FINAL

CUMULATIVE IMPACTS ANALYSIS AND NO NET LOSS REPORT

Clallam County Shoreline Master Program Update

Ecology Grant No. G1000062
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1.0 INTRODUCTION

Clallam County is updating its Shoreline Master Program (SMP) to comply with the Washington State Shoreline Management Act[1] (SMA) and the implementing rules in the Washington Administrative Code (WAC) (also known as the Shoreline Guidelines)[2]. As part of the SMP update effort, the County is required to evaluate the "cumulative impacts" of reasonably foreseeable future shoreline development to verify that proposed policies and regulations for shoreline management are adequate to ensure "no net loss of shoreline ecological functions." This report is an analysis of the cumulative impacts that can be expected to occur over time as the SMP is implemented[3,4] This report also describes how the County will achieve no net loss through the adoption and implementation of the SMP.

As the City of Forks may also adopt the County's SMP, shoreline areas within City jurisdiction were included in this cumulative impacts analysis. Therefore, references to Clallam County's SMP and shoreline areas in this report include both unincorporated County areas and the City of Forks.

This report was prepared as a requirement of the County's grant agreements with the Washington Department of Ecology (Grant No. G1000062) and the U.S. Environmental Protection Agency (Grant No. PO-00J08801).

1.1 Report Purpose and Background

The Shoreline Guidelines establish the standard of no net loss of shoreline ecological functions as one of the central tenets of shoreline management:

> *"To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts among development opportunities."*

No net loss assumes that some impacts may occur but that adequate measures are in place within the overall shoreline master program to offset them such that the post development conditions are no worse *overall* than pre-development conditions. There will be impacts from a vast array of anthropogenic and natural sources but only subset of these impacts will be associated with development within the SMP jurisdiction. The SMP only regulates new development along the shoreline. This report recognizes that there will be impacts that cannot be fully be mitigated either because they happened prior to the adoption of the updated SMP; are associated with established/grandfathered lots, structures, and uses;

[1] Revised Code of Washington (RCW) 90.58

[2] Washington Administrative Code (WAC) 173-26

[3] Note: All text, tables and charts concerning parcel attributes are based on available assessor's data and should be considered approximate. Information has not been field-verified or independently verified and is intended for general planning purposes only.

[4] This analysis is based on the current Draft SMP [under review by the County Planning Commission], which has not yet been adopted by the County Board of Commissioners nor approved by Ecology.

and/or will come from impacts outside of the SMP jurisdiction or from factors outside of the County's control (such as climate change and sea level rise).

The challenge is in maintaining shoreline functions while allowing appropriate new shoreline development. Success requires due diligence to ensure that new developments are located and designed to avoid and minimize impacts to shoreline ecological functions.

Local governments achieve no net loss by:

1. Establishing appropriate SMP goals, policies and regulations to protect shoreline functions;
2. Appropriately regulating individual shoreline development proposals to ensure they mitigate adverse impacts;
3. Implementing restoration actions to improve shoreline ecology;
4. Monitoring changes over time; and
5. Adjusting shoreline management protocols as needed to obtain the desired results.

The purpose of this report is to programmatically assess whether the right policies and regulations have been developed to prevent cumulative impacts from occurring once the County's updated SMP is implemented. This report includes recommendations and tools for improving administration and tracking of shoreline management decisions to better assess whether individual actions are achieving no net loss. The County's Shoreline Restoration Plans identify opportunities and needs for shoreline restoration. That said, achieving Steps 2 through 5 will require resources and commitment above and beyond the SMP update effort.

1.2 Scope of the Analysis

Neither the SMA nor the Shoreline Guidelines specifically define cumulative impacts. However, the National Environmental Policy Act provides the following definition:

> *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."*

In addition, the Washington State Environmental Policy Act states that a review of cumulative impacts) should address:

> *"how the impacts of the proposal will contribute towards the total impact of development in the region over time."*

The objective of the cumulative impacts analysis is to demonstrate that commonly occurring shoreline uses and developments within the County will not result in a *net* loss of ecological functions compared to existing conditions. For this analysis, the existing conditions are the conditions that are generally

identified and described in the May 2012 Revised Draft WRIA 20 Inventory and Characterization Report (ICR) and the March 2012 Shoreline Inventory and Characterization Report for WRIAs 17, 18 and 19.

This analysis is limited to land and water areas within unincorporated Clallam County and the City of Forks that are under the jurisdiction of the SMA and the County's SMP (see Section 1.8 of the SMP). The County's SMP does not apply to: 1) land held in trust by the United States for Indian Nations, Tribes and individuals and 2) land within the boundaries of the Olympic National Park, in accordance with RCW 37.08.210. The impacts addressed in this analysis are the cumulative ecological impacts that could result from allowed/permitted development and uses within shoreline jurisdiction. Development outside of Clallam County's shoreline jurisdiction is not considered in this cumulative impact / no net loss analysis assessment.

The Shoreline Guidelines describe the cumulative impacts analysis requirements as follows[5]:

> "*Evaluation of such cumulative impacts should consider: (i) current circumstances affecting the shorelines and relevant natural processes; (ii) reasonably foreseeable future development and use of the shoreline; and (iii) beneficial effects of any established regulatory programs under other local, state, and federal laws*."

The Guidelines state that the impacts of "commonly occurring and planned development" should be assessed programmatically "without reliance on an individualized cumulative impacts analysis". In contrast, developments that have unforeseen or uncommon impacts that cannot be reasonably identified at the time of SMP development should be evaluated via the shoreline substantial development and/or conditional use permit processes to ensure that all impacts are addressed and that there is no net loss of ecological function after mitigation.[6]

In addition, the Guidelines require evaluation of the cumulative effects caused by:

- Unregulated activities (i.e., timber harvest and certain agricultural uses)[7],
- Developments that are exempt from a shoreline substantial development permit (e.g., single-family residential development), and
- Residential bulkheads, residential piers, and runoff from newly developed properties.

The Guidelines require particular attention be paid to platting or subdividing property and installation of infrastructure that could establish a pattern for future shoreline development.

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[5] WAC 173-26-186(8)(d))

[6] WAC 173-26-201(3)(d)(iii)

[7] According to RCW 90.58.065: SMPs shall not require modification of or limit agricultural activities occurring on agricultural lands. According to WAC 173-16-241: Local master programs should rely on the Forest Practices Act and rules implementing the act and the *Forest and Fish Report* as adequate management of commercial forest uses within shoreline jurisdiction.

The SMP includes standards and procedures for evaluating the effects of specific development actions on a case-by-case basis at the time individual shoreline development proposals are reviewed (for example, see SMP sections 1.9.3, 8.2.1, 8.3.5, 10.2.2.3.d, and 10.2.3.6). Project-level analyses that are required at the time a development is proposed will allow site-scale factors to be included in the assessment of baseline conditions to supplement the shoreline inventory and characterization information available for the County as a whole. To achieve no net loss, the SMP requires each project to mitigate impacts by first avoiding, then minimizing adverse effects, then replacing damaged resources through compensatory mitigation efforts (this mitigation sequence is required in Section 8.3 of the SMP). The County is also required to implement restoration measures on a voluntary basis to supplement the project-level mitigation actions.

1.3 Report Methods and Structure

The methods used in this analysis are generally consistent with the guidance included in Ecology's SMP Handbook, Chapter 17 Cumulative Impacts. The cumulative impacts of shoreline development within the Water Resources Inventory Areas (WRIAs) that drain to the Strait of Juan de Fuca (WRIAs 17, 18, and 19) are discussed separately from the cumulative impacts of shoreline development within the WRIA that drains to the Pacific Ocean (WRIA 20) (Figure 1-1). This is because work in the two regions was funded through different grants and the analysis for the Strait of Juan de Fuca drainages was designed to be generally compatible with the Puget Sound Partnership's (Partnership) ongoing effort to protect and restore Puget Sound.

Although the written analysis of cumulative impacts / no net loss occurs is the final stage of the SMP update process, the effort to prevent cumulative impacts and achieve no net loss has been integral to all phases of Clallam County's SMP update process from the shoreline inventory and characterization phase through the development of the SMP and the Shoreline Restoration Plans. As a result, this report draws heavily from those documents and previous efforts.

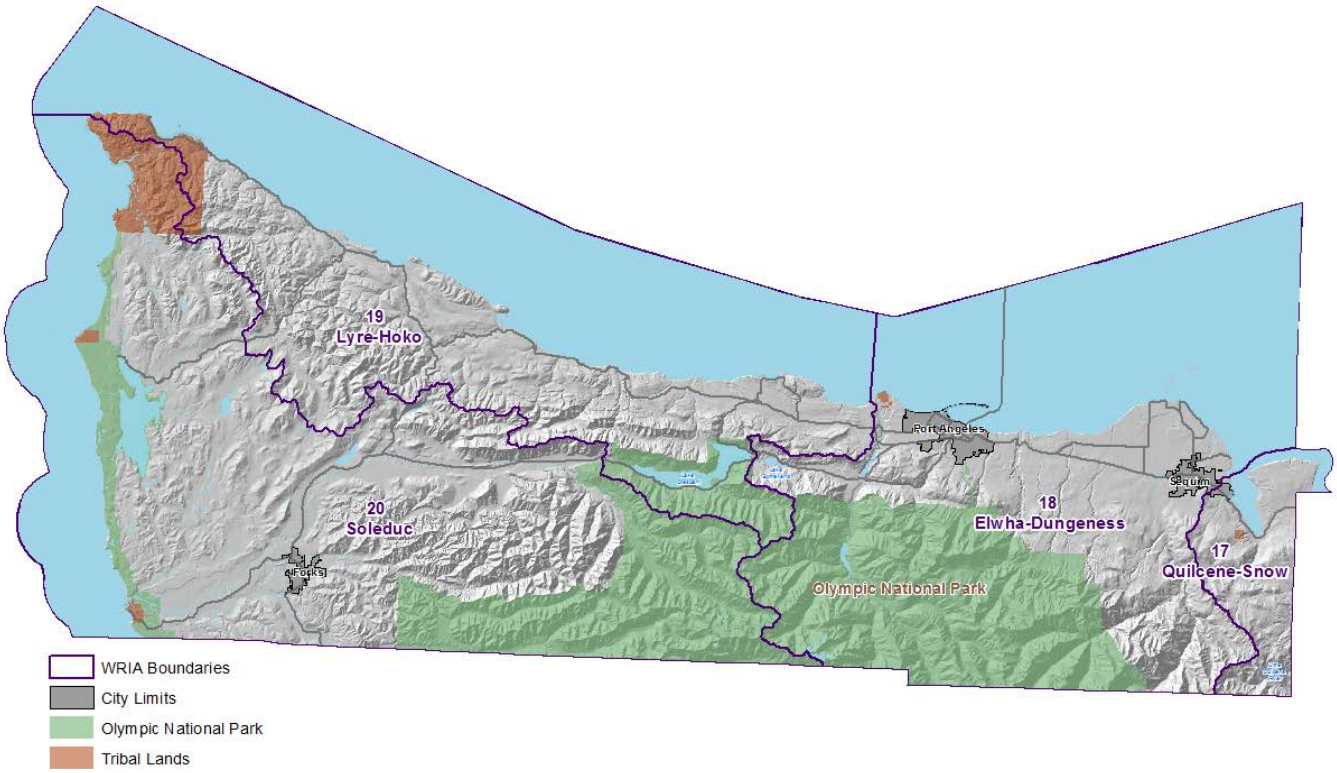

Figure 1-1. Water Resources Inventory Areas (WRIAs) within Clallam County.

1.3.1 Relationship to Puget Sound Recovery Efforts

The Partnership is in the midst of a multi-year collaborative process to identify the strategies and actions that are needed to recover Puget Sound by 2020. The Partnership is focusing on finding strategies and actions that reduce potential impacts to the ecosystem caused by:

- Land development
- Shoreline alteration
- Runoff from the built environment
- Wastewater discharge
- Loss of floodplain function

In doing this work, the Partnership is identifying a series of Sound-wide indicators that describe the biophysical components of the entire Puget Sound ecosystem. They are also defining targets for

assessing how the ecosystem responds to management actions[8]. The indicators and targets are the "vital signs" that help describe Sound's ecological and human health status and communicate progress toward recovery (Figure 1-2).

Figure 1-2. Puget Sound Vital Signs and Target for Puget Sound Recovery (Source: Puget Sound Partnership, 2012).

The Partnership is using a conservation planning framework known as *Open Standards for the Practice of Conservation (Open Standards)*. The Open Standards framework was developed by a consortium of non-governmental organizations to improve the planning, design, management, and assessment of conservation actions[9]. The framework is widely seen as a way to improve conservation outcomes through strategic planning, evaluation of progress, and learning related to ecosystem recovery. The Open Standards framework provides a process for defining:

- The vision and context for a specific conservation goal;

[8] See the 2012 Action Agenda, the 2012 Biennial Science Work Plan, the 2011 Science Update and the 2009 Technical Memorandum on Identification of Ecosystem Components and Their Indicators and Targets for more information. Available at: http://www.psp.wa.gov/action_agenda_center.php

[9] For more information on Open Standards, go to: https://sites.google.com/a/uw.edu/puget-sound-open-standards---temporary-share-site/

- Key components of the vision;
- Current conditions of components; and
- Major threats to maintaining or improving the components (i.e. potential impacts to the components).

To increase continuity with the Puget Sound recovery efforts, this report incorporates aspects of the Open Standards framework into the assessment cumulative impacts and no net loss in Clallam County. The report attempts to model the Partnership framework because there is no formal or established framework for analyzing cumulative impacts / no net loss in a robust, transparent or quantitative fashion and because the County's SMP update is an element of the overall Puget Sound recovery effort).

The analysis also incorporates aspects of the Partnership's approach related to indicator selection because the two efforts seek some of the same outcomes. For example, a goal of the SMP is to protect and restore habitat. This is also one of the Partnership's main goals (and a strategic initiative in the 2012 Action Agenda). Despite these similarities, the Partnership's work is much broader in scope than the County's SMP update—both geographically and statutorily—and the Partnership has the technical and financial resources to support a more complex and multifaceted effort. As a result, this analysis was tailored and simplified to fit the County's specific needs for a cumulative impact analysis:

- No net loss indicators are organized around the ecological function goals described in the Shoreline Guidelines: habitat, water quality, vegetation, hyporheic processes and hydrology10. Because there is considerable overlap in the categories described in the Guidelines, indicators are into three function categories: habitat, hydrology and water quality.
- Goals are divided into two components: marine (nearshore) and freshwater to correspond to the different types of shorelines. Each component encompasses the waterbody and the adjoining shorelands.
- The Partnership identifies multiple attributes to characterize each component. Attributes define the structure, composition or function of the component but are not easily measured. For each attribute, there are one or more indicators that serve as proxies for the attributes and provide a measurable way to judge ecosystem changes in response to management. This analysis is based on a narrow set of attributes and indicators that pertain to shoreline management and could be assessed now using readily available data.

[10] WAC 173-26-201(3)(d) (1) (C)

2.0 NO NET LOSS AS A VISION AND A GOAL

According to the vision statements for the Clallam County Shoreline Master Program update[11], Clallam County residents "envision a future environment that is at least as beautiful and productive as today--a future with more people, more fish and wildlife, sustainable forests for generations of working families, and accessible, clean shorelines." Achieving this vision will require the protection of shoreline ecological functions to keep the environment "at least" as healthy and productive as it is now and restoration of ecological processes in order to have "more" of what people currently enjoy, use, and value.

The County's vision is consistent with the state's requirement that shoreline master programs achieve no net loss of shoreline ecological functions.[12] The concept of ecological functions recognizes that each ecological system is composed of a wide variety of interacting physical, chemical and biological components, that are interdependent and that produce the landscape and habitats as they exist at any time. Ecological functions are the work performed or role played individually or collectively within ecosystems by these components[13].

As a shoreline management goal or statement of aspiration, maintaining ecological functions at a baseline level seems relatively straightforward. Operationally, it is much more challenging. Maintaining shoreline ecological functions through effective SMP implementation presupposes several things:

1. That ecological functions can be 'measured' to establish a baseline for no net loss comparisons;

2. That linkages between specific shoreline development actions and changes in ecological function can be documented (i.e., armoring of feeder bluffs affects sediment supply, which affects beach structure and the productivity of beaches for forage fish spawning, etc.);

3. That the effects of actions that occur outside of the scope of the SMP can be differentiated from those that are directly tied to SMP decisions; and

4. That the conditions at some future point in time can be compared to existing conditions to determine whether the level of function has increased, decreased, or remained the same.

