: MU - Mixed Use
- Hoquiam: C1 - General Commercial, C2 - Downtown Commercial

In addition, this was applied to the following zones, which allow both multi-family and single-family uses:

- Aberdeen: RM - Multiple Family Residential
- Cosmopolis: R57 - Residential (Medium Density)
- Hoquiam: R2 - High Density Residential

2.5.3. *Deduct Critical Areas*

1. Lakes and Wetlands:

Lakes and wetlands were deducted from the gross developable land inventory. Lakes and wetlands were identified in the WDNR wetlands and lakes GIS shape files.

2. Rivers and Streams:

Rivers and streams were deducted from the gross developable land inventory. Rivers and streams identified in the WDNR rivers and streams GIS shape files.

3. Adopted Floodway or the 2010 Flood Channel Study Area

4. All land in the adopted floodway or the 2010 flood channel study area was removed from the inventory.

5. Critical Area Buffers:

Critical area buffers were deducted from the gross developable land inventory based on the following criteria:

- o Critical area buffers were not deducted from residential parcels due to the variety of clustering options available on these parcels.
- o Critical area buffers for commercial and industrial parcels were deducted from these areas. Given the lack of data on potential classes of wetlands, buffer distances were based on an average of the 150-foot buffer required for Category III wetlands and 50-foot buffer required for Category IV wetlands for high-intensity uses found in Aberdeen Code 14.100.250(C)(1)(b) and Hoquiam Code 11.06.140. Buffer distances were not specified in the Cosmopolis City Code.

6. Deduct Land Set Aside for Conservation Purposes:

Identified fish and wildlife habitat conservation areas were deducted from the gross developable land inventory. These included Grays Harbor County Parks, Washington State Parks, WDFW state natural area preserves, natural resource conservation areas managed by the WDNR, National Wildlife Refuges, National Parks, Wilderness Areas, other Federal lands, and private conservation areas such as the Nature Conservancy.

2.5.4. *Deduct Infrastructure and Public Uses*

1. Deduct Lands Identified for Public Purposes:

Lands identified for public purposes such as schools, boat ramps, police and fire stations, water and sewer facilities, port-owned properties, power line easements, and recreation and open space not deducted in Section 2.1.3.6, *Deduct Land Set Aside for Conservation Purposes*. Parcels with land use codes of "Government services," "Educational services," or "Park" were deducted.

2. Right-of-Way and Other Development Requirements:

A percentage reduction was deducted to account for future right-of-way, public and private vehicular access (including driveways), and other development requirements (i.e., stormwater, utilities, and similar facilities). Most jurisdictions included a deduction in the 5 to 15 percent range. The 8 percent deduction used by this Land

Capacity Analysis was within that range and on the slightly lower end because this Land Capacity Analysis considered the shoreline jurisdiction only, where likely fewer new roads and vehicle access would be found.

3. Determine Developable Acres by Planned Land Use Category (Zoning District):

Developable acres (vacant, partially used, and under-utilized with critical area deductions) were calculated by zoning district. This does not include the subtotal of Sections 2.1.4.1, *Deduct Lands Identified for Public Purposes*, and 2.1.4.2, *Right-Of-Way and Other Development Requirements*.

2.5.5. Market Factor Deduction

1. Vacant Lands:

A market factor was included to account for vacant lands that do not develop within the planning timeframe. A 15 percent market factor was used for vacant residential zones.

2. Partially-Used and Under-Utilized Lands:

A market factor was included to account for partially used and under-utilized lands that do not develop within the planning timeframe. A 25 percent market factor was used for vacant residential and commercial/industrial zones.

2.5.6. Determine Development Capacity

1. Development Type:

Development was assumed either as residential or commercial based upon the zoning district. Zones listed as commercial were identified as such in Section 2.1.2.2, *Multi-Family, Commercial, and Industrial Developable Land*.

2. Determine Total Dwelling Units Capacity by Zone:

The net acres of developable land in each zone were multiplied by assumed density of each zone to determine total dwelling units of capacity. Existing dwelling units were subtracted if they exist. If the number of existing dwelling units exceeded capacity within a zoning district, no dwelling units were added to the total capacity. Comprehensive Plan densities as identified on the Comprehensive Plan Official maps were applied for shoreline and upland portions of parcels. Use data was found in available GIS layers provided by the county.

3. Number of Vacant Parcels:

The subtotal of number of vacant parcels that cannot be subdivided by zoning district was included from Section 2.1.2.1.a, *Vacant Land Too Small for Subdivision*.

3. ECOSYSTEM-WIDE CHARACTERIZATION

3.1. Regional Overview

The cities in this report are in the Pacific Northwest Coast ecoregion, which includes most of the Olympic Peninsula and coast mountain ranges. Streams typically begin as deeply incised, steep gradient drainages in the high elevation mountains outside the cities. The streams feed large, low-gradient river systems such as the Chehalis River on the coastal plain. Coniferous forests dominate vegetation in the ecoregion but several major vegetation zones are present. Along the outer coast and adjacent valleys, fog and cool temperatures in the summer are important climatic factors influencing these zones. Lowland forests are dominated by the Westside Western Hemlock vegetation zone comprised of western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii*), and western red cedar (*Thuja plicata*). In the coastal fog belt, Douglas fir is rare and Sitka spruce (*Picea sitchensis*) becomes abundant; this zone is called the Sitka Spruce vegetation zone. The cities are near the convergence of these two major vegetation zones that surround Grays Harbor and dominate Washington's outer coast (WDFW 1996).

The cities are in Water Resource Inventory Area (WRIA) 22, the lower Chehalis watershed. The Chehalis River is the main tributary of Grays Harbor. The cities are located around the mouth of the Chehalis River where it enters the harbor, and around the western point of the estuarine inner harbor. However, shorelines include reaches along the Hoquiam River, Wishkah River, Wynoochee River, Aberdeen Lake, and several smaller tributary streams that are tidally influenced. This includes portions of the lower reaches of Fry Creek, Charley Creek, Newkah Creek, and Mill Creek, and several tidal sloughs, including Elliott Slough. The shoreline in the cities is associated with Grays Harbor and four major river systems described above: the Hoquiam River, the Wishkah River, the Wynoochee River, and the Chehalis River. The largest tributaries are on the Hoquiam River, including the Little Hoquiam River and the East Fork Hoquiam River. Combined, the cities have approximately 7,500 acres and 86 miles of shoreline associated with these stream, lake, and marine water bodies.

Grays Harbor is one of the largest estuaries on North America's west coast, approximately 15 miles long and 13 miles wide. Extensive mudflats radiate from the mouths of major rivers emptying into the estuary. The estuary is a bar-built estuary that formed by the combined processes of sedimentation and erosion influenced by both the Chehalis River and the Pacific Ocean. Historically, sediment accumulated during low flows in the Chehalis River to form a bar across a portion of the estuary mouth (CBPHWG 2008). As river flows increased, the sediment bars likely impeded direct mixing with near shore ocean waters until the force of the downstream flow began to erode the sediment bar. The process likely resulted in a constantly shifting channel in the lower Chehalis River (CBPHWG 2008). At mean lower low water (MLLW) 58 percent of the harbor is mudflat (Loehr and Collias 1981). The harbor has two navigation channels (north and south) that the USACE dredges annually (NMFS 2010).

The Chehalis River originates from headwaters in steep sided valleys in southeastern Lewis County before transitioning into the broad farming valley and tidal wetlands that characterize the lower watershed in Grays Harbor County and the cities' vicinity.

Significant tributaries of the lower Chehalis River in the Cities' shoreline jurisdiction are the Wishkah River and Hoquiam River. The Wishkah River and Hoquiam River have their headwaters in the southern Olympic Mountains where they begin in steep gradient mountain drainages and flat brushy valleys surrounded by low hills. Urban development of Hoquiam and Aberdeen characterizes the lower main stems, while rural residences and some agricultural lands lie along the river and its major tributaries outside the city limits. The Middle Fork Hoquiam River and its subbasin are in second-growth timber production lands (CBPHWG 2011).

Both the Hoquiam and Wishkah Rivers have diversion structures to supply municipal and industrial water. Davis Creek, Little North Fork Hoquiam, and West Fork Hoquiam have diversion dams for municipal water supplies. The East Fork Hoquiam River has an industrial water supply diversion (CBPHWG 2011). Hoquiam diverts 2.5 cfs from the Hoquiam River system and Aberdeen diverts 10 cfs from the Wishkah River (EnviroVision 2000). However, these diversion structures are located in the county, outside of the Cities' shoreline jurisdiction.

The Wynoochee River is another significant tributary of the lower Chehalis River that originates in the southern Olympic Mountains. The industrial diversion at the confluence of Wedekind Creek and the Wynoochee River is in a broad floodplain valley used primarily for farming. The Wynoochee River flows approximately 7.5 miles from the diversion facility, through the flat valley, before meeting the Chehalis River near Montesano. The confluence is approximately 14 miles upstream from the Chehalis River mouth at Grays Harbor, near the upstream extent of tidal influence. The City of Aberdeen operates an industrial water supply in the Wynoochee River (Wedekind Confluence Reach) within the City's shoreline jurisdiction. The City has a water right for 110 cfs from the Wynoochee River and a diversion facility capacity of 125 cfs, which allows the City to remove approximately 70 to 80 million gallons per day from the Wynoochee River. The diversion is connected to the industrial water system at Lake Aberdeen where it is then piped to pulp and paper mills in the City.

Outside of the main tributary watersheds of the Chehalis River that are described above is Lake Aberdeen. Lake Aberdeen is a dammed reservoir in Van Winkle Creek that flows into the Lower Chehalis River via Elliott Slough. The reservoir (Aberdeen Lake Reach) is managed by Aberdeen to provide flood control and industrial water supply. The lake also supports a fish hatchery operated by WDFW primarily for steelhead production.

3.2. Key Physical Controls

3.2.1. Existing Climate

The regional climate of the cities has been called "maritime" or "Mediterranean", with mild, wet winters and cool, dry summers. For example, in Aberdeen, average summertime high temperature is 68 degrees Fahrenheit and the average wintertime low temperature is 35 degrees Fahrenheit (Western Regional Climate Center 2014). Precipitation is high by comparison with other parts of the state, ranging from 69 inches per year in Hoquiam

(at Bowerman Airport) to 84 inches per year in Aberdeen. Though the cities are not large, there is variability in precipitation due to local topography, as seen in differences in long-term precipitation rates at Bowerman Airport and downtown Aberdeen. It is likely that the higher elevations of the cities see rainfall rates up to 100 inches per year based upon rates of similar places on the outer Washington coast. Snow is limited to rare large events during the winter. On average, snowfall is less than 8 inches (Western Regional Climate Center 2014).

3.2.2. Future Climate

An analysis of climate change of Grays Harbor and the Lower Chehalis River was recently completed by the Wild Fish Conservancy (Sandell and McAninch 2013). Their analysis reviewed recent climate change literature relevant to the area and found there will be increases in stream temperatures, particularly in the summertime (Mantua et al. 2010), compromised habitat restoration success (Battin et al. 2007), hydrologic change of stream basins (Elsner et al. 2010), increased wave energy (Allan and Komar 2006) and increased sea level (Canning 2005; Mote et al. 2008). While some of the climatic responses discussed in these works are expected to be negligible in the cities (i.e., the reduction in snowmelt and the increase in wave energy), others, such as increased stream temperatures, are likely to have significant effects on ecological conditions (Mantua et al. 2010).

It is uncertain what influence climate change will have on local precipitation patterns and stream flow in the smaller rivers in the cities, as this is a current data gap. However, sea level rise is a known process well studied and will be addressed in a separate subsection below.

3.2.2.1. Sea Level Rise

Sea level rise in the region was examined recently by Sandell and McAninch (2013). Sea level rise is produced by the combined effects of global sea level rise and local factors, such as vertical land deformation (e.g., tectonic movements) and seasonal water surface elevation changes due to atmospheric circulation effects (Mote et al. 2008). Within the cities, there is little if any tectonic motion (Verdonck 2006; Central Washington University 2014), so sea levels reflect eustatic (globally averaged) changes (Canning 2005; Mote et al. 2008). This explains the relatively modest sea level rise observed at Toke Point, the nearest sea level NOAA gage, in the twentieth century (1.60 mm per year) (NOAA 2014).

Recent (within the last 30 years) sea level rise has been suppressed by large-scale oceanographic processes, the reversal of which may trigger acceleration of sea level rise in the near future (Bromirski et al. 2011). Sandell and McAninch (2013) modeled future sea level rise with the Sea Level Affecting Marshes Model (SLAMM). The model can simulate not only changes in marine inundation over time, but it also can predict in a simplified way, shoreline geomorphic change. As the authors themselves note, their modeling was preliminary; it did not incorporate levees or other shoreline hardening in the cities themselves. These structures arrest shoreline movement and would likely prevent the conversion of developed areas to salt marsh and other marine lands near the cities. Even though the model is simplified in this sense, the degree to which developed areas appeared to be converted likely reflects a future hazard to development activities throughout the shoreline jurisdiction, particularly those that are exposed to Grays Harbor.

It is also important to couch these predicted changes in known interannual sea level variability associated with El Niño. Mojfeld (1992) has shown that during El Niño years the average water level can be up to 1 foot higher than in ordinary winters, with deviations during storms of up to 3 feet. It is unclear whether and if these changes will be moderated by the more global processes examined by Sandell and McAninch (2013), but the intensity of North Pacific cyclones might increase water levels beyond what has historically occurred. Regardless of which mechanism produces higher water levels (increased sea level, geomorphic conversion, or extreme storms producing abnormally high tides), future development within the shoreline jurisdiction should plan for higher water levels than have historically occurred.

3.2.3. Topography

The cities are at the convergence of many water bodies. The topography of the area was set by the outflow of the Puget Sound during the last glaciation, which included the Skagit, Snohomish, Puyallup, and the Chehalis rivers, and numerous smaller rivers and streams that drain western Washington, with meltwater from the Puget Lobe. This tremendous flow widened the floodplain of the Chehalis River into a broad low area, much larger than the river can currently inundate. As such, the Chehalis River valley is much larger than would be expected from the modern hydrology of the Chehalis River.

The upland portions rise quickly on steep hillsides comprised of recently uplifted sandstone bedrock (see next section). These steep hillsides can be prone to shallow slumping as they are still equilibrating to the changing base level in the area. Several portions of Aberdeen shoreline are in such areas where slopes are steep and landslides are common.

3.2.4. Geology and Soils

The geology of the cities is relatively simple, though it is not well known (see Section 7, *Data Gaps*). Nearly the entire area was mapped in Rau (1986). This geologic map does not discriminate between alluvium, glaciodeltaic sediments laid down during the last Ice Age, and fill, but otherwise it completely summarizes the contrast between the uplifted sandstone of the surrounding hills from these younger sediments found in lower areas. From this map, the dominant rock type of the hills that bound the cities is the Montesano Formation. The Montesano Formation is siltstone to sandstone unit of Miocene age (23 to 5 million years old). These rocks are poorly lithified, and can form into landslides easily once deformed and wetted (see Map Folio).

The low-lying, flat areas where most of the development is concentrated is a mix of alluvium, estuarine marsh deposits and fill. Although terrace deposits from the outflow of Puget Sound are more obvious on the south side of Grays Harbor outside of the cities, it is likely some of the lowlands are comprised of sediment remaining from the last glaciation, particularly in the higher areas near the Montesano Formation hillsides.

Fill in the shoreline of all the cities is common. The Udorthents soil unit provides a proxy for its extent as disturbance is one of its defining properties. Using this proxy, fill extends to approximately 10 percent of the total shoreline among all the cities. The fill material could be from a variety of sources: dredge spoils, quarried sand/gravel or construction debris. Fill is generally concentrated along the Grays Harbor shoreline that was once intertidal marsh, but

could be found along any of the rivers in the cities. Filled areas can be easily liquefiable in the case of an earthquake and likely existing maps underestimate these highly localized (and generally unmapped) areas.

Soil development within the cities mimics the underlying geology. Nearly all of the soils are fine textured reflecting the low energy environments under which the sediment that comprises them was laid down. There are only a few soil classes in the area, with three units consisting of more than a third of the shoreline area: Ocosta (silt loam), Fluvaquents, and Udorthents. Ocosta silt loam is the most common soil unit and it is associated with the major river valleys draining to the harbor. It has hydric properties and can be highly variable owing to the diversity of the floodplain environments in which the soils were formed. Fluvaquents are the native soils associated with the intertidal marshes that were common in the cities. As such, they also have hydric properties. As mentioned above, one of the most interesting soils is the Udorthents unit, which provides a crude estimate for the extent of historic disturbance and fill. All of the native soils (and some of the Udorthents) are nutrient rich and can easily support a wide range of vegetation.

Other soils, such as the Zenker (silt loam), are in place soils associated with the Montesano Formation hillsides that surround the cities; like the rest, they are fine grained. Because these soils are found on steeper slopes, they are prone to landslides. However, unlike the marsh and floodplain soils of the lowland, they are not necessarily hydric due to their coarser texture.

3.3. Key Ecosystem Processes

Ecosystem processes are the dynamic physical, chemical, and biological interactions that form and maintain natural landscapes. Ecosystem-wide processes are "... the suite of naturally occurring physical and geologic processes of erosion, transport, and deposition; and specific chemical processes that shape landforms within a specific shoreline ecosystem and determine both the types of habitat and the associated ecological functions" (WAC 173-26-020(12)). In the Cities' shoreline jurisdiction, ecosystem-wide processes influence, and are influenced by the ecosystem structure such as stream channel form, wetland presence, and vegetation communities. This in turn, affects the functions within a specific watershed, City, or reach considered in this characterization report; and there is considerable overlap between the processes and functions defined in WAC 173-26-201.

Processes and functions in the Cities' shoreline jurisdiction are related to the Grays Harbor estuary, rivers, streams, lakes, and associated wetlands that are present throughout the cities. Table 3.1 provides an overview of the relationships between ecosystem processes and functions within the cities. A more comprehensive list of functions considered in this inventory and characterization was provided in Section 2.4.

Ecosystem Process	Associated Functions
Hydrologic – Movement of surface and subsurface water, erosion, and sediment transport and deposition	Water quantity functions; storage of surface water in floodplains and depressional wetlands
Energy and nutrient cycling – Movement of sediment, toxics, nutrients and pathogens	Water quality functions; removal/replenishment of sediment, toxics, nutrients and pathogens through dispersion and sequestration
Habitat development – Vegetation development and succession; movement of water, sediment and large woody debris	Habitat functions; aquatic habitat for invertebrates, native fish, amphibians, birds, and mammals; development of structure that supports vegetation communities which, in turn, support water quantity and water quality functions on a landscape scale

Ecosystem processes are characterized by the physical constraints described previously (*Key Physical Controls*) including variables such as precipitation, climate change, geology, topography, and soils. Additionally, ecosystem processes are influenced by variables such as land use (e.g., residential, commercial, industrial and preservation), and land cover including dominant vegetation community, impervious surface, and development or other disturbances.

Ecosystem processes are dependent on natural and anthropogenic controlling factors or ecosystem stressors, some occurring within the shoreline jurisdiction and some occurring upstream and outside the shoreline jurisdiction, such as agricultural and forestry practices. In a properly functioning ecosystem, the controlling factors occur within the naturally occurring range under which the ecosystem evolved, and the ecosystem in turn provides the suite of naturally occurring associated functions. Ecological processes considered in the characterization and assessment of shoreline functions in the cities include, for example:

- Flow and movement of water
- Erosion, and sediment transport and deposition
- Vegetation development and succession
- Energy and nutrient cycling

Within the cities, primary ecosystem processes are associated with the flow and movement of water and sediment from the Hoquiam River and Chehalis River through alluvial valleys and floodplains, and the tidal interactions that form the estuary. This contributes to channel formation and structure to support associated functions. Dynamic interactions between process and structure are both naturally and human caused. For example, the ecological impacts of flow control and water quality and quantity can significantly influence salmon population success and production. Salmon, in turn, have an indirect relationship with the entire food web and ecosystem processes through biofeedback (i.e., movement of nutrients) and related consequences for vegetation production and success of other water dependent populations of species. As a “keystone” species, the ranges of salmon populations that occur

in the cities (described later) have an important role, and perhaps a disproportionate influence on other species, in the ecosystem (Knight 2009).

Ecosystem processes and the associated functions can be influenced or impaired by stressors including the following:

- Ground clearing or excavation
- Shoreline filling and armoring
- Channel or bank alteration (e.g., dredging and armoring)
- Impervious surface creation
- In-water and over-water structures installation
- Hatchery and aquaculture operations
- Point source pollution
- Non-point source pollution
- Riparian vegetation removal
- Invasive species introduction
- Freshwater sources elimination, withdrawal, and flow control

Fisheries activities are also stressors and important factors in resource management and the protection of sensitive species. Activities such as development and operation of hatcheries, aquaculture, and related facilities, as well as certain restoration activities, are considered in shoreline planning and development regulations. Other aspects of fisheries management such as harvest regulation are not a component of shoreline planning in the context of the SMA.

Key impairments to ecological processes in the cities are likely associated with development (e.g., shoreline filling and impervious surfaces creation) in floodplains, which can alter the flow and movement of water; vegetation alteration including historical forestry practices, which can alter vegetation development and succession; presence of dams or flow controls and pollution sources on local and landscape scales.

The marine shoreline along Grays Harbor in the cities is typically low gradient, as it was predominantly saltmarsh prior to development. Currently, in many locations, these areas are comprised of fill, armored in most places by riprap or other structural means. Even prior to development, the shoreline was low energy and straight. It remains that way after more than a century of fill activities and human modification. The naturally straight, relatively stable, and low-gradient nature of the shorelines in the cities derives from area geologic history; they differ significantly from other marine shorelines in Washington State. Today, the shorelines of Grays Harbor are largely characterized by the ongoing processes of the Chehalis River delta interacting with the tidal marine waters of the coast. Shorelines in the harbor support a variety of estuarine habitats ranging from mudflats and eelgrass beds to salt marsh vegetation

communities dominated by pickleweed (*Salicornia* spp.), Lyngby's sedge (*Carex lyngbyei*), and tufted hairgrass (*Deschampsia cespitosa*). Salt marsh and dune grass communities are found throughout much of the inner harbor shoreline.

The streams in the cities are low gradient rivers and streams that have meandering planform morphology and sandy to muddy substrates. Many of these streams are tidally influenced. Regular tidal flooding of nearshore areas often results in the deposition of mud and sand near the channel margin, particularly in well-vegetated areas. Levees and engineered revetments are often used to prevent saltwater inundation and erosion of developed areas. The levees are typically low because of the low energy environment.

In the reservoir (Lake Aberdeen), much of the shoreline consists of inundated hillslopes that have been reworked to varying extents by wave action. Because water surface elevations vary more significantly in reservoirs, shorelines there are usually less well defined and are often poorly vegetated, particularly during periods of reservoir draw down. A delta has formed where Van Winkle Creek enters the reservoir. Reservoir shoreline functionality is highest when the boundary between water and upland areas is relatively wide, well vegetated, and lacks shoreline armoring.

3.4. Land Use and Land Cover

Shorelines in the region support a range of land uses ranging from heavy industrial development, to commercial and recreational fishing, and relatively intact natural shorelines that are preserved. Land use in the immediate riparian areas was historically dominated by surge-plain ecosystems. Vegetation in the intertidal region was dominated by dense eelgrass beds. Historically, the estuary was considered the primary bottleneck for salmon survival in the basin, due to poor water quality. However, recent advances in water quality treatment are thought to have improved this condition (CBPHWG 2008), although this has not been empirically confirmed.

The estuary is generally in fair condition. Currently, 70 percent of the historically available estuary habitat is intact (CBPHWG 2008). The majority of land that has been converted from its historical cover is now dominated by urban development.

In addition to assessing ecological functions to guide land-use planning, examining land-use patterns and existing public-access opportunities are important considerations in the SMP analysis because such examinations can identify opportunities for preferred uses, particularly water-dependent, water-oriented, and water-enjoyment uses. Land uses adjacent to the water are also a determinant in assigning environment designations to sections of the shoreline. An analysis of land use conditions is necessary to determine potential land use changes and their effect on shorelines to meet SMA objectives. The proposed environment designation boundaries and provisions must be mutually consistent with the Comprehensive Plan of the respective City.

Current and planned land uses are covered in more detail for each reach in the three Cities in Sections 4.1.2, 4.2.2, and 4.3.2.

The SMA calls for establishing a compatible use pattern over the 20-year planning period of the SMP. Compatible uses are based on current or planned preferred uses in the shoreline jurisdiction that should be protected or promoted to meet SMA goals for “water-oriented uses,” shoreline access, and ecological protection. The SMA defines a special category of shorelines where specific priority uses are preferred called Shorelines of Statewide Significance. Within the three cities, these include the Chehalis River and Grays Harbor Estuary. The SMA promotes the following use preferences (RCW 90.58.020) for Shorelines of Statewide Significance in the stated order, pursuant to the definition of Shorelines of the State in RCW 90.58.030, described previously¹:

1. Recognize and protect the statewide interest over local interest
2. Preserve the natural character of the shoreline
3. Provide for long term benefits over short term benefits
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
7. Provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary

Existing land cover, zoning designations, and aerial imagery provide a baseline for the types of land use found within the shoreline jurisdiction. Future land use and current zoning data for the area covered by the Cities’ shoreline jurisdiction were obtained from the Cities and existing land cover data were derived from the National Land Cover Database. These data sets are overlaid on the inventory maps in Appendix A.

According to Ecology’s SMP Guidelines (WAC 173-26-020), “water-oriented use” means a use that is water-dependent, water-related, or water-enjoyment, or a combination of such uses. The SMA promotes uses that are “... unique to or dependent upon use of the state's shoreline ...” as well as:

“... ports, shoreline recreational uses including but not limited to parks, marinas, piers, and other improvements facilitating public access to Shorelines of the State, industrial and commercial developments which are particularly dependent on their location on or use of the Shorelines of the State and other development that will provide an opportunity for substantial numbers of the people to enjoy the Shorelines of the State.” (RCW 90.58.020)

Definitions and examples of “water-oriented uses” are included in Table 3.2 below.

¹ Shorelines of the State in the cities of Aberdeen, Cosmopolis, and Hoquiam include Aberdeen Lake, Charley Creek, the Chehalis River, Fry Creek, Grays Harbor, Newkah Creek, Wedekind Creek, the Wishkah River, Mill Creek, the Hoquiam River, and the Little Hoquiam River.

Table 3.2. Water-Oriented Uses Definitions and Examples.

Water-Oriented Use Definitions	Water-Oriented Use Examples
<p>"Water-dependent use" means a use or portion of a use that 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(36))</p>	<p>Examples of water-dependent uses may include ship cargo terminal loading areas, ferry and passenger terminals, barge loading facilities, shipbuilding and dry-docking, marinas, aquaculture, float plane facilities and sewer outfalls.</p>
<p>"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:</p> <p>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</p> <p>The use provides a necessary service supportive of the water dependent uses and the proximity of the use to its customers makes its services less expensive and/or more convenient. (WAC 173-26-020 (40))</p>	<p>Examples of water-related uses may include warehousing of goods transported by water, seafood processing plants, hydroelectric generating plants, gravel storage when transported by barge, oil refineries where transport is by tanker, log storage, and potentially agriculture.</p>
<p>"Water-enjoyment use" means a recreational use 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.</p> <p>In order to qualify as a water enjoyment use, the use must be open to the general public and the shoreline-oriented space within the project must be devoted to the specific aspects of the use that fosters shoreline enjoyment. (WAC 173-26-020 (37))</p>	<p>Primary water-enjoyment uses may include, but are not limited to, parks, piers and other improvements facilitating public access to the Shorelines of the State; and general water-enjoyment uses may include, but are not limited to restaurants, museums, aquariums, scientific/ecological reserves, and resorts/hotels.</p>

3.5. Historical and Cultural Resources

The cities of Aberdeen, Cosmopolis, and Hoquiam contain many known, and unknown, historic and cultural resource sites within shoreline areas. The existing shoreline master program for the Cities includes general goals and policies to protect and restore sites within the shoreline jurisdiction that have significant historic, cultural, educational, or scientific value.

According to the Washington State Department of Archaeology and Historic Preservation (DAHP), 16 properties in the cities are listed on the National Register of Historic Places or the Washington Heritage Register (DAHP 2014). Table 3.3 lists those properties and indicates whether they are within the shoreline jurisdiction.

Table 3.3. Properties Listed on State and National Historic Registers for Aberdeen, Cosmopolis, and Hoquiam.

City	Resource Name	Address	Listing Status	Date Built	Within Shoreline Jurisdiction?
Hoquiam	Hoquiam's Castle (Robert Lytle Mansion)	515 Chenault Ave.	WHR and NRHP	1897	No
	Joseph Lytle Home	509 Chenault Ave.	WHR and NRHP	1900	No
	Lachlin McTaggart House	224 L St.	WHR and NRHP	1907	No
	Judge Charles W. Hodgdon House	717 Bluff St.	WHR and NRHP	1907	No
	F. Arnold Polson House and Alex Polson Grounds (Polson Park and Museum)	1611 Riverside Ave. (Highway 101)	WHR and NRHP	1923	Yes; Hoquiam River Reach
	Seventh Street Theater	313 7th St.	WHR and NRHP	1928	No
	US Post Office, Hoquiam	620 8th St.	WHR and NRHP	1932	No
	Hoquiam Carnegie Library	621 K St.	WHR and NRHP	1911	No
	Hoquiam Olympic Stadium	2811 Cherry St.	WHR and NRHP	1938	No
	Masonic Temple, Hoquiam	510 8th St.	WHR and NRHP	1922	No
	American Veterans Building, Hoquiam	307 7th St.	WHR and NRHP	1920	No
Hoquiam River Bridge	North of SR 12	WHR and NRHP	1928	Yes; Hoquiam River Reach	
Aberdeen	Chehalis River Bridge	SR 101 over the Chehalis River	WHR	1953–1955	Yes; Grays Harbor South Bank, Chehalis River Reach, and Grays Harbor North Bank
	Liberty Tavern	500 East Schley	WHR	1915	No
	Sierra (Motor Ship)	1401 Sargent Blvd. (Chehalis River)	WHR and NRHP	1916	Yes; Chehalis River Reach
Cosmopolis	Neil Cooney Mansion (Spruce Cottage)	802 East 5th St.	WHR and NRHP	1910	No

Source: DAHP 2014.

NRHP = National Register of Historic Places

SR = State Route

WHR = Washington Heritage Register

As shown in Table 3.3, four historic properties lie within the shoreline jurisdiction: two in Hoquiam (Polson Park and Museum, and Hoquiam River Bridge) and two in Aberdeen (Chehalis River Bridge and the Sierra). Both properties in Hoquiam are within the Hoquiam River Reach. The Sierra motor ship is within the Chehalis River Reach. The Chehalis River Bridge lies within three reaches: Grays Harbor South Bank, Chehalis River, and Grays Harbor North Bank.

Shoreline areas within the Cities' jurisdictions were likely occupied in the past by Native Americans. Prior to the 1850s, when treaties were made and diseases introduced, the Humptulips people lived along the north shore of Grays Harbor and along the Humptulips, Hoquiam, and Wishkah rivers; the Hoquiam and Wishkah may have been considered separate groups (Hajda 1990). The Chehalis people lived on the south shore of Grays Harbor and the lower Chehalis River (Hajda 1990). All of these groups spoke the Lower Chehalis language.

Salmon was a primary food source for all of these peoples, and the territory of each group centered on a major salmon stream. Other types of fish were also harvested, and shellfish were collected in the harbor (Hajda 1990). Most villages were located at the mouths of rivers and creeks. In general, the people lived near fishing streams in cedar longhouses during the winter months (Chehalis Tribe 2009). In spring, they would move to prairies and the mountains to harvest plants, berries, and trees for canoes, and to hunt. Based on this information, archaeological artifacts and other cultural resources may be present within the Cities' shoreline areas.

3.6. Shoreline Modifications

This section provides an overview of shoreline modifications common in the cities and region. Additional information on shoreline modifications is provided under the sections discussing each city (Section 4). The following shoreline modifications are found in the cities:

- Fill is the most significant physical alteration to the shoreline landscape within the cities. In some areas fill is extensive and has resulted in a completely artificial shoreline, with modified, typically straightened channels constructed as a way to drain the placed fill. For instance, the Grays Harbor shoreline once extended only to the Northern Pacific rail line throughout Aberdeen and Hoquiam, nearly one-half mile landward of the current shoreline (US Coast and Geodetic Survey 1911). In addition, the peninsula that defines the Bowerman Airport and connects former Moon Island to the mainland is fill (essentially the airport used to be an island).
- Dikes are raised berms or embankments intended to limit saltwater inundation and prevent flooding during peak marine high water events. They simplify the geometry of the shoreline and require revetments (see below) to maintain them. The simplification and hardened protection of the shoreline limits shallow water habitat for migrating fishes and decreases rearing opportunities for juvenile salmonids.
- Levees are raised berms or embankments on streams that prevent channel migration, and limit and direct flood inundation. They reduce the ability of streams to store water in the floodplain and limit off-channel rearing opportunities for juvenile salmonid fish.

- Culverts, sometimes attached with tide gates, regulate the flow of runoff and tidal inundation. They are common in filled areas. Culverts can be perched, causing an elevation break at the downstream side of the culvert that often acts as an upstream barrier to migrating fish. Culverts can also be undersized, in which case peak flows backwater behind them, causing hydraulic, geomorphic, and sedimentation effects. Culverts and associated fill can limit saltwater inundation and cause unnatural jumps in salinity and temperature along the watercourse, which can be harmful to fish and other estuarine organisms (Giannico and Souder 2005).
- Bridges may also constrict flow during peak events and locally restrict channel migration. Many of the bridges in the cities are associated with fill pads that protrude into active channels, eliminating or disrupting shallow water habitat.
- Revetments are erosion resistant structures, usually made of rock or wood, placed to eliminate bank erosion where its direction threatens property or infrastructure. Revetments reduce the structural complexity of shorelines, and by design eliminate their ability to exchange sediment to the adjacent water body.
- The USACE routinely conducts dredging to maintain the deep draft navigation channel along the cities' shorelines from Elliot Slough to Hoquiam's western boundary and beyond. Channelization and channel straightening increases the conveyance capacity of streams, at the cost of hydraulic and shoreline complexity. Dredging and channelization are often combined with or affected by the installation of revetments, dikes, and fill. Many of the smaller channels (i.e., creeks, ditches, sloughs) in the cities are entirely artificial, particularly those that run through filled areas adjacent to Grays Harbor.