[11] Available at http://www.clallam.net/realestate/assets/applets/Vision_WRIA17_19_8-2-11_FINAL.pdf and http://www.clallam.net/realestate/assets/applets/FINAL_WRIA_20_FORUM_AND_SURVEYS_Report.pdf

[12] The no net loss requirement is specific to shoreline ecological functions and must be balanced with other policy goals of the SMA such as providing public access or accommodating water-dependent uses. In fact, there are multiple human dimensions to the SMA that are not directly tied to no net loss, but which must nevertheless be factored into shoreline management

[13] WAC 173-26-201(3)(c)

This report attempts to address each of these challenges by:

1. Describing shoreline conditions in terms of a few key functions that are heavily influenced by SMP decisions;

2. Identifying potential impacts to shoreline ecological functions. In this context "potential impacts" are defined as development activities that have the potential to degrade shoreline functions and processes;

3. Evaluating potential land use changes at the parcel scale and reach scales;

4. Assessing the potential for the expected land use changes to cause loss of functions;

5. Showing how the SMP policies and regulations address type and level of expected loss; and

6. Offering a tool for tracking development actions and their effects on shoreline functions to improve SMP implementation over time. [Appendix A]

To select no net loss indicators, the County considered a wide range of characteristics that reflect the functionality of the shoreline. The County examined the list of suggested no net loss indicators in Ecology's Shoreline Handbook[14] and engaged a technical work group to provide guidance on the indicator selection. Indicators were selected to meet all of the following criteria:

- Theoretically sound;

- Directly relevant to SMP management decisions;

- Sensitive to change; and

- Trackable using available data.

The list of selected indicators includes at least one indicator for each major function category identified in the Shoreline Guidelines (habitat, water quality and hydrology)[15]. Each function category has two components—marine (nearshore) and freshwater (both rivers and lakes) —corresponding to the two shoreline habitat domains. Each component is characterized by one or more indicators that serve as proxies for the conditions of key attributes. In other words, the indicators are not direct measures of function, but are indirect surrogates for direct functional measurements. For example, the presence of a feeder bluff within a shoreline reach is an indicator that the shoreline plays a role in sediment supply and habitat formation; and the presence of eelgrass is an indicator that the shoreline is important for primary productivity or food web functions (Table 2-1).

[14] See Table 4-1 in Chapter 4 available at http://www.ecy.wa.gov/programs/sea/shorelines/smp/handbook/Chapter4.pdf

[15] The Shoreline Guidelines [WAC 173-26-201(3)(d) (1)(C)] describe the different types of shoreline ecological functions that the SMP must protect in terms of habitat, water quality, vegetation, hyporheic processes and hydrology. To simplify, we condensed this to three categories. Vegetation is included in the habitat category and hyporheic is included in the water quality category.

Table 2-1. Components, attributes and indicators of shoreline ecological functions

Function Category	Habitat		Water Quality		Hydrology	
Component	***Marine***	***Freshwater***	***Marine***	***Freshwater***	***Marine***	***Freshwater***
Attribute / Indicator	Condition of feeder bluffs	Status of salmon stocks	Status of Shellfish beds (closures)	Amount of impervious surface	Number of tidal barriers	Area of undeveloped floodplain/ channel migration zone
	Area of kelp/eelgrass beds	Condition of riparian vegetation				
	Condition of riparian vegetation					

The functions represented by the indicators above are not the only functions important to the shoreline environment—they are simply indicators that can be relatively easily tracked given using available data and resources. The requirement for no net loss applies to *all* functions—and the County's SMP is designed to protect all shoreline functions, not just certain ones. However, the County lacks the means, technology, and capacity to objectively measure all functions, or track their status in response to management actions.

As a result, this quantitative analysis focuses on certain functions that are closely tied to shoreline development activities (and correlated to the Partnership's indicators for the Protect and Restore Habitat goal as depicted in Figure 1-2). Tracking these indicators over time allows for a more objective assessment of how and to what degree shoreline conditions and functions are changing. By taking note of the type, location and amount of change observed, the County can assess whether there is a link to actions governed by the SMP. The changes can be reviewed in light of specific shoreline management decisions to determine if the SMP is achieving no net loss as shown in Table 2-2.

Table 2-2. Changes in no net loss indicators and potential linkages to the SMP

No Net Loss Indicator	Potential Linkage to SMP
Change in condition of marine bluffs	If the amount or extent of feeder bluff exceptional, feeder bluff or feeder bluff talus is reduced it may mean that these features have been modified (through armoring or other means). Any modification would have a direct link to the SMP, so new modifications may be a sign that the SMP is not fully protecting shoreline functions.
Status of salmon stocks	A decline in abundance of any wild salmon stock may be a sign that the SMP is not fully protecting habitat, but other factors (like changing ocean conditions) may be exerting greater influence. The County would need to examine where and what types of shoreline development actions have occurred to know if the SMP is a key contributor to declines.
Status of Shellfish beds (closures)	More frequent or widespread shellfish bed closures may be a sign that the SMP is not fully protecting water quality functions, but other factors may be exerting influence as well. The County would need to examine where and what types of shoreline development actions have occurred to know if the SMP is a key contributor to water quality concerns.
Amount of impervious surface	An increase in impervious surface of 10% in the shoreline zone or more may be a sign that the SMP is not fully protecting shoreline functions. The County would need to examine where and what types of stormwater BMPs are being provided to determine if there is a no net loss issue.
Number of tidal barriers	An increase in the number of tidal may be a sign that SMP is not fully protecting shoreline functions. The County would need to examine what specific mitigation measures occurred in conjunction with these projects to know if there is a no net loss issue.
Area of undeveloped floodplain / channel migration zone	A decrease in the amount/extent of undeveloped floodplain / channel migration zone may be assign that the SMP is not fully protecting habitat. The County would need to examine what specific mitigation measures occurred in conjunction with these projects to know if there is a no net loss issue.
Area of kelp/eelgrass beds	A decrease in the amount/extent of kelp or eelgrass may be assign that the SMP is not fully protecting habitat, although other factors (like changing sediment transport) may be exerting greater influence. The County would need to examine where and what types of shoreline development actions have occurred to know if the SMP is a key contributor. The County would also need to examine what specific mitigation measures occurred to know if shoreline developments are contributing to no net loss.

No Net Loss Indicator	Potential Linkage to SMP
Condition of riparian vegetation	A decrease in the amount/extent of closed canopy riparian forest may be assign that the SMP is not fully protecting habitat, although other factors (like forest fires) may be a factor. The County would need to examine where and what types of shoreline development actions have occurred to know if the SMP is a key contributor. The County would also need to examine what specific mitigation measures occurred to know if shoreline developments are contributing to no net loss.

3.0 SUMMARY OF CURRENT CIRCUMSTANCES AND SHORELINE ECOLOGICAL FUNCTIONS

This chapter summarizes the current conditions and relevant ecological processes in terms of specific shoreline functions. This summary is based upon the Shoreline Inventory and Characterization Reports (ICRs) prepared for WRIAs 17, 18 and 19 (ESA, 2012) and WRIA 20 (Wecker & Gentry, 2012). The ICRs contains maps and literature citations for the information summarized here.

3.1 WRIAs 17, 18 and 19

3.1.1 Marine Component

The Strait of Juan de Fuca marine shoreline consists of 18 reaches, each composed of different shoretypes that reflect the underlying geology, degree of exposure to wind/waves, long-term patterns of sea level change, the ongoing redistribution of sediment by net shore-drift processes and the influence of freshwater systems including the Dungeness, Elwha, Lyre and other rivers (Figure 3-1). By some measures, the processes that shape and maintain the marine ecosystem are among the least altered in the Puget Sound basin. The Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) completed a comparative analysis that ranked each reach of the Puget Sound/Strait of Juan de Fuca shoreline based on the degree to which a suite of ecosystem processes were altered. The level of degradation was rated on a relative scale from "most degraded" to "not degraded." Overall the reaches of the Strait were less degraded than most other areas of Puget Sound (Schlenger et al., 2010). It is important to note that PSNERP did not evaluate biological conditions (such as vegetation or habitat availability) per se, but assessed the configuration of the shoreline compared to historic conditions and the presence of "stressors" such as fill, armoring, marinas, dams, etc., which influence biological attributes.

Figure 3-1. Inventory reaches along the Strait of Juan de Fuca numbered from east to west (MR= marine reach)

3.1.1.1 Habitat

The marine shoreline of Clallam County supports numerous species of marine mammals, fish, birds and other wildlife and provides a critical pathway for Orca, Pacific salmon and many other species to migrate to and from the Pacific Ocean. The beaches and intertidal areas support sand lance, Pacific herring, surf smelt and many species of bivalves. There are several species of rockfish in the nearshore waters. Gray whales feed at the mouths of several streams and harbor seals haul out on rocks in the intertidal. Black brant, harlequin ducks, and many other avian species use the marine shore for foraging.

The eastern Strait is designated critical habitat for threatened Chinook and chum salmon; the entire Strait is critical habitat for endangered Orca. Other Endangered Species Act-listed species including steelhead trout use the nearshore area for rearing and migration.

The nearshore habitats of the Strait are relatively free of the stressors that degrade habitat. Outside of incorporated areas, only about eight percent of the marine shore is armored. Most of the armoring is on low bank shores as opposed to feeder bluffs. Exceptions to this occur around Sequim Bay / Gibson Spit.

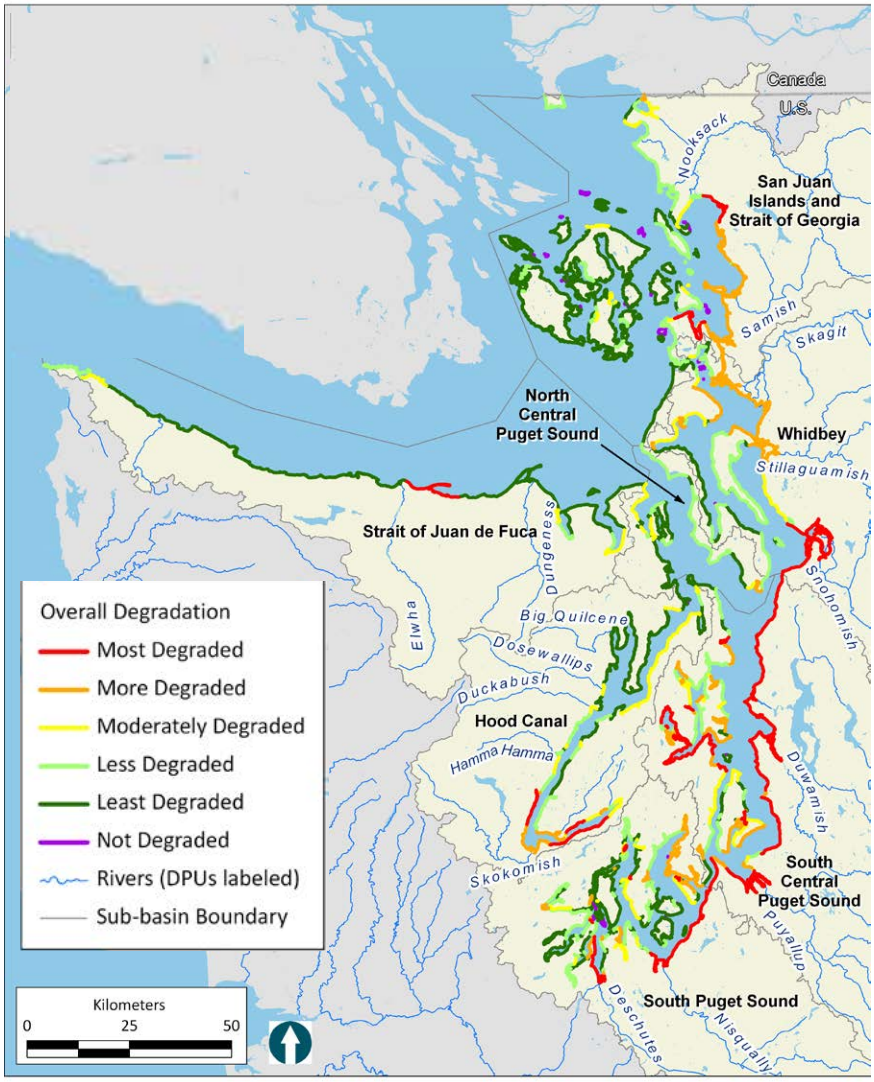

Figure 3-2. Relative overall degradation of Strait of Juan de Fuca nearshore reaches in terms of nearshore processes (Schlenger et al., 2010)

Relatively few overwater structures are located in the Strait of Juan de Fuca, but there are small concentrations of docks and piers in Clallam Bay, Sequim Bay and at Bullman Beach. Because the majority of these structures are located outside of sediment transport zones, they generally do not have a major effect on net shore-drift. However, they can impact migratory habitat, shade out aquatic plants, become havens for predator species and have other adverse impacts on nearshore habitat quality and availability.

Other structural shoreline modifications are scattered along the shore at Twin Rivers (intertidal fill or mole), Whiskey Creek (boat launch / breakwater), Deep Creek (boat launch), Gibson Spit (Port Williams Road fill), Clallam Bay (breakwaters), and Shipwreck Point (SR 112 fill).

The quality and availability of marine shoreline habitat is determined by a wide array of physical, biological, chemical and sociological factors. Three indicators were selected that are strong measures of habitat attributes along the marine shoreline: 1) the condition of feeder bluffs; 2) riparian forest cover; and, 3) aquatic plant communities. Unmodified feeder bluffs, dense forest canopies and continuous beds of kelp and eelgrass are indicators of healthy, properly functioning marine habitat and the opposite conditions are evidence of habitat degradation. Using Geographic Information Systems (GIS) technology, these attributes can be measured to obtain a quantitative estimate of habitat function. Although these are not the only indicators of habitat function, these are the indicators that can be readily measure to support our no net loss analysis.

Feeder bluffs make up roughly 30 percent of the County's Strait of Juan de Fuca marine shoreline—roughly 39 miles in total length (Coastal Geologic Services [CGS], 2011). These are mostly located in eastern Clallam County, along the Miller Peninsula, Green Point, Dungeness Harbor, and Freshwater Bay. Less than two percent (about 0.2 mile) of the mapped feeder bluffs are modified with structural armoring (Table 3-1).

Table 3-1. Percent of each marine reach mapped as feeder bluff along the Strait of Juan de Fuca in Clallam County (data from CGS, 2011)

Marine Reach*		Feeder Bluff Area as a Percent of Reach Length		
	Reach Miles (approx)	Feeder Bluff - Exceptional	Feeder Bluff	Feeder Bluff - Talus
1– Diamond Point	12.5	14%	30%	0%
2 – Sequim Bay**	8.2	0%	28%	0%
3 – Gibson Spit **	6.1	28%	10%	0%
4 – Kulakala Point	7.9	0%	6%	0%
5 – Dungeness Spit	15.7	0%	0%	0%
6 – Green Point	10.4	63%	8%	0%
7 – Angeles Point	7.3	3%	22%	1%
8 – Observatory Point	4.9	0%	0%	0%
9 – Crescent Bay / Low Point	10.7	0%	4%	35%
10 – Twin Rivers	7.4	7%	7%	68%
11 – Deep Creek	5.3	0%	0%	47%
12 – Pysht River	2.4	0%	0%	4%

Marine Reach*		Feeder Bluff Area as a Percent of Reach Length		
	Reach Miles (approx)	Feeder Bluff - Exceptional	Feeder Bluff	Feeder Bluff - Talus
13 – Pillar Point	2.1	0%	0%	63%
14 – Slip Point	6.8	0%	0%	0%
15 – Clallam Bay	5.7	0%	0%	0%
16 – Sekiu River /Kydaka	3.6	0%	0%	14%
17 – Shipwreck Point	6.9	0%	0%	0%
18 – Rasmussen /Bullman Creek	4.6	0%	0%	0%
* = see Figures 5-1 through 5-3 in Chapter 5 for marine reach locations.				
** = includes some armored feeder bluff. In Sequim Bay 0.17 miles of feeder bluff are armored; Gibson Spit 0.05 mile of mapped feeder bluff are armored				

Feeder bluffs are the engines of sediment delivery, continually eroding to form beaches, sand spits and other marine/ nearshore habitats. Properly functioning (unmodified) bluffs generate the mixed sand and pea gravel substrates where forage fish such as sand lance and surf smelt spawn. Given that littoral drift can rapidly transport particles of this size, the of presence feeder bluffs that erode at a fairly high rate is directly linked to the extent of suitable sand lance and surf smelt spawning habitat (Shaffer and Ritchie, 2008).

The process of bluff erosion and beach formation begin when sediment grains, blocks or slabs detach from the bluff face and slide down the slope. The eroded material deposited at the base or toe of the slope protects the bluff from wave attack for a while, but is gradually distributed along the shore by a process called littoral drift. Surface waves typically approach the shore at an angle from the northwest creating longshore currents that transport the sediment down-drift.

The type and extent of riparian forest is another attribute of habitat conditions on the marine shore. Using GIS, the amount of closed canopy forest was measured within 200 feet of the ordinary high water mark as an indicator of habitat function. Shoreline riparian vegetation is fairly intact on the bluffs and low bank shores west of Port Angeles, but bluff and low bank areas near the east end of the Strait tend to be cleared and are more developed. Along the Strait, the percentage of the shoreline composed of vacant land with closed canopy forest undeveloped ranges from about 10 to 85 percent (Table 3-2). The forests provide abundant foraging, perching and nesting habitat for bald eagles and other birds. The areas of mapped bald eagle habitat form a nearly continuous band along the Strait from the Miller Peninsula to the Makah Reservation. Vegetation overhanging the intertidal area provides shade for surf smelt and sand lance eggs, and serves as a source of terrestrial insects for consumption by marine fishes and provides cover at high tide.

Table 3-2. Developable Lands (Vacant Parcels) that have Closed Canopy Forest along the Strait of Juan de Fuca in Clallam County

Marine Reach *	Vacant Parcel Area with Closed Canopy Forest (Acres)	Total Reach Area (land only)	Percent of Reach Area
1– Diamond Point	25.9	268.2	9.7%
2 – Sequim Bay	24.5	254.8	9.6%
3 – Gibson Spit	16.0	616.7	2.6%
4 – Kulakala Point	20.5	920.1	2.2%
5 – Dungeness Spit	4.2	248.8	1.7%
6 – Green Point	26.2	280.1	9.3%
7 – Angeles Point	53.7	322.1	16.7%
8 – Observatory Point	4.3	107.3	4.0%
9 – Crescent Bay / Low Point	50.0	252.7	19.8%
10 – Twin Rivers	69.4	175.0	39.7%
11 – Deep Creek	87.1	127.4	68.4%
12 – Pysht River	21.5	65.7	32.7%
13 – Pillar Point	25.8	48.6	53.0%
14 – Slip Point	132.6	154.7	85.7%
15 – Clallam Bay	5.4	96.1	5.6%
16 – Sekiu River /Kydaka	51.0	93.4	54.6%
17 – Shipwreck Point	24.4	156.9	15.5%
18 – Rasmussen /Bullman Creek	42.3	119.2	35.5%
Total	684.9		

* = see Figures 5-1 through 5-3 in Chapter 5 for marine reach locations.

The intertidal areas along the Strait support kelp forests and eelgrass meadows that provide cover, feeding and rearing areas for a wide range of species including several species of salmon, pelagic fish, crab and sea birds. The extent of these aquatic plant communities is an indicator of habitat function. Kelp and eelgrass are relatively abundant along the Strait; occurring as continuous beds or in patches within a majority of the marine reaches (Table 3-3).

Table 3-3. Kelp abundance per mile of reach along the Strait of Juan de Fuca in Clallam County (data from WDNR 2004)

Marine Reach*	Total Aquatic Area of Reach (acres)	Percent Kelp Coverage	Percent Eelgrass Coverage[1]
1 – Diamond Point	1295	7%	77%
2 – Sequim Bay	843	0%	98%
3 – Gibson Spit	577	0%	66%
4 – Kulakala Point	845	1%	86%
5 – Dungeness Spit	1622	14%	17%
6 – Green Point	1336	37%	4%
7 – Angeles Point	833	61%	74%
8 – Observatory Point	524	45%	45%
9 – Crescent Bay / Low Point	1113	42%	17%
10 – Twin Rivers	860	53%	39%
11 – Deep Creek	590	37%	0%
12 – Pysht River	239	0%	0%
13 – Pillar Point	261	54%	0%
14 – Slip Point	809	57%	0%
15 – Clallam Bay	390	57%	0%
16 – Sekiu River /Kydaka	454	64%	0%
17 – Shipwreck Point	737	60%	19%
18 – Rasmussen /Bullman Creek	546	80%	74%
* = see Figures 5-1 through 5-3 in Chapter 5 for marine reach locations.			

3.1.1.2 Water Quality

Marine water quality in the Strait is affected by point and non-point source pollution, including poorly maintained septic-systems, runoff from roads, agricultural fields, and chemically treated lawns. These sources of pollution can cause elevated levels of fecal coliform, high water temperature and low dissolved oxygen—conditions that affect eelgrass and other marine organism and can potentially impact

shellfish harvest areas. The presence of marine biotoxins such as Paralytic Shellfish Poisoning ("red tide"), Amnesic Shellfish Poisoning and Diarrhetic Shellfish Poisoning are also a concern in Clallam County. These are conditions affect the suitability of beaches for shellfish harvest (commercial and recreational) and other human uses. Some of the main areas of concern in terms of water quality functions are Freshwater Bay, Dungeness Bay, Washington Harbor, Sequim Bay and Discovery Bay.

Hart Crowser (2007) catalogued nine important pathways or sources of pollutants to Puget Sound as a whole including aerial transport, surface runoff, groundwater discharge, discharges from industrial and municipal wastewater treatment plants, discharges from combined sewer overflows, direct spills, transport of pollutants through exchange of oceanic water and reintroduction of pollutants from contaminated sediments. Most of these pathways can be loosely related or unrelated to SMP decisions. SMPs arguably have a somewhat limited influence on marine water quality because the SMP regulates a very small percentage and very narrow portion of the land draining to the Strait. Furthermore, it is difficult to parse out the effect of SMP land use decisions from other decisions such as health department decisions about septic systems, municipal decisions about wastewater treatment, decisions about road construction/management, and decisions related to agriculture/forest practices which are outside the scope of the SMP.

As a result, one relatively narrow indicator of water quality related to shellfish harvest was selected, which is an important shoreline management issue in Puget Sound. The frequency/presence of shellfish harvest closures (or lack thereof) was considered to be an indicator of water quality function for the marine shoreline component. This is compatible with the Partnership's indicator and targets for human health.

The State and County Health Department monitor water quality conditions along the Strait to ensure the beaches and tidelands are safe for shellfish harvest. Beach closures occur when water quality conditions degrade to the point of making the shellfish unsafe to eat. Over the years, certain areas including Dungeness Bay have been plagued by water quality degradation. In 2011, approximately 500 acres of the Dungeness Bay growing area was upgraded from Prohibited to Conditionally Approved for commercial shellfish harvest. The upgrade was due to improved marine water quality at monitoring stations near the mouth of the Dungeness River. The change was prompted by cleanup actions, monitoring, and public outreach by Clallam County, Clallam Conservation District, the Jamestown S'Klallam Tribe, and other partners. The reclassified area has the same seasonal restriction as inner Dungeness Bay: open to commercial shellfish harvest from February through October but closed from November through January. The tidelands surrounding the mouth of the Dungeness River are still closed to shellfish harvest year-round due to freshwater inputs from the river and Meadowbrook Creek, elevated levels of fecal coliform bacteria in Meadowbrook Creek, and uncertainty about the marine water quality at the mouths of these drainages.

3.1.1.3 Hydrology

Tidal barriers are structures such as dikes and levees that impede tidal flow into and out of estuarine/nearshore areas. They can also include roads constructed across estuarine wetlands. Tidal barriers alter flow dynamics and impact the free exchange of sediment, detritus, and organisms. Lack of tidal flow retards tidal channel formation and maintenance, and prevents water and sediment from reaching marshes, which reduces marsh size and complexity.

The hydrologic processes along the marine shoreline are altered in numerous places by tidal barriers. Roads, dikes and levees and other structures have modified several of the estuaries and river deltas along the Strait. To assess existing tidal hydrology functions, the number and location of tidal barriers (or partial barriers) along the Strait were tallied. There are 48 mapped barriers and they occur at Graysmarsh, Washington Harbor, Dungeness River estuary, and Pysht River estuary.

3.1.1.4 Summary of Marine Reach Existing Conditions

This section provides summaries of Strait of Juan de Fuca marine shoreline existing conditions by reach, as assessed for key components based on attributes and indicators. See Figures 5-1 through 5-3 in Chapter 5 for marine reach locations.

1 – Diamond Point

Half of the shoreland area within the reach is heavily forested, which provides habitat for a diversity of wildlife species and helps stabilize erosive bluffs. Outside of the shoreland zone, the majority of Miller Peninsula upland area is forested. The predominant shoreform of Miller Peninsula is bluff backed beach. Half the shoreline consists of feeder bluffs which, along with net shore-drift, supply the sediments that maintain barrier beaches at adjacent spits and Diamond Point. The densest concentration of residential development is located in the Diamond Point vicinity, with sparser development in the Travis Spit vicinity and along the Discovery Bay shoreline. Much of the remaining area is undeveloped Miller Peninsula State Park, managed by Washington State Parks. Sections of the shoreline (6% of reach total) have been armored, presumably to protect adjacent residences. The armoring occurs along Diamond Point and Paradise Cove, which are accretion shoreforms. Approximately 3 docks are located in the Diamond Point vicinity, but no other overwater structures are present.

2 – Sequim Bay

Approximately one-third of the shoreland area within the reach is heavily forested. The dense forest cover also helps stabilize the bluffs within the reach. Outside of the shoreland zone, forest is the predominant land cover; however, portions have been cleared for residential development, agriculture, and other uses. The predominant shoreform of Sequim Bay is bluff backed beach (approximately one-third of the total reach shoreline is classified as feeder bluffs, which supply the sediments that maintain numerous barrier beaches). Bluffs within the reach are generally stable (at least partially due to relatively sheltered position of Sequim Bay = less wave energy).

3 – Gibson Spit

Over 4/5 of shoreland vegetation is natural within 300 feet of the shoreline (predominantly natural shrub and herbaceous habitat predominantly inventoried as wetland). The majority of the landslide hazard areas within the reach are forested, which helps stabilize the slopes. Outside of the shoreland zone, the majority of the surrounding land is agricultural, but some forest land is present in the Gierin and Bell creek vicinities. Shoreforms in the reach consist of bluff backed beach, barrier beach, and barrier estuary, with a lesser amount of Dungeness River delta shore at the northern end of the reach. Washington Harbor (aka Bell Creek estuary) is the largest tidal wetland complex in the vicinity of Sequim Bay. Associated shoreforms and habitats remain; however, a public maintenance road and dikes have degraded ecosystem processes including tidal hydrology, sediment supply, and tidal channel formation.

4 – Kulakala Point

Within 300 feet of the shore, approximately half of the area contains forest and natural shrub and herbaceous vegetation. However, much of the vegetation directly bordering the shoreline has been removed to accommodate dense shoreline development (focused along Three Crabs Road, Seashore Lane, Jamestown Road, and the south shore of Dungeness Harbor). The reach predominantly consists of delta shoreform associated with the Dungeness River, with barrier beach at Cline Spit and bluff backed beach along Dungeness Harbor. Cline Spit is maintained by the sand, gravel, and cobble that drifts from the east and west; the western side of Cline Spit is armored, and several residential properties along Three Crabs Road are protected by bulkheads and other types of armoring. Complete and partial tidal barriers (levees) are located at the Dungeness River mouth. Pockets of nearshore fill and/or structures cover portions of the beach and may impede sediment transport processes (at the end of Crays Road, at Cline Spit, and near Three Crabs Road, and a concrete flume at the mouth of Cooper Creek). The naturally vegetated areas that remain in the reach, located primarily in the Dungeness River delta and its associated wetlands and Dungeness Bay, provide important habitat for a large diversity of fish and wildlife species.

5 – Dungeness Spit

Dungeness Spit is the longest natural sand spit in the United States. Eastward net shore-drift along the feeder bluffs to the west (Reach 6) supplies the sand, gravel, and cobble that maintains the spit. There are no identified shoreline modifications within the reach. Almost the entirety of Dungeness Spit, and all of Graveyard Spit, are contained within the Dungeness National Wildlife Refuge. The refuge protects a wide array of wildlife species and habitat assemblages. The majority of the shoreland area in the reach contains natural shrub and herbaceous vegetation.

6 – Green Point

Approximately one-third of the shoreland area in the Green Point reach is forested, and another third contains natural shrub and herbaceous vegetation. Forest cover is generally absent in the heavily developed areas (Morse Creek vicinity, as well as residential development along most of the marine shoreline landward of the coastal bluff). The predominant shoretype in the reach is bluff backed beach, with smaller portions of barrier beach and barrier estuary. Over 70% of this reach is mapped as feeder bluff or feeder bluff exceptional. These feeder bluffs are subject to the high wind and wave energy. There is very minimal armoring within the eastern half of the reach, which allows unimpeded drift and natural beach building processes to occur to occur along Dungeness Spit (Reach 5). Further west, a second drift cell flows west from Lees Creek towards Port Angeles. The shoreline within this drift cell is heavily modified with armoring that protects the Olympic Discovery Trail, and contains an area of nearshore fill. The mouths of Morse and McDonald Creek, also within Reach 6, are in tsunami hazard areas and mapped FEMA 100-year floodplains (coastal and stream). There is limited residential development adjacent to the McDonald Creek mouth; however, dense residential development is located near the Morse Creek mouth, and many of these homes are within the floodplain and/or channel migration zone of the creek. There are no overwater structures identified within the reach.

7 – Angeles Point

Shoretypes within the reach are primarily bluff backed beach and Elwha River delta shores, with net shore drift consistently eastward (from west end of Freshwater Bay, across Elwha River mouth and feeding Ediz Hook [long spit within City of Port Angeles jurisdiction]). The feeder bluffs within the reach, located east of Angeles Point and within Freshwater Bay, are mapped as unstable, but no recent slides are identified. Shoreline unmodified, except at levied and armored sections at the mouth of the Elwha. Within 300 feet of the shore, more than half of the shoreland area contains forest cover, and another quarter is natural shrub and herbaceous vegetation. Substantial estuarine wetland associated with mouth of Elwha River. Land ownership within the reach is 58% private, 18% public, and 24% tribal. The majority of the private and tribal-owned land is used for residential development, with some agriculture land present. The publicly owned land includes DNR forest land and park land.

8 – Observatory Point

Virtually the entire shoreline of this reach consists of rocky platform shore. The rocky shoreline is relatively stable compared to most of the reaches to the east; minimal landslide or erosion hazards are mapped within the reach. There are no identified shorelines modifications (such as armoring or docks) identified within the reach. There is no appreciable net shore-drift along this reach. The majority of the shoreland area is forest habitat, with a lesser portion of natural shrub and herbaceous vegetation. Less than one-tenth of the riparian vegetation has been altered. Private development within the reach is limited to moderate-density residential development (east third of the reach); most homes are set back over 200 feet from the shoreline. A substantial amount of forest coverage remains on the developed parcels. At the western end of the reach, surrounding Tongue Point, is the Salt Creek Recreation Area, one of the County's premier marine parks.

9 – Crescent Bay / Low Point

Reach contains shoreline along Crescent Bay, the mouths of Salt, Whiskey, and Murdock creeks, and the Lyre River estuary. Net shore-drift is generally eastward along the reach. The western half of the reach generally consists of feeder bluffs, which supply the sand, gravel, and cobble to sustain the beaches of Crescent Bay. The feeder bluffs near the center of the reach are composed of talus, which erode much slower than the unconsolidated glacial deposits that make up the feeder bluffs in the western portion of the reach. Just over half of the shoreland area contains forest vegetation, and the majority of the land that borders the shoreland zone is also forested. Less than 10% of the shoreland area consists of wetland habitat that is concentrated along the river mouths, primarily in the Salt Creek estuary. A breakwater, associated with a boat ramp, is located at the Whiskey Creek Campground (only mapped shoreline modification within the reach). Land uses and ownership within the shoreland area vary throughout the reach, but generally consist of park lands, private recreational uses (Crescent Beach and RV Park), commercial forestry, and rural residential.

10 – Twin Rivers

The predominant shoretype within the reach is rocky platform shores, with small portions of barrier beach and bluff-backed beach located at the Twin River mouths. Over three-quarters of the shoreline consists of feeder bluffs, but the majority of these bluffs are composed of talus, which erode more slowly than the unconsolidated glacial deposits (common along eastern shore of the Strait of Juan de

Fuca). Net shore-drift is entirely eastward through the reach. However, a large, manmade obstruction to littoral drift occurs in the western portion of the reach; referred to as a mole, this remnant shoreline modification from past mining activities bisects drift into two separately functioning cells. Most of the land within the shoreland area is privately owned and zoned for Commercial Forestry. Some DNR-managed forest land is located in the eastern portion of the reach. Shorelands within the reach are largely undeveloped.

In 2017, the County issued permits for a restoration project at the earthen pier (i.e. 'mole') site, a large (5 acre) rectangular fill area that was constructed in the intertidal zone to allow barge loading (there is a nearby quarry). The restoration project consists of removal of approximately 13,000 cubic yards of rock armor and 425 linear feet of sheetpile along the perimeter of the earthen pier. Upon removal of the armor and sheetpile, the native fill sediment comprising the mole will naturally erode and replenish the local shoreline.