3.7. Critical Areas and Priority Habitat and Species

This section describes critical areas and priority habitat and species (PHS) of state and local concern including instream habitat, wetlands, riparian habitat, fish, and other wildlife dependent on water and shoreline environments in the shoreline jurisdiction. Critical areas within the Cities' shoreline jurisdiction include:

- Frequently flooded areas
- Wetlands
- Geologically hazardous areas
- Fish and wildlife habitat conservation areas(FWHCAs)
- Critical aquifer recharge areas²

² Critical aquifer recharge areas are those areas with a critical recharging effect on aquifers used for potable water as defined by WAC 365-190-030(2). They include areas such as wellhead protection areas, USEPA designated sole source aquifers, special protection areas (WAC 173-200-090), or vulnerable aquifer recharge areas delineated by a hydrogeologic study.

FWHCAs typically include Washington State designated PHS. Designated PHS includes wetlands, streams, and riparian areas; therefore, there is often considerable overlap between FWHCAs and other designated critical areas such as wetlands and frequently flooded areas.

For this report, FWHCAs in the shoreline jurisdiction are assumed to include the following pursuant with HMC 11.06.230 and AMC 14.100.500:

- Areas where endangered, threatened, and sensitive species have a primary association
- Bald eagle habitat under WAC 232-12-292 (AMC 14.100.500)
- Habitats and species of local importance, as determined locally (assumed to include all state designated priority species and habitats potentially occurring in the cities)
- Kelp and eelgrass beds
- Forage fish (e.g., herring and smelt) spawning areas
- Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat
- Waters of the state and their associated riparian areas
- State natural area preserves, natural resource conservation areas, and state wildlife areas
- Lakes, ponds, streams, and rivers planted with game fish as defined by RCW 77.08.020, planted with game fish by a governmental or tribal entity
- Areas open to shellfish gathering under applicable health regulations and any “shellfish protection district” that may be established under Chapter 90.72 RCW
- Areas of rare plant species and high quality ecosystems identified by the Washington State Department of Natural Resources (WDNR) through the natural heritage program
- Land useful or essential for preserving connections between habitat blocks and open spaces

These features are discussed within the context of PHS in this section. Under state requirements for amending SMPs, WAC 173-26-201(3)(c) and 173-26-221, this section focuses on species listed as endangered, threatened, or sensitive, and priority habitats primarily associated with the shoreline and aquatic environment. The descriptions of species also focus on the species that are most likely to be present in the Cities’ shoreline jurisdiction. However, the state code requires that all critical areas, including fish and wildlife conservation areas, be considered in managing shorelines. Therefore, all species and habitats considered priority by WDFW (see Appendix B) and identified as locally important according to each city’s code should be considered in shoreline planning.

The species and habitats for which PHS data or other geographic databases were available are included in the functional assessment for this characterization and reach level functional

assessment. However, they are not all described in detail in this section due to their listing status (i.e., not sensitive, threatened or endangered) or due to their association with the terrestrial environment as opposed to the shoreline. The presence of species and habitats identified by WDFW as priority should also be evaluated on a site-specific scale during individual project review by the Cities.

In terms of priority fish species, this characterization focuses on salmon and trout due to the availability of mapped data and their important role as a fisheries resource, along with fish species that have a federal or state status of endangered, threatened, or sensitive. Other designated priority species such as pacific lamprey and river lamprey have a status of “candidate” or “species of concern” and may be present in the shoreline jurisdiction. Although they are not specifically described in this characterization, they were considered in the reach level functional assessment where data are available.

3.7.1. Coastal Nearshore

General master program provisions (WAC 173-26-221) include principals and standards for protection of critical saltwater habitats. State designated “priority habitat” includes coastal nearshore habitat. Critical saltwater habitats include coastal nearshore areas such as kelp beds, eelgrass beds, spawning and holding areas for forage fish, such as herring, smelt and sand lance; subsistence, commercial and recreational shellfish beds; mudflats, intertidal habitats with vascular plants, and areas with which priority species have a primary association (WAC 173-26-221).

Priority coastal nearshore habitat includes “relatively undisturbed” nearshore estuaries of Washington’s outer coast including Grays Harbor. Relatively undisturbed means “any nearshore habitats that retain some essential elements or functions important to the maintenance of native species use (e.g., native eelgrass for herring spawning)” (WDFW 2008). It includes the marine riparian zone, intertidal, and subtidal areas of the nearshore, which are present along the marine reaches in the Cities’ shoreline jurisdiction. Coastal nearshore areas provide important habitat elements for a variety of sensitive species discussed in this section. FWHCAs that are closely associated with coastal nearshore areas include eelgrass and nearshore vegetation that provide habitat where sensitive species have a primary association, shellfish areas, and forage fish spawning areas. These FWHCAs are described in separate sections below. Other species such as salmon and bird species also use nearshore habitat but might also occur in other shoreline environments. Those are also addressed later in this report under separate headings.

3.7.2. Eelgrass and Nearshore Vegetation

Designated critical areas in Washington State include kelp and eelgrass beds. Marine shorelines in the cities support a range of large patchy eelgrass beds and fringe eelgrass communities. The cities’ shorelines do not contain the rocky substrate associated with kelp and kelp is not mapped within the shoreline jurisdiction (WDNR 2001). A range of saltmarsh and dunegrass vegetation communities are present (see Appendix A, Figure 11). Nearshore vegetation communities and eelgrass in particular, provide important primary production habitats that support early life stages of a wide range of priority fish and shellfish species. Nearshore vegetation provides key habitat for these species provides and important benefit

for marine mammals and shore birds that rely on healthy populations of fish and shellfish food sources.

3.7.3. Shellfish Areas

Grays Harbor supports a variety of crab, clams, and oysters. The greatest variety and abundance occurs in the outer bays of the harbor. The inner harbor and cities' marine shoreline habitats are less conducive for shellfish growth and the communities are less diverse. Surveys conducted by Washington State (Albright and Bouthillette 1982; Weitkamp 2009, cited by NMFS 2010) indicate a community dominated by the small Baltic clam (*Macoma balthica*) and pointed macoma (*Macoma inquinata*) in the intertidal areas of the inner harbor and the cities' shoreline. The cities' marine shorelines are entirely within the inner harbor closed to commercial shellfish growing and recreational harvest due to pollution (WDOH 2014a).

Grays Harbor estuary is an important Dungeness crab (*Cancer magister*) nursery for population production and fisheries on a regional scale. As with clams, crab presence is greater in the outer harbor than in the Cities' shoreline jurisdiction. Studies have found that crab densities are greater in the navigation channel than on the mudflats. However, both intertidal habitat and subtidal channels support crab populations and are likely important habitat areas in the cities' marine shorelines.

3.7.4. Streams

Instream areas are a priority aquatic habitat designated by WDFW. Instream habitat is defined as the combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. This priority habitat occurs throughout much of the shoreline jurisdiction, which is dominated by river and stream water features. Coastal nearshore habitat, influenced by instream conditions and processes, and reaches dominated by lake or wetland habitats are not included within this priority habitat category but are also priority aquatic habitat types.

3.7.5. Freshwater Wetlands and Fresh Deepwater

In addition to estuarine wetlands designated as coastal nearshore habitat, WDFW designates freshwater wetlands and fresh deepwater as priority aquatic habitats in Washington State. Wetlands are also designated critical areas. Mapped wetlands in the shoreline jurisdiction include those that are identified in the National Wetland Inventory (NWI) and the PHS database. Freshwater wetlands and deepwater priority habitats are defined as follows:

- **Freshwater Wetlands** - Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following attributes: the land supports, at least periodically, predominantly hydrophytic plants; substrate is predominantly undrained hydric soils; and/or the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

- **Fresh Deepwater** - Permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so water, rather than air, is the principal medium within which the dominant organisms live. The dominant plants are hydrophytes; however, the substrates are non-soil because the water is too deep to support emergent vegetation. These habitats include all underwater structures and features (e.g., woody debris, rock piles, and caverns).

Freshwater wetlands are found throughout the Cities' shoreline jurisdiction and are typically associated with stream segments (Appendix A, Figure 2). Lake Aberdeen is a significant deepwater habitat in the shoreline jurisdiction.

3.7.6. Riparian Habitat

Riparian habitat in a variety of forms ranging from low slope, valley bottom grasslands to steeply sloped hillsides is common throughout the cities' shorelines. Riparian habitat is the area adjacent to flowing or standing freshwater aquatic systems and is a designated priority habitat in Washington State. It encompasses the area beginning at the ordinary high water mark and extends to that portion of the terrestrial landscape that is influenced by, or that directly influences, the aquatic ecosystem. For example, hyporheic zones associated with riparian habitats can influence the vegetative structure and subsequently affect food production and food web interactions for fish and other aquatic organisms.

In riparian systems, the vegetation, water tables, soils, microclimate, and wildlife inhabitants of terrestrial ecosystems are often influenced by perennial or intermittent water. Simultaneously, adjacent vegetation, nutrient and sediment loading, terrestrial wildlife, and organic and inorganic debris influence the biological and physical properties of the aquatic ecosystem.

Riparian habitat includes the entire extent of the floodplain and riparian areas of wetlands directly connected to stream courses or other freshwater. Therefore, it is present throughout the entire shoreline jurisdiction, albeit at various levels of development and functional quality or value.

3.7.7. Snags and Logs

Snags and logs are habitat features designated by WDFW as priority habitat in Washington State. Snags and logs may be present in the designated priority habitats described in the previous sections if those habitats support trees or the transport of large wood through the aquatic system. Prior to most development, snags were common throughout the cities, particularly in Grays Harbor and its many river mouths (US Coast and Geodetic Survey 1911). Many have been removed over time to improve navigation.

Priority snag and log habitat includes individual snags or logs, or groups of snags or logs of exceptional value to wildlife due to their scarcity or location in a particular landscape. Areas with abundant, well-distributed snags and logs are also considered priority snag and log habitat. Examples include large, sturdy snags adjacent to open water, remnant snags in developed or urbanized settings, and areas with a relatively high density of snags.

In western Washington, priority snags have a diameter at breast height of greater than 51 cm (20 inches) and are greater than 2 m (6.5 feet) in height. Priority logs are greater than 30 cm (12 inches) in diameter at the largest end, and greater than 6 m (20 feet) long.

3.7.8. Salmon and Trout

Priority and sensitive salmon and trout species in the study area are summarized in Table 3.4 (WDFW 2002, 2004, 2014a). These fish migrate through Grays Harbor and use nearby streams for rearing and spawning, including most streams in the Cities' shoreline jurisdiction.

There are 9 stocks of Chinook salmon, 7 stocks of coho salmon, 2 stocks of chum salmon, and 10 stocks of steelhead that occur near the cities and rely on the cities' shorelines at various life stages. The stocks include both native and introduced stocks in varying states of health.

The Chehalis, Wishkah, and Wynoochee rivers and Grays Harbor within the Cities' shoreline jurisdiction are designated under the ESA as critical habitat for bull trout (75 FR 63898). These water bodies provide freshwater and marine foraging, migration, and overwintering habitat outside of the Hoh, Queets, and Quinalt core areas where breeding populations occur.

All of the streams and estuarine waters in the shoreline jurisdiction that support Chinook or coho salmon are considered "essential fish habitat" (EFH) protected by the Magnuson-Stevens Fishery Conservation and Management Act under the jurisdiction of NMFS. Besides the streams listed above that contain critical habitat for bull trout, the Hoquiam and Little Hoquiam rivers and Lake Aberdeen are designated EFH.

Species	Endangered Species Act Unit ^a	Federal Listing Status	State Listing Status	PHS Criteria ^b
Chinook (<i>Oncorhynchus tshawytscha</i>)	Washington Coast ESU	None	Candidate	#1, #2, #3
Coho (<i>O. kisutch</i>)	Southwest Washington ESU	None	None	#2, #3
Steelhead and Rainbow Trout (<i>O. mykiss</i>)	Southwest Washington DPS	Undetermined	Candidate	#3
Chum (<i>O. keta</i>)	Pacific Coast ESU	None	Candidate	#1, #2, #3
Bull Trout (<i>Salvelinus confluentus</i>)	Olympic Peninsula RU	Threatened / designated critical habitat	Candidate	#1, #2, #3
Coastal Resident Cutthroat Trout (<i>O. clarki clarki</i>)	Not Applicable	Species of Concern	None	#3

^a ESU is Evolutionarily Significant Unit. DPS is Distinct Population Segment. RU is Recovery Unit.

^b Criterion 1 = State-Listed and Candidate Species; Criterion 2 = Vulnerable Aggregations; Criterion 3 = Species of Recreational, Commercial, and/or Tribal Importance (WDFW 2008).

Coastal resident cutthroat trout is a federal listed species of concern, and both cutthroat and rainbow trout are WDFW designated priority species due to their recreational value. Coastal

resident trout use habitats in all of the cities' shorelines with the possible exception of Mill Creek, where they remain undocumented.

3.7.9. Other Priority Fish

Table 3.5 summarizes non-salmonid priority fish species that occur in the shoreline jurisdiction. These include forage fish, groundfish, rockfish, sturgeon, lamprey, and mudminnow described in the following sections.

Species Group	Priority Area	Federal Listing Status	State Listing Status	PHS Criteria^a
Smelt – Pacific Eulachon (<i>Thaleichthys pacificus</i>)	Regular concentrations	Threatened	Candidate	#1, #2, #3
Smelt – longfin smelt (<i>Spirinchus thaleichthys</i>), surf smelt (<i>Hypomesus pretiosus</i>), Pacific Sand Lance (<i>Ammodytes hexapterus</i>)	Breeding areas, regular concentrations	None	None	#2, #3
Pacific Herring (<i>Clupea pallasii</i>)	Breeding areas, regular concentrations	Species of Concern	Candidate	#1, #2, #3
Groundfish – English sole (<i>Pleuronectes vetulus</i>) Rock sole (<i>Lepidopsetta bilineata</i>)	Breeding Areas, regular concentrations	None	None	#3
Rockfish (<i>Sebastes</i> spp.)	Regular concentrations, any occurrence for some species	None, Species of Concern, Threatened or Endangered ^b	Candidate	#1, #2, #3
Green Sturgeon (<i>Acipenser medirostris</i>)	Any occurrence	Threatened	None	#1, #2, #3
White Sturgeon (<i>Acipenser transmontanus</i>)	Any occurrence	None	None	#2, #3
Pacific Lamprey (<i>Entosphenus tridentate</i>)	Any occurrence	Species of Concern	None	#3
River Lamprey (<i>Lampetra ayresii</i>)	Any occurrence	Species of Concern	Candidate	#1
Olympic Mudminnow (<i>Novumbra hubbsii</i>)	Any occurrence	None	Sensitive	#1

^a Criterion 1 = State-Listed and Candidate Species; Criterion 2 = Vulnerable Aggregations; Criterion 3 = Species of Recreational, Commercial, and/or Tribal Importance (WDFW 2008).

^b Puget Sound populations of Bocaccio rockfish (*Sebastes paucispinis*), canary rockfish (*Sebastes pinniger*), and yelloweye rockfish (*Sebastes ruberrimus*) are federally listed, and individuals could potentially migrate into the cities' shorelines. However, presence is unlikely.

3.7.9.1. Forage Fish Spawning Areas

At least eight forage fish species occur in Grays Harbor. Priority forage fish species include Pacific Eulachon (*Thaleichthys pacificus*), longfin smelt (*Spirinchus thaleichthys*), surf smelt (*Hypomesus pretiosus*), Pacific sand lance (*Ammodytes hexapterus*), and Pacific herring (*Clupea pallasii*) (Table 3.5). Northern anchovy (*Engraulis mordax*), whitebait smelt (*Allosmerus elongatus*), and American shad (*Alosa sapidissima*) are also present. Surf smelt are the most common species in the lower estuary, while longfin smelt use the upper reaches of the estuary (NMFS 2010). Grays Harbor is designated EFH for northern anchovy (PFMC 1999). Forage fish spawning areas are one FWHCA that must be considered for classification and designation as a critical area (WAC 365-190-130).

Forage fish spawning areas including sand lance, smelt, and herring spawning are mapped in Grays Harbor in the North Bay near Ocean Shores and South Bay near Westport, but are not documented in the Cities' shoreline jurisdiction (WDFW 2014b). However, eelgrass and coastal nearshore habitat in the shoreline jurisdiction may indirectly support these species by providing water quality and rearing habitat for larvae and juvenile forage fish. In addition, local studies, including site-specific investigations for individual project reviews, may result in the identification of known or potential spawning habitats that have not yet been identified and mapped.

Pacific eulachon are listed by NMFS as threatened. Pacific eulachon are anadromous forage fish that spawn in freshwater natal streams. Spawning grounds are typically in the lower reaches of larger rivers fed by snowmelt (Hay and McCarter 2000). The Columbia River basin is the origin of most Pacific Eulachon in the continental United States. Preferred spawning habitat consists of course, sandy substrates (WDFW and ODFW 2001; NMFS 2013) and the Cities' shoreline jurisdiction does not generally contain habitat suitable for spawning. Eulachon presence in the Cities' shoreline jurisdiction is limited, although feeding fish or "strays" may use the upper harbor (NMFS 2010). Therefore, the cities' shorelines may be important for foraging and for migration into streams that are known to support small populations. In 1993, unseasonably cold-water conditions in the Columbia River tributaries that normally support the majority of spawning was a possible explanation for relatively abundant eulachon in the Quinault and Wynoochee rivers (WDFW and ODFW 2001).

Threats to this species include habitat loss and degradation. Dredging activities in Grays Harbor and the Chehalis River during spawning runs may entrain and kill fish or otherwise result in decreased spawning success (NMFS 2013). Besides fishing restrictions, effective conservation efforts include habitat restoration or enhancements that improve conditions for eulachon, other forage fish, salmon, and a variety of native species.

3.7.9.2. Groundfish and Rockfish

There are numerous species of groundfish and rockfish that are state priority species and may be present in Grays Harbor (WDFW 2008, 2014c). As for Pacific salmon, marine shorelines in Grays Harbor are designated EFH for English sole (*Pleuronectes vetulus*) and black rockfish (*Sebastes melanops*) (PFMC 1999). Thirteen species of rockfish are designate state priority fish (Appendix B). Presence of rockfish is likely limited in the Cities' shoreline jurisdiction due

to the silt and mud character and the species' habitat preferences. Groundfish and rockfish are more likely to use habitat in the outer harbor and offshore areas.

3.7.9.3. *Sturgeon*

Habitat in the Grays Harbor estuary is used by green sturgeon (*Acipenser medirostris*) and white sturgeon (*Acipenser transmontanus*); these are long-lived species that spawn several times during their life. They migrate seasonally along the West Coast, congregating in bays and estuaries such as Grays Harbor during the summer and fall. Green sturgeon is listed as threatened under the ESA (71 FR 17757). Green sturgeon use Grays Harbor for rearing, feeding, and holding, although no spawning is thought to occur in Grays Harbor or the Chehalis River. Threats to the species related to shoreline development or activities that could occur in the Cities' shoreline jurisdiction include entrainment of juveniles by in-water projects, introduction of exotic species, migration barriers, and exposure to contaminants (71 FR 17757, NMFS 2010).

3.7.9.4. *Lamprey*

Both Pacific lamprey (*Entosphenus tridentate*) and river lamprey (*Lampetra ayresii*) are state priority species and federal species of concern. River Lamprey is a state candidate species. There are limited data regarding the presence, distribution, and habitat use of these species in water bodies that include the Cities' shoreline jurisdiction. In the shoreline jurisdiction, Pacific lamprey is documented near the outfall of Lake Aberdeen.

3.7.9.5. *Olympic Mudminnow*

Olympic mudminnow (*Novumbra hubbsi*) is a species endemic to Washington where it is listed as sensitive, meaning it is native to Washington, is vulnerable or declining, and is likely to become endangered or threatened in a significant portion of its range without cooperative management or removal of threats (WAC 232 12 297). Within their range, which includes all of the cities' freshwater shorelines, they would potentially be found in slow-moving streams, wetlands, ponds, ditches, or sloughs with muddy substrate, still or slow moving water, and abundant aquatic vegetation. Olympic mudminnow presence is not well documented in the Cities' shoreline jurisdiction. Locations in the shoreline jurisdiction are not documented in the PHS dataset. General locations of known presence in the county were illustrated by Mongillo and Hallock (1999) and WDFW (2013). The highest densities of detections geographically are in the lower Chehalis River valley and coastal streams north of Grays Harbor, indicating a high potential for presence in the Cities' shoreline jurisdiction where suitable habitat is present. Population decline in Washington has been attributed to wetland habitat loss (Mongillo and Hallock 1999; WDFW 2013b). Wetland protection is considered essential for the conservation of the species (WDFW 2013b).

3.7.10. *Marine Mammals*

Grays Harbor supports a variety of marine mammals. Steller sea lions (*Eumetopias jubatus*) and whales have been observed in the harbor, although usually in the outer harbor. NMFS (2010) found that southern resident killer whales (*Orcinus orca*), humpback whales (*Megaptera novaeangliae*), and Steller sea lions are unlikely to occur in the Grays Harbor navigation channel, or the harbor proper. However, these federally listed species, as well

gray whales (*Eschrichtius robustus*), which are designated sensitive in Washington State, have been observed offshore and in the outer harbor. Occurrences of these species would be rare in the inner harbor and cities' shorelines. However, on a broad scale, shoreline conditions and habitat such as eelgrass beds in the cities' shorelines are interrelated and contribute to the primary food production and food chain interactions that are important to marine mammals. Harbor seals are also common in the Grays Harbor Estuary and frequently forage in the lower estuarine waters of the Hoquiam River and Chehalis River in the Cities' shoreline jurisdiction.

3.7.11. Pacific Pond Turtle

Pacific pond turtle (*Actinemys marmorata*), also known as western pond turtle, is a priority endangered species in Washington State, and is identified by WDFW as potentially in Grays Harbor County (see Appendix B). The range of the western pond turtle extends from the Puget Sound lowlands in Washington south to Baja California. However, western pond turtles were extirpated in the Puget Sound lowlands by the 1980s. In 1999, their range in Washington was thought to comprise two small populations in Skamania and Klickitat counties, and a small pond complex in Pierce County where they were recently reintroduced from captive bred stock (Hays et al. 1999). A recent status report (WDFW 2013b) showed no reintroduction attempts in the cities' vicinity or Grays Harbor County. Presence of Western pond turtle is undocumented in the PHS dataset. These factors limit the potential for presence in the Cities' shoreline jurisdiction. With the advancement of recovery programs, the species may be reintroduced into the region, although suitable sites may not be present in the Cities' shoreline jurisdiction and it is likely that more suitable sites in the area outside the cities would be selected for reintroduction.

3.7.12. Sea Turtles

Three species of sea turtles that are listed as threatened or endangered could potentially occur in the Cities' shoreline jurisdiction: green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*). Although generally associated with tropical waters, they have extensive migratory ranges much like whales, and have been observed off the coast of Grays Harbor cities such as Westport. Presence in Grays Harbor and the Cities' shoreline jurisdiction would be limited to rare occurrences due to habitat preferences. Suitable breeding habitat is not present in the cities' shorelines and preferred migration and foraging habitat is outside the cities in coastal waters. No occurrences in the Cities' shoreline jurisdiction are documented in the Washington State PHS database (WDFW 2014a).

3.7.13. Birds

The Cities' shoreline jurisdiction provides a variety of habitats for numerous marine birds, shorebirds, ducks, and other birds associated with aquatic environments. The priority species and habitats most likely to occur in the Cities' shoreline jurisdiction are described below.

3.7.13.1. Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) are commonly associated with shorelines where they are often attracted by live or dead fish and other prey items. They nest in tall trees (greater than 85 feet in height) usually within 0.25 mile of shorelines. While the bald eagle was

delisted from a federal ESA status of threatened in 2008, it is still protected under the Bald Eagle Management Act, and is a state sensitive species that requires protection. Bald eagles are present throughout the cities' shorelines and have been observed perching on natural and human-made structures near nesting sites on Rennie Island, and throughout Grays Harbor.

3.7.13.2. *Peregrine Falcon*

Peregrine falcon (*Falco peregrinus*) is a state listed sensitive species. Although they use a wide variety of open habitats, peregrine falcons are similar to bald eagles because they are associated with lake and open water shorelines where waterfowl concentrate, providing foraging opportunities. Regular occurrences and breeding areas are designated priority areas. Priority areas for peregrine falcons are designated along much of the Grays Harbor marine shoreline in Hoquiam and along the undeveloped north shore of the Chehalis River in Aberdeen.

3.7.13.3. *Marine Birds*

Marbled murrelets (*Brachyramphus marmoratus*) are federally listed as threatened. Marbled murrelets are documented in the outlying forests in the cities' vicinity, within approximately 1 mile of Aberdeen in several locations (WDFW 2014a). Suitable foraging habitat is primarily in the deeper waters of the outer estuary where forage fish are more common. The species has not been documented in the Cities' shoreline jurisdiction (WDFW 2014a), but like many marine mammals and birds that migrate through the area, they could occasionally be present, and the shoreline conditions and functions have indirect implications for the population due to factors such as water quality, primary production, and food web interactions.

Common loon (*Gavia immer*) is a state sensitive species with breeding sites, regular concentrations, and migratory stopovers designated as priority areas. Common loons are regularly observed foraging for fish in the cities' marine shorelines. Other priority marine birds such brown pelican (*Pelecanus occidentalis*), listed as endangered in the State, may occasionally enter the cities' shoreline areas during migration or foraging forays, although their presence is limited and regular concentrations are not mapped by WDFW.

3.7.13.4. *Shorebirds, Waterfowl, and Herons*

Priority habitat in the Cities' shoreline jurisdiction includes regular concentrations and breeding areas for numerous bird species. Nonbreeding concentrations of shorebirds are also a designated priority habitat. Common in the Grays Harbor region, shorebird concentrations are mapped in Hoquiam, primarily in the Grays Harbor reach.

Cavity nesting ducks and waterfowl concentrations are also commonly associated with estuarine or freshwater shorelines, and are documented in several of the cities' shorelines. Breeding areas of cavity nesting ducks are a priority area designated by WDFW and include breeding areas for the following species:

- Wood Duck (*Aix sponsa*)
- Barrow's Goldeneye (*Bucephala islandica*)
- Common Goldeneye (*Bucephala clangula*)

- Bufflehead (*Bucephala albeola*)
- Hooded Merganser (*Lophodytes cucullatus*)

Waterfowl (family *Anatidae*) concentrations including significant breeding areas and regular winter concentrations are also designated priority areas. Regular concentrations of Canada goose are excluded from the priority area designation. The estuary area between State Route (SR) 109 and Bowerman Airport in Hoquiam is designated as priority area for waterfowl concentrations. Wood duck priority areas are mapped along the Chehalis River in Cosmopolis and around Lake Aberdeen. The Wedekind Confluence Reach is within a priority harlequin duck habitat area.

Although the species is not listed as sensitive, threatened, or endangered, great blue herons are a species strongly associated with shorelines, and breeding areas are designated priority areas in Washington State. An active heron rookery is on Rennie Island in Aberdeen. Herons forage in nearby estuarine and freshwater wetlands.

3.7.14. Geologic Hazard Areas

Areas that are susceptible to one or more of the following hazards are classified as geologically hazardous areas (WAC 365-190-120):

- Erosion hazard
- Landslide hazard
- Seismic hazard
- Tsunami hazard

The cities have each of these hazard areas. Erosion hazards are not mapped in a systematic way in the cities. Erosion hazard is common, particularly where the land surface has been filled in the past, but the factors regulating the degree of hazard are local and likely related to past human activities. Most of these erosion areas are also already protected by nearly 9 miles of levees and an undocumented amount of shoreline armoring. Instream and tidal flow velocities are generally not large in the cities and therefore the risk is primarily associated with inundation inasmuch as it is related to erosion. Inundation will become more pronounced over time with sea level rise and possibly from larger seasonal flows in the many rivers flowing into the cities (Sandell and McAninch 2013).

The other three geologic hazards are linked; a catastrophic rupture of the Cascadia subduction zone would likely generate large amount of seismicity, trigger landslides, and generate a large tsunami. Local surface faulting is rare in the cities (USGS 2014; Rau 1986), unlike other areas of the state such as Puget Sound; therefore, the seismic hazard is almost exclusively from events associated with the Cascadia subduction zone (i.e., large offshore landslides (Goldfinger et al. 2000) or a subduction-zone-wide rupture (Venturato et al. 2007). A subduction-zone-wide rupture to the west of the cities would generate a large (greater than 8.0 on the Richter scale) earthquake event. The worst-case rupture is often called the Scenario 1A event, the tsunami inundation extents of which are mapped in the Map Folio

(Appendix A, Figures 15.1 through 15.4). The Scenario 1A event magnitude is 9.1 (Venturato et al. 2007).

Given the fine textured hydric soils in most of the cities, shaking and liquefaction associated with a Scenario 1A event would be significant. Buildings not designed for seismic activity would be vulnerable to collapse. On the Montesano Formation hills, where the liquefaction hazard is lower, landslides would be likely, particularly on steep, recently deforested areas (e.g., the hillside along Olympic Highway at the eastern entrance to Aberdeen). However, like most recent large subduction earthquakes (e.g., 2004 Boxing Day Earthquake in Indonesia and the 2013 Tohoku Earthquake in Japan), most of the death and destruction associated with these events would be associated with the resulting tsunami.

Tsunami risk to the cities is well documented (Wood and Soulard 2008). Initial and early work has focused on a plate-wide slip of the Cascadia subduction zone, typified by the Scenario 1A event (Venturato et al. 2007). This large event would inundate 22 percent of the cities shoreline (an even greater percentage if upland areas such as the area around Lake Aberdeen are excluded) and approximately 80 percent of the entire City of Aberdeen (Wood and Soulard 2008). In fact, there are more residents in the tsunami zone in Aberdeen than any single jurisdiction in the state.

Despite the severity of the worst-case scenario, recent research has suggested a wider range of tsunami behavior from the Cascadia subduction zone, with partial ruptures that increase in frequency as one approaches Cape Mendocino (Priest et al. 2014). These partial ruptures would produce much more modest tsunamis throughout the cities, typically less than two meters in height (Priest et al. 2014). Further, they would reduce stress accumulation along the southern portions of the subduction zone, making a future plate-wide rupture less likely. Depending on the timing of the waves from a partial rupture, these events could inundate the lowest, most exposed areas of the shoreline, but inundation would be far less than with the Scenario 1A event. Tsunamis that originate from distant points along the Pacific Ocean margin, such as the 2011 Tohoku event in Japan, also could produce tsunamis in the cities. These waves are typically smaller still. For example, the recent Tohoku event produced an approximately one meter wave at Westport (Allan et al. 2012), which is generally comparable to the atmospheric perturbations on tides (Mojfeld 1992). However, partial rupture and distant events are more likely than a Scenario 1A event and should therefore be considered in any shoreline planning.

Finally, an important consideration of the tsunami hazard as it applies to risk within the cities' shorelines is the existing level of preparedness. Recent work has described important features of tsunami preparedness from disasters elsewhere (Dengler and Preuss 2003) and many of these recommendations have already been implemented in the cities. Education is a key component of preparedness and the Cities and other state and federal agencies have made numerous efforts to keep the public informed of tsunami hazards. Evacuation routes have been established and are signed throughout the cities. Fact sheets have been printed and distributed widely (WDNR 2014a, 2014b). As the science of tsunamis evolves, it is important to continue to educate the public about the latest research. This is particularly important with respect to smaller tsunami events from distant and partial-rupture Cascadia events, which are more limited in inundation extent, but are more likely to occur.

3.7.15. Aquifer Recharge Areas

Critical aquifer recharge areas have not been mapped in the cities. There are no known wellhead protection areas in the cities or their shoreline jurisdictions (WDOH 2014b). Where no specific studies have been done, the Cities may use existing soil and surficial geologic information to determine where recharge areas exist. To determine the threat to groundwater quality, existing land use activities and their potential to lead to contamination should be evaluated (WAC 365-190-100). Critical aquifer recharge areas may be present and require protection in the shoreline jurisdiction but none has been identified in the cities at the time of this inventory and characterization report.

3.8. Water Quality

Ecology's 303 (d) list was the primary source for water quality information and conditions for this characterization. The 303(d) list assigns a category to each water body based on its condition as evidenced by water quality or biological data. Five different categories are included in the list. Water bodies or reaches listed under Category 1 by Ecology are those having no known water quality problems. Those listed as Category 2 are waters of concern; indicating there may be a threat to water quality or some evidence of possible deterioration but they are not considered polluted. Category 3 waters have insufficient data to make a determination. Category 4 waters are polluted but there is a plan or program in place to address the problem. Last, Category 5 waters are polluted but no plan or program is yet in place to address the problem.

The descriptions in the next section, *Discussion of Shoreline Management Areas* identify those reaches known to be polluted (Category 4 and 5 waters) and those associated with concern or threat (Category 2 waters).

4. DISCUSSION OF SHORELINE MANAGEMENT AREAS

The following sections discuss conditions and characteristics of each of the three Cities (i.e., shoreline management areas) including physical and biological processes, shoreline use and access, shoreline modifications, and land capacity analysis. A reach functional assessment for each City is provided along with recommended environment designations. Known restoration projects and general restoration opportunities are identified. Restoration opportunities within each City will be further explored in a separate restoration plan.

Tables in the sections describing each City provide summaries of physical characteristics, locations of shoreline reaches, geologic hazards, Comprehensive Plan land use designations, current land use, zoning, and shoreline modifications. All of the Cities have priority species present.

Table 4.1 provides summaries of the shoreline characteristics for each City, including physical and biological conditions directly related to habitat function. Appendix C contains data sheets that provide the detailed assessment data for individual reaches.

The following discussions cover both the conditions scored in the reach functional assessment and the ecosystem characterization conducted on a larger scale. The discussions of critical areas and priority habitat and species, including salmonids, rely primarily on available PHS data on species presence that are included in the map folio (Appendix A). To avoid cumbersome redundancy throughout the sections, these are not cited in each case. However, where other sources are referenced, citations are provided.

The reach functional assessment for each management area uses the shoreline inventory to evaluate the specific physical and biological conditions of individual shoreline segments. Based on the rating of the function (low to high), a numerical rating is applied to each function (low = 1, moderate = 2, high = 3) to arrive at a total score within a possible range of 16 to 44 for each reach. These data are analyzed and summarized for each City in terms of the total score for ecological functions and the primary reasons for the range of scores in individual reaches.