11 – Deep Creek

The eastern half of the reach is composed of bluff backed beach (feeder bluffs are composed of talus, which erode more slowly than the unconsolidated glacial deposits) while the western half is rocky platform shores, with a small barrier beach area at the mouth of Deep Creek. Net shore-drift along the reach is entirely eastward; however, a large obstruction (the Silver King Resort breakwater) is located at the mouth of Jim Creek. Nearshore fill, armoring, and 3 overwater structures are located in the resort vicinity. The remainder of the reach has no identified shoreline modifications. Approximately three-quarters of the shoreland area of the reach consists of forest habitat. In addition, most of the land surrounding the shorelands is forested. Land ownership within the reach is 100% private. Land usage within the shoreland is Commercial Forestry, with the exception of the Silver King Resort area, which is zoned Rural Neighborhood Commercial.

12 – Pysht River

The most abundant shoretype in the reach is barrier estuary, associated with the mouth of the Pysht River. A south-trending drift cell, originating at Pillar Point, supplies the sand, gravel, and cobble that forms barrier beach north of the Pysht River mouth. This drift cell converges with a westward drift cell at the Pysht River estuary. Rocky platform shores comprise the eastern portion of the shoreline. Tidal barriers (levees) are located at the mouth of the river. More than half of the shoreland area of the reach is mapped as forest habitat, and most of the remainder of the shorelands (Pysht River estuary) contain natural shrub and herbaceous vegetation. In addition, most of the land surrounding the shorelands is forested. The Pysht estuary is one of the largest estuarine complexes on the Olympic Peninsula and provides important habitat for waterfowl and other wetland-dependent species, as well as steelhead and several salmon species. Land ownership within the reach is 100% private. Land use in the reach is primarily timber land, with a small amount of low-density residential and open space. The entire reach is zoned Commercial Forest.

13 – Pillar Point

Almost the entire shoreline of the reach consists of bedrock shores, with rocky platforms comprising the eastern half and a broad pocket beach in the western half. Feeder bluff talus shoreforms back the pocket beach. The reach consists of two short drift cells, which converge at the pocket beach area. There is no appreciable drift along the rocky platform area. There are no identified shoreline modifications within the reach. Almost the entire shoreland area contains forest habitat, and the surrounding land is also forested. Land ownership within the reach is almost entirely private, and use is primarily timber, with a smaller amount of low-density residential located in the eastern portion of the reach, adjacent to Pillar Point.

14 – Slip Point

Bedrock rocky platform shores comprise the entire shoreline within the reach, and there is no appreciable net shore-drift along the shores. There are no identified shoreline modifications within the reach. Almost the entire shoreland area contains forest habitat, and the surrounding land is also forested. Almost the entire shoreland area is privately-owned timber land.

15 – Clallam Bay

The eastern half of the shoreline in this reach consists of low beaches (barrier estuary and barrier beach), with bluff backed beach in the western portion. These beaches are maintained by two drifts cells (originating at the Clallam Bay headlands), which converge in the central portion of the bay near the mouth of the Clallam River. Almost one-quarter of the shoreline within the reach has been armored, or otherwise modified. Two marina breakwaters are located within the reach, near the center of the bay and at the west end. In addition, shoreline armoring is present along the shoreline near the west marina. There are several overwater structures (docks) at each of the marinas. This is one of the more heavily developed reaches in western Clallam County so the shoreline vegetation has been substantially altered. Only about one-quarter of the shoreland area contains forest cover, with natural shrub and herbaceous vegetation located along the Clallam River. The remainder of the shorelands contains developed and lawn/landscaped area. Most of the land outside of the SMP jurisdiction is forested. Major land uses within the shoreland area include open space, roads, lodging, high-density residential, and commercial. Over 90% of the shoreland area is privately owned.

16 – Sekiu River /Kydaka

Rocky platform shores comprise over half of the shoreline within the reach, with bluff backed beach in the center of the reach. Two small pocket beaches are located in the western portion of the reach. Net shore-drift within the reach is entirely eastward. A small section of shoreline armoring is located at the eastern end of the reach, near Sekiu. The remainder of the shoreline is unaltered. Almost the entire shoreland area contains forest habitat, and the surrounding land is also forested. The eastern two-thirds of the reach is primarily privately owned timber land, with one publicly owned parcel (managed by State Parks) located near the center of the reach. Land use in the western third of the reach is moderate-density residential and vacant parcels.

17 – Shipwreck Point

The majority of the shoreline consists of rocky platforms shores, with barrier beaches and barrier estuary located near the Hoko and Sekiu estuaries. A bluff backed beach is located between the estuaries, and a pocket beach is located in the western portion of the reach. Net shore-drift in the reach is entirely eastward. Nearly the entire eastern half of the reach is armored (50% of the total reach), which protects Highway 112. Approximately one-third of the reach is heavily forested, with a lesser amount of natural shrub and herbaceous vegetation within the wetlands associated with the river estuaries. Natural vegetation cover within a third of the shoreland area has been altered by residential development and roads. Almost half of the land use within the reach is timber, with other substantial land uses being residential, open space, and roads. Moderate- to high-density residential subdivisions are located along the pocket beach near the center of the reach, on the landward side of Highway 112, and directly west of the Hoko River estuary. Most of the homes are set back more than 75 feet from the shoreline.

18 – Rasmussen / Bullman Creek

More than three-quarters of the reach consists of rocky platform shores, with some intermittent pocket beaches. Most of the shoreline within the reach has no appreciable net shore-drift; however, eastward drift occurs along Bullman Beach and at the mouth of Rasmussen Creek. Two small segments of shoreline armoring (8% of reach total length) are mapped in the western portion of the reach, at Bullman Beach and the mouth of Snow Creek. In addition, there is one overwater structure (dock) mapped at Snow Creek. Approximately half of the shoreland area within the reach is heavily forested, which helps stabilize erosive slopes and provides habitat for a diversity of wildlife species. Natural shrub and herbaceous vegetation is present near the creek mouths. Vegetation in approximately a quarter of the reach has been altered by roads and development. Most of the shoreland area is bordered by forest land. The predominant land usage within the reach is timber, with residential, lodging, and open space land at the west end of the reach. A pocket of higher density residential development is located at Bullman Beach, and most of the homes are fairly close to the shoreline (approximately 50 feet). The entire residential area is within mapped tsunami and coastal floodplain hazard areas.

3.1.2 Freshwater Component

Rivers and streams within WRIAs 17, 18, and 19 pass through a complex patchwork of land use and land cover as they flow north from the Olympic Mountains and foothills to the Strait of Juan de Fuca. As with the marine environment, the movement and storage of materials such as water, sediment, nutrients, pathogens, and organic materials in/across upland areas affects the health and sustainability of freshwater rivers and lakes.

3.1.2.1 Habitat

Freshwater rivers, streams and lakes in WRIAs 17, 18 and 19 are vital to the health of many Puget Sound salmon and trout stocks, including Chinook salmon, summer chum salmon, bull trout and steelhead, which are listed as threatened under the federal Endangered Species Act. Due to their reliance on healthy freshwater systems, stock status for certain salmon species was selected as one of two indicators of habitat function.

Historically, the basins of the Dungeness, Elwha, and Lyre rivers and Morse Creek were among the most productive of the north Olympic coast[16]. However, these and other basins have experienced marked declines in stock productivity likely caused by habitat loss, harvest practices, and changes in ocean conditions. The Sekiu, Clallam, Pysht, Twin, Hoko, Deep Lyre-Crescent basins are all at risk of losing one or more runs of Chinook, pink, chum and/or coho salmon (Table 3-4).

Table 3-4. Basins with critical, declining or at risk salmon stocks (based on data from North Olympic Peninsula Lead Entity)

Area	Critical and Declining	Specific Stocks at Risk of Extirpation
Central Strait (McDonald, Siebert, & Bagley creeks)		Coho
Clallam Basin		Chum
Deep Basin	Fall chum	Chum
Dungeness Basin	Fall pink, summer steelhead	
East and West Twin Basins	Fall chum	Chum
Eastern Strait (Bell, Gierin, Cassalery, Cooper, Meadowbrook creeks)[1]		Coho
Elwha Basin	Summer pink, fall chum	
Hoko Basin		Chum
Jimmycomelately	Summer chum	Chum, coho
Lyre-Crescent Basin		Chum
Pysht Basin		Chinook
Sekiu Basin		Chinook, chum
Western Strait Clallam Independents (Village east to Colville Creek) [1]	Fall coho, fall chum	Coho, chum

Further declines in abundance of more than 2 wild Chinook, chum or coho populations would be a sign that the County's SMP is not achieving no net loss.

The second indicator of freshwater habitat function that was selected is riparian forest cover. Salmon and other aquatic organisms rely on processes sustained by the dynamic interaction between the stream and the adjacent riparian area. As with marine shorelines, riparian forest cover has a major impact on habitat (as well as water quality and hydrology functions). Streamside (and lakeside) riparian forests are

[16] (NOPLE Strategy available at http://www.noplegroup.org/nople/pages/strategy/PrioritizedWatersheds.htm).

essential components of healthy freshwater habitats. Insects falling from overhanging vegetation provide food for fish, while leaves and other organic matter falling into streams provide food and nutrients for many species of aquatic insects, which in turn provide forage for fish. Most juvenile salmonids that rear in streams prey on aquatic invertebrates and terrestrial insects that fall into streams from overhanging vegetation (Horner and May, 1999; May et al., 1997).

Riparian forest cover is also the primary source of organic / woody debris. Organic material, including large woody debris, enters streams via streambank erosion and treethrow/windthrow processes operating within roughly 200 feet of stream channels. These processes play a substantial role in stream channel maintenance and in-stream habitat formation and are therefore critical to the heath of freshwater habitats. According to some studies more than half of all large woody debris recruitment is from within 25 feet of streams, and about 90 percent comes from trees growing within about 50 feet of streams (Murphy and Koski, 1989; McDade et al., 1990; Van Sickle and Gregory, 1990). In addition, for larger streams that are prone to avulsion (such as the lower Dungeness River), large woody debris can be recruited from distances much greater than 50 feet (Latterell, J.J., Naiman, R.J., 2007).

In WRIAs 17, 18 and 19, most streams and rivers have a high percentage of closed canopy riparian cover within 200 feet of the stream channel—especially in western Clallam County (Table 3-5). The amount of closed canopy riparian forest along the lower reaches of the Dungeness, Elwha and Salt Creek is lower than most other areas of the County.[17] These data are a "snapshot" in time, based off of 2009 imagery (1:25,000-scale) from the U.S. Department of Agriculture's National Agriculture Imagery Program (NAIP). The categories are as follows: Closed Canopy (CC), Other Natural Vegetation (ONV), Non-Forest (NF), Water (W) (freshwater) and Off-Shore (OS). The "closed canopy" category is defined as a land cover class that included deciduous and conifer dominated forests with closed canopies. The trees are not classified based on age, but rather the structure of the canopy cover as seen from the imagery (looking down) and their relative height as compared to surrounding vegetation using the NAIP imagery and Ecology's oblique photos. The "condition" or state of the forest floor or understory is not taken into consideration because they are not detectable in the imagery. This data is still in draft form and analysis of repeatability, field verification and statistical error for category correctness is still underway.

Table 3-5. Acres of closed canopy forest within 200 feet of the ordinary high water line (Data from Point No Point Treaty Council, 2011)

Reach Name*	Acres of Riparian Forest within 200' Shoreline	Total Acres of Reach	% of Riparian Forest
Bear_Cr_01	121	130	93%
Boun_Cr_01	54	55	99%
Brow_Cr_01	10	13	75%
Bull_Cr_01	11	18	58%
Cany_Cr_01	71	77	91%
Char_Cr_01	30	42	72%

[17] The freshwater reaches in WRIA 17, 18, and 19 are identified in the "analysis area" figures in Chapter 5.

Reach Name*	Acres of Riparian Forest within 200' Shoreline	Total Acres of Reach	% of Riparian Forest
Clal_Rv_01	59	110	53%
Clal_Rv_02	19	30	64%
Clal_Rv_03	31	89	35%
Clal_Rv_04	291	322	90%
Covi_Cr_01	15	15	100%
Deep_Cr_01	258	280	92%
Dung_Rv_01	15	45	33%
Dung_Rv_02	114	263	43%
Dung_Rv_03	83	175	48%
Dung_Rv_04	238	250	95%
Dung_Rv_05	326	330	99%
Dung_Rv_06	170	170	100%
Elli_Cr_01	35	44	79%
Elwh_Rv_01	104	214	49%
Elwh_Rv_02	51	147	34%
Elwh_Rv_03	68	102	67%
Etwi_Rv_01	201	216	93%
Gray_Rv_01	375	392	96%
Gree_Cr_01	27	33	83%
Herm_Cr_01	51	84	61%
Herm_Cr_02	37	55	68%
Hoko_Rv_01	36	44	81%
Hoko_Rv_02	66	115	57%
Hoko_Rv_03	264	319	83%
Hoko_Rv_04	64	103	63%
Hoko_Rv_05	185	246	75%
Hoko_Rv_06	131	179	73%
Hoko_Rv_07	110	150	73%
Hoko_Rv_08	90	117	77%
Hoko_Rv_09	105	124	85%
Indi_Cr_01	174	238	73%
Last_Cr_01	2	3	67%
Lhok_Rv_01	149	211	71%
Litt_Rv_01	111	115	96%
Lyre_Rv_01	171	187	91%

Reach Name*	Acres of Riparian Forest within 200' Shoreline	Total Acres of Reach	% of Riparian Forest
Lyre_Rv_02	65	65	100%
Mcdo_Cr_01	242	350	69%
Mors_Cr_01	274	424	65%
Nbhe_Cr_01	43	52	82%
Nfse_Rv_01	206	244	84%
Oldr_Cr_01	13	24	56%
Pysh_Rv_01	60	92	65%
Pysh_Rv_02	189	264	72%
Pysh_Rv_03	41	69	60%
Pysh_Rv_04	183	251	73%
Roya_Cr_01	17	17	100%
Salm_Cr_01	25	47	52%
Salt_Cr_01	9	37	24%
Salt_Cr_02	158	183	86%
Sbli_Rv_01	69	70	100%
Seki_Rv_01	178	272	66%
Sfpy_Rv_01	44	67	66%
Sfpy_Rv_02	116	145	80%
Sfse_Rv_01	114	124	92%
Silv_Cr_01	34	34	100%
Suth_Lk_01	1	3	39%
Wtwi_Rv_01	206	256	80%
Grand Total	**6,623**	**8,695**	**76.2%**
* = see Figures 5-1 through 5-3 in Chapter 5 for freshwater reach locations.			

3.1.2.2 Water Quality

Water quality is an important factor in maintaining suitable freshwater habitats for fish and other aquatic species. Salmonids, in particular, require water that is both colder and has lower nutrient levels than many other types of native fish. Dissolved oxygen is one of the most influential water quality parameters for stream biota, including salmonids (Bjornn and Reiser, 1991). A chief influence on dissolved oxygen levels in most streams is temperature; cooler waters maintain higher levels of oxygen than warmer waters. Thus the riparian forest cover indicator discussed above provides an indirect measure of stream shade, which is directly related to temperature.

As with the marine environment, selecting a measure of water quality function that is highly responsive to SMP decisions (as opposed to other types of land management decisions) is difficult. The amount of

impervious surface within shoreline jurisdiction was selected as an indicator of freshwater quality functions. Two major impacts of increased imperviousness are increased runoff (e.g., Booth et al., 2002) and increases in deposition of nutrients, pathogens and contaminants into water bodies (e.g., Kaye et al., 2006). Higher percentages of impervious surface are correlated with declining water quality in freshwater systems (Horner et al.,1997. Dissolved oxygen was not selected as an indicator because the monitoring data are limited and not available for the full study area.

Minimizing new impervious surfaces can also help to maintain water quality in freshwater streams. Currently, there is relatively little impervious cover within 200 feet of most freshwater streams in WRIAs 17, 18 and 19 (Table 3-6). This means that infiltration and recharge processes are largely intact in these areas, which helps to maintain hydrologic, water quality and habitat functions. Exceptions to this are the upper reach (Reach 3) of the Clallam River, Lake Sutherland and the lower reach of Morse Creek (Reach 1). These areas have roads near the shoreline, so the levels of impervious surface areas are ~10 percent or more.