4.1. City of Aberdeen

Aberdeen spans the largest range of physical environments and habitats among the cities. Included in the city are a reservoir, a confluence of two rivers, the lower reaches of the Wishkah and Chehalis Rivers, two small tidally influenced tributaries, and two distinct shorelines segments along Grays Harbor. Nine reaches were identified for Aberdeen; their associated water body and shoreline area are provided in Table 4.2. Background on the City's current SMP and other applicable regulations such as critical areas code is provided in Sections 1.2.3 and 1.2.4.

Table 4.1. Summary of Shoreline Characteristics by Management Area.

Management Area	Number of Reaches Shoreline Length Shoreline Area	Land Ownership ^a	Land Cover ^b	Shoreline Modifications	Critical Areas
Aberdeen	9 reaches 39 miles 1,868 acres	87% Private 10% Municipal 3% Port < 1% State	50% Open Water 19% Developed 14% Forested 12% Herbaceous 6% Barren Land	1.4 miles leveed 77 barriers	Habitat Conservation Areas/Priority Habitat and Species Coastal Nearshore, Eelgrass, Estuarine and Freshwater Wetlands, Streams, Riparian Areas Chinook, Coho, Chum, Steelhead, bull trout, Coastal Resident Cutthroat Trout, Pacific Lamprey Peregrine Falcon, Wood Duck, Harlequin Duck, Harbor Seals, Shellfish Geologic Hazards Tsunami, Liquefaction, Landslides
Cosmopolis	2 reaches 7 miles 303 acres	87% Private 10% Port 3% Municipal	40% Forested 34% Open Water 14% Developed 11% Herbaceous 1% Barren Land	0.5 miles leveed 14 barriers	Habitat Conservation Areas/Priority Habitat and Species Wetlands, Streams, Riparian Areas Chinook, Coho, Chum, Steelhead, bull trout, Coastal Resident Cutthroat Trout, Pacific Lamprey Wood Duck Habitat, Peregrine Falcon, Bald Eagle, Harbor Seals Geologic Hazards Tsunami, Liquefaction
Hoquiam	5 reaches 39 miles 5,296 acres	85% Private 11% Port 3% Municipal < 1% State	68% Open Water 12% Herbaceous 8% Barren Land 7% Developed 6% Forested	6.7 miles leveed 38 barriers	Habitat Conservation Areas/Priority Habitat and Species Coastal Nearshore, Eelgrass, Estuarine and Freshwater Wetlands, Streams, Riparian Areas Chinook, Coho, Chum, Steelhead, bull trout, Coastal Resident Cutthroat Trout, Pacific Lamprey Waterfowl Concentrations, Shorebird Concentrations, Peregrine Falcon, Bald Eagle, Blue Heron Breeding Areas, Harbor Seals, Shellfish Geologic Hazards Tsunami, Liquefaction

^a As a percentage of total land divided into parcels. Some land, particularly in the middle of Grays Harbor is not included.

^b As a percentage of total land cover as reported by the National Land Cover Database (NLCD) and including the non-delineated areas as open water. Figures 4.1 through 4.3 in Appendix A show areas with land cover classified in the NLCD.

Reach Name	Primary Water Body	Shoreline Area (acres)
Aberdeen Lake Reach	Lake Aberdeen	114
Charley Creek Reach	Charley Creek	17
Chehalis River Reach – Aberdeen	Chehalis River – Aberdeen	429
Fry Creek Reach – Aberdeen	Fry Creek – Aberdeen	22
Grays Harbor North Bank Reach	Grays Harbor North Bank	414
Grays Harbor South Bank Reach	Grays Harbor South Bank	603
Newskah Creek Reach	Newskah Creek	12
Wedekind Confluence Reach	Wedekind Confluence	45
Wishkah River Reach	Wishkah River	211

4.1.1. *Physical and Biological Characterization*

This section discusses characteristic aspects of physical and biological conditions in Aberdeen. Refer to Section 3.2 for an overview of the terrain and physical processes that influence shorelines in Aberdeen.

All of the waters in Aberdeen, except for Lake Aberdeen and the confluence of Wedekind Creek and the Wynoochee River, are tidally influenced. Tidal motions are regulated by local topography and freshwater sources. Most of the interactions of freshwater sources are mediated by shoreline modifications, mostly via culverts and tide gates, but also by a series of dikes and levees. Lake Aberdeen is influenced only by lowland rainfall, whereas the Wynoochee River has a mix of hydrologic sources, including some snowmelt, though its flow is also modified by the Wynoochee Dam.

Sediment yield to most of the lowland channels has been reduced compared to times in the geologic past; and, therefore, most of the rivers are naturally inset into their primary channels. They are also lowland channels, which by definition means sediment supply is less than more upland settings typical of other parts of Grays Harbor County. Erosion of banks is a concern due to the level of development in the floodplain, but the shorelines, with the possible exception of the confluence of Wedekind Creek and the Wynoochee River, are not dynamic. Grays Harbor is actively dredged to maintain shipping channels (approximately 3.2 million cubic yards per year) (USACE 2011). The dredged sediment comes from a variety of sources, including some from as far away as the Columbia River (Gelfenbaum and Kaminsky 2010).

Current levels of large woody debris (LWD) in the lower Chehalis and Wishkah rivers are low, as compared to predevelopment conditions, in part due to a history of LWD removal and timber harvest (US Coast and Geodetic Survey 1911). There is also a limited supply of large trees available for contributing to stream ecosystems processes (Watershed GeoDynamics 2012). In Grays Harbor, numerous snags have been removed over time so the navigation channel can be kept open (US Coast and Geodetic Survey 1911). There are large deposits of

LWD between the Cosmo Specialty Fiber settling ponds and the US-101 Bridge on the south shore of Grays Harbor. This area is one of the few undisturbed estuarine shorelines in the City. LWD supply to Lake Aberdeen is mostly intact due to the established vegetative buffer around the lake.

Areas of geologic hazards found in the Aberdeen shoreline are provided in Table 4.3. Aberdeen is one of the most susceptible communities to tsunamis in Washington State, even though there are elevated portions of the City that are outside the tsunami-inundation zone (Wood and Soulard 2008). Aberdeen is also one of the most tsunami prepared communities in the state. Evacuation routes have been planned and are well signed (WDNR 2014a and 2014b). Besides tsunamis, the City is susceptible to liquefaction in most of the filled areas within the shoreline jurisdiction.

Aberdeen also has several landslide sites throughout the shoreline jurisdiction. All of the landslide sites are in the Montesano Formation (see Section 3.7.14, *Geologic Hazards*, for details). Some of the landslide sites are present along the shores of Lake Aberdeen, while a few others are along the hillsides surrounding the Wishkah and Chehalis rivers. The most recognizable landslide site is on the north side of US-12 at the east entrance to the City.

All of the shorelines in the city, except the Newskah Creek Reach, support a variety of salmon and trout species (Appendix A, Figure 8.2). Rearing habitat for coho is present in most of the reaches. Steelhead migrate in the Wishkah River and Wedekind Confluence Reaches. The Wishkah River also provides Chinook rearing habitat, while chum spawning has been documented in the Wynoochee River, which includes the Wedekind Confluence Reach. The Chehalis River provides rearing and migration habitat for a variety of salmon species. The north bank of the Chehalis River is mapped as priority habitat for peregrine falcon (Appendix A, Figure 10.2). The north and south shorelines of Grays Harbor in the City support a variety of nearshore and riparian vegetation including dunegrass and salt marsh communities (Appendix A, Figure 11.2).

Hazard Type	Percentage of Management Area	Reaches Affected
Tsunami	41	All, except Aberdeen Lake Reach and Wedekind Confluence Reach
Seismic/Liquefaction ^a	41	All
Landslides	< 1	Aberdeen Lake Reach and Chehalis River Reach – Aberdeen

^a Moderate to high liquefaction susceptibility

Newskah Creek and Charley Creek are listed on the Washington State 303(d) list for water quality concerns related to bacteria levels (Category 4) and temperature (Category 2). Portions of Grays Harbor and the Chehalis River within the shoreline jurisdiction are listed with the same impairments and additional Category 2 designations due to other pollutants.

4.1.2. Shoreline Use Analysis

Shoreline land uses within the Aberdeen shoreline jurisdiction are comprised of Single Family Residential zones, Multiple Family Residential zones, General Commercial and Commercial/Residential zones, Industrial and Light Industrial zones, and Waterfront Development areas. The industrial area along the Grays Harbor waterfront and the Chehalis River is the area of most intensive use in the shoreline jurisdiction and includes Port of Grays Harbor activities as well as marine activities originating from WSDOT and timber and lumber production activities. Much of the shoreline jurisdiction is highly developed. The shoreline jurisdiction includes a mixture of land covers, consisting primarily of open water, woody wetlands, emergent herbaceous wetlands, low-intensity development, and barren land (Figures 4.2-4.32 in Appendix A).

Based on a review of land cover and zoning maps, the current use categories that are considered most likely to meet the definition of “water-oriented uses” are as follows:

- Industrial
- Waterfront Development

There are nine reaches within the Aberdeen shoreline jurisdiction (see Table 2.2). Grays Harbor South Bank Reach is zoned primarily for Industrial development as well as some Single Family Residential, Light Industrial, and Commercial Residential. Wishkah River Reach, and Chehalis River Reach, both include zoning designations for Waterfront Development, as well as Single Family and Multiple Family Residential. Current development along the shoreline includes port activities related to the Port of Grays Harbor, the State of Washington, and Aberdeen. A lumberyard and a timber production facility exist within Grays Harbor South Bank Reach, both of which are “water-oriented uses.” Within the shoreline jurisdiction, there exists some residential development in Grays Harbor South Bank Reach, Wishkah River Reach, and Chehalis River Reach - Aberdeen. Currently 83 percent of Wishkah River Reach is zoned for Single Family Residential or Multiple Family Residential. Thirty percent of Chehalis River Reach - Aberdeen is zoned for Single Family Residential or Multiple Family Residential; however, this reach is mostly developed and it would likely not see much residential development.

As stated above, the shorelines of Grays Harbor and the Chehalis River are zoned primarily for industrial uses. Current industrial uses include the SR 520 pontoon construction site, Port of Grays Harbor Terminals 2 and 4, industrial detention ponds, and vacant mill sites. The City of Aberdeen 2001 Comprehensive Plan encourages the development and redevelopment of industrial uses on lands zoned Industrial in the Grays Harbor reach. In the event of continued economic growth, it is likely that vacant industrial sites will be redeveloped for industrial uses. In addition to the priority placed on industrial development, the Waterfront Development goals and policies in the Comprehensive Plan support public access to the shoreline. The City of Aberdeen seeks a balance between expanding and redeveloping its industrial base and providing public access to the city’s shorelines.

4.1.2.1. Existing Land Use Patterns

Shoreline jurisdiction land use in Aberdeen is shown in Table 4.4.

Table 4.4. Current Land Use Patterns in the Shoreline Jurisdiction of the City of Aberdeen.

Current Land Use Patterns	Percentage of Shoreline Area
All Other Residential Not Elsewhere Coded (Bare Land Platted and Outside Plats and Sheds in City Limits)	11
Automobile Parking – Parking Lots	< 1
Commercial Land	5
Commercial Land – with a Shed, Warehouse, etc.	< 1
Commercial Land with a Single-Family Residence	< 1
Communication	< 1
Contract Construction Services	1
Educational Services	< 1
Fabricated Metal Products	< 1
Finance, Insurance, and Real Estate Services	< 1
Food and Kindred Products	< 1
Governmental Services	1
Hotels/Motels	< 1
Household, 2 to 4 Units	< 1
Household, Multi-Units (5 or more)	< 1
Household, Single-Family Units	4
Industrial Land	53
Industrial Land With Building	4
Lumber and Wood Products (Except Furniture)	< 1
Miscellaneous Manufacturing	< 1
Miscellaneous Services – Churches	1
Motor Vehicle Transportation	< 1
Other Cultural, Entertainment, and Recreational	< 1
Other Retail Trade	1
Other Transportation, Communication, and Utilities not Classified Elsewhere – Water Systems	4
Parks	6
Personal Services	< 1
Professional Services	< 1
Public Assembly	< 1
Repair Services	< 1
Retail Trade – Building Materials, Hardware, and Farm Equipment	< 1
Retail Trade – Eating and Drinking – Restaurants	< 1
Retail Trade – Food	< 1
Retail Trade – Furniture, Home Furnishings, and Equipment	< 1
Retail Trade – Auto, Marine Craft, Aircraft, and Associated – Gas Stations	< 1
Stone, Clay, and Glass Products	1
Undeveloped Land	5

The primary land use within Aberdeen Lake Reach is the Lake Aberdeen Recreation Area, a 640-acre park. The park consists mostly of undeveloped forest lands but also includes 5 acres of land developed for recreational purposes. Aberdeen Lake Reach includes the following land cover types: open water (37 percent), woody wetlands (18 percent), evergreen forest (18 percent), emergent herbaceous wetlands (7 percent), open space (6 percent), and low-intensity development (5 percent). Woody wetland is a land cover classification used by the NLCD. It is not a wetland classification and is not synonymous with Cowardin wetland classifications that are used in the NWI. However, it is used as an indicator of where scrub-shrub and forested wetlands may be present. Areas of mapped NWI wetlands are provided for each reach in Appendix C.

Charley Creek Reach is zoned Industrial. The northern portion of the reach is developed with an existing auto-wrecking yard. The southern portion of the reach is characterized mainly by undeveloped woody wetland (59 percent of the reach), although it likely also contains areas of high quality palustrine scrub-shrub and forested wetland that are not identified in the NWI database.

Chehalis River Reach - Aberdeen Reach merges with Elliot Slough and is used for passive recreation, such as fishing. This reach is largely covered by open water (50 percent), but it also includes some woody wetlands (15 percent), low-intensity development (9 percent), and medium-intensity development (7 percent), among other land covers.

Fry Creek Reach - Aberdeen is an industrial reach. It consists of medium-intensity development (46 percent), low-intensity development (41 percent), and high-intensity development (13 percent).

Grays Harbor North Bank Reach is used as industrial land; industrial land with buildings; commercial land; churches; and other water systems transportation, communication, and utilities. The reach is covered by open water (75 percent), low-intensity development (6 percent), medium-intensity development (5 percent), and high-intensity development (5 percent).

Grays Harbor South Bank Reach is zoned primarily for Industrial although it includes mostly open water (50 percent), and emergent herbaceous wetlands (20 percent), woody wetlands (12 percent), and barren land (11 percent).

Newskah Creek Reach is primarily covered by a restored estuarine riparian area. Newskah Creek Reach includes portions of the Bishop Athletic Complex. The 38-acre complex will include four full size soccer fields, two softball fields, and one full sized baseball field when completed.

Wedekind Confluence Reach is primarily forested and undisturbed riparian areas. It is covered by open space (29 percent), emergent herbaceous wetlands (28 percent), and woody wetlands (21 percent).

Wishkah River Reach is mostly undeveloped land, platted land, and single-family households. The east shore of the Wishkah River contains a significant segment of undeveloped, forested shorelands. Low-intensity development covers 24 percent of this reach, with the rest of it

comprised of woody wetlands (17 percent), open space (13 percent), barren land (13 percent), and medium-intensity development (10 percent).

4.1.2.2. Projected Land Use Patterns

Aberdeen Lake Reach consists of Aberdeen Lake (52 acres). The area is a recreation area and serves as a destination for fishing, swimming, and boating. Future development within this reach not related to the City's current use of the park is unlikely.

Zoning in Charley Creek Reach consists of Industrial (17 acres). The majority of this reach is undeveloped forested wetland and riparian areas.

Zoning in Chehalis River Reach - Aberdeen consists of Industrial (79 acres), Single Family Residential (26 acres), Waterfront Development (21 acres), Commercial/Residential (2 acres), Light Industrial (1 acres) and General Commercial (1 acre). Industrial areas in this reach are largely developed and it will remain industrial use unless changes in the adopted zoning code are made.

Zoning in Fry Creek Reach - Aberdeen includes Industrial (18 acres) and Light Industrial (3 acres). The area is highly developed; and due to limited industrial land within the city, it will likely remain in this designation.

Zoning in Grays Harbor North Bank Reach includes Industrial (46 acres) and Light Industrial (16 acres). Unless changes in the adopted zoning code are made, this area will likely remain as industrial.

Zoning in Grays Harbor South Bank Reach includes Industrial (356 acres), Single Family Residential (27 acres), Light Industrial (8 acres), Commercial/Residential (7 acres), and General Commercial (2 acres). The area is predominately zoned for Industrial use, and much of the undeveloped land within the reach falls into this designation. While the area has some residential development, the levee, existing public access, and estuarine wetlands present may deter additional development.

Zoning in Newkah Creek Reach consists of Industrial (12 acres). While the area adjacent to the reach is currently being developed as an athletic center and as such, it will likely not see any future developments due to deed restrictions and conservation easements that protect it as a mitigation site for wetland impacts associated with utility work at Stafford Creek Prison.

Zoning in Wedekind Confluence Reach consists of Industrial (39 acres). This reach, at the confluence of the Wynoochee River and Wedekind Creek, has little expected development other than maintenance of the utility plant.

Zoning in Wishkah River Reach includes Multiple Family Residential (73 acres), Single Family Residential (38 acres) and Waterfront Development (18 acres), Light Industrial (2 acres) and General Commercial (2 acres).

Planned land use in the shoreline jurisdiction of the City of Aberdeen is shown in Table 4.5. Current zoning designations are shown in Table 4.6.

Land Use Designation	Use Description	Percentage of Shoreline Area
General Commercial	The General Commercial area should provide for a wide variety of commercial uses, particularly large-scale commercial uses and commercial uses dependent upon high traffic volumes, in areas best suited for these uses and where their intensity will not adversely impact other uses.	< 1
Commercial/ Residential	The Commercial Residential area should provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Aberdeen while enabling the continuation of existing residential uses. Because of the opportunities provided by the state highways and high levels of transit service, a wide range of uses is allowed within the area. Provisions are included to improve compatibility between the wide ranges of uses allowed by the Commercial Residential area.	1
Industrial	The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.	70
Light Industrial	The Light-Industrial area should provide space for transportation, warehousing, contractors yards, industrial sales, and industrial uses contained within a building which do not create objectionable noise, odors or hazards.	3
Multiple Family Residential	The Multiple Family Residential area should provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided. The area also contains requirements to increase compatibility between this area and the single-family residential area.	10
Single Family Residential	The Single Family Residential area should protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.	10
Waterfront Development	The Waterfront Development area should encourage the appropriate redevelopment of under-utilized and vacant waterfront areas suitable for a mix of uses. Because of the unique opportunities provided by access to shorelines of statewide significance, special provisions are included to encourage compatibility among these various uses. Public access to the shoreline should be addressed through the shoreline permit process for any proposed land use action.	4

Table 4.6. Current Zoning Designations in the Shoreline Jurisdiction of the City of Aberdeen.

Designation	Symbol	Typical Uses	Percentage of Shoreline Area
General Commercial	CG	Retail sales; personal, professional and business services; financial services; offices; eating and drinking establishments; food processing and baking for retail sales on premises; automobile repair services within a building and service stations; equipment repair and servicing within a building; recycling drop boxes; parking lots and parking structures; parks, recreation centers, public buildings, colleges and other public and semi-public uses.	1
Commercial/ Residential	CR	Personal and professional services and offices; retail sales within a building; single-family dwellings; multiple-family dwellings; duplexes and townhomes; hotels, motels, bed and breakfast inns, and meeting rooms and facilities; child care facilities; kennels and animal hospitals.	1
Industrial	I	Manufacturing, light manufacturing, processing, light processing, light assembly, fabricating, and light fabrication and industrial activities all within a building; equipment, heavy equipment sales, repair and rentals, auto and truck rental, repair and servicing within a building, exterior storage of goods and equipment, shipping terminals, truck terminals, materials movement facilities, and docks, wharfs, marine terminals, and contractors yards; warehousing, indoor and outdoor storage, wholesale sales, industrial sales, building and industrial material retail sales, and retail sales accessory to a related permitted or conditional use; kennels and animal hospitals; service stations; laboratories and industrial research facilities.	70
Light Industrial	LI	Light manufacturing, light processing, light assembly and light fabrication; warehousing, wholesale sales, industrial sales, building and industrial material retail sales, retail sales accessory to a related permitted or conditional use; equipment, auto and truck rental, repair and servicing within a building; laboratories and industrial research facilities; restaurants accessory to a permitted use; truck terminals, shipping terminals, docks and contractors yards.	3
Multiple Family Residential	RM	Duplexes and townhomes; multiple-family dwellings; single-family dwellings; home day care and mini day care; mobile homes.	10
Single Family Residential	RS	Single-family dwellings; mobile homes; home day care.	10

Designation	Symbol	Typical Uses	Percentage of Shoreline Area
Waterfront Development	WD	Light manufacturing, fabrication and repair within a building; commercial marine uses including fuel service, docks, wharfs, shipyards, ways, passenger and ferry terminals; wholesale and retail sales within a building, and warehousing; personal, professional, financial and business services; farmers' markets; truck and equipment rental, repair and servicing within a building; eating and drinking establishments, outdoor cafes and restaurants, hotels, motels, meeting rooms facilities, convention centers; food processing and baking for retail sales on premises; multiple-family dwellings, residences in the upper floors of buildings, townhouses and residential cluster developments; child care facilities; public and semi-public uses, and related support services; kennels and animal hospitals; service stations.	4

4.1.3. Shoreline Modifications

Shoreline modifications are extensive in Aberdeen (see Table 4.7). Much of the north shore of Grays Harbor waterfront has been filled in the past and subsequently armored. There are also extensive levee systems that protect the City from both riverine and marine floods.

There are also many potential hydraulic barriers. Most of these are tide gates placed on or near outfalls from stormwater infrastructure. These gates are necessary to prevent marine or river inundation of developed areas during high water events. These gates most likely are at least a partial barrier to fish, though most of stormwater infrastructure does not provide access to valuable habitat.

Reach	Percentage of Fill	Total Number of Barriers
Aberdeen Lake Reach	2	1
Charley Creek Reach	18	0
Chehalis River Reach – Aberdeen	24	29
Fry Creek Reach – Aberdeen	100	9
Grays Harbor North Bank Reach	44	9
Grays Harbor South Bank Reach	11	8
Newskah Creek Reach	6	0
Wedekind Confluence Reach	0	1
Wishkah River Reach	23	20

Abandoned piles and other antiquated overwater structures are also common.

There are dams on both the upland reaches. In both cases, the dams have accumulated sediment upstream. At Lake Aberdeen, a delta, a depositional feature, has formed since the construction of the dam at the upstream end of the reservoir. In the Wedekind Reach, a water supply diversion dam on the Wynoochee River has also caused upstream deposition, which has initiated significant river migration upstream from the dam.

4.1.4. Public Access Analysis

Aberdeen offers many opportunities for the public to access the shoreline. The City has prioritized public access to the shoreline in its Comprehensive Plan and emphasizes that any waterfront developments address public access through a permitting process. The Comprehensive Plan states that all new developments fronting the water should provide appropriate levels of public access.

Within the Chehalis River Reach, residents enjoy access to the shoreline at the Morrison Riverfront Park, which includes 4,650 feet of waterfront access as well as a pavilion, picnic tables, and a fishing/viewing dock. A public access site adjacent to the Walmart provides access to an associated trail that connects to the Morrison Riverfront Park. A trail also connects the Morrison Riverfront Park to the Chehalis River via the East Aberdeen Waterfront Walkway. This 6-foot-wide asphalt trail runs along the north side of the Chehalis River. Aberdeen Ramp, also on the Chehalis River provides boat access to the river via a concrete plank ramp on the site. Visitors may park in one of five parking spaces at the ramp.

A 3-mile trail also connects the Chehalis River on the south side of Aberdeen to the Bishop Athletic Complex along the abandoned Burlington Northern railroad grade and levee. The Chehalis River Reach connects with the Mill Creek Reach in Cosmopolis and includes the Basich Trailway that connects the two cities.

Located within Aberdeen Lake Reach, Lake Aberdeen is a natural area with 640 acres of forest and 100 acres of water. The lake is used for swimming and fishing, and it includes a dock for non-motorized boats.

In its 2011-2016 Comprehensive Parks Plan, Aberdeen puts forth recommendations and guidelines for public and private decisions concerning the use and preservation of open space for recreation as well as the acquisition, development, and management of public parks or facilities for recreation-oriented uses. Although the City still has 2 years left to enact some of the recommendations listed within the plan, there are many action items that have yet to be developed; and there could be opportunities for public access to the shoreline if the City were to act on them.

The City's Comprehensive Park Plan identifies several gaps and opportunities for public shoreline access. For Morrison Riverfront Park, the City plans to pursue funding sources to fund the construction of a floating fishing dock. This will allow the elderly and persons with mobility issues the opportunity to fish from the banks of the Chehalis River. The City also plans to pursue funding sources to extend the East Aberdeen Waterfront Walkway from the South Aberdeen Boat Launch to the Chehalis River Bridge.

The City currently has only two public boat launching facilities, one located at Lake Aberdeen and the other at the south shore of the Chehalis River northeast of the Chehalis Bridge. Additional boat launch facilities exist outside of City limits within Hoquiam and Cosmopolis. The City has determined that a boat launch could potentially be developed on the south shore of the Chehalis River. The site is an undeveloped street right-of-way that the City owns. It has been used as an unimproved and unmaintained boat launch site for many years. The boat launch would only allow space for a 24-foot-wide roadway and a parking area for up to 26 vehicle/trailer units.

The City has also identified expansion opportunities at Lake Aberdeen, which would allow for more access to the lake. Long-term plans for Lake Aberdeen include adding tent camping areas and a native/interpretive trail around the lake.

The City also has general goals to encourage and promote the development of public recreation facilities adjacent to the waterfront providing recreational opportunities.

An active transportation plan titled *Connect Grays Harbor* is currently being drafted by the Grays Harbor County Public Health and Social Services Department. The plan has identified several priorities for the County relating to shoreline access, including the Rails to Trails program. The Rails to Trails development will connect the Bishop Athletic Complex towards Westport. Currently, there is a 3-mile paved pathway along the dike that goes from the Bishop Athletic Center to the Chehalis Bridge in South Aberdeen. The proposal is to further this development west towards Stafford Creek, Westport Winery, and onward towards Westport.

Many of the trails listed in this section will be included in the plan as existing bicycle and recreation paths. Additional paths and extensions of paths are also being considered as a result of a public input process. Proposals include creating bike-friendly pathways that connect Makarenko Park with Grays Harbor College (Hill Connection). A multi-use pathway linking East Huntley Street with Cosmopolis has also been proposed.

4.1.5. Shoreline Land Capacity Analysis

The shoreline jurisdiction in Aberdeen contains 966 parcels. Of these parcels, 33 percent are vacant; and it appears approximately 15 percent of the parcels are protected from development by public or conservation group ownership, conservation easements, or similar mechanisms. It was not possible to determine what percent of parcels have a non-conforming structure.

The City's shoreline is designated entirely for urban land uses. City land use designations in the shoreline jurisdiction include General Commercial (CG), Commercial/Residential (CR), Industrial (I), Light Industrial (LI), Multiple Family Residential (RM), Single Family Residential (RS), and Waterfront Development (WD).

Based on these land-use designations, the most intense use of property occurs within the Industrial designated lands found in a majority (70 percent) of the City's shoreline jurisdiction. Most of the new residential development capacity in the shoreline jurisdiction (21 acres) exists in the RM Multiple Family Residential land-use designation. Only 1 percent of

the residential development capacity in the shoreline jurisdiction occurs on lots too small to be subdivided under the City's code. Larger subdivision opportunities exist, particularly on underutilized Multiple Family Residential zoned lands.

The City's shoreline jurisdiction contains land for shoreline uses such as single-family residential, and water-enjoyment uses associated with recreation at Lake Aberdeen, Wynoochee Wildwood Park, and other City parks.

4.1.6. Reach Functional Assessment

Table 4.8 provides a summary of the functional assessment for Aberdeen. The scores for each reach ranged between 16 points, indicating a high level of impairment, and 41 points, indicating a relatively unimpaired reach with high ecological functions. Note that not all functions and their related assessment criteria are applicable to both estuary and freshwater reaches within the Aberdeen shoreline jurisdiction. Not applicable (NA) is assigned to functions that are not applicable to the reach due to the water type present (i.e., estuary, stream, lake) and the criteria used to assess the function.

Table 4.8. Functions Assessment for Aberdeen.

Function	Hydrologic Functions				Water Quality Functions				Habitat Functions								
	Floodwater Storage/ Flood Protection and Surge Protection	Floodwater Storage/ Flood Protection and Surge Protection	Floodwater Storage/ Flood protection and Surge Protection	Support of Base Flow and Groundwater (freshwater shorelines)	Maintaining Temperature	Removing Excessive Nutrients and Toxic Compounds	Removing Excessive Nutrients and Toxic Compounds	Sediment Removal and Stabilization	Sediment/Bank Stabilization and Shoreline Protection	Attenuation of Wave Energy	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food production and Delivery	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food production and Delivery	Provision and Redistribution of Woody Debris and Organic Material	Provision and Redistribution of Woody Debris and Organic Material	Total Score
Criteria ^a	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Reach Name																	
Aberdeen Lake Reach	3	2	3	3	2	3	3	2	3	3	3	NA	3	3	2	3	41
Charley Creek Reach	3	2	2	3	2	1	3	2	2	3	2	NA	3	2	2	3	35
Chehalis River Reach	1	1	1	1	1	2	1	1	1	1	1	NA	1	1	1	1	16
Fry Creek Reach	1	1	1	1	1	2	1	1	1	1	1	NA	1	1	1	1	16
Grays Harbor North Bank Reach	1	NA	1	NA	1	2	1	1	2	1	1	1	1	1	1	1	16
Grays Harbor South Bank Reach	1	NA	3	NA	1	1	1	1	2	3	2	3	2	2	2	2	26
Newskah Creek Reach	3	2	3	3	2	1	3	3	2	3	3	NA	3	3	2	3	39
Wedekind Confluence Reach	2	2	3	2	2	3	2	1	2	2	3	NA	2	3	2	2	33
Wishkah River Reach	2	1	2	2	1	3	2	1	2	2	2	NA	1	2	2	1	26

^a Criteria are described in Table 2.4 for each corresponding number (1 through 16).

NA = Not applicable is assigned to functions that are not applicable to the reach due to the water type present (i.e., estuary, stream, lake) and the criteria used to assess the function.

High-scoring reaches include Aberdeen Lake, Charley Creek, Newkah Creek, and the Wedekind Confluence reaches (ranging between 33 and 41 points). The lowest rated reaches scored 16 points and exhibit high levels of development and shoreline modifications or altered vegetation. The low scoring reaches include the Chehalis River, Fry Creek, and the Grays Harbor North Bank.

4.1.6.1. Aberdeen Lake Reach

Aberdeen Lake Reach scored the highest (41 points), primarily due to good vegetative conditions along the shoreline, relatively low level of shoreline development, and good connectivity between habitats. There are areas of altered vegetation along the south shore associated with the dam, roads, parking areas, and the fish hatchery. Docks are also present, but it is unlikely the structures significantly impair functions for the lake overall due to their limited number and extent along the lake shoreline. Although it is an anthropogenic structure, the dam is the key physical feature responsible for the presence of the lake, its current character, and much of the function that it provides, particularly in terms of floodwater storage. The relatively undeveloped and well-vegetated condition of the shoreline provides deep water and riparian habitat for several fish species and waterfowl. Most emergent and scrub-shrub wetlands, providing additional water quality and habitat functions, are associated with the delta where Van Winkle Creek and a smaller unnamed tributary enter the reservoir from the north. Although channel migration zones have not been formally mapped, the channel migration zone of Van Winkle Creek extends the entire valley width.

4.1.6.2. Charley Creek Reach

Charley Creek scored high (30 points) partly due to good vegetation and channel conditions, despite existing development and lack of vegetation in the northern portion of the reach. The NWI indicates only 2 percent wetland cover in the reach, although land cover data indicates significant amounts of woody wetland (scrub-shrub and forested areas likely containing wetlands) comprising 59 percent of the reach. This is primarily in the undeveloped southern portion of the reach. The northern portion of the reach is characterized by the wrecking yard and is an area identified as a potential restoration opportunity (see *Restoration Opportunities* below). Charley Creek channel migration is dominated by marine flooding events that extend throughout the lower reaches of the creek. Seventy-six percent of the reach is mapped within the 100-year floodplain and therefore designated as a frequently flooded area.

4.1.6.3. Chehalis River Reach

The Chehalis River (16 points) scored low primarily due to the extensive levees along the entire southern shoreline and armoring along the active channel. Most of the land waterward of the levee has been cleared and is used for log staging. Although most of it is outside the floodplain, the levee and historical filling of the area likely contribute to the present day form of the channel and floodplain. Wetlands are limited and are primarily associated with the wetland area adjacent to the Mill Creek Reach in Cosmopolis, and near the mouth of Elliot Slough. They are less common, but also present, along the main channel shorelines. Nearshore estuarine vegetation is not present in this reach. However, the reach provides an important migration corridor for species moving upstream and downstream to key habitats in the Chehalis River's tidal surge plain. Due to levee construction and fill, the entire reach is disconnected permanently from the remainder of its historical channel migration zone.

4.1.6.4. Fry Creek Reach

Fry Creek scored low for functions (16 points). The reach is highly altered by development and reduced vegetative conditions. The shoreline lacks channel complexity and connectivity with key habitats, and shoreline functions are likely impaired by tide gates. The channel is constructed in historical fill and the reach is dominated by impervious surface associated with industrial uses. Wetlands are not mapped within the reach and, if present, are likely limited to the creek channel itself or a narrow margin along its edge. Fry Creek likely once meandered throughout the City, prior to substantial fill, development, and channelization. Therefore, a channel migration zone is no longer present in this constructed channel and floodplain.

4.1.6.5. Grays Harbor North Bank Reach

The north bank of Grays Harbor (16 points) scored low due to extensive industrial development and shoreline modifications that reduce many of the functions provided by native vegetation and wetlands that would occur with less developed conditions. The shoreline lacks significant wetlands and nearshore vegetation. A patchy distribution of dunegrass is mapped along the shoreline west of Fry Creek (Figure 11.2 in Appendix A). Portions of the reach are listed as Category 2 for water quality concerns related to various pollutants. These include areas near Fry Creek and downstream of the Chehalis River Bridge. Although functions in the reach are relatively impaired due to historical filling and development, the reach is an important migration corridor for salmon that migrate from the Chehalis River and its tributaries to the Pacific Ocean.

4.1.6.6. Grays Harbor South Bank Reach

The south bank of Grays of Harbor scored moderate (26 points) due to similar impairments as the north bank. However, it is less developed and retains important vegetative characteristics. Eelgrass (1.7 miles) and saltmarsh habitat (3.1 miles) extend throughout most of the reach's 3.3-mile-long estuarine shoreline. The reach's total length (11 miles) includes associated forested and shrub wetlands in the floodplain (Figure 2.2 in Appendix A), which likely provide water quality and habitat functions. The riparian areas in the reach are relatively well connected with other habitats such as Charley Creek, Newkah Creek, and forested upland areas outside the shoreline jurisdiction. Like the north bank, this reach is likely a key migration corridor for salmon. The area between the Cosmo Specialty Fiber settling ponds and the US-101 Bridge is likely a key habitat area for fish and other wildlife due to its undeveloped and well-vegetated condition, and the presence of significant LWD.

4.1.6.7. Newkah Creek Reach

Newkah Creek scored high for functions (39 points). The only criteria with a low rank is related to water-quality concerns including temperature and bacteria. The stream is listed on the State 303(d) list as Category 2 for temperature, indicating evidence of a water-quality problem, but not enough to require a water-quality improvement project such as a total maximum daily load (TMDL). The stream is Category 4A for bacteria, meaning it has a pollution problem, but a TMDL is in place and being implemented to improve the water quality. These water-quality concerns suggest that water-quality functions may be impaired in the stream. However, the reach ranked higher for other criteria used to indicate water-

quality functions. The stream has natural surface water exchange and dilution patterns, and good coverage by emergent vegetation (31 percent) and woody wetland (53 percent) land-cover types. Sixty percent of the reach is mapped as wetland in the NWI. The reach includes a restoration site in the floodplain and riparian buffer between the creek and the adjacent Bishop Athletic Complex. The floodplain side channel and LWD in the restored floodplain provide a complex habitat structure that supports a variety of species. Newkah Creek channel migration is dominated by marine flooding events that extend throughout the lower portions of the creek, including the reach in Aberdeen's shoreline jurisdiction. Few shoreline modifications (fill in 6 percent of the reach) and vegetated, undeveloped conditions indicate a high level of function in the reach.

4.1.6.8. Wedekind Confluence Reach

The Wedekind Confluence reach exhibits stream related hydrologic functions including flood protection and support of base flows. The reach scored moderate or high in most categories, with a relatively high rank overall (33 points). Functions may be limited due to vegetation conditions and altered shoreline, primarily associated with the City's water diversion facility. The floodway, 100-year floodplain, and wetlands dominate the reach; and there is good connectivity between various habitats within and adjacent to the shoreline jurisdiction. Although the historical channel migration zone here is not formally mapped, it likely extends from Wynoochee Valley Road in the east to the valley wall in the west.

4.1.6.9. Wishkah River Reach

Functions in the Wishkah River are moderate (26 points) partly due to numerous docks, piling, bridge structures, bulkheads, tide gates, altered vegetation, and development throughout the reach. Channel and flow configuration is simple, and lacks LWD, limiting some of the hydrologic and habitat functions of the reach. The reach scored moderate in most categories, but stream channel and vegetation conditions impair some functions. Low-intensity development (24 percent of the reach) and medium-intensity development (10 percent) is spread throughout the reach. There are significant areas of wetland (40 percent of the reach is mapped as wetland in the NWI), primarily in the northern portion of the lower segment of the reach (see Figure 2.2 in Appendix A). The wetlands are within the floodplain between the stream channel and Wishkah Road on the west side of the stream, and between the channel and Thomas Street on the east side of the stream. The channel migration zone of the Wishkah River reach has not been formally mapped, but likely extends beyond the channel in the upstream portions of the reach where the floodplain wetlands are located. However, the historical channel migration zone does not extend into presently developed areas. The floodplain wetlands exhibit conditions to support a variety of functions provided by this reach, while more developed areas may provide relatively less function. The reach provides important habitat for a variety of priority salmon and trout.

4.1.7. Recommended Environment Designations

Environment designations proposed for Aberdeen are shown in Figures 17.2 and 17.3 in Appendix A. For all portions of the City's shoreline jurisdiction, lands that are waterward of the OHWM are designated Aquatic. Other proposed shoreline environment designations, including the criteria used to determine the designation based on SMP Guidelines in

WAC 173-26-211(2)(a), are described for various portions of the shoreline jurisdiction in the sections below.

4.1.7.1. Aberdeen Lake Reach

Urban Conservancy

Criteria for determining the proposed Urban Conservancy environment designation for Lake Aberdeen Reach includes the following:

1. The existing land use pattern surrounding the lake is primarily recreational.
2. Several species of fish and birds are documented within the lake including coast resident cutthroat trout, Chinook salmon, coho salmon, steelhead trout, and the wood duck. The physical and biological characteristics of the lake indicate that it should be preserved for recreation.
3. The Comprehensive Plan designations for the reach are:
 - a. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration.

4.1.7.2. Charley Creek Reach

High Intensity

Criteria for determining the proposed High Intensity environment designation for Charley Creek Reach includes the following:

1. The existing land use pattern for the area designated High Intensity is industrial. An auto wrecking-salvage yard intersects with the western portion of this reach and a construction company falls within the eastern portion.
2. Charley Creek is a migratory path for Coastal Resident Cutthroat trout.
3. The Comprehensive Plan designations for the reach are:
 - a. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.
4. The adopted zoning district in the reach is:
 - a. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses".
6. High Intensity is proposed for areas zoned for Industrial in the northern portion of the reach.

Urban Conservancy

Criteria for determining the proposed Urban Conservancy environment designation for the Charley Creek Reach includes the following:

1. The existing land use in the area of Charley Creek Reach designated Urban Conservancy is primarily an undisturbed riparian area.
2. Charley Creek is a migratory path for Coast Resident Cutthroat trout.
3. The Comprehensive Plan designations for the reach are:
 - a. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.

4. The adopted zoning district in the reach is:
 - a. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain, or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration
6. Urban Conservancy is proposed for the undeveloped riparian areas in the southern portion of the reach.

4.1.7.3. Chehalis River Reach

High Intensity

Criteria for determining the proposed High Intensity environment designation for the Chehalis River Reach includes the following:

1. The existing land use pattern is predominately industrial and waterfront development.
2. The shoreline reach covers the Chehalis River, which is home to several priority habitat species such as bull trout, Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, largemouth bass, steelhead trout, and peregrine falcons. A boat launch located near the fire station provides public access to the river.
3. The Comprehensive Plan designations for the reach are:
 - a. Commercial/Residential - The Commercial Residential area should provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Aberdeen while enabling the continuation of existing residential uses. Because of the opportunities provided by the state highways and high levels of transit service, a wide range of uses is allowed within the area. Provisions are included to improve compatibility between the wide ranges of uses allowed by the Commercial Residential area.

- b. General Commercial - The General Commercial area should provide for a wide variety of commercial uses, particularly large-scale commercial uses and commercial uses dependent upon high traffic volumes, in areas best suited for these uses, and where their intensity will not adversely affect other uses.
 - c. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.
 - d. Light Industrial - The Light-Industrial area should provide space for transportation, warehousing, contractors yards, industrial sales, and industrial uses contained within a building which do not create objectionable noise, odors or hazards.
 - e. Waterfront Development - The Waterfront Development area should encourage the appropriate redevelopment of under-utilized and vacant waterfront areas suitable for a mix of uses. Because of the unique opportunities provided by access to shorelines of statewide significance, special provisions are included to encourage compatibility among these various uses. Public access to the shoreline should be addressed through the shoreline permit process for any proposed land use action.
4. The adopted zoning districts in the reach are:
- a. Commercial/Residential (C-R) - The purpose of the C-R district is to provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Aberdeen while enabling the continuation of existing residential uses. Because of the opportunities provided by the state highways and transit service, a wide range of uses is allowed within the area. Provisions are included to improve compatibility between the wide-range of uses allowed by this zoning district.
 - b. General Commercial (C-G) - The purpose of the C-G district is to provide for a wide variety of commercial uses that are either large in scale and/or dependent upon high traffic volumes and where their intensity will not adversely affect other uses.
 - c. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
 - d. Light Industrial (L-I) - The purpose of the L-I district is to provide space for transportation, warehousing, contractors' yards, industrial sales, and industrial uses contained within a building.
 - e. Waterfront Development (W-D) - The purpose of the W-D district is to encourage the re-use and redevelopment of Aberdeen's central waterfront and similar waterfront areas by providing for an appropriate mix of uses tailored to their unique opportunities. Compatibility among the variety of allowed uses is encouraged and public access to the shoreline is required where necessary.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban

growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."

6. High Intensity is proposed for areas zoned for General Commercial, Industrial, Light Industrial, and Waterfront Development.

Urban Conservancy

Criteria for determining the Urban Conservancy environment designation for the Chehalis River Reach include:

1. Land use includes portions of residential development that fall within the reach due to their proximity to the FEMA preliminary DFIRM floodway.
2. The shoreline reach covers the Chehalis River, which is home to several priority habitat species such as bull trout, Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, largemouth bass, steelhead trout, and peregrine falcons. A boat launch located near the fire station provides public access to the river.
3. The Comprehensive Plan designations for the reach are:
 - a. Commercial/Residential (C-R) - The purpose of the C-R district is to provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Aberdeen while enabling the continuation of existing residential uses. Because of the opportunities provided by the state highways and transit service, a wide range of uses is allowed within the area. Provisions are included to improve compatibility between the wide-range of uses allowed by this zoning district.
 - b. Multiple Family Residential - The Multiple Family Residential area should provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided. The area also contains requirements to increase compatibility between this area and the single-family residential area.
 - c. Single Family Residential - The Single Family Residential area should protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.

4. The adopted zoning districts in the reach are:
 - a. Commercial/Residential (C-R) - The purpose of the C-R district is to provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Aberdeen while enabling the continuation of existing residential uses. Because of the opportunities provided by the state highways and transit service, a wide range of uses is allowed within the area. Provisions are included to improve compatibility between the wide-range of uses allowed by this zoning district.
 - b. Multiple Family Residential (R-M) - The purpose of the R-M district is to provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided and to designate the major public parks, schools, and semi-public uses that either currently exist or that are proposed. The area also contains requirements to increase compatibility between this area and the single-family residential area.
 - c. Single Family Residential (R-S) - The purpose of the R-S district is to protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated single-family residential to provide for increased residential development and to designate the major public parks, schools, and semi-public use that currently exist or are proposed. The single-family residential district should provide a full range of low-intensity housing opportunities.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration
6. Urban Conservancy is proposed for the residential and undeveloped wetland area within the FEMA preliminary DFIRM floodway.

4.1.7.4. *Fry Creek Reach*

High Intensity

Criteria for determining the proposed High Intensity environment designation for Fry Creek Reach includes the following:

1. The existing land use pattern is primarily industrial and is utilized by the Port of Grays Harbor and Washington Department of Transportation (WSDOT).
2. The reach has limited biological functions and is particularly suited to industrial activities.
3. The Comprehensive Plan designations for the reach are:
 - a. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.
 - b. Light Industrial - The Light-Industrial area should provide space for transportation, warehousing, contractors yards, industrial sales, and industrial uses contained within a building which do not create objectionable noise, odors or hazards.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
 - b. Light Industrial (L-I) - The purpose of the L-I district is to provide space for transportation, warehousing, contractors' yards, industrial sales, and industrial uses contained within a building.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
6. High Intensity is proposed for areas zoned for Industrial and Light Industrial.

4.1.7.5. *Grays Harbor North Bank Reach*

High Intensity

Criteria for determining the proposed High Intensity environment designation for Grays Harbor North Bank Reach includes the following:

1. The existing land use pattern in this reach is industrial.
2. Major landowners within the reach include the Port of Grays Harbor and WSDOT. Major uses include water-oriented industrial activities such as timber production.

3. The Comprehensive Plan designations for the reach are:
 - a. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.
 - b. Light Industrial - The Light Industrial area should provide space for transportation, warehousing, contractors yards, industrial sales, and industrial uses contained within a building which do not create objectionable noise, odors or hazards.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
 - b. Light Industrial (L-I) - The purpose of the L-I district is to provide space for transportation, warehousing, contractors' yards, industrial sales, and industrial uses contained within a building.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
6. High Intensity is proposed for areas zoned for Industrial and Light Industrial.

4.1.7.6. Grays Harbor South Bank Reach

High Intensity

Criteria for determining the High Intensity portion of the Grays Harbor South Bank Reach includes the following:

1. The existing land use pattern is primarily industrial and light industrial. The City and Grays Harbor County own portions of this reach in addition to other private entities such as a timber company.
2. The Comprehensive Plan designations for the reach are:
 - a. General Commercial - The General Commercial area should provide for a wide variety of commercial uses, particularly large-scale commercial uses and commercial uses dependent upon high traffic volumes, in areas best suited for these uses, and where their intensity will not adversely affect other uses.
 - b. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.

3. Light Industrial - The Light Industrial area should provide space for transportation, warehousing, contractors yards, industrial sales, and industrial uses contained within a building which do not create objectionable noise, odors or hazards. The adopted zoning districts in the reach are:
 - a. General Commercial (C-G) - The purpose of the C-G district is to provide for a wide variety of commercial uses that are either large in scale and/or dependent upon high traffic volumes and where their intensity will not adversely affect other uses.
 - b. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
4. Light Industrial (L-I) - The purpose of the L-I district is to provide space for transportation, warehousing, contractors' yards, industrial sales, and industrial uses contained within a building. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation, or navigation; or are suitable and planned for high-intensity "water-oriented uses".
5. High Intensity is proposed for areas zoned for General Commercial, Industrial, and Light Industrial.

Shoreline Residential

Criteria for determining the Shoreline Residential portion of the Grays Harbor South Bank Reach includes the following:

1. Some residential development occurs within the reach; however, most of the area zoned for residential uses lies within wetlands and is currently undeveloped.
2. The Comprehensive Plan designations for the reach are:
 - a. Commercial/Residential - The Commercial Residential area should provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Aberdeen while enabling the continuation of existing residential uses. Because of the opportunities provided by the state highways and high levels of transit service, a wide range of uses is allowed within the area. Provisions are included to improve compatibility between the wide ranges of uses allowed by the Commercial Residential area.
 - b. Multiple Family Residential - The Multiple Family Residential area should provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided. The area also contains requirements to increase compatibility between this area and the single-family residential area.

- c. Single Family Residential - The Single Family Residential area should protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.
3. The adopted zoning districts in the reach are:
 - a. Commercial/Residential (C-R) - The purpose of the C-R district is to provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Aberdeen while enabling the continuation of existing residential uses. Because of the opportunities provided by the state highways and transit service, a wide range of uses is allowed within the area. Provisions are included to improve compatibility between the wide-range of uses allowed by this zoning district.
 - b. Multiple Family Residential (R-M) - The purpose of the R-M district is to provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided and to designate the major public parks, schools, and semi-public uses that currently exist or that are proposed to be built. The area also contains requirements to increase compatibility between this area and the single-family residential area.
 - c. Single Family Residential (R-S) - The purpose of the R-S district is to protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated single-family residential to provide for increased residential development and to designate the major public parks, schools, and semi-public use that currently exist or are proposed. The single-family residential district should provide a full range of low-intensity housing opportunities.
 4. Specific designation criteria in WAC 173-26-211(5)(f)(iii): Assign a Shoreline Residential environment designation to shoreline areas inside incorporated municipalities if they are predominantly single-family or multi-family residential development or are planned and platted for residential development.
 5. Shoreline Residential is proposed for areas zoned Single Family Residential, Multiple Family Residential, or Commercial/Residential.

4.1.7.7. *Newskah Creek Reach*

Urban Conservancy

Criteria for determining the proposed Urban Conservancy environment designation for Newskah Creek Reach includes the following:

1. The existing land use pattern is an undeveloped forested riparian area adjacent to the Bishop Athletic Complex, which includes several soccer and baseball fields.
2. The reach is located in a noncontiguous portion of the city. The reach is small and therefore it does not include much of the creek; however, the creek has biological functions that should be preserved and any development planned for the athletic complex should be considerate of the impacts on the creek.
3. The Comprehensive Plan designations for the reach are:
 - a. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses;
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed;
 - c. They have potential for ecological restoration;
 - d. They retain important ecological functions, even though partially developed; or
 - e. They have the potential for development that is compatible with ecological restoration.

4.1.7.8. *Wedekind Confluence Reach*

Urban Conservancy

Criteria for determining the proposed environment designation for Wedekind Confluence Reach (Urban Conservancy) includes the following:

1. The existing land use pattern of this reach is primarily open space and a significant portion of the reach falls within the floodway. A utility outpost and dam are located at the confluence of the Wedekind Creek and the Wynoochee River, which may affect the biological functions of the reach.

2. The reach has important ecological and biological functions that should be preserved. Several priority habitat species are located within the reach including bull trout, Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, steelhead trout and the harlequin duck.
3. The Comprehensive Plan designations for the reach are:
 - a. Industrial - The Industrial area should provide the opportunity for intensive heavy industrial uses or large-scale manufacturing uses in appropriate locations, and reserve the limited amount of industrial lands within Aberdeen for industrial uses.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The purpose of the Industrial district is to provide the opportunity for intensive industrial uses in appropriate locations.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses;
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed;
 - c. They have potential for ecological restoration;
 - d. They retain important ecological functions, even though partially developed; or
 - e. They have the potential for development that is compatible with ecological restoration.

4.1.7.9. *Wishkah River Reach*

High Intensity

Criteria for determining the High Intensity proposed environment designation for Wishkah River Reach) includes the following:

1. The existing land use pattern designated High Intensity includes light industrial and commercial activities.
2. The area is nearly built out with commercial and waterfront developments. A high percentage of land cover in this portion of the reach is impervious and includes buildings and parking lots.

3. Several species of fish are documented within this reach including bull trout, Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, largemouth bass, and steelhead trout.
4. The Comprehensive Plan Designations for the reach are:
 - a. General Commercial - The General Commercial area should provide for a wide variety of commercial uses, particularly large-scale commercial uses and commercial uses dependent upon high traffic volumes, in areas best suited for these uses, and where their intensity will not adversely affect other uses.
 - b. Light Industrial - The Light Industrial area should provide space for transportation, warehousing, contractors yards, industrial sales, and industrial uses contained within a building that do not create objectionable noise, odors, or hazards.
 - c. Waterfront Development - The Waterfront Development area should encourage the appropriate redevelopment of underutilized and vacant waterfront areas suitable for a mix of uses. Because of the unique opportunities provided by access to shorelines of statewide significance, special provisions are included to encourage compatibility among these various uses. Public access to the shoreline should be addressed through the shoreline permit process for any proposed land use action.
5. The adopted zoning districts in the reach are:
 - a. General Commercial (C-G) - The purpose of the C-G district is to provide for a wide variety of commercial uses that are either large in scale and/or dependent upon high traffic volumes and where their intensity will not adversely affect other uses.
 - b. Light Industrial (L-I) - The purpose of the L-I district is to provide space for transportation, warehousing, contractors' yards, industrial sales, and industrial uses contained within a building.
 - c. Waterfront Development (W-D) - The purpose of the W-D district is to encourage the reuse and redevelopment of Aberdeen's central waterfront and similar waterfront areas by providing for an appropriate mix of uses tailored to their unique opportunities. Compatibility among the variety of allowed uses is encouraged, and public access to the shoreline is required where necessary.
6. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
7. High Intensity is proposed for areas zoned for General Commercial, Light Industrial, and Waterfront Development.

Shoreline Residential

Criteria for determining the proposed Shoreline Residential environment designation for Wishkah River Reach includes the following:

1. The existing land use pattern is primarily single-family residential and multi-family residential.
2. The area is relatively built out with single-family homes, a number of which include docks. Some of the area zoned multiple family residential is undeveloped but lies within a significant freshwater forested/shrub wetland and may not be suitable for future development.
3. Several species of fish are documented within this reach including bull trout, Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, largemouth bass, and steelhead trout.
4. The Comprehensive Plan Designations for the reach are:
 - a. Multiple Family Residential - The Multiple Family Residential area should provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided. The area also contains requirements to increase compatibility between this area and the single-family residential area.
 - b. Single Family Residential - The Single Family Residential area should protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.
5. The adopted zoning districts in the reach are:
 - a. Multiple Family Residential (R-M) - The purpose of the R-M district is to provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided and to designate the major public parks, schools, and semi-public uses that currently exist or that are proposed. The area also contains requirements to increase compatibility between this area and the single-family residential area.
 - b. Single Family Residential (R-S) - The purpose of the R-S district is to protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated single-family residential to provide for increased residential development and to designate the major public parks, schools, and semi-public use

that currently exist or are proposed. The single-family residential district should provide a full range of low-intensity housing opportunities.

6. Specific designation criteria in WAC 173-26-211(5)(f)(iii): Assign a Shoreline Residential environment designation to shoreline areas inside incorporated municipalities if they are predominantly single-family or multi-family residential development or are planned and platted for residential development.
7. Shoreline Residential is proposed for areas zoned Single Family Residential or Multiple Family Residential.

Urban Conservancy

Criteria for determining the proposed Urban Conservancy environment designation for Wishkah River Reach includes the following:

1. The existing land use pattern is undeveloped forested riparian area.
2. The area is undeveloped and zoned for single family and multiple family residential and undeveloped but lies within a significant freshwater forested/shrub wetland that likely makes the area unsuitable for future development.
3. Several species of fish are documented within this reach including bull trout, Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, largemouth bass, and steelhead trout.
4. The Comprehensive Plan Designations for the reach are:
 - a. Multiple Family Residential - The Multiple Family Residential area should provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided. The area also contains requirements to increase compatibility between this area and the single-family residential area.
 - b. Single Family Residential - The Single Family Residential area should protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.
5. The adopted zoning districts in the reach are:
 - a. Multiple Family Residential (R-M) - The purpose of the R-M district is to provide for residential neighborhoods with a mix of multi-family residences in areas where the available or planned public facilities are adequate for the allowed density. The area contains provisions to ensure that adequate public facilities and amenities are provided and to designate the major public parks, schools, and semi-public uses

that currently exist or that are proposed. The area also contains requirements to increase compatibility between this area and the single-family residential area.

- b. Single Family Residential (R-S) - The purpose of the R-S district is to protect and maintain Aberdeen's single-family residential neighborhoods in a manner that encourages neighborhood revitalization where needed. Suitable undeveloped areas are designated single-family residential to provide for increased residential development and to designate the major public parks, schools, and semi-public use that currently exist or are proposed. The single-family residential district should provide a full range of low-intensity housing opportunities.
6. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain, or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration.
 7. Urban Conservancy is proposed for the forested riparian areas zoned Single Family Residential or Multiple Family Residential.

4.1.8. Restoration Opportunities

There have been several restoration opportunities identified by others within Aberdeen's shoreline jurisdiction. For instance, two auto-wrecking yards on Charley Creek have been targeted for relocation by the Wild Fish Conservancy (Sandell et al. 2013). The Aberdeen Auto Wrecking yard is just outside of the City limits, but Emery Auto Wrecking also borders Charley Creek and is within City limits. During their sampling, near both of the wrecking yards, Sandell et al. (2013) documented juvenile Chinook, coho and chum salmon, and cutthroat trout, all of which were likely rearing. A host of chemicals could be an ongoing pollution source to the surrounding water bodies from wrecking yard runoff, potentially harming fish, particularly since this area is low and regularly floods.

There are likely many fish passage barriers within the City limits, mostly related to stormwater infrastructure within the more developed portions of the City near the confluence of the Wishkah and Chehalis rivers. To prevent backwater flooding of City streets, most are

fitted with tide gates that prevent backflow to upland areas. The most common tide gate is called a flap-gate, which can prevent fish access for much of the tidal cycle (Giannico and Souder 2005). Though many of these gates lead to stormwater infrastructure (i.e., pipes and storm drains), some are associated with streams that could provide useable habitat to anadromous fish upstream of developed areas (e.g., Fry Creek) if tide gates were improved.

In addition, there are a large number of abandoned pilings throughout the City. Currently WDNR has a program to catalog these pilings and their character (i.e., whether they are creosote-treated or not: WDNR 2014d). Although the program is not actively removing pilings in the City, there is a potential to do so once they are cataloged and characterized.

4.1.9. Aberdeen Photographs



Chehalis River Reach in Aberdeen.



Fill in Grays Harbor North Bank Reach in Aberdeen.



Fry Creek Reach in Aberdeen.



Grays Harbor South Bank Reach.



Newkah Creek Reach.



Wishkah River Reach in Central Aberdeen.

4.2. City of Cosmopolis

The Cosmopolis shoreline jurisdiction encompasses portions of the south bank and north bank of the Chehalis River. It includes Mill Creek and wetlands associated with this formerly complex confluence. Two reaches were identified for Cosmopolis; their associated water body and shoreline area are provided in Table 4.9. Background on the City's current SMP along with other applicable regulations such as critical areas code are provided in Sections 1.2.3 and 1.2.4.

Reach	Primary Water Body Name	Shoreline Area (acres)
Chehalis River Reach – Cosmopolis (Includes north and south subreaches for functional assessment)	Chehalis River	255
Mill Creek Reach	Mill Creek	49

4.2.1. Physical and Biological Characterization

Cosmopolis contains the least physically diverse shoreline of the cities because it is predominantly freshwater tidal, and lacks open access to Gray Harbor. It is strongly regulated by several shoreline modifications placed to protect the town from marine and riverine floods. Stream flow in the Chehalis basin follows the yearly variation of precipitation, with high precipitation and stream flow between December and March and low precipitation and stream flow in August (Reckendorf et al. 2012). The City experiences more change from Chehalis River flow because it is more riverine than estuarine and is not directly exposed to the harbor.

Current levels of LWD in the lower Chehalis River are low, in part due to a history of LWD removal and timber harvest (US Coast and Geodetic Survey 1911). Nevertheless, it is probable that LWD volumes were not as high in Cosmopolis as elsewhere in the cities prior to development due to its geomorphic placement in the landscape.

Geomorphic change in the City's shoreline jurisdiction is expected to be small due to the extensive management of the system (levees, flow control structures, dredging, etc.). These activities act to fix water bodies in place, particularly in the lower energy environment typical in this City. Due to the small gradients in the water bodies, erosion risk is low. The primary ongoing geomorphic impact is the dredging of the Chehalis River, which must occur to keep the river navigable.

Geologic hazards found within the shoreline jurisdiction of Cosmopolis are shown in Table 4.10. Tsunami inundation occurs in the western portion of the City, but the eastern half of the City is outside the Scenario 1A inundation zone, partly due to the protection afforded by the levee that runs along the Chehalis River waterfront. Most tsunami inundation that would occur in the City and within the shoreline jurisdiction would come from the west via South Aberdeen. Liquefaction is also a hazard throughout the core of the City, particularly in those areas filled in the past.

Hazard Type	Percentage of Total Area	Reaches Affected
Tsunami Hazard	62	All
Seismic/Liquefaction ^a	69	All

^a Moderate to high liquefaction susceptibility

Priority fish presence in the Cosmopolis shoreline jurisdiction includes all six Washington coast priority salmon and trout species that occur in the Chehalis River. The Chehalis River also provides habitat for other priority fish such as lamprey, and for water-dependent bird species that frequently use shoreline habitats along large rivers such as the Chehalis. Mill Creek also contains habitat used by coho for spawning. Wetlands dominate the shoreline jurisdiction in Cosmopolis. The forest and shrub wetland that encompasses the entire land area along the Chehalis River’s northern shoreline in Cosmopolis contains priority habitat for wood ducks, and provides important rearing and foraging opportunities for a variety of fish and birds, as well as harbor seals.

The Washington State 303(d) list does not indicate water quality impairments in the Chehalis River and Mill Creek in Cosmopolis.

4.2.2. Shoreline Use Analysis

Shoreline land uses in the Cosmopolis shoreline jurisdiction are comprised of Mixed Use, Manufacturing, Medium Density Residential, Public Reserve, and Waterfront Use. The manufacturing area along the Chehalis River is the area of most intensive use in the shoreline jurisdiction. This area includes a wood pulp production facility. Much of the shoreline jurisdiction is undeveloped. The shoreline jurisdiction includes a mixture of land covers, consisting primarily of woody wetlands, open water, open space, low-intensity development, and emergent herbaceous wetlands (Figure 4.4 in Appendix A).

Based on a review of land cover and zoning maps, the current use categories considered most likely to meet the definition of “water-oriented uses” were selected:

- Manufacturing
- Waterfront Use

There are two reaches in Cosmopolis (see Table 2.2). Due to the distinct differences in current land use and level of development between the two sides of the river, the Chehalis River Reach is divided into two subreaches for assessing ecological functions (see Section 4.2.6, *Reach Functional Assessment*). Overall, the Chehalis River Reach is largely zoned manufacturing; however, some Public Reserve land exists on the north side of the river across from a Waterfront Use zoning district. Currently, 18 percent of Mill Creek Reach is zoned for Medium Density Residential. Most of this reach is developed and would likely not see further residential development.

One of the primary goals of the Cosmopolis Comprehensive Plan is to retain existing business and industry. As the wood pulp production facility in the Chehalis River - south subreach is a

major employer in the city, it can be assumed based that on the Comprehensive Plan goals and land-use designation that the mill will continue to operate as long as economically feasible. Expansion of high-intensity industrial uses in the Chehalis River - north subreach will be hindered by the lack of infrastructure and the locations of wetlands and the 100-year floodplain.

Much of the land adjacent to the Chehalis River near the city core is zoned Waterfront Use. The Comprehensive Plan Waterfront Development Land Use policies encourage the redevelopment of underutilized and vacant parcels to include a mix of uses. The Comprehensive Plan policies also prioritize public access to the waterfront. Much of the land designated Waterfront Use is vacant, and it should be assumed that water-related development will occur on one or more parcels.

4.2.2.1. Existing Land Use Patterns

The majority of the Chehalis River Reach is covered by open water (41 percent) and woody wetlands (35 percent), as well as some emergent herbaceous wetlands (12 percent), and low-intensity development (7 percent). Current development along the shoreline is focused along the south bank of the Chehalis River (Chehalis River - South) and includes a wood pulp mill, the Cosmopolis Treaty Grounds Memorial, the Cosmopolis Waterway, and a boat launch. Except for a power line corridor, the north side of the river (Chehalis River - North) is undeveloped within the city limits, which extends to Junction City Road, and is dominated by wetlands.

The land cover in Mill Creek Reach is primarily woody wetlands (68 percent), open space (14 percent), and low-intensity development (10 percent). Within the shoreline jurisdiction, there is a small amount of residential development in Mill Creek Reach.

Shoreline jurisdiction land use in Cosmopolis is shown in Table 4.11.

Current Land Use Patterns	Percentage of Shoreline Area
All Other Residential Not Elsewhere Coded (Bare Land Platted & Outside Plats and Sheds in City Limits)	4
Commercial Land	19
Commercial Land w/ Single Family Residence	1
Designated Forest Land RCW 84.33	33
Household, Multi-Units (5 or more)	< 1
Household, Single Family Units	1
Industrial Land	20
Lumber and Wood Products (Except Furniture)	4
Miscellaneous Services – Churches	< 1
Parks	1
Personal Services	< 1
Recreational Activities – RV Parks	< 1
Undeveloped Land	15

4.2.2.1. Projected Land Use Patterns

Zoning in Chehalis River Reach – Cosmopolis is largely Manufacturing (101 acres), with some Public Reserve (25 acres), and Waterfront Use (11 acres). The north side of the river is largely undeveloped; however, it is almost entirely surge-plain wetlands and tidal channels making future development in this area unlikely.

Zoning in Mill Creek Reach consists of Mixed Use (33 acres), Medium Density Residential (8 acres), Public Reserve (2 acres), and Low Density Residential (0.5 acres). The Medium Density Residential area is largely built out, and it would likely not see any additional development. The area designated Mixed Use is covered by woody wetlands and may not be ideal for future development.

Planned land use in the shoreline jurisdiction of the City of Cosmopolis is shown in Table 4.12. Current zoning designations are shown in Table 4.13.

4.2.3. Shoreline Modifications

Shoreline modifications in Cosmopolis come primarily in two forms: 1) a levee and shoreline hardening along the banks of the Chehalis River and 2) flow control structures along Mill Creek. A levee exists between the City and the Chehalis River approximately along the former Northern Pacific Railway alignment between the Weyerhaeuser property and the City limits. A portion of the levee near the center of the City appears to be armored with rock due to the proximity of the levee with the active channel. Within the Weyerhaeuser property, there also appears to be shoreline hardening to protect fill, and possibly fill placed to prevent inundation from the Chehalis River. Table 4.14 summarizes the percentage of fill and number of barriers found in the Cosmopolis shoreline jurisdiction.

Mill Creek has been regulated by a USACE structure at its confluence with the Chehalis River. The tide gate at the Mill Creek confluence with the Chehalis River modifies natural geomorphic processes at this ecological hot spot. The tide gate is contained within the levee that is parallel to the Chehalis River shoreline.

4.2.4. Public Access Analysis

Within Cosmopolis, residents may access the shoreline via the Weyerhaeuser Boat Ramp along the Chehalis River. This boat ramp includes one asphalt ramp, one gravel ramp, and fifty gravel parking spaces for visitors. The boat ramp is influenced by fluctuations in the river and tidal changes. Trails provide access to Mill Creek within Makarenko Park and along the Chehalis River.

Within Mill Creek Reach, a rail trail, the Basich Trailway, connects the city of Cosmopolis to Aberdeen through the wetland areas. Located in the Chehalis River Reach – south, the Cosmopolis Treaty Grounds are located in a small park on the riverfront with a mural and small structure.

Table 4.12. Comprehensive Plan Designations Representing Planned Land Use in the Shoreline Jurisdiction of the City of Cosmopolis.