Table 3-6. Impervious surface area as a percent of the shoreland jurisdictional area for streams in WRIA 17, 18 and 19 streams in Clallam County by reach (From National Land Cover Data Set)

Freshwater Reach*	Percent Impervious Area (excludes aquatic areas)
Bullman Creek Reach 01	5.0%
Canyon Creek Reach 01	1.1%
Charlie Creek Reach 01	0.9%
Clallam River Reach 01	3.0%
Clallam River Reach 02	4.9%
Clallam River Reach 03	15.0%
Clallam River Reach 04	1.3%
Deep Creek Reach 01	0.5%
Dungeness River Reach 01	2.4%
Dungeness River Reach 02	3.0%
Dungeness River Reach 03	6.1%
Dungeness River Reach 04	0.3%
East Twin River Reach 01	0.8%
Elwha River Reach 01	0.6%
Elwha River Reach 02	3.7%
Elwha River Reach 03	7.9%
Hoko River Reach 01	2.4%
Hoko River Reach 02	1.6%
Hoko River Reach 03	1.3%
Hoko River Reach 04	1.1%

Freshwater Reach*	Percent Impervious Area (excludes aquatic areas)
Indian Creek Reach 01	5.8%
Lake Sutherland Reach 01	18.1%
Little River Reach 01	0.7%
Lyre River Reach 01	1.3%
McDonald Creek Reach 01	2.4%
Morse Creek Reach 01	9.8%
Pysht River Reach 01	0.2%
Pysht River Reach 02	4.1%
Pysht River Reach 03	5.7%
Pysht River Reach 04	2.1%
Salt Creek Reach 01	2.3%
Salt Creek Reach 02	1.5%
Sekiu River Reach 01	7.5%
Grand Total	**3.5%**
* = see Figures 5-1 through 5-3 in Chapter 5 for freshwater reach locations.	

Note: No impervious surface areas were detected within reaches not listed.

3.1.2.3 Hydrology

The freshwater streams and lakes of WRIAs 17, 18 and 19 are fed by surface water runoff and groundwater recharge. Precipitation is the primary source of groundwater recharge. Soil permeability and underlying geology influence the amount of precipitation that becomes surface runoff. In mountainous areas with intact forest cover, shallow soils tend to limit infiltration so water either travels laterally as shallow subsurface flow, or percolates to deep groundwater through cracks and fissures in the bedrock. River valleys in the lowlands tend to have deeper, porous soils that create favorable conditions for groundwater discharge. In their natural state, these areas can store large quantities of water in shallow aquifers.

Removal of forest cover and development along streams alters the natural hydrologic cycle and increases the frequency, duration and amount of surface water runoff (Booth and Jackson, 1997); Alberti and Marzluff, 2004). Runoff rates also increase when rivers become disconnected from their floodplains. Reduced storage and connectivity occur as a result of dikes, revetments and/ or levees along stream channels; stream channelization; and floodplain and wetland fill. The loss of surface water storage potential can increase the magnitude and frequency of peak flows and can increase water level fluctuations in river and lake systems. In contrast, unaltered floodplains help to mitigate effects of increased runoff. Connected floodplains allow for overbank storage, which dissipates the erosive forces

of the flood. As a result, the amount/extent of development within floodplains and channel migration zones provides a measure of hydrologic functions. For this reason, floodplain development was selected as an indicator of freshwater hydrology function.

A comprehensive catalog of existing floodplain development across WRIAs 17, 18 and 19 is not available; however, the Inventory and Characterization Report describes known revetments and levees that occur along WRIA 17, 18, and 19 streams. A total of 40 existing revetments and levees are inventoried (covering roughly 67 acres of shoreline, not including all of the floodplain area that is disconnected from the river). These structures are along the Dungeness (primarily within Reaches 1, 2 and 3, and the downstream 0.25 miles of Reach 4), Elwha (primarily within Reach 1, as well as Reach 3), and Pysht Rivers (only within Reach 1), and also occur along Morse Creek Reach 1 (primarily downstream of U.S. Highway 101) and Little River Reach 1 (immediately above the convergence with the Elwha) (ESA, 2011). For all other freshwater reaches, there are no inventoried revetments or levees that constrain channel interactions with the riparian zone and associated floodplain. Levees and revetments are typically constructed to constrain channels and/or prevent flooding – in order to protect development and uses occurring in adjacent areas. As such, the location and extent of these structures are indicative of where the most extensive existing floodplain development exists[18].

For freshwater reaches with high development pressure, the potential for new floodplain development (lots that the assessors' data shows as vacant lots occurring entirely within the mapped FEMA 100-year floodplain) was assessed. See Section 5.1 of this report for additional details.

3.1.2.4 Summary of Freshwater Reach Existing Conditions

An overview of existing conditions along the freshwater shorelines of WRIAs 17, 18 and 19 follows. Data is provided consistent with the components, attributes, and indicators of healthy marine shorelines (as presented in Table 2-1). See Figures 5-1 through 5-3 in Chapter 5 for freshwater reach locations. Additional details on existing freshwater conditions can be found in the WRIAs 17, 18, and 19 ICR (ESA, 2012).

Bear Creek (Bear_Cr_01)

The reach meanders through moderately steep terrain, trending generally westward. Vegetative cover through the reach is primarily forest habitat, which provides shading and habitat for fish and wildlife. Bear Creek provides habitat for Chinook, chum, and coho salmon, and steelhead trout. Erosion and landslides are prevalent throughout the middle and upper reach. The lower portion of the reach, near the Hoko River confluence, is within the FEMA 100-year floodplain. The reach consists of privately owned commercial timber lands. No shoreline modifications are mapped within the reach.

[18] The freshwater reaches where extensive revetments and levees are inventories maintain an overall riparian forest cover of 65%, by area. Comparatively, freshwater reaches with no inventoried revetments or levees have an overall riparian forest cover of 80% by area. See Tables 3-5 and 3-6 for additional information on land use patterns within freshwater reaches.

Boundary Creek (Boun_Cr_01)

The stream profile through the reach is generally straight, flowing east and northeast through steep mountain terrain and valleys. The channel is bordered by a narrow floodplain. Dense forest cover is present within the reach, providing substantial shading and habitat for fish and wildlife. Boundary Creek provides habitat for resident cutthroat and rainbow trout populations. The reach contains public timber lands managed by DNR. The majority of the reach is located in a geologic hazard area, susceptible to erosion. No shoreline modifications are mapped within the reach. No shoreline modifications are mapped within the reach.

Brownes Creek (Brow_Cr_01)

Forest habitat borders the riparian corridor and extends outward through much of the reach, providing shade and habitat for fish and wildlife. The reach provides spawning and rearing habitat for Chinook, chum, and coho salmon, and steelhead trout. Resident cutthroat and rainbow trout are also present in the reach. Commercial forestry and timber lands are located throughout the reach. Much of the eastern portion of the reach lies within the FEMA 100-yearfloodplain. The middle and upper portions of the reach are located in geologic hazard areas, and are susceptible to erosion and landslides. The lands within the reach are largely undeveloped. No shoreline modifications are mapped within the reach. No shoreline modifications are mapped within the reach.

Bullman Creek (Bull_Cr_01)

The stream channel within the reach flows in a relatively straight, well-defined course. Vegetative cover in the reach is a combination of forest and herb and shrub habitat. Bullman Creek provides habitat for Chinook, chum, and coho salmon, and steelhead trout. Breeding populations of bald eagle are also located within the reach. Moderate- to low-density residential development is located in the lower portion of the reach along Highway 112. Timber and commercial forest lands are located in the middle and upper portion of the reach. The lower portion of the reach lies within the tsunami hazard zone and FEMA 100-year floodplain, and the majority of the reach is located in a geologic hazard area for erosion. Residential developments in the lower reach are located within the tsunami hazard zone, FEMA 100- year floodplain, and/or geologic hazard areas. No shoreline modifications are mapped within the reach.

Canyon Creek (Cany_Cr_01)

The stream meanders northeastward in a relatively straight path toward its confluence with the Dungeness. Vegetative cover is primarily dense forest cover that extends from the surrounding foothills into the riparian corridor, providing stream shading and habitat for fish and wildlife. The reach provides habitat for resident cutthroat and rainbow trout. The reach supports breeding populations of elk and harlequin duck. The majority of the reach consists of public, DNR-managed forest lands. Some commercial forestry parcels are located in the lower and middle portions of the reach. The majority of the reach lies in a geologic hazard area for slides. Public access to trails in the reach is available from Forest Service Road 2870. A hatchery water intake dam located at RM 0.08 is a complete barrier to upstream fish passage.

Charlie Creek (Char_Cr_01)

The stream profile in the reach is typically straight with a few broad meanders in the lower portion of the reach. Forest cover is prevalent throughout the reach, extending from the surrounding hillside into the riparian corridor. Herb and shrub habitat is located in portions of the lower reach. Wetland habitat is located in the floodplain of the lower portion of the reach, adjacent to Charley Creek Rd. The reach provides spawning and rearing habitat for coho and chum salmon, in addition to steelhead and resident cutthroat trout. Low-density rural residential development is located in the lower portion of the reach. Most of the reach area is DNR-managed public forest land. The upper and middle portions of the reach are located in a geologic hazard area for erosion. Slides areas are located in the upper portion of the reach along the southern reach boundary. No shoreline modifications are mapped within the reach.

Clallam River 1 (Clal_Rv_01)

Encompasses the large, flat alluvial fan complex of the river. The channel profile through this reach is highly sinuous supporting several large meander bends that move laterally across the broad low-gradient floodplain. Tributary streams braid and join the river in the lower portion of the reach. Patches of herb and shrub habitat, as well as forest habitat, are located in portions of the reach that have not been cleared for agriculture. Wetland habitat extends across the floodplain in several locations. The reach provides habitat for coho and chum salmon, as well as steelhead and resident cutthroat trout. The reach supports breeding populations of bald eagle. The majority of the reach contains moderate- to-low density residential development and agriculture. Approximately a third of the reach is zoned for commercial forestry. The majority of the reach lies within the tsunami hazard zone, the FEMA 100-year floodplain, and/or channel migration area. The upper portion of the reach lies in a geologic hazard area for erosion. This reach contains three identified shoreline modifications. River road crossings are present at Frontier Street and Weel Road. Additionally, a dam is located on a tributary to the river, in the southwestern portion of the reach.

Clallam River 2 (Clal_Rv_02)

The river profile in this reach is characterized by stretches of relatively straight channel segments followed by gentle sweeping meanders. Vegetation adjacent to the stream corridor is a mixture of dense forest cover and natural shrub and herb habitat. Highway 112 corridor runs perpendicular to the stream course through the central portion of the reach, potentially limiting access to floodplain and side-channel habitat. Wetland habitat extends through the southeastern portion of the reach. The reach provides spawning and rearing habitat for coho and chum salmon, steelhead, and cutthroat trout. The reach contains low-density commercial and residential development. The majority of the reach lies in the FEMA 100-year floodplain and/or in the channel migration zone. A geologic hazard area for erosion is present in the southeast portion of the reach. Some residences are located within the flooding and/or channel migration areas. Highway 112 crosses the river near the center of the reach.

Clallam River 3 (Clal_Rv_03)

The reach is characterized by a sinuous river channel containing several meanders throughout a broad and relatively flat floodplain. Highway 112 parallels the river through much of the reach and constitutes a lateral barrier between the river and portions of its natural floodplain. Two bridge crossings are located in the middle and upper portion of the reach. Much of the reach contains forest habitat, although

a substantial portion of the reach has been cleared for agriculture and/or rural residential development. Wetland habitat is present throughout the reach. The reach provides spawning and rearing habitat for coho and chum salmon, in addition to steelhead and resident cutthroat trout. The reach also supports breeding populations of bald eagle. Low-density residential development and agriculture is prevalent in the reach. The majority of the reach lies in the FEMA 100-year floodplain and/or in channel migration area. Geologic hazard areas for slides and erosion are located in the east and west, respectively. Several existing residences are located within flood and/or channel migration hazard areas. Highway 112 runs parallel to the stream corridor before crossing in two locations in the central and south central portions of this reach.

Clallam River 4 (Clal_Rv_04)

The channel is throughout the reach is confined within a narrow floodplain. Dense, contiguous forest habitat covers the majority of the reach, which provides shade and habitat for fish and wildlife. The reach provides spawning and rearing habitat for coho and chum salmon, in addition to steelhead and resident cutthroat trout. The majority of the reach contains public forest lands managed by DNR. The Clallam River Campground, a popular recreation area, is located in the lower portion of the reach. Undeveloped/informal public access to shorelines is available from Highway 112 throughout the reach. Approximately one half of the reach lies within the FEMA 100-year floodplain. Geologic hazard areas for slides and erosion are located throughout the reach. The majority of the floodplain supports dense forest cover and natural vegetation. No shoreline modifications are mapped within the reach.

Coville Creek (Covi_Cr_01)

The reach is relatively short, extending from near the stream mouth to approximately 0.3 mile upstream. The portion of Coville Creek within the reach trends generally northwest, along a straight channel length that flows across a wide terrace. The reach contains dense forest cover. The stream provides habitat for coho and chum salmon, and resident cutthroat trout. The reach provides habitat for breeding populations of bald eagle. The majority of the reach contains low density residential and forest lands. Existing homes are generally located 200 feet from the stream channel. The lower half of the reach lies within a tsunami hazard area and the FEMA 100-year floodplain. The entire reach lies within a geologic hazard area for slides. No shoreline modifications are mapped within the reach.

Deep Creek (Deep_Cr_01)

The reach is characterized by steep terrain. The channel profile through the reach is fairly sinuous as it meanders through low to moderate gradient stream segments. The reach contains dense forest cover, intermixed with herb and shrub communities. The reach provides spawning and rearing habitat for coho and chum salmon, and also provides habitat for steelhead trout and resident cutthroat trout. The lower portion of the reach supports breeding populations of bald eagle. Public (DNR-managed) and private timber lands are located throughout the reach. The lower portion of the reach is located within a tsunami hazard area and the FEMA 100-year floodplain. Geologic hazard areas for slides and erosion are located in the upper and middle portions of the reach. Some existing residences in the lower portion of the reach are located within flood and tsunami hazard areas. Highway 112 crosses Deep Creek at the north end of the reach, and the stream channel was historically denuded of large woody debris.

Dungeness River Reach 1 (Dung_Rv_01)

The reach consists of the broad alluvial floodplain of the lower Dungeness. The river channel within the reach has a relatively narrow forested riparian corridor; the surrounding floodplain is utilized for agriculture. Wetland habitat is located throughout the reach, adjacent to the stream course. The reach provides habitat for Chinook, chum, coho, and pink salmon, in addition to steelhead, bull, and resident cutthroat trout. The reach also provides priority habitat for bald eagle, harlequin duck, peregrine falcon, and waterfowl. The majority of the reach contains rural low-density residential and agricultural lands. The lower portion of the reach lies within a tsunami hazard zone, as well as the FEMA 100-year floodplain and channel migration zone. Geologic hazard areas for slides are located in the northwestern portion of the reach. Existing residential and agricultural development is located within the tsunami, flood and/or channel migration areas. This reach contains several shoreline modifications. The Dungeness River is constrained by levees along its entire east bank and a portion of the west bank, which have disconnected the river from its floodplain. Two culverts are present under East Anderson Road, west of the Schoolhouse Bridge.

Dungeness River 2 (Dung_Rv_02)

The channel profile through the reach is dynamic, supporting a high degree of sinuosity and braiding. The reach contains some forest and herb and shrub habitat, but much of the area has been converted to agriculture. A substantial portion of the reach contains wetland habitat. The reach provides spawning and rearing habitat for Chinook, chum, coho, and pink salmon, in addition to steelhead, bull, and resident cutthroat trout. Sockeye salmon have also been documented in the reach. The reach also provides habitat for bald eagle, harlequin duck, peregrine falcon, and waterfowl concentrations. The reach contains moderate- to low-density residential development and agricultural lands. The Mary Lukes Wheeler County Park provides public access to shorelines in this reach. Additionally, the Olympic Discovery Trail crosses in the northern portion of the reach. Most of the reach, including developed areas, are located in the FEMA 100-year floodplain and/or the channel migration zone. Four road crossings are located within the reach. The Hurd Creek Fish Hatchery is located in the western portion of the reach. South of Woodcock Road, most of the east side of the river is constrained by levees.

Dungeness River 3 (Dung_Rv_03)

The stream profile through the reach is sinuous, meandering and braiding across its floodplain. Vegetative cover in the reach is a mixture of forest cover and herb and shrub habitat. Portions of the stream corridor and floodplain have been cleared for agricultural uses and residential development. The reach provides spawning and rearing habitat for Chinook, chum, coho, and pink salmon, in addition to steelhead, bull, and cutthroat trout. Sockeye salmon have also been observed within the reach. Additionally, the reach provides habitat for bald eagle and harlequin duck. The reach contains moderate- to low-density residential development and agricultural lands. Undeveloped/informal public access is available through several publically owned side roads that allow access to shorelines within the reach. Additionally, the river can be accessed at the fish hatchery near the Canyon Creek confluence. Most of the reach lies within channel migration and FEMA 100-year floodplain hazard areas. Geologic hazard areas for erosion are located in the southern portion of the reach. Many existing residences are located within flood and/or channel migration hazard areas. Several levee sections are located within the

reach. In addition, the Sequim Fish Hatchery is located in south eastern portion of the reach, and the Morse Creek Acclimation ponds are located in the southwest.

Dungeness River Reaches 4, 5, and 6 (Dung_Rv_04, Dung_Rv_05 and Dung_Rv_06)

The stream channel within the reaches is relatively confined and meandering. Vegetative cover in the reaches is consists primarily of forest habitat. The reaches provides spawning and rearing habitat for Chinook, coho, chum, and pink salmon, in addition to steelhead, bull, cutthroat, and rainbow trout. Additionally, reach 4 provides habitat for elk and harlequin duck populations. Reach 4 is primarily public forest land (DNR and Olympic National Forest). Reaches 5 and 6 are located within the Olympic National Forest. Much of reach 4 lies within flood hazard areas, and the central portion of the reach lies in a geologic hazard area for slides. Portions of the lower reach lie in a geologic hazard area for erosion. Public access to reaches 5 and 6 is accessible through Forest Service Road 2870. No shoreline modifications are mapped within these reaches.

Elli_Cr_01

The reach extends from the Hoko River confluence to approximately 1 mile upstream. The reach is covered primarily by dense forest. The reach provides spawning and rearing habitat for Chinook and coho salmon, in addition to steelhead and cutthroat trout. The majority of the reach contains commercial forest lands. The lower portion of the reach is located within the FEMA 100-year floodplain. Geologic hazard areas for erosion and slides are located throughout the reach. No shoreline modifications are mapped within the reach.

Elwha River 1 (Elwh_Rv_01)

The stream channel within the upper portion of the reach is constrained by the steep bedrock walls of the Elwha Canyon, while the channel floodway widens in the lower portion of the reach and supports substantial wetland habitat. In the lower reach, levees are present along the eastern border of the reach. The reach consists primarily of forest habitat, although forest cover has been removed in some areas. Within the reach, the river provides habitat for bull trout, resident cutthroat, and steelhead trout, and Chinook, chum, pink, and coho salmon. The reach also provides habitat for bald eagle. Reach 1 of the Elwha is largely undeveloped, with the exception of the City of Port Angeles water facility. The northern portion of the reach lies within mapped channel migration, tsunami, and flood hazard zones. Elwha River Road and Granite Road cross the stream corridor in the central and south central portions of the reach, respectively. Levee sections are present throughout the lower portion of the reach, and a levee is present along the entire east side of the floodplain in the lower portion of the reach.

Elwha River 2 (Elwh_Rv_02)

The reach area consists primarily of forest habitat. The river provides habitat for bull trout, resident cutthroat, and steelhead trout, and Chinook, chum, pink, and coho salmon. Bald eagle and trumpeter swan habitat is mapped throughout the reach. The upper portion of the reach lies within Olympic National Forest. The remainder of the reach area consists of forest land, both publically (DNR managed) and privately owned.

Elwha River 3 (Elwh_Rv_03)

The stream channel is relatively confined throughout the reach, and consists of a relatively straight single channel. Most of the reach contains dense forest cover. However, Olympic Hot Spring Road borders the river within the reach, which has permanently removed some forest habitat. The reach provides habitat for bull trout, resident cutthroat, and steelhead trout, and Chinook, chum, pink, and coho salmon. The Elwha River Dam (removed in 2014) previously blocked anadromous fish access to the reach. The reach contains a mix of commercial forest land and low-density residential development. The majority of the reach lies within mapped channel migration and flood hazard zones. Olympic Hot Springs Road generally runs parallel to the Elwha within the reach, which blocks access to portions of its natural floodplain.

East Twin River (Etwi_Rv_01)

The river channel trends generally straight, accentuated by a few, tight meanders as the river flows through a steep valley. Vegetation within the reach is predominantly contiguous forest cover. The reach provides spawning and rearing habitat for chum and coho salmon, as well as steelhead trout. Natural cascades and waterfalls located at RM 3.6 block upstream passage. Populations of bald eagle are supported in the lower portion of the reach. Private timber lands are located in the lower third of the reach while public forest lands (DNR and Olympic National Forest) are located throughout the upper portion of the reach. Portions of the lower river channel have been constrained by the construction of dikes composed of river sediments, and the channel was historically denuded of large woody debris.

Gray Wolf River (Gray_Rv_01)

Forest cover is present throughout most of the reach. The Gray Wolf River provides habitat for Chinook, coho, chum, sockeye, and pink salmon, in addition to steelhead, bull, and resident cutthroat trout. The reach also supports populations of elk and harlequin duck. The Gray Wolf River is located within Olympic National Forest, portions of which are designated wilderness areas. The Lower Gray Wolf Trail is located within the reach, which is a popular hiking and camping area. Forest Service Road 2870 also provides public access to the reach. No shoreline modifications are mapped within the reach.

Green Creek (Gree_Cr_01)

The reach is covered primarily by dense forest habitat. This reach provides spawning habitat for chum and coho salmon, and juvenile rearing habitat for steelhead trout. The presence of resident cutthroat is also mapped within the reach. The reach contains privately owned commercial forest lands. The majority of the reach is situated within the FEMA 100-year floodplain. Geologic hazard areas for erosion and slides are located in the eastern half of the reach. No shoreline modifications are mapped within the reach.

Herman Creek 1 (HERM_CR_01)

Dense forest cover extends throughout much of the reach. The reach provides spawning and rearing habitat for steelhead and Chinook and coho salmon, in addition to resident cutthroat. The reach contains commercial forest lands. The lower portion of the reach is situated in the FEMA 100-year floodplain. Geologic hazard areas for erosion and land slide are located in the middle and upper portions of the reach. No shoreline modifications are mapped within the reach.

Herman Creek 2 (HERM_CR_02)

Dense forest cover is present throughout most of the reach. The reach provides spawning and rearing habitat for coho salmon and steelhead trout. Resident cutthroat trout are also present within the reach. The reach contains commercial forest lands. Geologic hazard areas for erosion and landslides are present throughout the entire reach. No shoreline modifications are mapped within the reach.

Hoko River 1 (HOKO_RV_01)

The reach encompasses a large and flat alluvial floodplain. Dense forest cover extends throughout much of the reach. Wetland and estuarine habitat also extends through the majority of the reach. This reach provides spawning habitat for Chinook, chum, and coho salmon, and the presence of resident cutthroat and steelhead trout is also mapped within the reach. The reach supports breeding populations of bald eagle. Much of the lower portion of the reach is undeveloped park land (Hoko River State Park). Agricultural lands are located in the upper portion of the reach. Most of the reach lies within a tsunami hazard area, the FEMA 100-year floodplain and/or a channel migration area. Geologic hazard areas for erosion and slides are located in the northeastern portion of the reach. Highway 112 crosses the stream corridor at the upstream end of the reach.

Hoko River 2 (HOKO_RV_02)

The river channel within the reach contains a series of well-defined braids and meanders, moving laterally across a broad floodplain. The Hoko-Ozette Road runs parallel to the river through much of the reach, acting as a lateral barrier between the river and its natural floodplain. The majority of the reach has been cleared for agriculture and rural residential development, leaving sparse residual forest cover and herb and shrub habitat along the stream. Wetland habitat is located in the floodplain of the river throughout much of the reach. The reach supports spawning and rearing habitat for Chinook, coho, and chum salmon, in addition to steelhead and cutthroat trout. Approximately one-third of the reach contains low-density residential development. The other two-thirds of the reach area is commercial timberland. The majority of the reach lies within mapped flooding and/or channel migration hazard areas. The northern portion of the reach lies within the undeveloped Hoko River State Park, and Hoko-Ozette Road provides additional informal public access to shorelines in the reach. Highway 112 crosses the stream corridor at the downstream end of the reach.

Hoko River 3 (HOKO_RV_03)

Channel configuration through the reach is a series of relatively straight stream segments followed by several tight meanders. The Hoko-Ozette Road runs parallel to the river through much of the reach, acting as a lateral barrier between the river and its natural floodplain. Forest cover borders the stream throughout much of the reach area. The reach supports spawning and rearing habitat for Chinook, coho, and chum salmon, in addition to steelhead and cutthroat trout. Bald eagle and harlequin duck populations are also present within the reach. Approximately two-thirds of the reach contains commercial forest lands. Low-density residential development is limited to the lower portion of the reach. Much of the reach area is located within FEMA 100-year floodplain and/or channel migration areas. Additionally, geologic hazard areas for erosion and land slide extend through much of the reach. The Hoko-Ozette Road provides informal public access to shorelines in the reach. No shoreline modifications are mapped within the reach.

Hoko River 4 – 8 (HOKO_RV_04 through HOKO_RV_08)

The stream channel is mostly unconfined throughout these reaches, with areas of meanders and segments of braided channel. Vegetative cover in the reach is primarily forest cover. Spawning and rearing habitat for Chinook, coho, and chum salmon, in addition to steelhead and cutthroat trout. The majority of all reaches contain commercial forest lands. Reaches are mapped with FEMA 100-year floodplain and/or channel migration area throughout much of shoreline. Geologic hazard areas for slides are located in portions of all these reaches. No shoreline modifications are mapped within these reaches.

Indian Creek (INDI_CR_01)

Outlet of Lake Sutherland to the creek's confluence with the Elwha River. The valley floor within the reach is generally broad and flat from the Lake Sutherland outlet until the stream is within a mile of a half of the Elwha, where the stream falls into a narrow, ravine-like valley. The majority of the reach area contains dense forest cover. The creek provides habitat for resident cutthroat and rainbow trout, and with the recent Elwha dam removals, anadromous fish stocks now have access to Indian Creek. The predominant land use in the reach is timber, much of which is public land managed by DNR. However, some low-density residential development is located within the reach. Flood hazard areas are located within the eastern portion of the reach. The existing residences along the creek are generally set back from the flood hazard areas. Highway 101 crosses the creek in 3 locations within the reach.

Last Creek (LAST_CR_01)

The reach contains dense forest cover. The reach supports spawning and rearing habitat for coho salmon, in addition to steelhead and resident cutthroat trout. The reach contains commercial forest lands. The reach is situated entirely within the FEMA 100-year floodplain. A geologic hazard area for erosion is located in the north eastern portion of the reach. No shoreline modifications are mapped within the reach.

Little Hoko (LHOK_RV_01)

Continuous forest cover is present throughout most of the reach. The reach supports spawning and rearing habitat for Chinook, chum, and coho salmon, in addition to steelhead and cutthroat trout. The reach contains public and private timber land, and over half the reach area consists of park land (the undeveloped Hoko River State Park). The lower portion of the reach is located in the FEMA 100-year floodplain and/or channel migration hazard area. Geologic hazard areas for erosion and land slide are located in the upper reach. The downstream end of the Little Hoko River is channelized, through the Hoko-Ozette road bridge.

Little Quilcene River

The reach contains dense forest cover. The Little Quilcene River within the reach provides habitat for resident cutthroat trout; anadromous fish passage to the reach is blocked by a natural falls at RM 7.0, in Jefferson County. The majority of the reach area lies within Olympic National Forest, with a small portion on private timber land. Under current zoning regulations, there is no potential for subdivision or residential development within the reach. There are no shoreline modifications mapped within the reach.

Little River (LITT_RV_01)

Most of the reach area is forested, but forest cover has been altered in some areas by low-density residential development and Little River Road. Erosion and slide hazard areas are mapped in portions of the reach. The Little River provides habitat for bull trout, resident cutthroat, and rainbow trout, and with the recent Elwha dam removals, anadromous fish stocks now have access to the Little River. Land use within the reach is primarily commercial timber, with some rural residential development located at the east end of the reach. Olympic Hot Springs Road crosses the Little River near its confluence with the Elwha.

Lyre River 1 (LYRE_RV_01)

The reach has a fairly steep gradient and flows within a relatively confined channel. Vegetative cover throughout the reach is primarily forest habitat. The reach provides spawning and rearing habitat for chum salmon and steelhead trout. Chinook and coho salmon have also been observed within the reach along with resident cutthroat trout. Breeding populations of bald eagle and band-tailed pigeon also utilize portions of the reach. Bank armoring and channelization have adversely affected habitat in the lower 1 mile of the reach. The upper two thirds of the reach are public forest lands (managed by DNR). Low density residential development is located in the lower portion of the reach, near Highway 112. The lower 0.4 miles of the reach located within a tsunami hazard zone. Geologic hazard areas including slides and erosion areas are located throughout the reach. Portions of the stream are also within the FEMA 100-year floodplain. Developed public access is available at the Lyre River campground, while informal/undeveloped public access to the shoreline is available along Lyre River Rd. Highway 112 crosses the river within the reach. The lower portion of the reach is channelized through a private campground.

Lyre River 2 (LYRE_RV_02)

The reach area is almost entirely covered by continuous forest habitat. The reach provides habitat for cutthroat and rainbow trout. A series of cascades and falls located at RM 2.7 prevent upstream migration and spawning of salmon and steelhead in this reach. The majority of the reach is located on public forest land (DNR and Olympic National Forest). Some private timber parcels are located near the confluence of June Creek and in the southeastern portion of the reach. The lower half of the reach lies in a geologically unstable zone, and is susceptible to erosion. No shoreline modifications are mapped within the reach.

McDonald Creek (MCDO_CR_01)

McDonald Creek flows fairly straight, and is located within a deep ravine. The lands within the reach are predominantly forested. McDonald Creek is utilized as a conveyance for a portion of the Dungeness irrigation system; Dungeness River water is put into the creek at RM 5, and withdrawn downstream at RM 2. The Creek provides spawning habitat for steelhead and coho salmon, and the reach provides habitat for bald eagle, peregrine falcon, and wood duck. The upper portion of the reach consists primarily of publically owned timber land managed by DNR. Low- to moderate-density development surrounds the lower portion of the reach, but forest cover within the riparian corridor is largely intact. Erosion and landslide areas are mapped along the stream channel for most of its extent. However, these

hazard areas are generally confined to the creek's forested riparian corridor on undeveloped land. There are two road crossings over the stream (Old Olympic Highway and Highway 101).

Morse Creek (MORS_CR_01)

The reach extends from near the creek mouth to the boundary of Olympic National Park. Below the park, the creek is generally confined in a ravine-like canyon, but below approximately RM 1.7 the valley broadens into a relatively wide, low-gradient floodplain. The upper portion of the reach is largely forested, but forest cover decreases downstream in the developed areas. Morse Creek provides spawning habitat for steelhead, and Chinook, chum, coho, and pink salmon. In addition, the presence of bull trout, residential cutthroat, and rainbow trout are identified in the creek. The reach also provides habitat for wood duck and harlequin duck. Land use in the upper portion of the reach is primarily low- to moderate- density residential, with some commercial timber parcels. Higher density residential development in present in the reach downstream from approximately RM 3.0. Much of the upper portion of the reach lies within erosion and landslide hazard areas. Channel migration zones and mapped flood hazard areas are present in the lower portion of the reach. Many homes are present within these hazard areas. Several levee sections border the stream channel near the mouth, and the lower 1.2 miles of the creek was historically channelized. Highway 101 crosses the stream near the mouth.

North Branch Herman Creek (NBHE_CR_01)

The reach extends from the Herman Creek confluence to approximately 1.8 miles upstream. The stream profile in the upper portion of the reach is relatively straight and trends generally south. The channel becomes more sinuous by middle reach and by the lower reach the stream contains several meanders. Vegetative cover in the reach consists primarily of dense forest cover, with some herb and shrub habitat is located in the lower portion of the reach. The reach provides habitat for coho salmon and steelhead trout. The reach contains timber lands, both publically and privately owned. Many of the stream banks and surrounding areas are unstable. Geologic hazard areas for erosion and slides extend through the upper and lower portions of the reach, respectively. No shoreline modifications are mapped within the reach.

North Fork Sekiu River (NFSE_RV_01)

The reach extends from the confluence with the Sekiu River to approximately 4.6 miles upstream. In the upper portion of the reach, the river is characterized by a relatively straight channel. The channel becomes increasingly sinuous and meandering downstream before its confluence with the mainstem Sekiu. The majority of the reach contains dense forest habitat. The reach supports spawning and rearing habitat for Chinook, coho, and chum salmon, as well as steelhead trout. The upper and lower portions of the reach are primarily privately owned commercial timber lands. The middle reach contains public forest lands managed DNR. Much of the reach is located within the FEMA 100-year floodplain. Geologic hazard areas for erosion and landslides are located throughout the reach, but are concentrated in the upper and lower portions of the reach. No shoreline modifications are mapped within the reach.