Land Use Designation	Typical Uses	Percentage of Shoreline Area
Manufacturing	Groupings of similar or compatible industrial uses can improve the flow of shipping and employment traffic, as well as allowing firms to share facilities and services. Groupings also help reduce land use conflicts with less-intensive uses. Light industries are those with relatively minor impacts, such as electronic research and assembly, equipment repair, and light fabrication, with all activities customarily conducted inside a building. Heavy industries, such as wood processing, machinery manufacturing, mining operations, and port facilities, may have multiple impacts that are more complicated to mitigate, such as heavy truck traffic, noise, vibration, light, glare, and odors.	56
Multiple Use Development	The Multiple Use area should provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Cosmopolis while enabling the continuation of existing residential uses.	18
Public Reserve	A wide variety of lands should be preserved for park purposes, including: natural areas and natural features with outstanding scenic or recreational value; lands that may provide public access to rivers, creeks, sloughs, or the harbor; lands that define, through their natural features, the boundaries of urban and rural areas, including parks, trails, water features, and scenic corridors; lands that visually or physically connect natural areas, or provide important linkages for recreation, transportation facilities for pedestrians and bicyclists, and plant communities and wildlife habitat; and lands valuable for active and passive recreation, such as athletic fields, trails, fishing and boating, swimming, or picnic areas. The preferable locations for public safety facilities, such as police and fire stations, are in the public reserve zoned areas as well.	15
Single Family Residential (R-57 & R-100)	The Single Family Residential area should protect and maintain single-family residential neighborhoods in a manner that ensures neighborhood revitalization. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.	4
Waterfront Development	The Waterfront Development area should encourage the appropriate redevelopment of under-utilized and vacant waterfront areas suitable for a mix of uses. Because of the unique opportunities provided by access to shorelines of statewide significance, special provisions are included to ensure compatibility among these various uses. Public access to the shoreline should be addressed through the shoreline permit process for any proposed land use action.	6

Designation	Symbol	Typical Uses	Percentage of Shoreline Area
Manufacturing	M	Lumber and wood products; Furniture and fixtures; Paper and allied products; Water transportation.	56
Multiple Use	MU	Retail and wholesale business; Professional and consumer services, offices, shops and clinics; Financial institutions; Entertainment facilities, except for drive-in theaters; Restaurants, cafes, fast-food shops, taverns and lounges; Automotive and marine repair shops and filling stations; Dry-cleaning and laundry facilities; Parks; Churches, private and commercial schools; Day care centers; Municipal buildings and utility buildings; Motels and hotels; Undertaking and funeral parlors; Warehousing in conjunction with a commercial use; Condominiums, townhouses, and multiple-family dwellings; Industrial supplies and services; Mini-warehouses; Single- or multi-family living units attached to or within approved businesses.	18
Public Reserve	PR	Public buildings; Educational institutions and churches; Public libraries, art galleries and museums; Public parks, playgrounds, tennis courts, and other recreational uses; Golf courses and related facilities; Cemeteries.	15
Low Density Residential	R100	One-family and two-family dwellings; Court apartments; Parks; Golf courses.	< 1
Medium Density Residential	R57	One-family dwellings; two-family dwellings; Court apartments.	4
Waterfront Use	WUD	Retail and wholesale business; Professional and consumer services, offices, shops and clinics; Financial institutions; Restaurants, cafes, fast-food shops, taverns and lounges; Water access facility; Water enjoyment facility; Water-oriented facility; Water-related facility; Motels and hotels; Condominiums and townhouses.	6

Reach	Percentage of Fill	Total Number of Barriers
Chehalis River Reach – Cosmopolis (Includes north and south subreaches)	11	4
Mill Creek Reach	9	10

Cosmopolis identifies that public access opportunities to the waterfront be protected and developed as a goal in its Comprehensive Development Plan. The City requires that all new developments fronting the waterfront should provide appropriate levels of public access as well as a few opportunities for the development of new and upgraded facilities.

The City recommends that the development of a waterfront park be examined on the east bank of the Chehalis River. The City also recommends that the boat launch facility at the foot of F Street be upgraded. The boat ramp currently includes one asphalt ramp, one gravel ramp, and fifty gravel parking spaces for visitors.

The Grays Harbor County Public Health and Social Services department is currently working on an active transportation plan titled *Connect Grays Harbor*. The plan has identified several project priorities relating to shoreline access including the Rails to Trails program. The Rails to Trails development will connect Montesano to Cosmopolis along the Blue Slough Road linking the two kayaking boat launch parks with a 3-mile gravel pathway. In addition, the trails listed in this section will be included in the plan as existing bicycle and recreation paths. Additional paths and extensions of paths are also being considered based on results from a public input process. Proposals include creating a multi-use pathway linking East Huntley Street in Aberdeen with Cosmopolis has also been proposed.

4.2.5. *Shoreline Land Capacity Analysis*

The shoreline jurisdiction in Cosmopolis contains 139 parcels. Of these parcels, 36 percent are vacant and it appears approximately 19 percent of the parcels are protected from development by public or conservation group ownership, conservation easements, or similar mechanisms. It was not possible to determine what percent of parcels have a non-conforming structure.

The city's shoreline is designated entirely for urban land uses. City land use designations in the shoreline jurisdiction include Manufacturing (M), Mixed Use (MU), Public Reserve (PR), Residential Low Density (R100), Residential Medium Density (R57), and Waterfront Use (WA).

Based on these land use designations, the most intense use of property appears to be within the Industrial designated lands found in a majority (54 percent) of the city's shoreline jurisdiction. Most of new residential development capacity in shoreline jurisdiction exists in the R57 Residential Medium Density land use designation and consists of underutilized land. Within the shoreline jurisdiction there does not exist any vacant single-family residential land that could be developed or subsidized.

Commercial and industrial land uses are found in the city's shoreline jurisdiction. Very little vacant or underutilized commercial land exists within the city's shoreline jurisdiction.

4.2.6. *Reach Functional Assessment*

Table 4.15 provides a summary of the functional assessment for Cosmopolis. For the purposes of the functional assessment the Chehalis River Reach was divided into two units or subreaches, a northern portion of the reach and a southern portion (see Appendix A, Figure 9.4), due to visually apparent differences in land use and existing development patterns between the two sides of the river (see Section 4.2.2.1, *Existing Land Use Patterns*).

Table 4.15. Functions Assessment for Cosmopolis.

Function	Hydrologic Functions				Water Quality Functions				Habitat Functions								Total Score
	Floodwater Storage/ Flood Protection and Surge Protection	Floodwater Storage/ Flood Protection and Surge Protection	Floodwater Storage/ Flood Protection and Surge Protection	Support of Base Flow and Groundwater (freshwater shorelines)	Maintaining Temperature	Removing Excessive Nutrients and Toxic Compounds	Removing Excessive Nutrients and Toxic Compounds	Sediment Removal and Stabilization	Sediment/Bank Stabilization and Shoreline Protection	Attenuation of Wave Energy	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food Production and Delivery	Provision and Redistribution of Woody debris and Organic Material	Provision and Redistribution of Woody Debris and Organic Material	
Criteria ^a	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Reach Name																	
Chehalis River Reach – North	3	2	3	3	1	3	3	2	3	3	3	NA	2	3	2	2	38
Chehalis River Reach – South	1	1	2	2	1	3	1	1	2	1	1	NA	1	1	1	1	20
Mill Creek Reach	3	2	3	2	2	3	2	2	2	3	2	NA	1	2	2	1	32

^a Criteria are described in Table 2.4 for each corresponding number (1 through 16).

NA = Not applicable is assigned to functions that are not applicable to the reach due to the water type present (i.e., estuary or stream) and the criteria used to assess the function.

4.2.6.1. Chehalis River Reach – North

The north side of the Chehalis River scored high (38 points) for functions overall primarily because it is currently undeveloped and retains good vegetation structure and hydrologic functions. The subreach is dominated by forest and shrub wetland and is within the tidal surge plain of the Chehalis River, a regionally unique habitat area used by a variety of priority aquatic and shoreline dependent species including wood ducks (Figure 10.4 in Appendix A) and numerous salmon and trout species. The subreach is rated low for the function of maintaining temperatures. It is unlikely that the forest in the subreach is significant enough to regulate water temperatures based on the limited density and coverage in the subreach, and the relatively large size of the Chehalis River in this location. The wetlands could provide a source of cool water to the extent that there are groundwater discharges, but this is uncertain within the subreach. The historical channel migration zone extends to the city limits throughout this subreach.

4.2.6.2. Chehalis River Reach – South

The south bank is comparatively more developed than the north bank and ranks moderate overall for functions (20 points). It is characterized partly by a levee and reduced and altered vegetation. The subreach is ranked low for most criteria. The reach ranked high for removing excessive nutrients and toxic compounds as indicated by no known water quality impairments on the 303(d) list. Estuarine wetlands along the upstream (eastern) portion of the reach and forest wetlands in the surge plain along an unnamed slough (see Figure 2.4 in Appendix A) provide key habitat and water-quality functions that are relatively unimpaired by development compared to other portions of the reach. The reach ranks moderate for functions related to flood and surge protection and shoreline bank protection. Due to levee construction and fill, the entire reach is disconnected permanently from the remainder of its historical channel migration zone, with the exception of 1,000 feet upstream of the unnamed slough. Upstream (east) of the slough, all area within the city limits is within the historical channel migration zone.

4.2.6.3. Mill Creek Reach

Mill Creek ranks moderately for overall functions (32 points) primarily due to the presence of wetlands and quality vegetation cover in the northern portion of the reach. Eighty-seven percent of the reach is mapped as NWI wetland, entirely associated with the northern portion (Figure 2.4 in Appendix A). Fill and shoreline modifications such as culvert crossings and tide gates (Figure 7.4 in Appendix A) may impair hydrologic and habitat functions, particularly in the heavily developed southern portion of the reach. Mill Creek likely once meandered throughout the city, prior to substantial fill, development, and channelization. Therefore, a channel migration zone is no longer present in this constructed channel and floodplain.

Impairments to functions in the Cosmopolis shoreline jurisdiction are primarily related to the high levels of stream modification in both Mill Creek and the lower Chehalis River. It is expected that Mill Creek will improve once the restoration project described Section 4.2.8 is complete.

4.2.7. Recommended Environment Designations

Environment designations proposed for Cosmopolis are shown on Figure 17.4 in Appendix A. For all portions of the City's shoreline jurisdiction, lands that are waterward of the OHWM are designated Aquatic. Other proposed shoreline environment designations, including the criteria

used to determine the designation based on SMP Guidelines in WAC 173-26-211(2)(a), are described for various portions of the shoreline jurisdiction in the sections below.

4.2.7.1. *Chehalis River Reach*

High Intensity

Criteria for determining the proposed High Intensity environment designation for Chehalis River Reach includes the following:

1. The existing land use pattern is primarily manufacturing and open space. The High Intensity area on the south side of the river is highly developed.
2. The reach includes the Chehalis River, which has several priority habitat species including bull trout, Chinook salmon, chum salmon, coast resident cutthroat, coho salmon, steelhead trout, and the wood duck. The ecological functions of the Chehalis River indicate that it should be protected.
3. The Comprehensive Plan designations for the reach are:
 - a. Manufacturing - Groupings of similar or compatible industrial uses can improve the flow of shipping and employment traffic, as well as allowing firms to share facilities and services. Groupings also help reduce land use conflicts with less-intensive uses. Light industries are those with relatively minor impacts, such as electronic research and assembly, equipment repair, and light fabrication, with all activities customarily conducted inside a building. Heavy industries, such as wood processing, machinery manufacturing, mining operations, and port facilities, may have multiple impacts that are more complicated to mitigate, such as heavy truck traffic, noise, vibration, light, glare, and odors.
 - b. Waterfront Development - The Waterfront Development area should encourage the appropriate redevelopment of under-utilized and vacant waterfront areas suitable for a mix of uses. Because of the unique opportunities provided by access to shorelines of statewide significance, special provisions are included to ensure compatibility among these various uses. Public access to the shoreline should be addressed through the shoreline permit process for any proposed land use action.
4. The adopted zoning districts in the reach are:
 - a. Manufacturing (M) - The manufacturing district (M) is a classification to ensure facilities that can have severe impacts on an area are kept separate from other uses to preserve social and physical as well as economic wellbeing for the city.
 - b. Waterfront Use (WUD) - The Waterfront Use District (WUD) is a classification to provide the opportunity and reserve space for water-related activities that can benefit from Cosmopolis' waterfront location and to protect the allowed uses from incompatible activities, thereby encouraging the continued development of water-oriented, water-related, and water enjoyment uses within Cosmopolis, and uses that are compatible with those uses and foster a vibrant waterfront.

5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
6. High Intensity is proposed for areas zoned for Manufacturing and Waterfront Use.

Urban Conservancy

Criteria for determining the proposed environment designation for Chehalis River Reach (Urban Conservancy) includes the following:

1. The existing land use pattern is primarily open space. The area on the north side of the river is zoned for manufacturing yet is mostly covered with freshwater forested/shrub wetlands.
2. The reach includes the Chehalis River, which has several priority habitat species including bull trout, Chinook salmon, chum salmon, coast resident cutthroat, coho salmon, steelhead trout, and the wood duck. The ecological functions of the Chehalis River indicate that it should be protected. While the south bank of the Chehalis River is suited for industrial development, the north bank should be preserved.
3. The Comprehensive Plan designations for the reach are:
 - a. Manufacturing - Groupings of similar or compatible industrial uses can improve the flow of shipping and employment traffic, as well as allowing firms to share facilities and services. Groupings also help reduce land-use conflicts with less-intensive uses. Light industries are those with relatively minor impacts, such as electronic research and assembly, equipment repair, and light fabrication, with all activities customarily conducted inside a building. Heavy industries, such as wood processing, machinery manufacturing, mining operations, and port facilities, may have multiple impacts that are more complicated to mitigate, such as heavy truck traffic, noise, vibration, light, glare, and odors.
 - b. Public Reserve - A wide variety of lands should be preserved for park purposes, including: natural areas and natural features with outstanding scenic or recreational value; lands that may provide public access to rivers, creeks, sloughs, or the harbor; lands that define, through their natural features, the boundaries of urban and rural areas, including parks, trails, water features, and scenic corridors; lands that visually or physically connect natural areas, or provide important linkages for recreation, transportation facilities for pedestrians and bicyclists, and plant communities and wildlife habitat; and lands valuable for active and passive recreation, such as athletic fields, trails, fishing and boating, swimming, or picnic areas. The preferable locations for public safety facilities, such as police and fire stations, are in the public reserve zoned areas as well.

4. The adopted zoning districts in the reach are:
 - a. Manufacturing (M) - The Manufacturing District (M) is a classification to ensure facilities that can have severe impacts on an area are kept separate from other uses to preserve social and physical as well as economic wellbeing for the city.
 - b. Public Reserve (P-R) - The Public Reserve District (P-R) is a special use classification to provide for the retention of lands necessary for open space, parks, playgrounds, and public facilities.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration
6. Urban Conservancy is proposed for areas zoned for Public Reserve.

4.2.7.2. *Mill Creek Reach*

Shoreline Residential

Criteria for determining the proposed Shoreline Residential environment designation for Mill Creek Reach includes the following:

1. The residential area within the reach is relatively built out and falls within the floodway.
2. The Comprehensive Plan Designations for the reach are:
 - a. Public Reserve - A wide variety of lands should be preserved for park purposes, including: natural areas and natural features with outstanding scenic or recreational value; lands that may provide public access to rivers, creeks, sloughs, or the harbor; lands that define, through their natural features, the boundaries of urban and rural areas, including parks, trails, water features, and scenic corridors; lands that visually or physically connect natural areas, or provide important linkages for recreation, transportation facilities for pedestrians and bicyclists, and

- plant communities and wildlife habitat; and lands valuable for active and passive recreation, such as athletic fields, trails, fishing and boating, swimming, or picnic areas. The preferable locations for public safety facilities, such as police and fire stations, are in the public reserve zoned areas as well.
- b. Single Family Residential - The Single Family Residential area should protect and maintain single-family residential neighborhoods in a manner that ensures neighborhood revitalization. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.
3. The adopted zoning districts in the reach are:
- a. Public Reserve (PR) - The Public Reserve District P-R is a special use classification to provide for the retention of lands necessary for open space, parks, playgrounds, and public facilities.
 - b. Residential Low Density (R100) - The Residential Use District R-100 is a residential use classification requiring the lowest density of population within the city, providing protection against hazards, objectionable influences, building congestion, and lack of light, air, and privacy.
 - c. Residential Medium Density (R57) - The Residential Use District R-57 is a residential use classification permitting a higher density of population with a high degree of protection from hazards, objectionable influences, building congestion and lack of light, air, and privacy.
4. Specific designation criteria in WAC 173-26-211(5)(f)(iii): Assign a Shoreline Residential environment designation to shoreline areas inside incorporated municipalities if they are predominantly single-family or multi-family residential development or are planned and platted for residential development.

Urban Conservancy

Criteria for determining the proposed Urban Conservancy environment designation for Mill Creek Reach includes the following:

1. The existing land use pattern is primarily public reserve. It is largely undeveloped and includes freshwater forested/shrub.
2. The Comprehensive Plan Designations for the reach are:
 - a. Multiple Use Development - The Multiple Use area should provide the opportunity for appropriate types of professional, commercial, and multi-family residential development on the major highway routes through Cosmopolis while enabling the continuation of existing residential uses.

- b. Public Reserve - A wide variety of lands should be preserved for park purposes, including: natural areas and natural features with outstanding scenic or recreational value; lands that may provide public access to rivers, creeks, sloughs, or the harbor; lands that define, through their natural features, the boundaries of urban and rural areas, including parks, trails, water features, and scenic corridors; lands that visually or physically connect natural areas, or provide important linkages for recreation, transportation facilities for pedestrians and bicyclists, and plant communities and wildlife habitat; and lands valuable for active and passive recreation, such as athletic fields, trails, fishing and boating, swimming, or picnic areas. The preferable locations for public safety facilities, such as police and fire stations, are in the public reserve zoned areas as well.
 - c. Single Family Residential - The Single Family Residential area should protect and maintain single-family residential neighborhoods in a manner that ensures neighborhood revitalization. Suitable undeveloped areas are designated Single Family Residential to provide for increased residential development and to designate the major public parks, schools, and semi-public uses that currently exist or are proposed. The single-family residential area should provide a full range of low-intensity housing opportunities.
3. The adopted zoning districts in the reach are:
- a. Multiple Use (MU) - The Multiple Use district MU is a classification providing for the development of commercial establishments such as retail and wholesale outlets and high-density residential housing such as condominiums, townhouses, and apartments.
 - b. Public Reserve (PR) - The Public Reserve district P-R is a special use classification to provide for the retention of lands necessary for open space, parks, playgrounds, and public facilities.
 - c. Residential Medium Density (R57) - The Residential Use district R-57 is a residential use classification permitting a higher density of population with a high degree of protection from hazards, objectionable influences, building congestion and lack of light, air, and privacy.
4. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
- a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed

- c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration
5. Urban Conservancy is proposed for areas zoned Multiple Use, Public Reserve, and Residential Medium Density.

4.2.8. Restoration Opportunities

The primary restoration project that has been identified in Cosmopolis is the removal of the Mill Creek Dam and updates of culverts located below the dam, but upstream of the Chehalis River. The project will improve fish passage to high quality habitat upstream of Cosmopolis on Mill Creek and remove deleterious material from the stream. The project is currently in permit review and is scheduled for completion in the fall of 2015.

In addition to the Mill Creek Dam removal project, there are a large number of abandoned pilings throughout the Cosmopolis shoreline. See Section 4.1.8, *Aberdeen Restoration Opportunities*, for more information regarding abandoned pilings. Improving culverts and connectivity between the wetland and Chehalis River channel may also restore more ecological function in this reach.

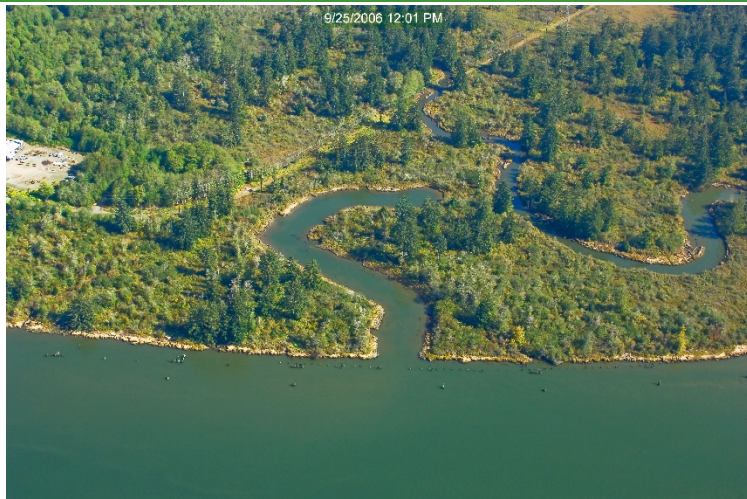
4.2.9. *Cosmopolis Photographs*



Mill Creek Dam Breach in Mill Creek Reach.



Mouth of Mill Creek with Control Structure in Chehalis River Reach - South in Cosmopolis.



Undeveloped Conditions in the Chehalis Reach - North in Cosmopolis.

4.3. City of Hoquiam

Hoquiam’s shoreline jurisdiction includes a long shoreline along Grays Harbor, with several reaches on the Hoquiam River and its tributary. In addition, the channel of Fry Creek at its mouth is mostly located in fill on Port of Grays Harbor property and is included within the shoreline jurisdiction.

Five reaches were identified for Hoquiam; their associated water body and shoreline area are provided in Table 4.16. Background on the City’s current SMP and applicable regulations such as critical areas code is provided in Sections 1.2.3 and 1.2.4.

Reach	Primary Water Body	Shoreline Area (acres)
East Hoquiam River Reach	East Fork Hoquiam River	53
Fry Creek Reach – Hoquiam	Fry Creek – Hoquiam	27
Grays Harbor Reach	Grays Harbor – Hoquiam	4778
Hoquiam River Reach (Includes west and east subreaches for functional assessment)	Hoquiam River	273
Little Hoquiam River Reach	Little Hoquiam River	165

4.3.1. Physical and Biological Characterization

This section discusses characteristic aspects of physical and biological conditions in Hoquiam’s shoreline jurisdiction. Refer to Section 3.2 for an overview of the terrain and physical processes that influence shorelines in Hoquiam.

All of the waters in Hoquiam’s shoreline jurisdiction are tidally influenced. The Grays Harbor shoreline in Hoquiam has more marine shoreline than other reaches in the cities. Tidal motions are influenced strongly by local topography, including fill, and freshwater sources. Most of the interactions of freshwater sources are mediated by shoreline modifications, mostly via culverts and tide gates, but also by a series of dikes and levees.

Sediment yield to the estuarine shorelines in Hoquiam has been reduced compared to the geologic past and therefore most of the rivers are naturally inset into their main channels. As a result, the shorelines in Hoquiam area are not dynamic. Rather, most of the navigation channels are actively dredged to be maintained (USACE 2011). Sediment comes from a variety of sources, including some sediment from as far away as the Columbia River (Gelfenbaum and Kaminsky 2010).

Current levels of LWD in Hoquiam are highly variable. Shorelines along Grays Harbor that have not been filled and which are exposed to deeper waters (typically those shorelines having south aspect) are rich with LWD. Filled areas are often armored and steep and therefore lack LWD. The Hoquiam River and its tributaries are also depleted with respect to LWD.

Historically, Hoquiam had enormous quantities of LWD. This is evident in the earliest detailed T-sheet of the area (US Coast and Geodetic Survey 1911), and even the name of the City means “hungry for wood” in a local Native American dialect (City of Hoquiam 2006).

Geologic hazards in the Hoquiam shoreline jurisdiction are summarized in Table 4.17. Hoquiam is susceptible to tsunamis, even though there are elevated portions of the City outside the Scenario 1A-tsunami-inundation zone (Venturato et al. 2007). Hoquiam is also very prepared with respect to tsunamis. Evacuation routes have been planned and are well signed (WDNR 2014b). In addition to tsunamis, liquefaction is a hazard particularly in and around the developed core of the City, largely due to the underlying fill.

Hazard Type	Percentage of Total Area	Reaches Affected
Tsunami	14	All
Seismic/Liquefaction ^a	19	All

^a Moderate to high liquefaction susceptibility

Similar to the other Cities, Hoquiam contains shorelines that are used by all six priority salmon and trout species. The Hoquiam River and its tributaries provide important migration habitat and contain known spawning areas used by Chinook, chum, and steelhead.

The lower Hoquiam River and Grays Harbor support a variety of nearshore vegetation including patches of eelgrass, saltmarsh, and dunegrass vegetation communities. Harbor seals and a variety of shorebirds and waterfowl use the estuarine shorelines in the City. The Grays Harbor Reach includes large areas of designated priority habitat for shorebirds, waterfowl, and peregrine falcons. Bald eagles and blue herons are also common. Rennie Island provides habitat used by bald eagles and blue herons for nesting and the isolated shoreline may provide a unique opportunity for refuge and foraging away from more intensely developed shorelines in the City.

Water quality impairments in Hoquiam listed in the Washington State 303(d) list include the Hoquiam River, a Category 2 for copper, and Grays Harbor for temperature (Category 2) and dioxin (Category 4). The 303(d) list does not indicate water quality problems in other reaches in the City.

4.3.2. Shoreline Use Analysis

Shoreline land uses in Hoquiam’s shoreline jurisdiction are comprised of General Commercial, Downtown Commercial, Industrial, Natural Resource, Low Density Residential, High Density Residential, Pedestrian Overlay, and Waterfront Overlay zoning districts.

There are five reaches in Hoquiam (see Table 2.2). Grays Harbor Reach is likely the most intensively used segment of the shoreline jurisdiction as it contains Bowerman Airport, as well as Port of Grays Harbor marine activities and logging and sawmill operations. However, Grays Harbor Reach also includes the Grays Harbor National Wildlife Refuge. The shoreline within Hoquiam River Reach, Grays Harbor Reach outside of the wildlife refuge, East Hoquiam River Reach, and Fry Creek Reach - Hoquiam Reach consists largely of low-intensity and high-intensity developments. Evergreen forests and woody wetlands cover most of Little Hoquiam River Reach (Figures 4.1-4.19 in Appendix A).

Based on a review of land cover and zoning maps, the current use categories considered most likely to meet the definition of “water-oriented uses” were selected:

- Industrial
- Waterfront Overlay District

The Hoquiam River Reach is zoned primarily for Industrial development and General Commercial. Hoquiam River Reach also includes High Density Residential zoning districts, which overlap with the Waterfront Overlay District. Grays Harbor Reach is zoned for Industrial use, but it also includes Natural Resource designations on Rennie Island. Grays Harbor Reach includes the majority of the heavy industrial uses within the shoreline jurisdiction, housing “water-oriented uses” such as the airport and the port.

Little Hoquiam River Reach is the least developed of the reaches and includes the most Low Density Residential designations. This reach remains largely undeveloped and it could potentially see new residential development. East Hoquiam River Reach is designated for Industrial and High Density Residential land uses. One water-oriented use exists within this reach, a lumber company that is located at the north end of the City along the Eastern Fork of the Hoquiam River. Fry Creek Reach is a smaller reach that is zoned nearly 100 percent Industrial. Water-oriented uses such as port related activities and industrial enterprises are present within this reach.

The City of Hoquiam has prioritized industrial development on its waterfront, as illustrated by Industrial zoning and the Waterfront Overlay District on lands adjacent to Grays Harbor. The Waterfront Overlay District allows a wide variety of development along the shoreline. Permitted development ranges from industrial to residential development in a planned unit development. Within the Waterfront Overlay District, industrial uses are permitted outright within Industrial zoned lands. Additionally, other uses such as recreation and community facilities are permitted if they are part of a planned unit development or mixed-use development.

The City of Hoquiam’s Comprehensive Land Use Plan supports continuing industrial uses, as does the Hometown Hoquiam Phase 2 Economic Development Strategic Action Plan: 2008--2012, which is adopted by reference in the Comprehensive Plan. A primary goal of the Hometown Hoquiam Phase 2 Plan is to support and grow industry by retaining existing industrial uses and attracting new enterprises to industrial land that is primarily located on Grays Harbor. There are large vacant sites along Hoquiam’s waterfront, including the former Harbor Paper mill and Port of Grays Harbor 150-acre Terminal 3, where new industrial uses may locate. Other major uses on the waterfront include Port of Grays Harbor’s Terminal 1 that operates as a barge and bulk liquid terminal and Bowerman Airport. Continuing industrial uses and industrial redevelopment should be anticipated in the Industrial areas adjacent to Grays Harbor.

4.3.2.1. Existing Land Use Patterns

East Hoquiam River Reach is currently used as platted land, industrial land, undeveloped land, lumber and wood products, and single-family households. The reach is mostly comprised

of woody wetlands (43 percent), low-intensity development (15 percent), barren land (12 percent), open water (11 percent), and emergent herbaceous wetlands (7 percent).

Fry Creek Reach - Hoquiam is currently utilized as industrial land with buildings and industrial land. It is highly developed, with 53 percent of the reach being low-intensity development, and 23 percent each of medium-intensity and high-intensity development.

Grays Harbor Reach is primarily comprised of Industrial land and wildlife habitat. This reach is mostly comprised of open water (36 percent), emergent herbaceous wetlands (26 percent), and barren land (19 percent), among other land covers. This reach includes developed areas such as Bowerman Airport, and undeveloped areas including Grays Harbor Estuary.

Hoquiam River Reach is currently utilized as industrial land, bare platted land, single-family households, commercial land, and undeveloped land, among other uses. Land cover varies throughout this reach, including open water (37 percent), low-intensity development (21 percent), medium-intensity development (11 percent), open space (10 percent), small amounts of barren land, high-intensity development, woody wetlands, emergent herbaceous wetlands, and evergreen forests.

Little Hoquiam River Reach is currently used as designated forest land, platted land, and undeveloped land. This reach is covered by woody wetlands (46 percent), evergreen forests (33 percent), low-intensity development (6 percent), and open space (5 percent), as well as small amounts of other land covers.

Shoreline jurisdiction land use in Hoquiam is shown in Table 4.18.

4.3.2.2. Projected Land Use Patterns

Zoning in East Hoquiam River Reach includes High Density Residential (29 acres) and Industrial (14 acres). This reach is relatively developed, and it does include one large plywood manufacturing plant. Future industrial development within this reach could occur south of the plywood manufacturing plant. The residential areas within this reach are built out; and as such, it is unlikely that there would be any high-density residential development in the future.

Zoning in Fry Creek Reach - Hoquiam consists of Industrial (26 acres). This area is highly developed. Any future development within this reach would be industrial in nature as that is the most suitable land use for this reach.

Zoning in Grays Harbor Reach includes Industrial (298 acres), Natural Resources (274 acres) and Low Density Residential (41 acres). Forty acres of this reach are included in the Waterfront Overlay District. While there is a significant portion of Natural Resource designated land within this reach, it is entirely on Rennie Island, which would likely not pose a threat for future development within the shoreline jurisdiction. The Industrial areas within this reach are largely built out and they include the airport and port activities. Any future development within this reach would likely be industrial in nature as that is the most suitable land use for this reach.

Table 4.18. Current Land Use Patterns in the Shoreline Jurisdiction of the City of Hoquiam.

Current Land Use Patterns	Percentage of Shoreline Area
Aircraft Transportation	22
All Other Residential Not Elsewhere Coded (Bare Land Platted & Outside Plats and Sheds in City Limits)	5
Automobile Parking – Parking Lots	< 1
Commercial Land	< 1
Commercial Land – with a Shed, Warehouse etc.	< 1
Commercial Land w/ Single Family Residence	< 1
Contract Construction Services	< 1
Designated Forest Land RCW 84.33	3
Finance, Insurance, & Real Estate Services	< 1
Governmental Services	< 1
Highway and Street Right-of-Way	< 1
Household, 2 to 4 Units	< 1
Household, Multi-Units (5 or more)	< 1
Household, Single Family Units	1
Industrial Land	57
Industrial Land With Building	4
Institutional Lodging	< 1
Lumber and Wood Products (Except Furniture)	< 1
Marine Craft Transportation	1
Misc. Manufacturing	< 1
Miscellaneous Services – Churches	< 1
Mobile Home Parks or Courts	< 1
Other Cultural, Entertainment, & Recreational	< 1
Other Retail Trade	< 1
Other Transportation, Communication, & Utilities not Classified Elsewhere – Water Systems	3
Parks	< 1
Professional Services	< 1
Recreational Activities – RV Parks	< 1
Repair Services	< 1
Retail Trade – Building Materials, Hardware, & Farm Equip.	< 1
Retail Trade – Eating and Drinking – Restaurants	< 1
Retail Trade – Food	< 1
Undeveloped Land	2
Wholesale Trade	< 1

Zoning in the Hoquiam River Reach consists of Industrial (48 acres), High Density Residential (37 acres), General Commercial (36 acres), Downtown Commercial (11 acres), and Natural Resources (2 acres). Eighty-four acres of this reach are included in the Waterfront Overlay District and seven acres are included in the Pedestrian Overlay District. Most of the land within this reach is developed. A few barren or platted areas exist, posing a potential for some development within this reach. However, due to the wetlands, this area may not be ideal for High Density development; and any other type of development would require changes in the adopted zoning code.

Zoning in Little Hoquiam River Reach consists of Low Density Residential (98 acres), Natural Resources (21 acres), High Density Residential (1 acre), and Industrial (0.5 acres). Most of this reach is covered by heavy forests and wetlands and it would not likely see any development in the future.

Planned land use in the shoreline jurisdiction of the City of Hoquiam is shown in Table 4.19. Current zoning designations are shown in Table 4.20.

4.3.3. Shoreline Modifications

There has been extensive fill along the entire length of the Grays Harbor shoreline. This includes the formation of a new peninsula that now contains the Bowerman Airport. Formerly Moon Island, at the west end of the airport, was an island separated from the mainland by a shallow tidal channel (US Coast and Geodetic Survey 1911). In addition to the fill, most of the shoreline along Grays Harbor that has been modified has required some sort of protection. This includes, but is not limited to the construction of levees, timber revetments, and placement of rock and other structural protection. Shoreline modifications in the Hoquiam shoreline jurisdiction are summarized in Table 4.21.

Along the rivers, there is less apparent shoreline modification, though small rock revetments and “sugar dikes” (i.e., small berms or levees comprised of pushed-up native soil) are common. The information on the rivers is limited and generally of poor quality. Abandoned piles, some of which may be creosote treated, are also common in the rivers.

4.3.4. Public Access Analysis

Hoquiam provides several ways for the public to enjoy the shoreline. Of the parks within the city, four offer shoreline access. At the Eighth Street Landing in Hoquiam River Reach, visitors enjoy 120 feet of public access to the Hoquiam River. The site includes four picnic tables and a shelter, as well as a boat dock for fishing and access to the river. Johnny Green Dike is a landscaped dike located between the Hoquiam River and Riverside Avenue. The park consists of open space, but a paved pathway on top of the dike is available for public use and provides a viewing point of the river.