Old Royal Creek (OLDR_CR_01)

The reach extends from the Hoko River confluence to approximately 0.4 miles upstream. The majority of the reach area is located within the FEMA 100-year floodplain. The reach is covered by contiguous forest cover. Old Royal Creek provides habitat for coho salmon and steelhead trout. Low-density

residential development is located in the upper portion of the reach, but most structures are located outside the reach boundary. The middle and lower portions of the reach contain commercial timber lands. No shoreline modifications are mapped within the reach.

Pysht River 1 (PYSH_RV_01)

Encompasses the large, flat alluvial floodplain complex. The channel profile through the reach is sinuous, and contains a series of wide meanders and several side channels that braid and join the mainstem near its mouth. Most of the river channel within the reach is constrained by levees. The stream corridor is bordered by a thin, but dense stand of forest cover, and patches of herb and shrub habitat. The reach provides habitat for Chinook, chum, and coho salmon, in addition to steelhead and resident cutthroat trout. In addition, the reach supports breeding populations of bald eagle and waterfowl concentrations. Tidal and estuarine influence extends upstream through the reach. The majority of the reach contains commercial forest lands. The northern portion of the reach contains limited rural residential development. The reach is situated within a tsunami hazard zone and the FEMA 100-year floodplain. Geologic hazard areas for erosion and slides are located in the eastern portion of the reach. The river channel is constrained by levees throughout most of the reach, and was historically hydromodified to accommodate log transport.

Pysht River 2 (PYSH_RV_02)

The river channel within the reach is highly sinuous and meandering. The river is bounded by State Highway 112 that runs parallel to the stream through much of the reach, and functions as a lateral barrier between the river and its natural floodplain. Vegetation through the reach is a mixture of dense forest cover and herb and shrub habitat. A number of anadromous fish including Chinook, chum, and coho salmon, as well as steelhead trout utilize the reach for spawning and rearing. The reach supports breeding populations of bald eagles. Low-density residential development and commercial forest lands are located in the majority of the reach. Portions of the lower reach are located in the tsunami hazard area. The majority of the reach is located in the FEMA 100-year floodplain, while geologic hazard areas for erosion and slides are located in the upper portion of the reach. Several residential developments are currently located in flood, geologic, and/or tsunami hazard areas.

Pysht River 3 (PYSH_RV_03)

Vegetation in the riparian corridor is primarily dense forest cover, intermixed by patches herb and shrub habitat. The reach provides spawning and rearing habitat for Chinook, chum, and coho salmon, in addition to steelhead and cutthroat trout. Low-density residential development is located in the lower half of the reach, and the upper half contains commercial forest lands. The majority of the reach is situated within the FEMA 100-year floodplain and/or the active channel migration area. Geologic hazard areas for erosion and landslides are located in the southeast and southwest, respectively. Existing residences within the reach are located in the flood and/or channel migration hazard areas. Highway 112 runs parallel to the Pysht River within the reach, which acts as a barrier between the river and its natural floodplain.

Pysht River 4 (PYSH_RV_04)

The river channel within the reach is confined to a narrow floodplain. Contiguous forest cover extends throughout much of the reach. The reach provides spawning and rearing habitat for Chinook, coho, and chum salmon, as well as steelhead and resident cutthroat trout. The reach supports breeding populations of bald eagle. The majority of the reach consists of commercial forest lands. The lower third of the reach is situated in the FEMA 100-year floodplain and/or channel migration zone. Geologic hazard areas for erosion and landsides are located throughout the upper two-thirds of the reach. Highway 112 crosses the river in the lower portion of the reach.

Royal Creek (ROYA_CR_01)

The stream channel is relatively confined straight. Vegetation throughout the reach consists of dense forest cover. The reach provides habitat for resident cutthroat and rainbow trout. The reach is located in Olympia National Forest. It can be accessed via trail, from Forest Service Road 2870. No shoreline modifications are mapped within the reach.

Salmonberry Creek (SALM_CR_01)

Within the reach, the channel is relatively narrow and confined. Vegetation along the stream corridor is primarily forest cover, with patches of herb and shrub habitat. The reach provides spawning and rearing habitat for coho salmon, in addition to steelhead and resident cutthroat trout. The reach consists entirely of commercial forest lands. The lower portion of the reach lies within the FEMA 100-year floodplain. Geologic hazard areas for erosion and slides are located through the lower and upper portions of the reach, respectively. No shoreline modifications are mapped within the reach.

Salt Creek (SALT_CR_01)

The channel profile through the reach is highly sinuous, with several side channels joining the mainstem near the mouth. Vegetative cover throughout the reach is mostly herb and shrub habitat, bordered in places by riparian forest. Wetland (salt marsh) habitat extends across the floodplain. The reach provides habitat for coho, chum and Chinook salmon, as well as steelhead, cutthroat, and rainbow trout. The reach supports breeding populations of bald eagle. Several adjacent tributaries have culvert structures, which reduces access to side-channel habitat within the reach. The majority of the reach area contains rural residential development. Approximately one-third of the land is zoned for commercial forestry and cannot be subdivided. The majority of the reach lies within a tsunami hazard zone, the FEMA 100-year floodplain, and/or identified channel migration areas. A private road bisects the salt marsh, which disconnects the creek from the western portion of its natural estuary. In addition, several culverts are located on tributaries to Salt Creek within the reach boundary.

Salt Creek (SALT_CR_02)

The stream channel within the reach is highly sinuous, and has a low gradient. The reach contains dense forest habitat sparsely intermixed by herb and shrub habitat. Wetlands are located in the lower third of the reach. The reach provides spawning and rearing habitat for coho salmon and steelhead trout, as well as resident cutthroat trout. The reach also provides priority habitat for breeding populations of band-tailed pigeon. The lower third of the reach consists of public forest lands (managed by DNR). The upper two-thirds of the reach are zoned for commercial forestry. The northern portion of the reach is

within a tsunami hazard zone, while geologic hazard and slide areas are located in the south. Portions of the reach are located within the FEMA 100-year floodplain and the active channel migration area. A semi- fish-passable dam is located at RM 6.5 which limits upstream fish migration.

South Branch Little River (SBLI_RV_01)

Dense, contiguous forest cover extends throughout the reach. This reach provides habitat for bull trout, resident cutthroat, and rainbow trout. The Elwha River Dam blocks anadromous fish access to the reach. The upper two-thirds of the reach are located in the Olympic National Forest, while the lower portion of the reach is privately owned. Geologic hazard areas for landslides are located throughout the reach. No shoreline modifications are mapped within the reach.

Sekiu River (SEKI_RV_01)

The Sekiu River Road borders much of the river, which separates the river from much of its natural floodplain. The majority of the reach is covered by dense forest habitat. Habitat provided for Chinook, coho, and chum salmon, in addition to steelhead and resident cutthroat trout; also habitat for breeding populations of bald eagle. Moderate- to low-density rural development is located in the lower portion of the reach. The middle and upper portions of the reach contain commercial forest land. The lower portion of the reach is located within a tsunami hazard area and the FEMA 100-year floodplain. Geologic hazard areas for erosion and landslides are located in the middle and upper portions of the reach, respectively. The Sekiu River Road borders much of the river, which separates the river from much of its natural floodplain.

South Fork Pysht River 1 (SFPY_RV_01)

The reach segment is relatively short and contains a fairly sinuous, meandering channel. Vegetative cover through the reach is mainly contiguous forest cover intermixed with sparse patches of herb and shrub habitat. The reach provides spawning and rearing habitat for Chinook and coho salmon, in addition to steelhead trout. The reach also provides habitat for resident cutthroat and chum salmon. The majority of the reach is commercial forest land. The northern portion of the reach lies in the active channel migration area and the FEMA 100-year floodplain. Areas in the southwest and northeast portion of the reach are susceptible to geologic hazards (primarily erosion). No shoreline modifications are mapped within the reach.

South Fork Pysht River 2 (SFPY_RV_02)

The river channel is moderately sinuous in this reach. Vegetative cover is primarily a mixture of dense forest habitat intermixed by patches of herb and shrub habitat. The reach provides spawning habitat for steelhead, and Chinook and coho salmon. The presence of resident cutthroat and chum salmon are also mapped within the reach. Land use within the reach is primarily commercial forestry. Most of the reach lies in the FEMA 100-year floodplain and in areas subject to geologic hazards. Three quarters of the reach is susceptible to erosion. Additionally, slide areas are located in the middle portion of the reach, along the north bank. There are no shoreline modifications mapped within the reach.

South Fork Sekiu River (SFSE_RV_01)

The reach extends from the mainstem confluence to approximately 3 miles upstream. The reach is covered by dense forest cover. The South Fork Sekiu River contains spawning habitat for coho salmon and steelhead trout, and also provides habitat for resident cutthroat trout. Land use within the reach is primarily commercial forestry. The lower portion of the reach is located within the FEMA 100-year floodplain. Geologic hazard areas for slides and erosion are located throughout the reach. No shoreline modifications are mapped within the reach.

Silver Creek (SILV_CR_01)

The reach is covered by dense forest cover. Silver Creek provides habitat for resident cutthroat and rainbow trout. The reach is located entirely within the Olympic National Forest, and can be accessed from Forest Service Road 2870. No shoreline modifications are mapped within the reach.

West Twin River (WTWI_RV_01)

The river flows northeast from steep mountain slopes onto lower gradient hills. The river then reenters a narrow valley between hillcrests to the east and west, emerging onto a low-gradient terrace and delta. Vegetative cover in the riparian corridor and surrounding watershed is comprised predominantly of dense forest habitat, intermixed with pockets of herb and shrub habitat. The reach provides spawning habitat for coho salmon and steelhead and rearing habitat for coho salmon. Resident cutthroat is also mapped within the reach. The reach supports breeding populations of bald eagle. Approximately half of the reach contains private timber lands, while the other half of the reach is public timber/forest lands (managed by DNR). Private lands are located in the middle and lower half of the reach, along the west bank of the West Twin River. Public lands are located along the east bank of the West Twin River and in the upper portion of the reach. The lower portion of the reach is located within a tsunami hazard zone, FEMA 100-year floodplain, and geologic hazard areas. No shoreline modifications are mapped within the reach.

Lake Sutherland (SUTH_LK_01)

Lake Sutherland is approximately 500 acres in area, and drains to Indian Creek. While natural vegetation within the reach has been completely cleared in some areas, over half of the shoreland area contains dense forest cover. The lake provides habitat for shore-spawning kokanee salmon, and resident cutthroat and rainbow trout, and with the recent Elwha dam removals, anadromous fish stocks now have access to Lake Sutherland. Most of the shoreline along Lake Sutherland contains moderate- to high-density residential development, and many docks are present along the shoreline. Portions of the developed lakeshore lie within mapped flood hazard areas. A small outlet structure at the lake outlet serves to retain fish stock and control water levels in the lake. Flooding events along the lake shore have occurred recently, which Lake Sutherland residents attribute to accumulating sediments and large woody debris at the outlet. Most of the Lake Sutherland shoreline has been modified with bulkheads and docks.

3.2 WRIA 20

The rivers and streams within WRIA 20 originate on the western slopes of the Olympic Mountains and flow into the Pacific Ocean (Figure 3-3). The ocean shoreline and river estuaries within WRIA 20 do not fall under the jurisdiction of the County's SMP, as these areas are located within Olympic National Park or tribal lands. The following summarizes the freshwater shorelines within County jurisdiction within WRIA 20, as detailed in the WRIA 20 ICR (Wecker and Gentry, 2012).

3.2.1 Habitat

Freshwater rivers, streams and lakes in WRIA 20 are vital to the health of many coastal and Puget Sound salmon and trout stocks. Fish habitat conditions in WRIA 20's shorelines appear to be generally healthy and functional. While run sizes are dramatically lower than historical numbers, almost all of the salmon stocks in WRIA 20 are considered healthy. The one exception is Lake Ozette sockeye which is listed as threatened under the federal Endangered Species Act; in fact, downward trends for all of the salmon and steelhead species in the Ozette watershed are reported in the WRIA 20 ICR (Wecker and Gentry, 2012). Among the healthy stocks are: Dickey and Quillayute system winter steelhead and fall coho, fall and winter Chinook, Quillayute and Sol Duc sockeye, and Quillayute, Calawah, and Bogachiel summer Chinook.

The riparian areas of WRIA 20 are among the least impaired in western Washington with roughly 83 percent of the riparian zone within SMP jurisdiction characterized as closed canopy, 14 percent is other natural vegetation, and only 3 percent is non-forest. Stream reach analyses revealed that only one reach – LK PLEASANT 10 – had more than 30 percent of the riparian area categorized as non-forested (Table 3-7). In every other reach, the forest canopy or other natural vegetation covers more than 80 percent of the riparian zone. Across the watershed, the largest trees are often found in protected draws and in lowland areas. Riparian stands in some sections are less mature than is desirable. In a few places, windthrow has completely eliminated the buffer. Native vegetation is dominated by enormous Sitka spruce trees in the lowlands and western hemlock with silver fir at higher elevations. Riparian zones often include hardwood such as bigleaf maple and red alder. In old growth stands, conifers can grow to 200 feet in height.

Table 3-7. Acres of closed canopy forest within 200 feet of the ordinary high water line (Data from Point No Point Treaty Council, 2011)

Reach Name	% of Riparian Forest	% of "Other Natural Vegetation"
Bear- Sol Duc 10	85	11
Bear- Sol Duc 20	95	5
Bear-Bogachiel 10	96	2
Bear-Bogachiel 20	100	0
Beaver 10	92	6

Reach Name	% of Riparian Forest	% of "Other Natural Vegetation"
Beaver 20	84	12
Beaver 30	87	13
Beaver Lk	87	13
Big River 10	80	16
Big River 20	74	8
Big River 30	96	4
Big River 40	93	6
Bockman 10	98	2
Bockman 20	100	0
Bogachiel	86	10
Calawah 10	91	9
Calawah 20	77	17
Calawah 30	90	9
Calawah S 10	96	3
Colby 20	73	20
Dry-Bogachiel	99	1
Elk 10	89	4
Elk 20	98	2
Elk 30	100	0
Lake Cr-Sol Duc 10	87	1
Lake Cr-Sol Duc 20	92	8
Lk Pleasant 10	68	1
Lk Pleasant 20	92	2
Lost	100	0
Maxfield 10	93	7
Maxfield 20	91	9
Mill	92	8
Murphy 10	92	8
Murphy 20	93	7
Quillayute 20	85	9
Shuwah 10	100	0
Shuwah 20	100	0
Shuwah 30	97	2
Sitkum	98	2

Reach Name	% of Riparian Forest	% of "Other Natural Vegetation"
Sol Duc 10	91	0
Sol Duc 20	86	11
Sol Duc 30	93	4
Sol Duc 40	95	4
Sol Duc 50	91	4
Sol Duc 60	94	5
Sol Duc 70	83	5
Sol Duc 80	85	8
Sol Duc 90	96	2
Average	**91**	**6**

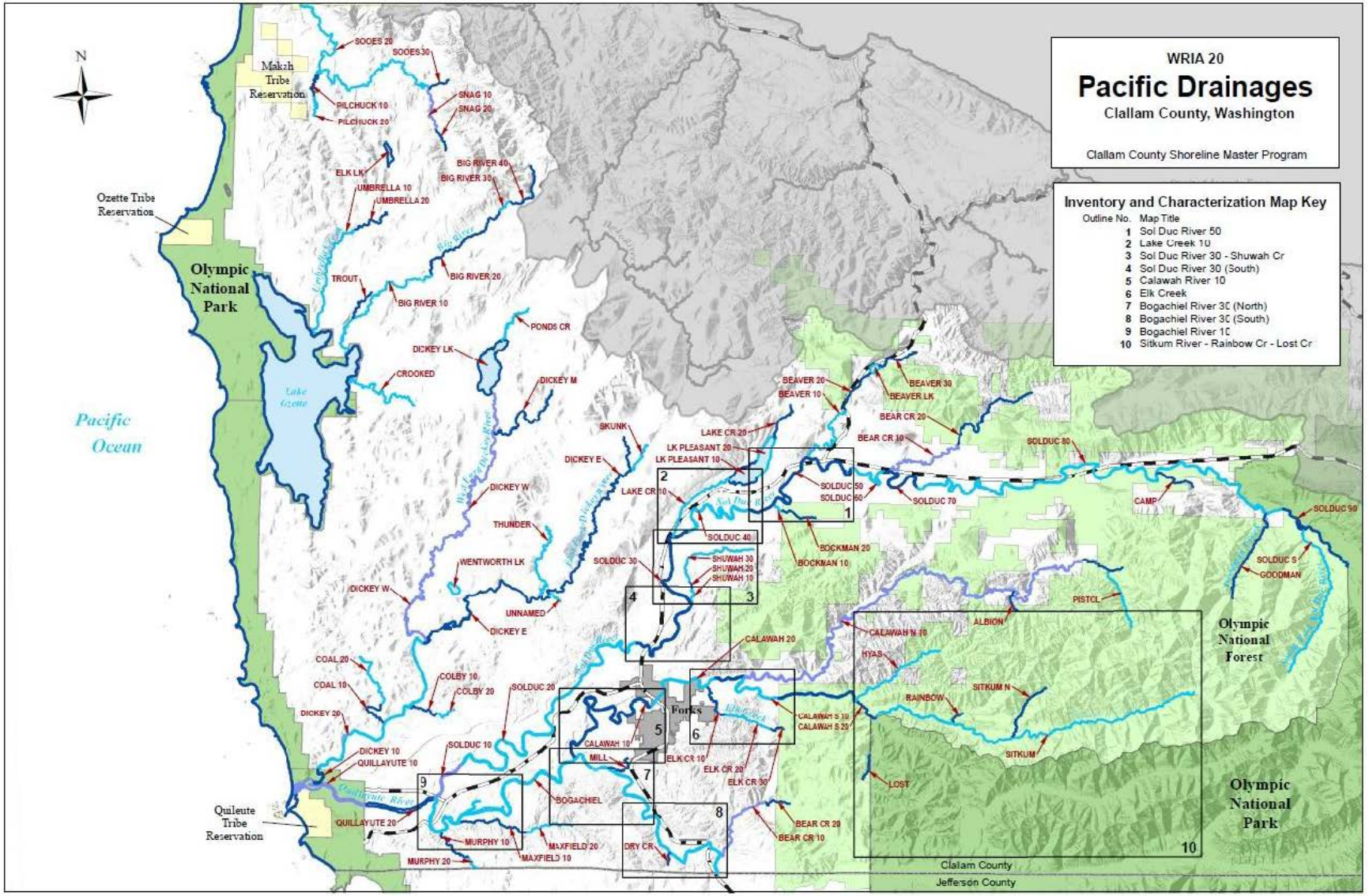

Figure 3-3. Inventory reaches within WRIA 20 (Wecker and Gentry, 2012)

One of the greatest habitat concerns in WRIA 20 relates to the spread of invasive weeds along the shorelines of the major rivers. Infestations of Japanese knotweed are found throughout the mainstems and tributaries of the Quillayute and Ozette sub-basins. This tall exotic outcompetes and displaces native plants including tree saplings. Functionally unshaded river edges and choked channels result from the knotweed invasion. Reed canarygrass, also a widespread exotic, has caused similar impacts to riparian areas.