The Little Hoquiam Boat Launch in Little Hoquiam River Reach provides public access to the Little Hoquiam River. The site includes one paved launch lane as well as parking for ten vehicles. The boat launch has 120 feet of shoreline frontage. Within Grays Harbor Reach, the Port of Grays Harbor Viewing Tower provides scenic views of the harbor and Rennie Island. A boat launch is also located at this site.

Table 4.19. Comprehensive Plan Designations Representing Planned Land Use in the Shoreline Jurisdiction of the City of Hoquiam.

Land Use Designation	Use Description	Percentage of Shoreline Area
Community Commercial District	The Community Commercial District focuses on retail, service, professional, and tourist-related uses.	3
Downtown Overlay District	Includes a mix of high-density residential development above the first floor of structures. The Downtown Overlay District encourages connections to the waterfront.	1
Industrial District	Industrial land uses associated with extraction, processing, transportation, distribution and wholesale activities are permitted. Industrial District lands have access to maritime, rail, aeronautical, and/or truck transportation systems. The district allows a mix of support activities as accessory uses in the district, such as offices, transshipment facilities, warehousing, and uses that benefit employees.	36
Natural Resource Production District	The Natural Resource Production District is designated for managing lands where the primary use is the commercial production and harvest of trees. Other allowed uses include passive recreation, educational uses, and public and private utilities.	28
Pedestrian Overlay District	The purpose of the Pedestrian Overlay is to provide for and result in the creation of safe, attractive, pedestrian friendly environment where pedestrians can incorporate physical activity, such as walking, into their daily routine. Priority is given to pedestrians over automobiles. Active commercial and services in the ground floor of buildings is encouraged.	1
Single Family Residential District	Single-family residences are permitted uses at a maximum density of five (5) dwelling units per acre. Duplex-family residences are permitted at a maximum density of ten (10) dwelling units per acre. □ Multi-family units are conditional uses at a maximum density of fifteen (15) dwelling units per acre.	13
General Residential District	Single-family residences are permitted uses at a maximum density of nine (9) dwelling units per acre. Duplex-family residences are permitted at a maximum density of eighteen (18) dwelling units per acre. Multi-family units are conditional uses at a maximum density of twenty-five (25) dwelling units per acre.	6
Waterfront Overlay District	The Waterfront District is an overlay that recognizes the unique character of the waterfront areas in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.	12

Table 4.20. Current Zoning Designations in the Shoreline Jurisdiction of the City of Hoquiam.

Designation	Symbol	Typical Uses	Percentage of Shoreline Area
General Commercial	C1	Automobile, heavy maintenance and repair shops; Automobile, RV, boat sales; Automobile service stations; Banks and financial services; Bars, cocktail lounges, and taverns; Contractor yards; Day care centers; Drive-through facilities; Farmers' market; Food processing; Freight terminals; Hospitals, medical and dental clinics; Industry, light and within a structure; Motels and hotels; Office and business parks; Professional services; Restaurants; Retail sales; Truck and heavy equipment sales and services; Veterinary hospitals and kennels; Warehousing.	3
Downtown Commercial	C2	Automobile, RV, boat sales; Automobile service stations; Banks and financial services; Bars, cocktail lounges, and taverns; Bed and breakfast inns; Day care centers; Dwellings, multi-family with five or more units; Dwellings, multi-family with four or less units; Farmer's market; Food processing; Hospitals, medical and dental clinics; Motels and hotels; Parks, public; Recreational facilities; Restaurants; Retail sales.	1
Industrial	I	Asphalt, rock crushing, and concrete batch plants; Automobile, heavy maintenance and repair shops; Automobile wrecking, towing, or junkyards; Contractor yards; Food processing; Freight terminals; Hospitals, medical and dental clinics; Industry, heavy; Industry, light and within a structure; Mini-storage facilities; Outdoor storage; Small engine sales, service and repair; Ship terminals, slips, and repair facilities; Truck and heavy equipment sales and services; Warehousing; Wholesale liquefied petroleum sales; Wholesale sales and product distribution centers.	36
Natural Resources	NR	Parks, public; Recreational facilities; Timberland production.	28
Pedestrian Overlay District		Automobile, RV, boat sales; Automobile service stations; Banks and financial services; Bars, cocktail lounges, and taverns; Bed and breakfast inns; Day care centers; Farmer's market; Food processing; Hospitals, medical and dental clinics; Motels and hotels; Parks, public; Recreational facilities; Restaurants; Retail sales.	1

Designation	Symbol	Typical Uses	Percentage of Shoreline Area
Low Density Residential	R1	Dwellings: duplex, manufactured, multi-family with four or less units, single-family; Family childcare providers; Home occupations.	13
High Density Residential	R2	Dwellings: duplex, manufactured, multi-family with five or more units, multi-family with four or less units, single-family; Family child care providers; Home occupations; Hospitals, medical and dental clinics; Manufactured home parks; Personal services; Restaurants, 20 seats or less.	6
Waterfront Overlay District	WF-1	Community facilities; Dwellings, multi-family with five or more units; Dwellings, multi-family with four or less units; Dwellings, single-family; Marina facilities; Motels and hotels; Parks, public; Personal services; Places for religious worship; Professional services; Recreational facilities; Retail sales.	12

Reach	Percentage of Fill	Total Number of Barriers
East Hoquiam River Reach	41	2
Fry Creek Reach – Hoquiam	100	2
Grays Harbor Reach	23	9
Hoquiam River Reach (Includes west and east subreaches)	39	18
Little Hoquiam River Reach	7	7

Within Hoquiam River Reach, Riverside Dike Park provides access to hiking trails along the Hoquiam River. Bowerman Basin in Grays Harbor National Wildlife Refuge is a prime area for bird watching.

The City also recommends in its Comprehensive Plan that two waterfront properties located in Hoquiam River Reach along Levee Street and totaling approximately 5 acres be acquired. The properties currently include a boat launch and park. Once acquired, the City plans to upgrade the boat launch facility to include a paved launch as well as a boarding ramp that would be ADA accessible to passengers. Capacity for up to 30 vessels to be moored would also be added to the site.

The 2011-2017 Comprehensive Park and Recreation Plan for Hoquiam serves to establish goals for providing recreational opportunities within the City and strategies for accomplishing them. There are a few recreation facility recommendations that the City has already begun to

make progress on. The City should continue to expand access to the shoreline by developing the additional public recreational facilities that have been identified in the plan.

The City recommends in its Comprehensive Park and Recreation Plan that all parks be connected by safe pedestrian pathways. The Little Hoquiam Boat Launch is currently inaccessible by sidewalk making it hard for residents to safely access and enjoy the shoreline. The City plans to pursue grant funding to add a sidewalk from the surrounding neighborhood to the boat launch. The City also plans to upgrade the existing boat ramp to make it safe for public use.

The City identifies two properties along the Hoquiam River to be acquired. One of the properties includes a boat launch and the City plans to upgrade the boat launch facility to be ADA accessible and construct a public moorage area for up to 30 vessels.

The Grays Harbor County Public Health and Social Services department is currently working on an active transportation plan titled *Connect Grays Harbor*. A project priority of this plan is the Rails to Trails program at Riverside Bridge North. The plan is looking at ways of increasing safety on this path at the corner of Chenault Avenue. The trails listed in this section will be included in the plan as existing bicycle and recreation paths. Additional paths and extensions of paths are also being considered based on a public input process. Several multi-use trails have been proposed along the Hoquiam River and at the mouth of the river along the harbor. Paddleboard and kayak rental locations have been proposed along the Hoquiam River.

4.3.5. Shoreline Land Capacity Analysis

The shoreline jurisdiction in Hoquiam contains 440 parcels. Of these parcels, 22 percent are vacant and it appears approximately 13 percent of the parcels are protected from development by public or conservation group ownership, conservation easements, or similar mechanisms. It was not possible to determine what percent of parcels have a non-conforming structure.

The city's shoreline is designated entirely for urban land uses. City land use designations in the shoreline jurisdiction include General Commercial (C1), Downtown Commercial (C2), Industrial (I), Natural Resource (NR), Low Density Residential (R1) and High Density Residential (R2), Pedestrian Overlay District and Waterfront Overlay District.

Based on these land use designations, the most intense use of property occurs within the Industrial and Natural Resource designated lands found in a majority (64 percent) of the city's shoreline jurisdiction. Most of new residential development capacity in shoreline jurisdiction exists in the R1 Low Density Residential land use designation and consists of vacant land that can be subdivided (38 acres). Within the R2 High Density Residential land use designation 25 acres exist that are underutilized and could be further subdivided.

Commercial and industrial land uses are found in the city's shoreline jurisdiction. Approximately 12 acres of vacant and underutilized commercial land is within the city's shoreline jurisdiction. The existing zoning allows some opportunity for nonwater-oriented uses in the city's shoreline jurisdiction, particularly in the General Commercial and Downtown

Commercial zoning districts. These zones allow a wide variety of uses, providing the potential for future use conflicts.

The city's shoreline jurisdiction contains land for water-enjoyment uses associated with recreation at several City parks as well as two vacant parcels along the Hoquiam River, which the City plans to develop as a waterfront park and boat access.

4.3.6. Reach Functional Assessment

Table 4.22 provides a summary of the reach functional assessment for Hoquiam. For the purposes of the reach functional assessment, the Hoquiam River Reach was divided into two units or subreaches called west and east (Appendix A, Figure 9.1) because of visually apparent differences in the existing land use and development patterns along the reach. The west unit includes the more intensively developed and modified western shoreline of the river and both sides of the lower segment of the river up to the northern extent of mapped shoreline modifications (see Appendix A, Figure 5.1).

Note that not all functions and their related assessment criteria are applicable to both estuary and freshwater reaches within the Hoquiam shoreline jurisdiction. Not applicable (NA) is assigned to functions that are not applicable to the reach due to the water type present (i.e., estuary or stream) and the criteria used to assess the function.

The scores for reaches in Hoquiam ranged between low scores (16 points) in Fry Creek and the Hoquiam River - west subreach, and a high score of (38 points) in the Little Hoquiam River reach. Low to moderate scores for reaches in Hoquiam are primarily because of the extensive fill, levees, and armoring present in most of the reaches. The scores reflect lower levels of ecological functions that are common for developed urban shorelines throughout the region.

4.3.6.1. East Hoquiam River Reach

The East Hoquiam River Reach is ranked moderate for overall functions (28 points). A significant wetland area east of Broadway Avenue contains most of the wetlands in the reach (62 percent of the reach is mapped as wetland in the NWI). The wetland is bisected by a road and adjacent disturbed vegetation north of the houses along Broadway Villa Drive, but contributes to shoreline functions in all three categories (hydrologic, water quality, and habitat) nonetheless. Depending on future development plans, the wetland could potentially benefit from vegetation planting to improve buffer conditions between the less impacted portion to the north and the housing development to the south.

The stream in this reach supports a variety of salmon and provides habitat for Chinook and chum spawning. For other salmon species, it is an important rearing area and migration route to spawning grounds further upstream outside the city limits. Although a channel migration zone was not formally mapped, it is likely that the East Hoquiam River historical channel migration zone extends from valley wall to valley wall, which encompasses much of the Woodlawn neighborhood. Hydrologic and habitat functions in the reach may be reduced by shoreline modifications including hard armoring along the east bank (Figure 5.1 in Appendix A) and piling along the channel.

Table 4.22. Functions Assessment for Hoquiam.

Function	Hydrologic Functions				Water Quality Functions				Habitat Functions								
	Floodwater Storage/ Flood Protection and Surge Protection	Floodwater Storage/ Flood Protection and Surge Protection	Floodwater Storage/ Flood Protection and Surge Protection	Support of Base Flow and Groundwater (freshwater shorelines)	Maintaining Temperature	Removing Excessive Nutrients and Toxic Compounds	Removing Excessive Nutrients and Toxic Compounds	Sediment Removal and Stabilization	Sediment/Bank Stabilization and Shoreline Protection	Attenuation of Wave Energy	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food Production and Delivery	Physical Space and Conditions, and Food Production and Delivery	Provision and Redistribution of Woody Debris and Organic Material	Provision and redistribution of woody debris and organic material	Total Score
Criteria ^a	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Reach Name																	
East Hoquiam River Reach	2	1	2	3	1	3	2	2	2	2	2	NA	1	2	2	1	28
Fry Creek Reach	1	1	1	1	1	2	1	1	1	1	1	NA	1	1	1	1	16
Grays Harbor Reach	1	1	3	NA	1	1	1	2	3	3	2	3	2	2	2	2	29
Hoquiam River Reach – West	1	1	1	1	1	2	1	1	1	1	1	NA	1	1	1	1	16
Hoquiam River Reach – East	1	NA	2	1	1	2	2	1	2	1	2	NA	1	3	2	1	22
Little Hoquiam River Reach	3	2	3	2	2	3	2	3	2	2	3	NA	3	3	2	3	38

^a Criteria are described in Table 2.4 for each corresponding number (1 through 16).

NA = Not applicable is assigned to functions that are not applicable to the reach due to the water type present (i.e., estuary or stream) and the criteria used to assess the function.

4.3.6.2. *Fry Creek Reach*

Fry Creek is ranked low for functions overall (16 points). The reach is highly modified from historical conditions by fill and channelization. Fry Creek likely once meandered throughout the city, prior to substantial fill, development, and channelization. Therefore, a channel migration zone is no longer present in this constructed channel and floodplain. The reach does not contain nearshore vegetation or significant wetlands except for a small amount (approximately 260 feet) that is more associated with the Grays Harbor shoreline (described below) than the Fry Creek stream reach (see Figure 11.1 in Appendix A). The dominant land cover (46 percent) is medium- and high-intensity development indicating significant impervious surface and poor vegetation conditions. These conditions affect reach functions in all three function categories. Coho salmon and cutthroat trout are documented in the reach. However, the habitat is of low quality due to channel simplification and barriers that likely prevent migration into upstream portions of the watershed. There is a tide gate in the western Fry Creek channel (Figure 7.1 in Appendix A). Many of the potential barriers, however, are in Aberdeen and outside of the shoreline jurisdiction.

4.3.6.3. *Grays Harbor Reach*

The Grays Harbor reach ranked moderate for functions overall (29 points), primarily due to habitat features that support numerous priority species, despite a wide range of shoreline modifications that reduce other functions of the shoreline in many respects. Shoreline functions vary widely between portions of the reach. Throughout much of the reach, functions are impaired by extensive shoreline armoring, levees, impervious surface, and relatively poor riparian vegetation. However, the Grays Harbor Reach includes large areas of priority habitat for shorebirds, waterfowl, and peregrine falcons, among other species. A significant portion of the Grays Harbor National Wildlife Refuge occurs in this reach in the Bowerman Basin between Moon Island (Bowerman Airport) and the north shore along SR 109 (Figure 10.1 in Appendix A). In the Bowerman Basin, the wildlife refuge (see Federal Government in Figure 12.1, Appendix A) and the Port of Grays Harbor contain important habitat that also supports priority nearshore vegetation and dunegrass communities (Figure 11.1 in Appendix A). Rennie Island and the north shore of Grays Harbor in the eastern portion of the reach also contain important nearshore and riparian vegetation communities. Estuarine wetlands, saltmarsh, and freshwater emergent wetlands are prevalent in Bowerman Bay and around Rennie Island, and provide functions related to sediment stabilization, bank protection, and habitat diversity for shoreline-dependent species. There is a forested wetland west of South Adam Street that likely provides water-quality functions and additional habitat functions. Wetlands are less common in the more developed areas, much of which are built on historical fill and not supporting shoreline functions to the same degree as less developed areas in the reach.

4.3.6.4. *Hoquiam River Reach - West*

The west subreach of the Hoquiam River is ranked low (16 points) primarily due to extensive levees in the lower portion (most of which are armored and hard shorelines), as well as impervious surface and poor vegetative conditions. Due to levee construction and fill, the entire reach is disconnected permanently from nearly all of the remainder of its historical channel migration zone.

4.3.6.5. Hoquiam River Reach – East

The east subreach of the Hoquiam River (22 points) is comparatively less developed than the west subreach and therefore likely provides a higher level of function. A moderate level of ecological function is due to healthy riparian vegetation conditions through much of the reach and less armoring. The levee is limited to the southern portion of the reach, while the northern portion has few shoreline modifications. However, due to levee construction and fill, the entire reach is disconnected permanently from nearly all of the remainder of its historical channel migration zone. The reach has few wetlands present, which reduces the ecological functions provided by wetlands. The stream is used by a variety of salmon for rearing, spawning, and migration. It is also an important corridor to key habitat areas in the upper watershed outside the city limits.

4.3.6.6. Little Hoquiam River Reach

The Little Hoquiam River scored the highest (38 points) among reaches in Hoquiam. Most of the reach is in the floodplain, well vegetated, and undeveloped, providing good habitat conditions for a variety of species. Twenty-three percent of the reach is mapped as wetland in the NWI. Land-cover data shows that forest and shrub wetlands cover 46 percent of the reach, indicating that additional wetlands may be present that are not mapped in the NWI, particularly along low-lying areas of the stream's floodplain. The historical channel migration zone for the Little Hoquiam River extends from valley wall to valley wall, which for the lower portion of the reach is approximately between SR 109 and Endresen Road. The upper portion is wider, likely encompassing the mapped floodplain.

4.3.7. Recommended Environment Designations

Environment designations proposed for Hoquiam are shown on Figure 17.1 in Appendix A. For all portions of the City's shoreline jurisdiction, lands that are waterward of the OHWM are designated Aquatic. Other proposed shoreline environment designations, including the criteria used to determine the designation based on SMP Guidelines in WAC 173-26-211(2)(a), are described for various portions of the shoreline jurisdiction in the sections below.

4.3.7.1. East Hoquiam River Reach

High Intensity

Criteria for determining the proposed environment designation for East Hoquiam River Reach (Shoreline Residential/High Intensity) includes the following:

1. The existing land use pattern within this reach is developed with industrial uses that include a lumber and wood processing plant. The southern portion of the High Intensity area of the reach is undeveloped and contains a freshwater forested/shrub wetland.
2. Several fish species have been documented within the river including Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, and steelhead trout.

3. The Comprehensive Plan Designations for the reach are:
 - a. Industrial District - Industrial land uses associated with extraction, processing, transportation, distribution, and wholesale activities are permitted. Industrial District lands have access to maritime, rail, aeronautical, and/or truck transportation systems. The district allows a mix of support activities as accessory uses in the district, such as offices, transshipment facilities, warehousing, and uses that benefit employees.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The general purposes of the Industrial district are to provide a variety of manufacturing and marine-related uses in limited areas, which if located elsewhere would be unacceptable. The district protects residential and nonmanufacturing areas from adverse effects associated with industrial activity.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
6. High Intensity is proposed for areas zoned for Industrial.

Shoreline Residential

Criteria for determining the proposed Shoreline Residential environment designation for the East Hoquiam River Reach (Shoreline Residential) includes the following:

1. The existing land use pattern within this reach is primarily high-density residential and undeveloped wetland.
2. An undeveloped freshwater forested/shrub wetland that intersects the 100-year floodplain comprises a large portion of this reach. Several fish species are documented within the East Fork of the Hoquiam River including Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, and steelhead trout.
3. The Comprehensive Plan Designations for the reach are:
 - a. Single Family Residential District - Single-family residences are permitted uses at a maximum density of five (5) dwelling units per acre. Duplex-family residences are permitted at a maximum density of ten (10) dwelling units per acre. Multi-family units are conditional uses at a maximum density of fifteen (15) dwelling units per acre. This designation comprises a very minimal amount of the reach.
 - b. General Residential District - Single-family residences are permitted uses at a maximum density of nine (9) dwelling units per acre. Duplex-family residences are permitted at a maximum density of eighteen (18) dwelling units per acre. Multi-

- family units are conditional uses at a maximum density of twenty-five (25) dwelling units per acre.
4. The adopted zoning districts in the reach are:
 - a. Low Density Residential (R-1) - The general purpose of the Low Density Residential district is to encourage sustainable residential development patterns within the community. The R-1 zone accommodates single-family residences including duplexes, triplexes, and fourplexes at a density of up to five (5) dwelling units per acre. This zoning designation comprises a very minimal amount of the reach.
 - b. High Density Residential (R-2) - The general purpose of the High Density Residential district is to accommodate single-family residences including duplexes, triplexes, and fourplexes at a density of nine (9) per acre and multi-family at twenty-five (25) per acre.
 5. Specific designation criteria in WAC 173-26-211(5)(f)(iii): Assign a Shoreline Residential environment designation to shoreline areas inside incorporated municipalities if they are predominantly single-family or multi-family residential development or are planned and platted for residential development.
 6. Shoreline Residential is proposed for areas zoned Low Density Residential and High Density Residential.

4.3.7.2. Fry Creek Reach

High Intensity

Criteria for determining the proposed environment designation for Fry Creek Reach (High Intensity) includes the following:

1. The existing land use pattern is exclusively industrial.
2. The area contains Port of Grays Harbor developments and other industrial activities that are water-oriented. Fry Creek is home to some fish species such as Coast Resident Cutthroat trout and Coho salmon. The area is also home to peregrine falcon, a priority wildlife species.
3. The Comprehensive Plan Designations for the reach are:
 - a. Community Commercial District - The Community Commercial District focuses on retail, service, professional, and tourist-related uses. The land area in this Comprehensive Plan Designation in Fry Creek Reach is negligible.
 - b. Industrial District - Industrial land uses associated with extraction, processing, transportation, distribution, and wholesale activities are permitted. Industrial District lands have access to maritime, rail, aeronautical, and/or truck transportation systems. The district allows a mix of support activities as accessory uses in the district, such as offices, transshipment facilities, warehousing, and uses that benefit employees.

4. The adopted zoning districts in the reach are:
 - a. General Commercial (C-1) - The general purposes of the General Commercial district are to provide appropriate commercial areas for retail and service establishments, neighborhood convenience stores and office uses required by residents of the City in a manner consistent with the Comprehensive Plan. The land area in this Comprehensive Plan Designation in Fry Creek Reach is negligible.
 - b. Industrial (I) - The general purposes of the Industrial district are to provide a variety of manufacturing and marine-related uses in limited areas, which if located elsewhere would be unacceptable. The district protects residential and nonmanufacturing areas from adverse effects associated with industrial activity.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
6. High Intensity is proposed for areas zoned for General Commercial and Industrial.

4.3.7.3. Grays Harbor Reach

High Intensity

Criteria for determining the proposed environment designation for Grays Harbor Reach (High Intensity) includes the following:

1. The primary land use within this reach is industrial. Both the Port of Grays Harbor and the City of Hoquiam have significant holdings within the shoreline jurisdiction.
2. The area is particularly suited for high-intensity uses, water-oriented, and water-related uses.
3. The Comprehensive Plan Designations for the reach are:
 - a. Industrial District - Industrial land uses associated with extraction, processing, transportation, distribution, and wholesale activities are permitted. Industrial District lands have access to maritime, rail, aeronautical, and/or truck transportation systems. The district allows a mix of support activities as accessory uses in the district, such as offices, transshipment facilities, warehousing, and uses that benefit employees.
 - b. Waterfront Overlay District - The Waterfront District is an overlay that recognizes the unique character of the waterfront areas in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.

4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The general purposes of the Industrial district are to provide a variety of manufacturing and marine-related uses in limited areas, which if located elsewhere would be unacceptable. The district protects residential and nonmanufacturing areas from adverse effects associated with industrial activity.
 - b. Waterfront Overlay District - The Waterfront district is an overlay that recognizes the unique character of the waterfront area in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
6. High Intensity is proposed for areas zoned for Industrial.

Urban Conservancy

Criteria for determining the proposed environment designation for Grays Harbor Reach (Urban Conservancy) includes the following:

1. The primary land use within this portion of the reach is undeveloped wetland. Along the northern side of the inlet, the shoreline is zoned for low-density residential; however, it falls within an estuarine and marine wetland that is completely undeveloped. This portion of the Grays Harbor Reach includes the Grays Harbor National Wildlife Refuge and Rennie Island.
2. The Comprehensive Plan Designations for the reach are:
 - a. Industrial District - Industrial land uses associated with extraction, processing, transportation, distribution, and wholesale activities are permitted. Industrial District lands have access to maritime, rail, aeronautical, and/or truck transportation systems. The district allows a mix of support activities as accessory uses in the district, such as offices, transshipment facilities, warehousing, and uses that benefit employees.
 - b. Natural Resource Production District - The Natural Resource Production District is designated for managing lands where the primary use is the commercial production and harvest of trees. Other allowed uses include passive recreation, educational uses, and public and private utilities.
 - c. Single Family Residential District - Single-family residences are permitted uses at a maximum density of five (5) dwelling units per acre. Duplex-family residences are permitted at a maximum density of ten (10) dwelling units per acre. Multi-family units are conditional uses at a maximum density of fifteen (15) dwelling units per acre.

3. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The general purposes of the Industrial district are to provide a variety of manufacturing and marine-related uses in limited areas, which if located elsewhere would be unacceptable. The district protects residential and nonmanufacturing areas from adverse effects associated with industrial activity.
 - b. Natural Resources (NR) - The general purposes of the Natural Resources district are to provide flexibility in the newly annexed area of the city for future development while limiting urban sprawl. The natural resource district is primarily used for the commercial production and harvesting of trees. Additionally, it is available for passive recreational activities, educational uses, and public and private utilities.
 - c. Low Density Residential (R-1) - The general purposes of the Low Density Residential district are to encourage sustainable residential development patterns within the community. The R-1 zone accommodates single-family residences including duplexes, triplexes, and fourplexes at a density of up to five (5) dwelling units per acre.
4. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:
 - a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration
5. Urban Conservancy is proposed for areas zoned Low Density Residential, Natural Resources, and the wetland area zoned industrial.

4.3.7.4. Hoquiam River Reach

High Intensity

Criteria for determining the proposed environment designation for Hoquiam River Reach (High Intensity) includes the following:

1. The existing land use pattern is primarily industrial and commercial.

2. The area is relatively developed. The river is home to several priority habitat species including Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, steelhead trout, peregrine falcons, and purple martin North American swallows.
3. The Comprehensive Plan Designations for the reach are:
 - a. Community Commercial District - The Community Commercial District focuses on retail, service, professional, and tourist-related uses.
 - b. Downtown Overlay District - Includes a mix of high-density residential development above the first floor of structures. The Downtown Overlay District encourages connections to the waterfront.
 - c. Industrial District - Industrial land uses associated with extraction, processing, transportation, distribution, and wholesale activities are permitted. Industrial District lands have access to maritime, rail, aeronautical, and/or truck transportation systems. The district allows a mix of support activities as accessory uses in the district, such as offices, transshipment facilities, warehousing, and uses that benefit employees.
 - d. Pedestrian Overlay District - The purpose of the Pedestrian Overlay is to provide for and result in the creation of safe, attractive, pedestrian friendly environment where pedestrians can incorporate physical activity, such as walking, into their daily routine. Priority is given to pedestrians over automobiles. Active commercial and services in the ground floor of buildings is encouraged.
 - e. Waterfront Overlay District - The Waterfront District is an overlay that recognizes the unique character of the waterfront areas in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.
4. The adopted zoning districts in the reach are:
 - a. General Commercial (C-1) - The general purposes of the General Commercial district are to provide appropriate commercial areas for retail and service establishments, neighborhood convenience stores and office uses required by residents of the City in a manner consistent with the Comprehensive Plan.
 - b. Downtown Commercial (C-2) - The general purposes of the Downtown Commercial district are to accommodate a mix of uses that have occurred over time in the city's downtown area. This district makes provision for retail uses on the ground floor of structures and promotes a mix of uses on the upper floors of historic buildings including residences, hotels, art studios, and professional offices.
 - c. Industrial (I) - The general purposes of the Industrial district are to provide a variety of manufacturing and marine-related uses in limited areas, which if located elsewhere would be unacceptable. The district protects residential and nonmanufacturing areas from adverse effects associated with industrial activity.

- d. Pedestrian Overlay District - The purpose of the Pedestrian Overlay is to provide for and result in the: (a) creation of a safe, attractive, pedestrian-friendly environment where pedestrians can incorporate physical activity, such as walking, into their daily routine; (b) creation of a district where priority is given to pedestrians over automobiles; and (c) encourage active commercial and service uses in the ground floor of buildings.
 - e. Waterfront Overlay District - The Waterfront district is an overlay that recognizes the unique character of the waterfront area in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.
5. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses".
 6. High Intensity is proposed for areas zoned for General Commercial, Downtown Commercial, and Industrial.

Shoreline Residential

Criteria for determining the proposed environment designation for Hoquiam River Reach (Shoreline Residential) includes the following:

1. The existing land use pattern includes 36 acres of high-density residential housing.
2. The area is relatively built out with some undeveloped land existing on the eastern side of the river. The river is home to several priority habitat species including Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, steelhead trout, peregrine falcons, and purple martin North American swallows.
3. The Comprehensive Plan Designations for the reach are:
 - a. General Residential District - Single-family residences are permitted uses at a maximum density of nine (9) dwelling units per acre. Duplex-family residences are permitted at a maximum density of eighteen (18) dwelling units per acre. Multi-family units are conditional uses at a maximum density of twenty-five (25) dwelling units per acre.
 - b. Waterfront Overlay District - The Waterfront District is an overlay that recognizes the unique character of the waterfront areas in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.

4. The adopted zoning districts in the reach are:
 - a. High Density Residential (R-2) - The general purpose of the High Density Residential district is to accommodate single-family residences including duplexes, triplexes, and fourplexes at a density of nine (9) per acre and multi-family at twenty-five (25) per acre.
 - b. Waterfront Overlay District - The Waterfront district is an overlay that recognizes the unique character of the waterfront area in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.
5. Specific designation criteria in WAC 173-26-211(5)(f)(iii): Assign a Shoreline Residential environment designation to shoreline areas inside incorporated municipalities if they are predominantly single-family or multi-family residential development or are planned and platted for residential development.
6. Shoreline Residential is proposed for areas zoned High Density Residential.

Urban Conservancy

Criteria for determining the proposed environment designation for Hoquiam River Reach (Urban Conservancy) includes the following:

1. The 2.7 acres proposed for Urban Conservancy designation is undeveloped.
2. The river is home to several priority habitat species including Chinook salmon, chum salmon, coast resident cutthroat trout, coho salmon, steelhead trout, peregrine falcons, and purple martin North American swallows.
3. The Comprehensive Plan Designations for the reach are:
 - a. Natural Resource Production District - The Natural Resource Production District is designated for managing lands where the primary use is the commercial production and harvest of trees. Other allowed uses include passive recreation, educational uses, and public and private utilities.
4. The adopted zoning districts in the reach are:
 - a. Natural Resources (NR) - The general purposes of the Natural Resources district are to provide flexibility in the newly annexed area of the City for future development while limiting urban sprawl. The natural resource district is primarily used for the commercial production and harvesting of trees. Additionally, it is available for passive recreational activities, educational uses, and public and private utilities.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or

industrial "limited areas of more intensive rural development" if any of the following characteristics apply:

- a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration
6. Urban Conservancy is proposed for areas zoned Natural Resources.

4.3.7.5. Little Hoquiam River Reach

Shoreline Residential/High Intensity

Criteria for determining the proposed environment designation for Little Hoquiam River Reach (Shoreline Residential) includes the following:

1. The existing land use pattern within this reach is primarily single-family residential and natural resources. The reach does include one water-dependent industrial use, a small manufacturing company that is located along the river.
2. The reach is developed with single-family homes near the confluence of the Hoquiam River. The river retains many ecological functions and is home to several priority fish species such as coast resident cutthroat trout, coho salmon, and steelhead trout.
3. The Comprehensive Plan Designations for the reach are:
 - a. Industrial District - Industrial land uses associated with extraction, processing, transportation, distribution, and wholesale activities are permitted. Industrial District lands have access to maritime, rail, aeronautical, and/or truck transportation systems. The district allows a mix of support activities as accessory uses in the district, such as offices, transshipment facilities, warehousing, and uses that benefit employees.
 - b. Single Family Residential District - Single-family residences are permitted uses at a maximum density of five (5) dwelling units per acre. Duplex-family residences are permitted at a maximum density of ten (10) dwelling units per acre. Multi-family units are conditional uses at a maximum density of fifteen (15) dwelling units per acre.
 - c. General Residential District - Single-family residences are permitted uses at a maximum density of nine (9) dwelling units per acre. Duplex-family residences are permitted at a maximum density of eighteen (18) dwelling units per acre. Multi-

- family units are conditional uses at a maximum density of twenty-five (25) dwelling units per acre.
- d. Waterfront Overlay District - The Waterfront District is an overlay that recognizes the unique character of the waterfront areas in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The general purposes of the Industrial district are to provide a variety of manufacturing and marine-related uses in limited areas, which if located elsewhere would be unacceptable. The district protects residential and nonmanufacturing areas from adverse effects associated with industrial activity.
 - b. Low Density Residential (R-1) - The general purpose of the Low Density Residential district is to encourage sustainable residential development patterns within the community. The R-1 zone accommodates single-family residences including duplexes, triplexes, and fourplexes at a density of up to five (5) dwelling units per acre.
 - c. High Density Residential (R-2) - The general purpose of the High Density Residential district is to accommodate single-family residences including duplexes, triplexes, and fourplexes at a density of nine per acre and multi-family at twenty-five per acre.
 - d. Waterfront Overlay District - The Waterfront district is an overlay that recognizes the unique character of the waterfront area in Hoquiam and allows a wide variety of development along the shoreline. The use of waterfront property can range from industrial to residential development in a planned unit development.
 5. Specific designation criteria in WAC 173-26-211(5)(f)(iii): Assign a Shoreline Residential environment designation to shoreline areas inside incorporated municipalities if they are predominantly single-family or multi-family residential development or are planned and platted for residential development.
 6. Shoreline Residential is proposed for areas zoned Low Density Residential, High Density Residential, and Industrial.
 7. Specific designation criteria in WAC 173-26-211(5)(d)(iii): Assign a "high-intensity" environment designation to shoreline areas within incorporated municipalities, urban growth areas, and industrial or commercial "limited areas of more intensive rural development," as described by RCW 36.70A.070, if they currently support high-intensity uses related to commerce, transportation or navigation; or are suitable and planned for high-intensity "water-oriented uses."
 8. High Intensity is proposed for areas zoned for Industrial.

Urban Conservancy

Criteria for determining the proposed environment designation for Little Hoquiam River Reach (Urban Conservancy) includes the following:

1. The existing land use pattern within this reach is primarily undeveloped single-family residential and natural resources lands.
2. The river retains many ecological functions and is home to several priority fish species such as coast resident cutthroat trout, coho salmon, and steelhead trout.
3. The Comprehensive Plan Designations for the reach are:
 - a. Natural Resource Production District - The Natural Resource Production District is designated for managing lands where the primary use is the commercial production and harvest of trees. Other allowed uses include passive recreation, educational uses, and public and private utilities.
 - b. Single Family Residential District - Single-family residences are permitted uses at a maximum density of five (5) dwelling units per acre. Duplex-family residences are permitted at a maximum density of ten (10) dwelling units per acre. Multi-family units are conditional uses at a maximum density of fifteen (15) dwelling units per acre.
4. The adopted zoning districts in the reach are:
 - a. Industrial (I) - The general purposes of the Industrial district are to provide a variety of manufacturing and marine-related uses in limited areas, which if located elsewhere would be unacceptable. The district protects residential and nonmanufacturing areas from adverse effects associated with industrial activity.
 - b. Natural Resources (NR) - The general purposes of the Natural Resources district are to provide flexibility in the newly annexed area of the city for future development while limiting urban sprawl. The natural resource district is primarily used for the commercial production and harvesting of trees. Additionally, it is available for passive recreational activities, educational uses, and public and private utilities.
 - c. Low Density Residential (R-1) - The general purpose of the Low Density Residential district is to encourage sustainable residential development patterns within the community. The R-1 zone accommodates single-family residences including duplexes, triplexes, and fourplexes at a density of up to five (5) dwelling units per acre.
 - d. High Density Residential (R-2) - The general purpose of the High Density Residential district is to accommodate single-family residences including duplexes, triplexes, and fourplexes at a density of nine per acre and multi-family at twenty-five per acre.
5. Specific designation criteria in WAC 173-26-211(5)(e)(iii): Assign an "urban conservancy" environment designation to shoreline areas appropriate and planned

for development that is compatible with maintaining or restoring of the ecological functions of the area, that are not generally suitable for water-dependent uses, and that lie in incorporated municipalities, urban growth areas, or commercial or industrial "limited areas of more intensive rural development" if any of the following characteristics apply:

- a. They are suitable for water-related or water-enjoyment uses
 - b. They are open space, flood plain or other sensitive areas that should not be more intensively developed
 - c. They have potential for ecological restoration
 - d. They retain important ecological functions, even though partially developed
 - e. They have the potential for development that is compatible with ecological restoration
6. Urban Conservancy is proposed for areas zoned Low Density Residential and Natural Resources.

4.3.8. Restoration Opportunities

There are likely many potential restoration opportunities in Hoquiam's shoreline jurisdiction, primarily related to improvements in fish access to small tributary streams and off-channel wetlands by the improvement or removal of obsolete tide gates. Pile removal, as has occurred in Puget Sound, may also be a restoration opportunity.

The largest potential project is on Rennie Island. Rennie Island is a natural island just offshore of the mainland that was diked in the 1890s (USACE 1894). More recently, it was used as an impoundment for waste discharges (Houck 1983). In the late 1970s, the USACE analyzed modifying the existing levees that isolate the interior of the island from Grays Harbor, but decided to leave them as is at that time (Vincent 1978). Cleaning up any remnant contamination and removing the now obsolete levees could restore predevelopment geomorphic processes and provide significant habitat to rearing juvenile salmonids and other fish species.

4.3.9. Hoquiam Photographs



Fill at Bowerman Airport in Grays Harbor Reach in Hoquiam.



Former Channel and Development in East Fork Hoquiam Reach.



Fry Creek Reach in Hoquiam.



Hoquiam River Reach - East (right) and
Hoquiam River Reach - West (left).



Little Hoquiam Reach.



Rennie Island in Grays Harbor Reach.

5. DATA GAPS

Some non-salmonid species such as Pacific lamprey, eulachon, and Olympic mudminnow are not included in the PHS dataset or their distribution is not well documented. This is a data gap in terms of mapping their known distribution or habitats and evaluating potentially sensitive sites. For example, known Olympic mudminnow statewide distribution was illustrated by Mongillo and Hallock (1999) and WDFW (2013) but data on specific locations and possibly more recent observations may be available from WDFW but not included in the PHS dataset.

A comprehensive inventory of shoreline modifications was not available for the study area. What little data that does exist, from the Washington Coastal Atlas and Washington DNR ShoreZone database, has many errors (Ecology 2014). Detailed information regarding shoreline modifications such as bank armoring, water diversion inlets and outlets, and other areas of altered bank or bed conditions could be collected and compiled into a georeferenced database. This information could then be used to make informed decisions on future protection and restoration opportunities along the cities' shorelines. The information could also be used to monitor development over time and determine net increases or reductions. Similarly, a survey of habitat features such as LWD, substrate types, and riparian vegetation could inform site-specific management decisions for protection, restoration, and enhancement activities.

While there is existing geologic information on the cities (Rau 1986), high-resolution geologic maps that fully describe the recent geologic history of the area are needed. The region is on the long-term targeted list of 1:24,000 quadrangles to be collected by WDNR, but the work has not been scheduled or prioritized (WDNR 2014c). These maps provide valuable information on historic and existing physical conditions that are important for sound shoreline management decisions, particularly for documenting the presence of fill in nearshore areas.

Despite the intensity of use of nearshore areas and the relatively low-lying nature of the cities in general, there is no local tide gage for the cities. Though water levels are monitored regularly at Westport (NOAA 2014), this relatively new gage (installed in 1982) is likely much more strongly influenced by the Pacific Ocean than are shorelines in the cities and therefore not representative. Though modest tectonic uplift may limit the impact of sea level rise, understanding the complexities of inflow from the Chehalis, Wishkah, and Hoquiam rivers in relation to high marine water conditions would help maximize efficient land use through more accurate assessment of inundation risk.

Given the predictions made by SLAMM, a sea level rise model applicable to the area (Sandell and McAninch 2013), it is recommended that an analysis of sea level rise be performed to assess the performance of stormwater infrastructure in the cities over time, similar to a recent effort made by King County (King County 2008). Even though there is not significant subsidence in the area and historical sea level rise has been modest, the model results

indicate that a significant portion of the cities could be at risk of marine inundation within the next 100 years. These results suggest that flooding and salt contamination of low-lying portions of the cities is possible, particularly in low-lying areas such as north Hoquiam, south bank Aberdeen and certain areas of Cosmopolis (Sandell and McAninch 2013). These issues could be made worse by human-induced increases to runoff by stormwater infrastructure found by others (Rosenberg et al. 2010).

Other aspects of climate change and their influence on the physical conditions in the cities is also a data gap. For instance, it is clear from existing data that there are precipitation patterns in the cities (Western Regional Climate Center 2014), but it remains unknown whether these will change with time and how that will affect the physical conditions of shorelines in the cities.

6. SHORELINE MANAGEMENT RECOMMENDATIONS

The following are recommended actions for translating the inventory and characterization findings into draft policies for each City's SMP. This document will inform each City's SMP regulations, environment designations, and restoration strategies for areas within the shoreline jurisdiction. In addition to the following analysis-specific recommendations, the updated SMP should incorporate all other requirements of the SMA (Chapter 90.58 RCW) and the SMP Guidelines (Chapter 173-26 WAC).

In addition to the recommended shoreline environment designations described for each City, the following sections include recommendations for general policies and regulations for consideration by each City for their SMP.

6.1. Critical Areas

- Consider whether the critical areas regulations used by the jurisdictions in the cities should be incorporated into the SMP by reference or through direct inclusion. Either method of inclusion may require modification of the jurisdiction's critical areas regulations to meet SMA criteria (e.g., exceptions and exemptions, allowance for water-dependent uses).
- Aberdeen and Hoquiam have recently updated their Critical Areas Ordinances to meet the GMA best available science criteria. The City of Cosmopolis should update its Critical Area Ordinance to include best available science.

6.2. Flood Hazard Reduction

- Consistent with the WAC provisions in the SMP Guidelines, provide maximum flexibility for developing and maintaining flood hazard reduction measures as needed to continue protection of existing developed areas.

6.3. Public Access

- Recognize vision of the jurisdictions in the cities for parks, trails, and natural areas as a shoreline public access plan.

6.4. Vegetation Conservation (Clearing and Grading)

- Build on the existing protections provided the critical areas regulations and current SMP of the Cities, paying special attention to measures that will promote retention of shoreline vegetation and development of a well-functioning shoreline, which provides both physical and habitat processes.
- Ensure clear regulations for selective pruning of trees for safety and view protection as may be allowed per WAC 173-26-221(5)(c).

6.5. Water Quality

- Include policies and regulations that appropriately incorporate recommendations of the water quality-related studies prepared for the Cities, particularly as related to impaired parameters listed by Ecology.
- Ensure that regulations allow for placement of any structures or facilities in the shoreline jurisdiction for improving water quality, as long as impacts are identified and mitigated, if necessary.
- Consider adding clarifying statements noting that the policies of the SMP are also policies of the Comprehensive Plans of each of the Cities, and that the policies also apply to activities outside the shoreline jurisdiction that affect water quality within the shoreline jurisdiction. However, the regulations apply only within the shoreline jurisdiction.
- Consider policies which seek to improve water quality, quantity (the amount of water in a given system, with the objective of providing for ecological functions and human use), and flow characteristics in order to protect and restore ecological functions and ecosystem-wide processes of shorelines within the shoreline jurisdiction.

6.6. Shoreline Modification Provisions

6.6.1. Shoreline Stabilization

- Ensure that the definitions and standards for replacement and repair are consistent with WAC 173-26-231(3)(a). "Repair" activities should be defined to include a replacement threshold so that applicants and staff will know when "replacement" requirements need to be met.
- Fully implement the intent and principles of the SMP Guidelines. Reference appropriate exemptions found in the WAC related to normal maintenance, repair, and construction of the normal bulkhead common to single-family residences. These are not exemptions from the regulations, however; they are exemptions from a Shoreline Substantial Development Permit.
- Give preference to those types of shoreline modifications that have a lesser impact on ecological functions. Policies should promote "soft" over "hard" shoreline modification measures. Preference should also be given to existing structures or those can be constructed entirely above the OHWM, and use vegetation and other natural materials (i.e., LWD) as the primary basis for protection.
- Incentives should be included in the SMP that would encourage modification of existing armoring, where feasible, to improve habitat while still maintaining any necessary site use and protection.

6.6.2. *Piers and Docks*

- Provide clear replacement and repair definitions and standards. “Repair” activities should be defined to include a replacement threshold so that applicants and staff will know when “replacement” requirements need to be met.
- Assess dimensional and other standards for new piers and replacement/modified piers contained in the existing SMP and update as needed to provide clarity.
- Consider standards that address materials such as grated decking for dock and pier replacements/modifications that may be proposed in the future along the shoreline.
- Be consistent with WDFW and USACE design standards, and recognize special local issues or circumstances.

6.6.3. *Fill*

- Restoration fills, (typically referred to as nourishment) using site-specific suitable sediment types, should be encouraged, including improvements to shoreline habitats, natural materials to anchor LWD placements, and as needed to implement shoreline restoration. Recommend not requiring a Shoreline Conditional Use Permit for restoration-related fills that are consistent with the on-site geomorphology.
- Fills waterward of the OHWM to create developable land should be prohibited and should only be allowed landward of OHWM if consistent with the requirement to protect shoreline ecological functions and ecosystem-wide processes.

6.6.4. *Dredging*

- Except for purposes of shoreline restoration, flood hazard reduction, the maintenance of existing legal moorage and navigation, consider prohibiting these modifications, with the exception of dredging to maintain the shipping channel in Grays Harbor and all accesses to it.

6.6.5. *Shoreline Habitat and Natural Systems Enhancement*

- The SMP should include incentives to encourage restoration projects, particularly in areas identified as having lower function. For example, allow modification of impervious surface coverage, density, height, or setback requirements when paired with significant restoration.

6.7. *Shoreline Uses*

6.7.1. *Agriculture*

- There may be limited, existing agricultural uses within in the shoreline jurisdiction. Ensure that appropriate provisions for agricultural uses continue while protecting critical areas such as riparian buffers from new agricultural development.

6.7.2. Aquaculture

- Ensure appropriate provisions for aquaculture uses are provided subject to strict protections for water quality and habitat that are essential components of healthy aquaculture.

6.7.3. Boating Facilities

- Regulations should be crafted that are consistent with the WAC, as well as accommodate any known plans for modifications of any of these facilities. They should be consistent with WDFW and USACE design standards, and recognize special local issues or circumstances. Incentives should be used where appropriate to encourage on-site restoration.

6.7.4. Commercial Development

- Recognize commercial uses and consider incentives to attract water-oriented uses in appropriate locations along the shoreline, while ensuring no net loss of shoreline ecological functions.

6.7.5. Forest Practices

- Provide general policies and regulations for forest practices according to the SMP Guidelines.

6.7.6. Industry

- Include provisions for industrial uses while ensuring no net loss of shoreline ecological functions.
- Recognize the important role waterfront industrial uses play in the local economy.

6.7.7. Shellfish Processing

- Provide general policies and regulations for shellfish processing according to the SMP guidelines.

6.7.8. Recreational Development

- Policies and regulations related to recreation management should provide clear preferences for shoreline restoration consistent with public access needs and uses. Include provisions for existing and potential recreational uses, including boating, scuba diving, kayaking, swimming, and fishing.

6.7.9. Residential Development

- Recognize current and planned shoreline residential uses with adequate provision of services and utilities as appropriate to allow for shoreline recreation and ecological protection.

- Include a policy to continue education of waterfront homeowners about the use of fertilizers and chemicals and encourage natural lawn care and landscaping methods to reduce chemical output into surrounding shorelines.
- Encourage low impact development techniques that reduce impervious surface areas, increase use of eco-friendly stormwater detention/transmission, and decrease flood hazards.

6.7.10. Transportation and Parking

- Allow for maintenance and improvements to existing roads and parking areas and for necessary new roads and parking areas where other locations outside of the shoreline jurisdiction are not feasible.
- Opportunities for armoring reduction may be available by removal or relocating some roads currently in the shoreline jurisdiction.

6.7.11. Utilities

- Allow for utility maintenance and extension with criteria for location and vegetation restoration as appropriate.

7. RESTORATION PLAN

Potential restoration projects are identified for each of the cities within Section 4 of this report. Recovery actions have been identified for multiple salmonid species within WRIs 22 and 23 through the *Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIA 22 and 23* (CBPHWG 2008, 2011), the Limiting Factors Analysis (Smith and Wenger 2001; Smith 2005), and other planning efforts. These recovery actions generally focus on improving water quality; improving freshwater, estuarine, and marine habitats; and controlling invasive plants. These and other potential projects will be proposed and examined in more detail in a restoration plan that will be prepared in a later phase of the SMP update process, consistent with WAC 173-26-201(2)(f). Note that the presence of pollutants and the potential to mobilize them should be studied before implementing recommended restoration actions, particularly in shoreline areas with 303d listed waters for chemical pollutants.

The restoration plan will incorporate the findings from this analysis report and address the following six subjects (WAC 173-26-201(2)(f)(i-vi)):

- i. *Identify degraded areas, impaired ecological functions, and sites with potential for ecological restoration;*
- ii. *Establish overall goals and priorities for restoration of degraded areas and impaired ecological functions;*
- iii. *Identify 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;*
- iv. *Identify additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs;*
- v. *Identify timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals; and*
- vi. *Provide for mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans and to appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals.*

The Restoration Plan developed for the SMP will

“... include goals, policies, and actions for restoration of impaired shoreline ecological functions. These master program provisions should be designed to achieve overall

improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program.”

The final restoration plan will mesh potential projects identified in this report with additional projects, regional or local efforts, and programs of each jurisdiction, watershed groups, and environmental organizations that contribute or could potentially contribute to improved ecological functions of the shoreline.

8. REFERENCES

- Albright, R. and P.K. Bouthillette. 1982. Benthic invertebrate studies in Grays Harbor, Washington. Washington State Department of Game report to US Army Corps of Engineers, Seattle, Washington. Cited in NMFS 2010.
- Allan, J.C. and P.D. Komar. 2006. Climate controls on US West Coast erosion processes. *Journal of Coastal Research* 22(3):511-529.
- Allan, J.C., P.D. Komar, P. Ruggiero, and R. Witter. 2012. The March 2011 Tōhoku Tsunami and its impacts along the US West Coast. *Journal of Coastal Research* 28(5):1143-1153.
- Battin, J., M.W. Wiley, M.H. Ruckelshaus, R.N. Palmer, E.Korb, K.K. Bartz, and H. Imaki. 2007. Projected impacts of climate change on salmon habitat restoration. *Proceedings of the National Academies of Science* 104:6720-6725.
- Bromirski, P.D., A.J. Miller, R.E. Flick and G. Auad. 2011. Dynamical suppression of sea level rise along the Pacific coast of North America: Indications for imminent acceleration. *Journal of Geophysical Research* 116:C07005,doi:10.1029/2010JC006759.
- Canning, D.J. 2005. Sea Level Rise and Coastal Hazards in Washington State. Washington State Department of Ecology. Presented at The Future Ain't What it Used to Be: Planning for Climate Disruption, 2005 Regional Climate Change Conference, Seattle, Washington. October 27, 2005.
- CBPHWG (Chehalis Basin Partnership Habitat Work Group). 2008. The Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIA 22 and 23. Prepared by the Chehalis Basin Partnership Habitat Work Group with Assistance by L. Napier, Lead Entity Coordinator, Grays Harbor County; C. Stussy, Washington Department of Fish and Wildlife; B. Demond, Streamworks, LLP, J. Kliem, Consultant, Creative Community Solutions. Updated September 2008.
- CBPHWG. 2011. The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy for WRIA 22 and 23. Prepared by Grays Harbor County Lead Entity Habitat Work Group with Assistance by L. Napier, Lead Entity Coordinator, Grays Harbor County; J. Kliem and D.A. Holden, Creative Community Solutions, Inc. Updated June 30, 2011.
- Central Washington University. 2014. Pacific Northwest Geodetic Array (PANGA) website. Available at: http://www.panga.cwu.edu/demo_vms/velo_map.html.
- Chehalis Tribe. 2009. "The Chehalis Tribe: Our Story." Accessed July 1, 2014. <http://www.chehalis-tribe.org/history/>
- City of Hoquiam. 2006. 2007-2008 budget for the fiscal biennium January 1, 2007 through December 31, 2008. October 23, 2006.

- DAHP. 2014. Washington Information System for Architectural and Archaeological Records Data (WISAARD). Washington State Department of Archaeology & Historic Preservation. Accessed July 1, 2014. <https://fortress.wa.gov/dahp/wisaard/>.
- Dengler, L. and J. Preuss. 2003. Mitigation lessons from the July 17, 1998 Papua New Guinea Tsunami. *Pure and Applied Geophysics* 160:2001-2031.
- Ecology. 2010a. SMP Handbook, Chapter 7, Shoreline Inventory and Characterization. <http://www.ecy.wa.gov/programs/sea/shorelines/smp/handbook/Chapter7.pdf> (accessed May 26, 2013).
- Ecology. 2010b. Levees of Washington State. Western Washington University, Huxley College of the Environment. Prepared for Washington State Department of Ecology. Available at: <http://www.ecy.wa.gov/services/gis/data/data.htm#l>.
- Ecology. 2011. Shoreline Management Act Adopted Shoreline Streams and Lakes. Washington State Department of Ecology, SEA Program. Available at: <http://www.ecy.wa.gov/services/gis/data/data.htm#l>.
- Ecology. 2012. 2012 Washington Water Quality Assessment 303(d). Washington State Department of Ecology. Available at: <http://www.ecy.wa.gov/services/gis/data/data.htm#l>.
- Ecology. 2013. Confirmed and Suspected Contaminated Sites List. Washington State Department of Ecology. Available at: http://www.ecy.wa.gov/programs/tcp/sites_brochure/SiteLists_CSCSinstr.htm.
- Ecology. 2014. Washington State Coastal Atlas. Washington State Department of Ecology. <https://fortress.wa.gov/ecy/coastalatlas/> (accessed July 29, 2014).
- Elsner, M.M., L. Cuo, N. Voisin, J.S. Deems, A.F. Hamlet, J.A. Vano, K.E.B. Mickelson, S. Lee, and D.P. Lettenmaier. 2010. Implications of 21st century climate change for the hydrology of Washington State. *Climatic Change* 102:225-260.
- Envirovision. 2000. Chehalis Basin Level 1 Assessment. Prepared for the Chehalis Basin Partnership. Envirovision Corporation, Olympia, Washington. In Association with WPN and SAIC. December 2000.
- FEMA. 2013. Digital Flood Insurance Rate Map Database, Grays Harbor, Washington, USA. Federal Emergency Management Agency. Available at: <http://www.msc.fema.gov/>
- Gelfenbaum, G. and G.M. Kaminsky. 2010. Large-scale coastal change in the Columbia River littoral cell: An overview. *Marine Geology* 273:1-10.
- Giannico, G. and J.A. Souder. 2005. Tide gates in the Pacific Northwest: Operation, types and environmental effects. Oregon Sea Grant.
- Goldfinger, C., L.D. Kulm, L.C. McNeill, and P. Watts. 2000. Super-scale failure of the Southern Oregon Cascadia Margin. *Pure and Applied Geophysics* 157:1189-1226.

Hajda, Y. 1990. Southwestern Coast Salish. In *Handbook of North American Indians*. Volume 7, Northwest Coast, William C. Sturtevant, general editor, and Wayne Suttles, volume editor, pp. 503-517. Smithsonian Institution, Washington, D.C.

Hay, D.E. and P.B. McCarter. 2000. Status of the eulachon *Thaleichthys pacificus* in Canada. Department of Fisheries and Oceans Canada, Canadian Stock Assessment Secretariat, Research Document 2000-145. Ottawa, Ontario.

Hays, D.W., K.R. McAllister, S.A. Richardson, and D.W. Stinson. Washington State Recovery Plan for the Western Pond Turtle. Washington State Department of Fish and Wildlife. Olympia, Washington. August 1999.

Houck, G. 1983. Rennie Island Discharge (1981-1982). Letter to Dale Clark, Water Quality Investigations Section, Washington State Department of Ecology. Publication No. 83-e08.

King County. 2008. Vulnerability of major wastewater facilities to flooding from sea level rise. King County Wastewater Treatment Division. July 2008.

Knight, K. 2009. Land Use Planning for Salmon, Steelhead and Trout. Washington Department of Fish and Wildlife, Olympia, Washington.

Loehr, L.C. and E.E. Collias. 1981. A review of water characteristics of Grays Harbor 1938-1979 and an evaluation of possible effects of the widening and deepening project upon present water characteristics. US Army Corps of Engineers, Seattle, Washington.

Mantua, N.J., I. Tohver, and A.F. Hamlet. 2010. Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington State. *Climatic Change* 102:187-223.

Mojfeld, H.O. 1992. Subtidal sea level fluctuations in a large fjord system. *Journal of Geophysical Research*, 97(C12):20,191-20,199.

Mongillo, P.E. and M. Hallock. 1999. Washington State Status Report for the Olympic Mudminnow. Washington Department of Fish and Wildlife. October 1999.

Mote, P., A. Petersen, S. Reeder, H. Shipman, and L.W. Binder. 2008. Sea Level Rise in the Coastal Waters of Washington State. UW Climate Impacts Group and Washington State Department of Ecology. January 2008.

NMFS. 2010. Endangered Species Act - Section 7 Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation: SR 520 Pontoon Construction Project, Grays Harbor, HUC 17100105, Grays Harbor County, Washington. National Marine Fisheries Service. October 25, 2010.

NMFS. 2013. Pacific Eulachon/Smelt (*Thaleichthys pacificus*) fact sheet. National Marine Fisheries Service. http://www.nmfs.noaa.gov/pr/species/fish/pacific_eulachon.htm. Accessed April 15, 2013.

NOAA. 2014. Westport, WA - Station ID: 9441102 webpage. Available at: <http://tidesandcurrents.noaa.gov/stationhome.html?id=9441102>.

PFMC. 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council, Portland, Oregon.

Priest, G.R., Y. Zhang, R.C. Witter, K. Wang, C. Goldfinger, and L. Stimely. 2014. Tsunami impact to Washington and northern Oregon from segment ruptures on the southern Cascadia subduction zone. *Natural Hazards* 72:849-870.

Rau, W.W. 1986. Geologic Map of the Humptulips Quadrangle and Adjacent Areas, Grays Harbor County, Washington. Washington State Department of Natural Resources Geologic Map GM-33.

Reckendorf, F., D. Renner, R. Amrine, K. Verd, N. Wilson, M. Stevens, D. Fenwick. 2012. Chehalis River Basin Studies Inventory and Evaluation. Lewis County Conservation District. <http://lewiscountycd.wordpress.com/chehalis-studies-2/>.

Rosenberg, E.A., P.W. Keys, D.B. Booth, D. Hartley, J. Burkey, A.C. Steinemann, and D.P. Lettenmaier. 2010. Precipitation extremes and the impacts of climate change on stormwater infrastructure in Washington State. *Climatic Change* 102:319-349.

Sandell, T. and A. McAninch. 2013. Climate Change in the Chehalis River and Grays Harbor Estuary. Wild Fish Conservancy. Prepared for Chehalis Basin Habitat Work Group. February 10, 2013.

Sandell, T., J. Fletcher, A. McAninch, and M. Wait. 2013. Grays Harbor Juvenile Fish Use Assessment: 2012 Annual Report. Wild Fish Conservancy.

Smith, C.J. 2005. Salmon Habitat Limiting Factors in Washington State. Washington State Conservation Commission, Olympia, Washington.

Smith, C.J. and M. Wenger. 2001. Salmon and Steelhead Limiting Factors, Chehalis Basin and Nearby Drainages Water Resource Inventory Areas 22 and 23. Washington State Conservation Commission Final Report. May 2001.

US Coast and Geodetic Survey. 1911. Grays Harbor, Hoquiam and Aberdeen, Washington. Register No. 3154.

USACE. 1894. Annual Report of the Chief of Engineers, United States Army, to the Secretary of War for the Year of 1894, Part IV. Government Printing Office.

USACE. 2011. Draft Environmental Assessment: Fiscal years 2011 through 2018 maintenance dredging and disposal, Grays Harbor and Chehalis River Navigation Project. US Army Corps of Engineers. CENWS-PM-ER Seattle District.

USFWS. 2011. National Wetlands Inventory. US Fish and Wildlife Service, Division of Habitat and Resource Conservation. Available at: <http://www.fws.gov/wetlands/>.

USGS. 2011. National Land Cover Database (2011 Edition). US Geological Survey. Available at: http://www.mrlc.gov/nlcd11_data.php.

USGS. 2014. Washington State Earthquake Hazards Program website.
<http://earthquake.usgs.gov/hazards/qfaults/wa/>.

Venturato, A.J., D. Arcas, and U. Kangolu. 2007. Modeling tsunami inundation from a Cascadia Subduction Zone earthquake for Long Beach and Ocean Shores, Washington. Pacific Marine Environmental Laboratory. NOAA Technical Memorandum OAR PMEL-137.

Verdonck, D. 2006. Contemporary vertical crustal deformation in Cascadia. Tectonophysics 417:221-230.

Vincent, M. 1978. Habitat development field investigations, Rennie Island Marsh Development Site, Grays Harbor, Washington summary report. Environmental Laboratory US Army Corps of Engineers Waterway Experiment Station. Technical Report D-78-11.

Watershed GeoDynamics. 2012. Geomorphology/sediment transport/large woody debris report, Chehalis River fish study. Chehalis River Basin Flood Authority, Chehalis, Washington.

WDFW and ODFW. 2001. Washington and Oregon Eulachon Management Plan. Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife.

WDFW. 1996. Washington Vegetation Zones map. Washington Gap Analysis Project. August 1996. Obtained from Washington State Department of Fish and Wildlife agency website: http://wdfw.wa.gov/conservation/gap/graphics/www_zone.jpg (accessed July 7, 2014).

WDFW. 2002. Salmon and Steelhead Stock Inventory. Washington State Department of Fish and Wildlife. <http://wdfw.wa.gov/conservation/fisheries/sasi/> (accessed June 26, 2014).

WDFW. 2004. Washington State Salmonid Stock Inventory - Bull Trout/Dolly Varden. Washington Department of Fish and Wildlife. October 2004.

WDFW. 2008. Washington State Priority Habitats and Species List. Washington State Department of Fish and Wildlife. August 2008.

WDFW. 2013a. Fish Passage Barrier Inventory, Dams. Washington Department of Fish and Wildlife. Available at: <http://geography.wa.gov/GeospatialPortal/dataDownload.shtml>.

WDFW. 2013b. Threatened and Endangered Wildlife in Washington: 2012 Annual Report. Listing and Recovery Section, Wildlife Program, Washington State Department of Fish and Wildlife, Olympia, Washington.

WDFW. 2014a. Priority Habitat and Species database. Washington State Department of Fish and Wildlife. Threatened and Endangered Wildlife in Washington: 2012 Annual Report. Listing and Recovery Section, Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington.

WDFW. 2014b. Forage fish Spawning Location Map. Washington Department of Fish and Wildlife. http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/ (accessed July 7, 2014).

WDNR. 2001. Washington State Shoreline Inventory. Nearshore Habitat Program, Washington State Department of Natural Resources, Aquatic Resources Division. Available on Washington State Coastal Atlas: <https://fortress.wa.gov/ecy/coastalatlus/tools/Map.aspx> (accessed July 3, 2014).

WDNR. 2007. Liquefaction Susceptibility. Washington State Department of Natural Resources, Division of Geology and Earth Resources. Available at: file:///snarf/am/ger/geomaps/IMS/ZIP/zip_files_for_IMS_download/ger_data_liquefaction/liq_ufaction.shp.

WDNR. 2010. Tsunami Inundation. Washington State Department of Natural Resources, Division of Geology and Earth Resources. Available at: http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/gis_data.aspx.

WDNR. 2014a. Tsunami! Evacuation Map for Cosmopolis and South Aberdeen. Washington Department of Natural Resources. Available at: http://www.dnr.wa.gov/Publications/ger_tsunami_evac_cosmopolis.pdf.

WDNR. 2014b. Tsunami! Evacuation Map for Aberdeen and Hoquiam. Washington Department of Natural Resources. Available at: http://www.dnr.wa.gov/Publications/ger_tsunami_evac_aberdeen_hoquiam.pdf.

WDNR. 2014c. Published and in-preparation geologic mapping of 7.5-minute topographic quadrangles. Washington Department of Natural Resources. Available at: http://www.dnr.wa.gov/Publications/ger_24k_mapping_status.pdf.

WDNR. 2014d. Aquatic Restoration Spotlight Project: Grays Harbor. Washington Department of Natural Resources. Available at: http://www.dnr.wa.gov/ResearchScience/Topics/AquaticClean-UpRestoration/Pages/aqr_rest_spotlight_grays_harbor.aspx.

WDOH. 2014a. Shellfish Safety Information. Washington State Department of Health. <https://fortress.wa.gov/doh/eh/maps/biotoxin/biotoxin.html> (accessed July 7, 2014).

WDOH. 2014b. Source Water Assessment Program (SWAP) Maps. Washington State Department of Health, Division of Environmental Health, Office of Drinking Water. <https://fortress.wa.gov/doh/eh/dw/swap/maps/> (accessed June 17, 2014).

Weitkamp, D. 2009. Mudflat Surveys for Potential Grays Harbor Pontoon Construction Sites. Washington State Department of Transportation. Seattle, Washington. Cited in NMFS 2010.

Western Regional Climate Center. 2014. Washington. Available at: <http://www.wrcc.dri.edu/summary/Climsmwa.html>.

Wood, N. and C. Soulard. 2008. Variations in Community Exposure and Sensitivity to Tsunami Hazards on the Open-Ocean and Strait of Juan de Fuca Coasts of Washington. Scientific Investigations Report 2008-5004.

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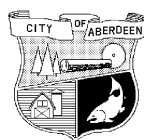
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The contents of this appendix are
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APPENDIX B

Priority Habitats and Species

	Species/ Habitats	State Status	Federal Status
Habitats	Biodiversity Areas & Corridors		
	Herbaceous Balds		
	Old-Growth/Mature Forest		
	Oregon White Oak Woodlands		
	West Side Prairie		
	Riparian		
	Freshwater Wetlands & Fresh Deepwater		
	Instream		
	Open Coast Nearshore		
	Coastal Nearshore		
	Caves		
	Cliffs		
	Snags and Logs		
Talus			
Fishes	Pacific Lamprey		Species of Concern
	River Lamprey	Candidate	Species of Concern
	Green Sturgeon		Threatened
	White Sturgeon		
	Olympic Mudminnow	Candidate	
	Pacific Herring	Candidate	Species of Concern
	Eulachon	Candidate	Threatened
	Longfin Smelt		
	Surfsmelt		
	Bull Trout/ Dolly Varden	<u>Candidate *</u>	<u>Threatened *</u>
	Chinook Salmon	Candidate	Threatened (Upper Columbia Spring run is Endangered)
	Chum Salmon	Candidate	Threatened
	Coastal Res./ Searun Cutthroat		Species of Concern
	Coho		Threatened – Lower Columbia Species of Concern – Puget Sound
	Kokanee		
	Pink Salmon		
	Rainbow Trout/ Steelhead/ Inland Redband Trout	<u>Candidate **</u>	<u>Threatened **</u>
	Sockeye Salmon	Candidate	Threatened – Ozette Lake Endangered – Snake River
	Pacific Cod	Candidate	Species of Concern
	Pacific Hake	Candidate	Species of Concern
	Walleye Pollock	Candidate	Species of Concern
	Black Rockfish	Candidate	
	Bocaccio Rockfish	Candidate	Endangered
	Brown Rockfish	Candidate	Species of Concern
	Canary Rockfish	Candidate	Threatened
	China Rockfish	Candidate	
	Copper Rockfish	Candidate	Species of Concern
	Greenstriped Rockfish	Candidate	
	Quillback Rockfish	Candidate	Species of Concern
	Redstripe Rockfish	Candidate	
Tiger Rockfish	Candidate		
Widow Rockfish	Candidate		
Yelloweye Rockfish	Candidate	Threatened	
Yellowtail Rockfish	Candidate		
Lingcod			
Pacific Sand Lance			
English Sole			
Rock Sole			

**** Important Note ****

These are the species and habitats identified for Grays Harbor County. This list of species and habitats was developed using the distribution maps found in the Priority Habitat and Species (PHS) List (see <http://wdfw.wa.gov/conservation/phs/>). Species distribution maps depict counties where each priority species is known to occur as well as other counties where habitat primarily associated with the species exists. Two assumptions were made when developing distribution maps for each species:

- 1) There is a high likelihood a species is present in a county, even if it has not been directly observed, if the habitat with which it is primarily associated exists.
- 2) Over time, species can naturally change their distribution and move to new counties where usable habitat exists.

Distribution maps in the PHS List were developed using the best information available. As new information becomes available, known distribution for some species may expand or contract. WDFW will periodically review and update the distribution maps in PHS list.

	Species/ Habitats	State Status	Federal Status
Amphibians	Dunn's Salamander	Candidate	
	Van Dyke's Salamander	Candidate	Species of Concern
	Western Toad	Candidate	Species of Concern
Reptiles	Pacific Pond Turtle (also known as Western Pond Turtle)	Endangered	Species of Concern
Birds	Brandt's Cormorant	Candidate	
	Brown Pelican	Endangered	Species of Concern
	Common Loon	Sensitive	
	Common Murre	Candidate	
	Marbled Murrelet	Threatened	Threatened
	Short-tailed Albatross	Candidate	Endangered
	Tufted Puffin	Candidate	Species of Concern
	Western grebe	Candidate	
	W WA nonbreeding concentrations of: Loons, Grebes, Cormorants, Fulmar, Shearwaters, Storm-petrels, Alcids		
	W WA breeding concentrations of: Cormorants, Storm-petrels, Terns, Alcids		
	Great Blue Heron		
	Brant		
	Cavity-nesting ducks: Wood Duck, Barrow's Goldeneye, Common Goldeneye, Bufflehead, Hooded Merganser		
	Western Washington nonbreeding concentrations of: Barrow's Goldeneye, Common Goldeneye, Bufflehead		
	Harlequin Duck		
	Trumpeter Swan		
	Waterfowl Concentrations		
	Bald Eagle	Sensitive	Species of Concern
	Golden Eagle	Candidate	
	Northern Goshawk	Candidate	Species of Concern
	Peregrine Falcon	Sensitive	Species of Concern
	Mountain Quail		
	Sooty Grouse		
	Wild Turkey		
	Snowy Plover	Endangered	Threatened
	W WA nonbreeding concentrations of: Charadriidae, Scolopacidae, Phalaropodidae		
	Band-tailed Pigeon		
Yellow-billed Cuckoo	Candidate	Candidate	
Spotted Owl	Endangered	Threatened	
Vaux's Swift	Candidate		
Pileated Woodpecker	Candidate		
Purple Martin	Candidate		
Streaked Horned Lark	Endangered	Candidate	

	Species/ Habitats	State Status	Federal Status
Mammals	Dall's Porpoise		
	Blue Whale	Endangered	Endangered
	Humpback Whale	Endangered	Endangered
	Gray Whale	Sensitive	
	Sperm Whale	Endangered	Endangered
	Harbor Seal		
	Orca (Killer Whale)	Endangered	Endangered
	Pacific Harbor Porpoise	Candidate	
	California Sea Lion		
	Steller Sea Lion	Threatened	Threatened
	Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat		
	Townsend's Big-eared Bat	Candidate	Species of Concern
	Keen's Long-eared Bat (formerly Keen's Myotis)	Candidate	
	Olympic Marmot	Candidate	
	Western Gray Squirrel	Threatened	Species of Concern
	Western Pocket Gopher	Threatened	Candidate
	Fisher	Endangered	Candidate
Marten			
Columbian Black-tailed Deer			
Mountain Goat			
Elk			
Invertebrates	Butter Clam		
	Native Littleneck Clam		
	Manila Clam		
	Olympia Oyster	Candidate	
	Pacific Oyster		
	Razor Clam		
	Dungeness Crab		
	Pandalid shrimp (Pandalidae)		
	Johnson's Hairstreak	Candidate	
	Queen Charlotte's Copper (formerly Makah Copper)	Candidate	Species of Concern
	Puget Blue	Candidate	
Red Urchin			
* Bull Trout only ** Steelhead only			

APPENDIX C

Reach Data Sheets

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Aberdeen Lake Reach
Type	Lake
Primary Water Body	Aberdeen Lake
Shorelines Jurisdiction Area (acres)	113.74
Length of Shoreline (miles)	2.81

Physical Characteristics

Geology	100% sandstone
Soils	52.8% Water 21.7% Lytell silt loam 15.1% Zenker silt loam 7.5% Rennie silty clay loam 1.5% Udorthents, level 1.4% Ocosta silty clay loam
FEMA 100-year Floodplain (area)	0%
Land Cover	36.6% Open Water 18.4% Woody Wetlands 17.7% Evergreen Forest 6.8% Emergent Herbaceous Wetlands 6.3% Developed, Open Space 4.6% Developed, Low Intensity 3.6% Shrub/Scrub 3% Deciduous Forest 1.4% Barren Land 0.7% Developed, Medium Intensity 0.6% Herbaceous 0.2% Mixed Forest

Human Use

Land Ownership	98% City Of Aberdeen 1.9% State Of Washington Dept Of Game 0.1% State Of Washington Wildlife
Zoning	100% N/A

Shoreline Modifications and Water Quality Impairments

Shoreline Modifications	-
303(d) Listings	

Critical Areas

Seismic Hazard	-
Liquefaction Hazard	35.2% N/A (bedrock) 47% N/A (water) 17.9% moderate to high
Landslide Hazard Zones	9.3% Deep-seated
NWI Wetland (area)	63%
Nearshore Vegetation	-

Priority Habitats and Species

PHS Wildlife (acres)	66.8% Wood Duck
PHS Fish	Chinook Salmon - Presence/Migration - 234 feet Coast Resident Cutthroat - Presence/Migration - 2,925 feet Coho Salmon - Known Juvenile Rearing - 176 feet Coho Salmon - Presence/Migration - 6,058 feet Steelhead Trout - Presence/Migration - 434 feet Steelhead Trout - Planted - 5,628 feet

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Charley Creek Reach
Type	Stream
Primary Water Body	Charley Creek
Shorelines Jurisdiction Area (acres)	16.73
Length of Shoreline (miles)	0.86
Physical Characteristics	
Geology	100% alluvium
Soils	81.8% Ocosta silty clay loam 18.2% Udorthents, level
FEMA 100-year Floodplain (area)	76%
Land Cover	58.9% Woody Wetlands 13.9% Emergent Herbaceous Wetlands 8.6% Developed, Medium Intensity 8.2% Developed, Low Intensity 7.8% Barren Land 2.6% Developed, High Intensity
Human Use	
Land Ownership	-
Zoning	100% I Industrial
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	-
303(d) Listings	Bacteria (Cat 4A), Temperature (Cat 2)
Critical Areas	
Seismic Hazard	100% Cascadia Scenario 1A
Liquefaction Hazard	15.3% very low to low 84.7% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	2%
Nearshore Vegetation	-
Priority Habitats and Species	
PHS Wildlife (acres)	-
PHS Fish	Coast Resident Cutthroat - Presence/Migration - 1,933 feet

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Chehalis River Reach - Aberdeen
Type	Stream
Primary Water Body	Chehalis River
Shorelines Jurisdiction Area (acres)	429.14
Length of Shoreline (miles)	8.23
Physical Characteristics	
Geology	64.4% alluvium 24.2% water 11.3% sandstone
Soils	50.5% Water 23.9% Udorthents, level 22.2% Ocosta silty clay loam 3.5% Zenker silt loam
FEMA 100-year Floodplain (area)	80%
Land Cover	49.8% Open Water 14.7% Woody Wetlands 9% Developed, Low Intensity 7.4% Developed, Medium Intensity 5.5% Developed, High Intensity 3.8% Herbaceous 3.7% Barren Land 3.2% Emergent Herbaceous Wetlands 2.8% Developed, Open Space 0.1% Evergreen Forest 0% Shrub/Scrub
Human Use	
Land Ownership	57.3% City Of Aberdeen 32.2% G H County 10% Port Of Grays Harbor 0.5% State Of Washington Dept Of Hwy 0% City Of Cosmopolis
Zoning	53.4% I Industrial 17.9% RS Single Family Residential 14.2% WD Waterfront Development 11.6% RM Multiple Family Residential 1.6% CR Commercial/Residential 0.7% LI Light Industrial 0.6% CG General Commercial
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	376 feet Concrete Bulkhead 519 feet Landfill 2289 feet Rip Rap 4113 feet Levees 20 Tide Gates 3 Partial Road Crossing Blockage 3 Unknown Road Crossing Blockage
303(d) Listings	2,3,7,8-TCDD TEQ (Cat 2), Bacteria (Cat 4A), Temperature (Cat 2)
Critical Areas	
Seismic Hazard	43.1% Cascadia Scenario 1A
Liquefaction Hazard	7.2% N/A (bedrock) 48.7% N/A (water) 44.1% moderate to high
Landslide Hazard Zones	0.4% Shallow undifferentiated
NWI Wetland (area)	19%
Nearshore Vegetation	-

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Chehalis River Reach - Aberdeen

Priority Habitats and Species

PHS Wildlife (acres)	4.5% Peregrine Falcon
PHS Fish	Bull Trout - Presence/Migration - 9,050 feet Chinook Salmon - Presence/Migration - 29,100 feet Chum Salmon - Presence/Migration - 9,050 feet Coast Resident Cutthroat - Presence/Migration - 10,999 feet Coho Salmon - Known Juvenile Rearing - 1,948 feet Coho Salmon - Presence/Migration - 9,050 feet Largemouth Bass - Presence/Migration - 906 feet Steelhead Trout - Known Juvenile Rearing - 1,593 feet Steelhead Trout - Known Spawning - 843 feet Steelhead Trout - Presence/Migration - 8 feet

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Fry Creek Reach - Aberdeen
Type	Stream
Primary Water Body	Fry Creek
Shorelines Jurisdiction Area (acres)	22.42
Length of Shoreline (miles)	1.21
Physical Characteristics	
Geology	61.9% alluvium 38.1% water
Soils	100% Udorthents, level
FEMA 100-year Floodplain (area)	19%
Land Cover	45.9% Developed, Medium Intensity 40.7% Developed, Low Intensity 13.4% Developed, High Intensity
Human Use	
Land Ownership	99.3% Port Of Grays Harbor 0.7% City Of Aberdeen
Zoning	87.5% I Industrial 12.5% LI Light Industrial 0% RS Single Family Residential 0% I
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	8 Tide Gates 1 Partial Road Crossing Blockage
303(d) Listings	
Critical Areas	
Seismic Hazard	100% Cascadia Scenario 1A
Liquefaction Hazard	4.4% N/A (water) 95.6% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	0%
Nearshore Vegetation	-
Priority Habitats and Species	
PHS Wildlife (acres)	8.2% Peregrine Falcon
PHS Fish	Coast Resident Cutthroat - Presence/Migration - 532 feet Coho Salmon - Known Juvenile Rearing - 532 feet

Reach Data Sheet	
Management Area	Aberdeen
Reach Name	Grays Harbor North Bank Reach
Type	Estuary
Primary Water Body	Grays Harbor
Shorelines Jurisdiction Area (acres)	414.09
Length of Shoreline (miles)	5.74
Physical Characteristics	
Geology	84.5% water 15.5% alluvium
Soils	54.4% Water 44.1% Udorthents, level 1.5% Fluvaquents, tidal
FEMA 100-year Floodplain (area)	35%
Land Cover	75.7% Open Water 6.5% Developed, Low Intensity 5.6% Developed, Medium Intensity 5.2% Developed, High Intensity 3% Barren Land 2.5% Herbaceous 0.8% Emergent Herbaceous Wetlands 0.7% Shrub/Scrub
Human Use	
Land Ownership	82.5% Port Of Grays Harbor 17.5% City Of Aberdeen
Zoning	71.4% I Industrial 24.8% LI Light Industrial 3.8% N/A 0% RS Single Family Residential 0% I
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	1514 feet Concrete Bulkhead 7652 feet Landfill 2000 feet Rip Rap 550 feet Wooden Bulkhead 8 Tide Gates 1 Total Road Crossing Blockage
303(d) Listings	4-Methylphenol (Cat 2), Benzo[ghi]perylene (Cat 2), Bis(2-Ethylhexyl) Phthalate (Cat 2), Copper (Cat 2), Indeno(1,2,3-cd)pyrene (Cat 2)
Critical Areas	
Seismic Hazard	15.5% Cascadia Scenario 1A
Liquefaction Hazard	87.3% N/A (water) 12.7% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	0%
Nearshore Vegetation	0.52 miles Dunegrass
Priority Habitats and Species	
PHS Wildlife (acres)	-
PHS Fish	Bull Trout - Presence/Migration Chinook Salmon - Presence/Migration Chum Salmon - Presence/Migration Steelhead Trout - Presence/Migration Coast Resident Cutthroat - Presence/Migration Coho Salmon - Presence/Migration

Reach Data Sheet	
Management Area	Aberdeen
Reach Name	Grays Harbor South Bank Reach
Type	Estuary
Primary Water Body	Grays Harbor
Shorelines Jurisdiction Area (acres)	603.40
Length of Shoreline (miles)	11.21
Physical Characteristics	
Geology	58.5% water 41.5% alluvium
Soils	45.8% Ocosta silty clay loam 24.3% Fluvaquents, tidal 18.1% Water 10.6% Udorthents, level 1.1% Seastrand mucky peat
FEMA 100-year Floodplain (area)	40%
Land Cover	49.9% Open Water 19.8% Emergent Herbaceous Wetlands 12.3% Woody Wetlands 10.6% Barren Land 2.4% Herbaceous 2.3% Developed, Low Intensity 2.2% Developed, Open Space 0.4% Shrub/Scrub 0.1% Developed, Medium Intensity 0.1% Developed, High Intensity
Human Use	
Land Ownership	55.8% City Of Aberdeen 28.3% Port Of Grays Harbor 15.8% G H County 0.1% State Of Washington
Zoning	87.1% I Industrial 6.6% RS Single Family Residential 2% N/A 2% LI Light Industrial 1.8% CR Commercial/Residential 0.5% CG General Commercial 0% RM Multiple Family Residential
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	500 feet Landfill 3385 feet Levees 6 Tide Gates 1 Partial Road Crossing Blockage 1 Unknown Road Crossing Blockage
303(d) Listings	4-Methylphenol (Cat 2), Bacteria (Cat 4A), Benzo[ghi]perylene (Cat 2), Bis(2-Ethylhexyl) Phthalate (Cat 2), Copper (Cat 2), Indeno(1,2,3-cd)pyrene (Cat 2), Temperature (Cat 2)
Critical Areas	
Seismic Hazard	45.2% Cascadia Scenario 1A
Liquefaction Hazard	54.2% N/A (water) 45.8% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	54%
Nearshore Vegetation	3.12 miles Salt Marsh, 1.69 miles Eelgrass
Priority Habitats and Species	
PHS Wildlife (acres)	-
PHS Fish	Coast Resident Cutthroat - Presence/Migration - 195 feet Coho Salmon - Known Juvenile Rearing - 214 feet Bull Trout - Presence/Migration Chinook Salmon - Presence/Migration Chum Salmon - Presence/Migration Steelhead Trout - Presence/Migration

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Newskah Creek Reach
Type	Stream
Primary Water Body	Newskah Creek
Shorelines Jurisdiction Area (acres)	12.39
Length of Shoreline (miles)	1.52
Physical Characteristics	
Geology	95.7% alluvium 4.3% glacial drift
Soils	94.5% Ocosta silty clay loam 5.5% Udorthents, level
FEMA 100-year Floodplain (area)	74%
Land Cover	53.1% Woody Wetlands 30.5% Emergent Herbaceous Wetlands 6.8% Barren Land 5.8% Shrub/Scrub 3.5% Herbaceous 0.4% Developed, Low Intensity
Human Use	
Land Ownership	69.3% City Of Aberdeen 30.7% State Of Washington Wildlife
Zoning	99.8% N/A 0.2% RS Single Family Residential
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	608 feet Rip Rap
303(d) Listings	Bacteria (Cat 4A), Temperature (Cat 2)
Critical Areas	
Seismic Hazard	100% Cascadia Scenario 1A
Liquefaction Hazard	100% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	60%
Nearshore Vegetation	0.12 miles Salt Marsh
Priority Habitats and Species	
PHS Wildlife (acres)	-
PHS Fish	-

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Wedekind Confluence Reach
Type	Stream
Primary Water Body	Wynoochee River / Wedekind Creek
Shorelines Jurisdiction Area (acres)	45.25
Length of Shoreline (miles)	1.91
Physical Characteristics	
Geology	100% alluvium
Soils	39.4% Juno sandy loam 20.9% Nemah silty clay loam 15.8% Water 15.6% Chehalis silt loam 8% Riverwash 0.3% Wishkah silty clay loam
FEMA 100-year Floodplain (area)	93%
Land Cover	29.1% Developed, Open Space 28.4% Emergent Herbaceous Wetlands 21.4% Woody Wetlands 7.4% Hay/Pasture 5.5% Evergreen Forest 4.3% Developed, Low Intensity 2.2% Deciduous Forest 1.7% Shrub/Scrub
Human Use	
Land Ownership	100% City Of Aberdeen
Zoning	99.9% N/A 0.1% RS Single Family Residential
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	Water diversion structure
303(d) Listings	
Critical Areas	
Seismic Hazard	-
Liquefaction Hazard	31.3% N/A (bedrock) 68.7% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	26%
Nearshore Vegetation	-
Priority Habitats and Species	
PHS Wildlife (acres)	100% Harlequin Duck
PHS Fish	Bull Trout - Presence/Migration - 1,628 feet Chinook Salmon - Known Spawning - 1,628 feet Chum Salmon - Known Spawning - 1,628 feet Coast Resident Cutthroat - Presence/Migration - 3,610 feet Coho Salmon - Known Spawning - 3,610 feet Steelhead Trout - Known Spawning - 1,628 feet Steelhead Trout - Presence/Migration - 1,628 feet

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Wishkah River Reach
Type	Stream
Primary Water Body	Wishkah River
Shorelines Jurisdiction Area (acres)	211.17
Length of Shoreline (miles)	5.85
Physical Characteristics	
Geology	66.5% alluvium 33.5% sandstone
Soils	32.5% Ocosta silty clay loam 25.1% Water 23.4% Udorthents, level 8% Zenker silt loam 4.9% Elochoman silt loam 4.9% Orcas peat 1.2% Skamo silt loam
FEMA 100-year Floodplain (area)	80%
Land Cover	23.7% Developed, Low Intensity 16.9% Woody Wetlands 13.4% Developed, Open Space 12.8% Barren Land 10.1% Developed, Medium Intensity 7.3% Emergent Herbaceous Wetlands 5.4% Evergreen Forest 5.3% Developed, High Intensity 3.8% Open Water 0.7% Deciduous Forest 0.6% Mixed Forest
Human Use	
Land Ownership	76.4% City Of Aberdeen 17.3% G H County 6.3% Port Of Grays Harbor
Zoning	54.7% RM Multiple Family Residential 28.6% RS Single Family Residential 13.6% WD Waterfront Development 1.8% LI Light Industrial 1.3% CG General Commercial
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	368 feet Wooden Bulkhead 17 Tide Gates 1 Partial Road Crossing Blockage 2 Unknown Road Crossing Blockage
303(d) Listings	
Critical Areas	
Seismic Hazard	88.7% Cascadia Scenario 1A
Liquefaction Hazard	13.7% N/A (bedrock) 20.2% N/A (water) 66.1% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	40%
Nearshore Vegetation	-

Reach Data Sheet

Management Area	Aberdeen
Reach Name	Wishkah River Reach

Priority Habitats and Species

PHS Wildlife (acres)	-
PHS Fish	Bull Trout - Presence/Migration - 10,438 feet Chinook Salmon - Known Juvenile Rearing - 10,438 feet Chum Salmon - Known Spawning - 10,438 feet Coast Resident Cutthroat - Presence/Migration - 10,839 feet Coho Salmon - Known Juvenile Rearing - 10,438 feet Coho Salmon - Known Spawning - 401 feet Largemouth Bass - Presence/Migration - 10,839 feet Steelhead Trout - Presence/Migration - 10,438 feet

Reach Data Sheet

Management Area	Cosmopolis
Reach Name	Chehalis River Reach - Cosmopolis
Type	Stream
Primary Water Body	Chehalis River
Shorelines Jurisdiction Area (acres)	254.62
Length of Shoreline (miles)	4.23
Physical Characteristics	
Geology	61.6% alluvium 37.6% water 0.8% sandstone
Soils	42.1% Water 38% Ocosta silty clay loam 10.5% Udorthents, level 6.5% Fluvaquents, tidal 2.9% Orcas peat
FEMA 100-year Floodplain (area)	96%
Land Cover	40.9% Open Water 34.6% Woody Wetlands 11.9% Emergent Herbaceous Wetlands 6.7% Developed, Low Intensity 1.7% Barren Land 1.6% Developed, Open Space 1.4% Developed, High Intensity 1.3% Developed, Medium Intensity
Human Use	
Land Ownership	97.7% Port Of Grays Harbor 1.5% City Of Aberdeen 0.8% City Of Cosmopolis
Zoning	73.6% M - Manufacturing 18.3% PR - Public Reserve 8.1% WA - Waterfront Use
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	357 feet Landfill 2882 feet Levees 3 Tide Gates 1 Partial Road Crossing Blockage
303(d) Listings	
Critical Areas	
Seismic Hazard	56.2% Cascadia Scenario 1A
Liquefaction Hazard	36.4% N/A (water) 63.6% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	42%
Nearshore Vegetation	-
Priority Habitats and Species	
PHS Wildlife (acres)	20.6% Wood Duck
PHS Fish	Bull Trout - Presence/Migration - 5,370 feet Chinook Salmon - Presence/Migration - 16,111 feet Chum Salmon - Presence/Migration - 5,370 feet Coast Resident Cutthroat - Presence/Migration - 5,370 feet Coho Salmon - Presence/Migration - 6,048 feet Steelhead Trout - Presence/Migration - 10,741 feet

Reach Data Sheet

Management Area	Cosmopolis
Reach Name	Mill Creek Reach
Type	Stream
Primary Water Body	Mill Creek
Shorelines Jurisdiction Area (acres)	48.96
Length of Shoreline (miles)	2.67
Physical Characteristics	
Geology	89.9% alluvium 9.5% glacial drift 0.6% sandstone
Soils	86.8% Ocosta silty clay loam 8.9% Udorthents, level 4.3% Mopang silt loam
FEMA 100-year Floodplain (area)	48%
Land Cover	67.8% Woody Wetlands 13.8% Developed, Open Space 9.9% Developed, Low Intensity 5.2% Emergent Herbaceous Wetlands 1.7% Developed, Medium Intensity 1.6% Developed, High Intensity
Human Use	
Land Ownership	100% City Of Cosmopolis
Zoning	77.1% MU - Mixed Use 17.7% R57 - Residential (Medium Density) 4.2% PR - Public Reserve 0.9% R100 - Residential (Low Density)
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	7 Tide Gates 1 Partial Road Crossing Blockage 1 Unknown Road Crossing Blockage
303(d) Listings	
Critical Areas	
Seismic Hazard	90.2% Cascadia Scenario 1A
Liquefaction Hazard	100% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	87%
Nearshore Vegetation	-
Priority Habitats and Species	
PHS Wildlife (acres)	-
PHS Fish	Coho Salmon - Known Spawning - 2,444 feet

Reach Data Sheet	
Management Area	Hoquiam
Reach Name	East Hoquiam River Reach
Type	Stream
Primary Water Body	Hoquiam River
Shorelines Jurisdiction Area (acres)	53.39
Length of Shoreline (miles)	2.90
Physical Characteristics	
Geology	100% alluvium
Soils	49.9% Ocosta silty clay loam 41.1% Udorthents, level 9% Water
FEMA 100-year Floodplain (area)	61%
Land Cover	43% Woody Wetlands 14.7% Developed, Low Intensity 11.7% Barren Land 10.8% Open Water 7.3% Emergent Herbaceous Wetlands 6.4% Developed, Medium Intensity 3.6% Developed, Open Space 2.3% Developed, High Intensity 0.1% Shrub/Scrub 0.1% Mixed Forest
Human Use	
Land Ownership	100% State Of Washington
Zoning	68.4% R2 31.6% I 0% R1
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	410 feet Wooden Bulkhead 2 Tide Gates
303(d) Listings	
Critical Areas	
Seismic Hazard	14.9% Cascadia Scenario 1A
Liquefaction Hazard	0.2% N/A (bedrock) 7.3% N/A (water) 92.5% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	62%
Nearshore Vegetation	-
Priority Habitats and Species	
PHS Wildlife (acres)	-
PHS Fish	Chinook Salmon - Known Spawning - 303 feet Chum Salmon - Known Spawning - 303 feet Coast Resident Cutthroat - Presence/Migration - 303 feet Coho Salmon - Known Juvenile Rearing - 303 feet Coho Salmon - Presence/Migration - 845 feet Steelhead Trout - Presence/Migration - 303 feet

Reach Data Sheet

Management Area	Hoquiam
Reach Name	Fry Creek Reach - Hoquiam
Type	Stream
Primary Water Body	Fry Creek
Shorelines Jurisdiction Area (acres)	26.96
Length of Shoreline (miles)	1.46
Physical Characteristics	
Geology	52.8% alluvium 47.2% water
Soils	100% Udorthents, level
FEMA 100-year Floodplain (area)	12%
Land Cover	53.3% Developed, Low Intensity 22.8% Developed, High Intensity 22.8% Developed, Medium Intensity 0.8% Developed, Open Space 0.2% Open Water 0.2% Emergent Herbaceous Wetlands
Human Use	
Land Ownership	92.1% Port Of Grays Harbor 7.9% City Of Hoquiam
Zoning	99.9% I 0.1% C1
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	257 feet Rip Rap 2303 feet Levees 2 Tide Gates
303(d) Listings	
Critical Areas	
Seismic Hazard	100% Cascadia Scenario 1A
Liquefaction Hazard	27.8% N/A (water) 72.2% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	5%
Nearshore Vegetation	0.05 miles Salt Marsh
Priority Habitats and Species	
PHS Wildlife (acres)	73.4% Peregrine Falcon
PHS Fish	Coast Resident Cutthroat - Presence/Migration - 1,731 feet Coho Salmon - Presence/Migration - 1,731 feet

Reach Data Sheet

Management Area	Hoquiam
Reach Name	Grays Harbor Reach
Type	Estuary
Primary Water Body	Grays Harbor
Shorelines Jurisdiction Area (acres)	4,777.56
Length of Shoreline (miles)	20.85

Physical Characteristics

Geology	96.8% water 2.9% glacial drift 0.2% alluvium
Soils	58.2% Fluvaquents, tidal 22.7% Udorthents, level 13.8% Ocosta silty clay loam 5% Water 0.2% Mopang silt loam 0.1% Hoquiam silt loam
FEMA 100-year Floodplain (area)	46%
Land Cover	35.9% Open Water 26.2% Emergent Herbaceous Wetlands 19.1% Barren Land 5.6% Woody Wetlands 4.4% Herbaceous 3.4% Developed, Open Space 2.4% Developed, Low Intensity 1.2% Developed, Medium Intensity 0.7% Developed, High Intensity 0.6% Deciduous Forest 0.6% Shrub/Scrub 0% Evergreen Forest

Human Use

Land Ownership	77.8% Port Of Grays Harbor 11.4% City Of Hoquiam 7.2% Usa 3.6% G H County
Zoning	45.6% I 42% NR 6.3% R1 6.1% Waterfront Overlay District

Shoreline Modifications and Water Quality Impairments

Shoreline Modifications	32044 feet Landfill 14196 feet Rip Rap 18494 feet Levees 5 Tide Gates
303(d) Listings	Dioxin (Cat 4A), Invasive Exotic Species (Cat 4C), Temperature (Cat 2), Water Column Bioassay (Cat 2)

Critical Areas

Seismic Hazard	10.8% Cascadia Scenario 1A
Liquefaction Hazard	89.4% N/A (water) 10.6% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	13%
Nearshore Vegetation	2616 acres Eelgrass, 12.96 miles Salt Marsh, 4.61 miles Dunegrass

Reach Data Sheet

Management Area	Hoquiam
Reach Name	Grays Harbor Reach

Priority Habitats and Species

PHS Wildlife (acres)	49.9% Peregrine Falcon 15% Shorebird Concentrations 14.2% Waterfowl Concentrations 1.3% Purple Martin
PHS Fish	Coast Resident Cutthroat - Presence/Migration - 250 feet Coho Salmon - Known Spawning - 250 feet Bull Trout - Presence/Migration Chinook Salmon - Presence/Migration Chum Salmon - Presence/Migration Steelhead Trout - Presence/Migration

Reach Data Sheet

Management Area	Hoquiam
Reach Name	Hoquiam River Reach
Type	Stream
Primary Water Body	Hoquiam River
Shorelines Jurisdiction Area (acres)	273.19
Length of Shoreline (miles)	7.26

Physical Characteristics

Geology	89.5% alluvium 9.5% water 1% glacial drift
Soils	45.1% Water 38.8% Udorthents, level 11.4% Ocosta silty clay loam 3.7% Elochoman silt loam 1% Zenker silt loam 0.1% Fluvaquents, tidal
FEMA 100-year Floodplain (area)	84%
Land Cover	36.5% Open Water 20.8% Developed, Low Intensity 10.9% Developed, Medium Intensity 9.8% Developed, Open Space 5.4% Barren Land 5.1% Developed, High Intensity 5% Woody Wetlands 3% Emergent Herbaceous Wetlands 2.3% Evergreen Forest 1.2% Herbaceous

Human Use

Land Ownership	66.3% City Of Hoquiam 32.5% Port Of Grays Harbor 0.9% State Of Washington 0.3% G H County
Zoning	37.4% Waterfront Overlay District 21.5% I 16.3% R2 16% C1 4.9% C2 3.2% Pedestrian Overlay District 0.8% NR

Shoreline Modifications and Water Quality Impairments

Shoreline Modifications	1449 feet Landfill 1269 feet Rip Rap 13478 feet Levees 13 Tide Gates 4 Partial Road Crossing Blockage
303(d) Listings	Copper (Cat 2)

Critical Areas

Seismic Hazard	53.5% Cascadia Scenario 1A
Liquefaction Hazard	2.5% N/A (bedrock) 37% N/A (water) 60.5% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	6%
Nearshore Vegetation	2.73 miles Salt Marsh

Reach Data Sheet

Management Area	Hoquiam
Reach Name	Hoquiam River Reach

Priority Habitats and Species

PHS Wildlife (acres)	2.8% Purple Martin 0.8% Peregrine Falcon
PHS Fish	Chinook Salmon - Presence/Migration - 12,103 feet Chum Salmon - Known Spawning - 12,103 feet Coast Resident Cutthroat - Presence/Migration - 12,281 feet Coho Salmon - Known Juvenile Rearing - 12,103 feet Coho Salmon - Presence/Migration - 542 feet Steelhead Trout - Known Spawning - 178 feet Steelhead Trout - Presence/Migration - 12,103 feet

Reach Data Sheet

Management Area	Hoquiam
Reach Name	Little Hoquiam River Reach
Type	Stream
Primary Water Body	Little Hoquiam River
Shorelines Jurisdiction Area (acres)	165.00
Length of Shoreline (miles)	7.01

Physical Characteristics

Geology	70.4% alluvium 29.4% glacial drift 0.2% tholeiite
Soils	67.7% Ocosta silty clay loam 16.9% Water 7% Udorthents, level 5.2% Zenker silt loam 2.3% Le Bar silt loam 0.9% Hoquiam silt loam 0.1% Pits, quarries
FEMA 100-year Floodplain (area)	81%
Land Cover	46.4% Woody Wetlands 33% Evergreen Forest 6.4% Developed, Low Intensity 5.4% Developed, Open Space 3.7% Deciduous Forest 3.6% Emergent Herbaceous Wetlands 1.1% Developed, Medium Intensity 0.3% Shrub/Scrub 0.1% Open Water

Human Use

Land Ownership	66.1% City Of Hoquiam 33.9% G H County 0% State Of Washington 0% Port Of Grays Harbor
Zoning	81.2% R1 17.3% NR 0.6% R2 0.6% Waterfront Overlay District 0.4% I

Shoreline Modifications and Water Quality Impairments

Shoreline Modifications	1323 feet Levees 4 Tide Gates
303(d) Listings	

Critical Areas

Seismic Hazard	19.7% Cascadia Scenario 1A
Liquefaction Hazard	0.2% N/A (bedrock) 8.2% very low 91.7% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	23%
Nearshore Vegetation	-

Priority Habitats and Species

PHS Wildlife (acres)	-
PHS Fish	Coast Resident Cutthroat - Presence/Migration - 17,307 feet Coho Salmon - Presence/Migration - 17,307 feet Steelhead Trout - Known Spawning - 17,307 feet

Reach Data Sheet	
Management Area	Hoquiam
Reach Name	Little Hoquiam River Reach
Type	Stream
Primary Water Body	Little Hoquiam River
Shorelines Jurisdiction Area (acre)	165.00
Length of Stream Shorelines (miles)	7.01
Physical Characteristics	
Geology	70.4% alluvium 29.4% glacial drift 0.2% tholeiite
Soils	67.7% Ocosta silty clay loam 16.9% Water 7% Udorthents, level 5.2% Zenker silt loam 2.3% Le Bar silt loam 0.9% Hoquiam silt loam 0.1% Pits, quarries
FEMA 100-year Floodplain (area)	81%
Land Cover	46.4% Woody Wetlands 33% Evergreen Forest 6.4% Developed, Low Intensity 5.4% Developed, Open Space 3.7% Deciduous Forest 3.6% Emergent Herbaceous Wetlands 1.1% Developed, Medium Intensity 0.3% Shrub/Scrub 0.1% Open Water
Human Use	
Land Ownership	66.1% City Of Hoquiam 33.9% G H County 0% State Of Washington 0% Port Of Grays Harbor
Zoning	81.2% R1 17.3% NR 0.6% R2 0.6% Waterfront Overlay District 0.4% I
Shoreline Modifications and Water Quality Impairments	
Shoreline Modifications	1323 feet Levees 4 Tide Gates
303(d) Listings	
Critical Areas	
Seismic Hazard	19.7% Cascadia Scenario 1A
Liquefaction Hazard	0.2% N/A (bedrock) 8.2% very low 91.7% moderate to high
Landslide Hazard Zones	-
NWI Wetland (area)	23%
Nearshore Vegetation	-
Priority Habitats and Species	
PHS Wildlife (acres)	-
PHS Fish	Coast Resident Cutthroat - Presence/Migration - 17,307 feet Coho Salmon - Presence/Migration - 17,307 feet Steelhead Trout - Known Spawning - 17,307 feet