As with WRIAs 17, 18 and 19, the primary indicator of freshwater habitat function selected for WRIA 20 is riparian forest cover. As detailed in Section 3.1.2, streamside (and lakeside) riparian forests are essential components of healthy freshwater habitats. Riparian forest cover is also the primary source of organic / woody debris. Organic inputs (falling vegetation and insects) provide food sources for juvenile salmonids. Additionally, recruited organic material, including large woody debris, play a substantial role in stream channel maintenance and in-stream habitat formation and are therefore critical to the heath of freshwater habitats.

3.2.2 Water Quality

Water quality is an important factor in maintaining suitable freshwater habitats for fish and other aquatic species. Salmonids, in particular, require water that is both colder and has lower nutrient levels than many other types of native fish. Dissolved oxygen is one of the most influential water quality parameters for stream biota, including salmonids (Bjornn and Reiser, 1991). A chief influence on dissolved oxygen levels in most streams is temperature; cooler waters maintain higher levels of oxygen than warmer waters.

A total of 34 sites in WRIA 20 are listed on the 2008 Department of Ecology's 303(d) list for temperature, fecal, dissolved oxygen, and pH exceedances. All but 7 are temperature exceedances. Only one of these sites is associated with fecal contamination: an area dedicated to commercial forest uses in the Dickey system. Dissolved oxygen levels are listed in 4 sites, and pH levels listed in 2 sites. Of these sites, 21 are associated with remote areas with very limited human presence. Within the Sol Duc and Bogachiel systems, temperature problems appear more related to seasonal low flows than lack of riparian shade. Many of these middle and lower reaches have wide floodplains with permeable geologic deposits. The one exceedance that the literature suggests may be related to human uses is the dissolved oxygen levels in Lake Creek downstream of Lake Pleasant. Prior planning efforts recognized that low oxygen levels may be related to the relatively dense residential development in the southwestern portion of Lake Pleasant and the associated water withdrawals and potential for nutrient inputs from septic systems.

Impervious surface coverage was selected as an indicator of water quality for freshwater habitat for WRIAs 17, 18, and 19. Unlike the ICR for these WRIAs, a reach-scale analysis of impervious surfaces was not included in the WRIA 20 ICR. However, potential increases in impervious surface coverage can be inferred from the vegetation coverage data, as shown in Table 3-7. In general, the high levels of riparian forest and other natural vegetation within WRIA 20 reaches indicates that water quality maintenance, infiltration, and recharge processes are largely intact. An exception to this is the Lake Pleasant 20 reach, which is the most highly-developed shoreline reach within WRIA 20 and based upon air photo interpretation, impervious surface coverage is approximately 10 percent.

3.2.3 Hydrology

The WRIA 20 freshwater streams and lakes in Clallam County are fed by surface water runoff and groundwater recharge. Precipitation is the primary source of groundwater recharge. Soil permeability and underlying geology influence the amount of precipitation that becomes surface runoff. In mountainous areas with intact forest cover, shallow soils tend to limit infiltration so water either travels laterally as shallow subsurface flow, or percolates to deep groundwater through cracks and fissures in the bedrock. River valleys in the lowlands tend to have deeper, porous soils that create favorable conditions for groundwater discharge. In their natural state, these areas can store large quantities of water in shallow aquifers.

The area's weather patterns affect both the vegetation and hydrology of the WRIA. Fitting the definition of a "temperate rainforest," rainfall in WRIA 20 averages about 80 inches near the coast to 240 inches in the Olympic Mountains. Although almost all of the WRIA 20 area is described as rain-dominated, the higher reaches of the Calawah and Sol Duc systems flow through rain-on-snow dominated zones. The proximity of the Pacific Ocean results in frequent exposure to high winds and unusually heavy rainstorms, particularly in the winter.

In WRIA 20, streambank armoring occurs in relatively few places and does not appear to have had a major effect on channel migration. The majority of mapped floodplain and channel migration areas are undeveloped forest land, with the exception of a few scattered pockets of development (such as within the Forks UGA).

For freshwater reaches with high development pressure, the potential for new floodplain development (lots that the assessors' data shows as vacant lots occurring entirely within the mapped FEMA 100-year floodplain) was assessed. See Section 5.2 of this report for additional details.

3.2.3.1 Summary of Stream/Lake System Existing Conditions

An overview of existing conditions along the stream/lake systems of WRIA 20 follows. The following overview was excerpted from the WRIA 20 ICR (Wecker & Gentry, 2012); additional details on reach-scale shoreline conditions can be found in the ICR.

Bogachiel River System

The Bogachiel River mainstem flows in a meandering fashion through beds of clay, sand and gravel ending at its confluence with the Sol Duc River where both join to form the Quillayute River. The Bogachiel is one of the most popular sport fishing rivers in the state due to its gentle grade, easy access points, and abundant fish runs. Healthy status ratings have been assigned to all Bogachiel stocks that have been assessed. Throughout almost its entire length, the mainstem flows through private lands. This landscape like much of the rest of WRIA 20 has long been dedicated to commercial timber production. Human impacts reported in this area include temperature exceedances, poor LWD levels and related channel incision problems. Erosion and mass wasting in the lower Bogachiel has threatened the stability of the La Push Road bridge and the Three Rivers bridge. Shoreline armoring was installed to protect these areas. An active channel migration zone that is important for salmon spawning is located in the lower mainstem. A second area characterized by a wide floodplain with an active meander occurs in the middle portion of the Bogachiel mainstem. An area identified as a flood plain and a critical aquifer recharge zone is located where the Bogachiel mainstem and its tributary, Mill Creek, flow through the

Forks UGA. The tributaries of the Bogachiel flow through commercial forestlands and are not likely to develop. The mainstem is close to roads, utilities, and population centers, yet few residences currently exist along its shorelines. This is probably due to the wide floodplain characteristic of the Bogachiel. Calawah River System

Dickey System

In general, the Dickey River system is a low gradient series of reaches that flow through privately-owned lowlands close to the ocean. High levels of precipitation, strong winds and logging practices have diminished the extent of canopy cover in the riparian zone. Windthrow is a major problem in this system, as are poor levels of large woody debris and sedimentation. The Dickey system supports important habitat for coho, steelhead and Chinook. The Dickey system contains abundant wetlands and an important lake system. Restoration opportunities are primarily associated with the impacts of past logging practices. A large list of culverts in need of replacement has been generated. Public access is available at Dickey Lake, but elsewhere is very limited.

Lake Pleasant and Lake Creek System

Lake Creek is a tributary of the Sol Duc River. Due to the value of the habitat and challenging planning environment present in Lake Pleasant and Lake Creek, they are described in a separate section. Flowing through the thick glacial till of the middle Sol Duc Valley, the Creek and Lake contain unique biological resources and highly valuable habitat. Upper Lake Creek provides highly productive Fall coho spawning beds and flows into an extensive wetlands complex before reaching Lake Pleasant. Lake Pleasant supports an unusual stock of beach spawning sockeye salmon. Lower Lake Creek provides sockeye spawning habitat below the Lake outlet and outstanding Fall Chinook habitat throughout much its length. Residential density is, by rural standards, very high along the southern reach of the Lake and the adjacent portion of lower Lake Creek. Low cost housing and recreational cabins dominant development in this area. A mill is located on the southern end of the Lake. The northern segment of Lake Pleasant shoreline is largely commercial forestlands with only a portion zoned for low density residential development. Lake Pleasant is also a major recreational destination with a well maintained county park along its southern shoreline. Lake Creek habitat has been impacted by logging practices in its watershed, but is described as improving. Sedimentation from roads and bank erosion are the key impacts. In lower Lake Creek, the lack of large woody debris and dissolved oxygen depletion are reported to be the most significant problems. With regard to Lake Pleasant, temperature and dissolved oxygen impairments have been linked to failing septic systems. Water withdrawals are also considered a source of long-term concern. Ozette System

Quillayute River System

The Quillayute River is the terminal mainstem of the largest and most productive river network on north Washington Coast. The waters of four major rivers – the Sol Duc, the Bogachiel, the Calawah, and the Dickey ultimately flow to the Quillayute River. The Quillayute mainstem is relatively short and low gradient throughout its length. The floodplain is wide, consists of long gravel bars, and shows evidence of the tidal influence that can extend to five miles upstream. All ten runs of salmon found in the Quillayute System pass through the waters of the mainstem. The mainstem also provides spawning habitat for Winter Steelhead, Spring, Summer, and Fall Chinook. Within the area of SMP jurisdiction, the Quillayute flows through private and tribally-owned lands. Light density residential development is

located along is shorelines. The Quileute Tribe conducts its salmon fisheries in the mainstem. The River presents safe and easy year-round access for popular non-Indian sport fisheries. Significant human impacts reported in the Quillayute River include low LWD levels, poor riparian conditions, and areas lacking natural levels of velocity-altering structures.

Sol Duc River System

With over 60 mainstem river miles, the Sol Duc River system represents the longest river system in WRIA 20 with nine major tributaries that qualify as shorelines of statewide significance. The system supports all species of salmon and contains extensive spawning habitat. The upper reaches of the Sol Duc start high in the Olympic Mountains, flow down into its boulder-filled middle reaches in the Sol Duc Valley, and ultimately reaches the low gradient meandering segments downstream where it flows into the Quillayute River. The middle and downstream reaches are close to roads and utilities and have attracted primarily sparse human residential development since the area was settled. A number of subdivisions that are unusually dense by rural standards are located on the Sol Duc and its tributaries. These subdivisions were made up of low-cost housing for timber industry workers or seasonal cabins. The ecological importance of this system and its complexity necessitated the presentation of most of the descriptive information on each reach and tributary in the form of tables. The remote upper reaches and tributaries unlikely to develop are only described briefly in the text discussion. In general, ecological conditions and habitat quality on the Sol Duc mainstem are healthy. Some segments experience temperature impairments. A number of sites have extensive riparian buffer failure and mass wasting, but those problems are generally localized. Due to the geology of the area, wetlands are very limited in the Sol Duc system. It is notable that an extensive block of wetlands in the middle reaches exists. While the mainstem channel is confined through much of its middle reaches, one expansive floodway and floodplain is present in a section that includes substantial residential development and is likely to attract more development.

Sooes River System

The Sooes River flows through commercial forestlands within the lowlands of the coast. A basalt feature called the Crescent Formation creates a steep landslide prone area to the east and north of the River. The area contains extensive wetlands, important side channel habitat and good quality spawning gravel. Few people live in this drainage and the prospects for development are limited. Information is lacking on the status of salmon stocks in this system. Human impacts are related to the past logging practices with high scour during peak flows, low LWD levels, sedimentation from high road density, and absence of riparian cover cited as the primary problems.

4.0 POTENTIAL IMPACTS TO SHORELINE FUNCTIONS

Most types of shoreline use or development have the potential to degrade ecological functions to some degree. The nature and severity of the degradation will depend on several factors including:

- How ubiquitous or widespread the development activity is;
- Its location relative to sensitive, fragile or valuable shoreline areas/resources;
- The design, scope and scale of the individual actions; and
- The level of scrutiny and regulation afforded by the SMP and other laws.

This chapter examines different types of shoreline use, development and modification that are likely to occur in Clallam County and programmatically assesses the level of potential impacts posed by each one (Table 4-1). Chapter 5 describes where these potential impacts are most prevalent and Chapter 6 describes how the SMP addresses potential impacts to shoreline functions.

Much of the foreseeable development along Clallam County's freshwater shorelines, especially in the upper watersheds, will be related to forest practices. Most of the development along the marine shore, the lakes and the downstream portions of the major rivers will be single-family residential development. Other types of shoreline use or development are generally considered to be a low potential for impacts to shoreline functions overall because they will occur infrequently or be limited to relatively few geographic areas. As described in Section 1.2, developments or uses that have unforeseeable or uncommon impacts are addressed via the conditional use permitting process (as opposed to the cumulative impacts analysis) to ensure that there is no net loss of ecological function.

Table 4-1. Qualitative assessment of potential impacts to shoreline functions posed by major types of shoreline use and development in Clallam County

Type of Development or Use	Qualitative Impact Assessment	Rationale
Agriculture	Low	Agricultural uses are relatively uncommon within shoreline jurisdiction, with the exception of areas along the mid and lower Dungeness River and scattered areas along the Sol Duc River. There are no significant areas of high-quality agricultural land that are not currently utilized for this purpose. However, as of June 2017, the County has a pending application for net pen aquaculture approximately 3.8 miles east of Ediz Hook and 1.5 to 1.8 miles offshore. The proposed facility includes 14 floating circular net pens. The proposal also includes decommissioning the existing net pen operation within Port Angeles Harbor.
Aquaculture	Low to Moderate	Some limited shellfish farming occurs within the County's marine bays, and may increase in the

Type of Development or Use	Qualitative Impact Assessment	Rationale
		future. There is currently one commercial finfish pen in Port Angeles Harbor, and there is potential for additional net pens within the Strait of Juan de Fuca. Aquaculture developments that have the greatest potential for impact (geoduck, net pens) are regulated as conditional uses.
Commercial / Industrial	Low	There are relatively few areas of commercial or industrial development along the shorelines and it is unlikely that this will change dramatically in the foreseeable future under the County's the current zoning and comprehensive plan. Commercial use/development is regulated as a conditional use except in the Marine Waterfront designation.
Forest Practices	Moderate	A majority of the shoreline area is zoned and managed for commercial timber harvest; however, the state Forest Practices Act limits timber harvest along shorelines.
Mining	Low	Mining is regulated as a conditional use.
Recreation	Low	Recreational areas are scattered throughout the County but most of the uses are low intensity / low impact.
Parking	Low	The SMP prohibits parking as a primary use in shoreline jurisdiction
Residential	Moderate to High	Residential use along shorelines is widespread and is expected to increase.
Restoration	Low	Restoration is expected to improve shoreline functions.
Signs	Low	Signs by their nature pose minimal impacts to shoreline functions. Given the lack of commercial /industrial use, signage is uncommon in shorelines areas.
Transportation	Moderate to High	Existing roads and bridges occur within and across the shoreline jurisdiction. These facilities can impact water quality, hydrology and/or habitat. Maintenance and safety improvements could also impact shoreline functions.
Utilities	Low to High	Utility impacts are difficult to anticipate or gauge without specific information on the type and location of the utility. Impacts could range from low to high—as a result most utilities are treated as conditional uses and would require a conditional use permit.

Uses and developments that potentially pose the highest potential impacts to shoreline functions in Clallam County are further described below.

4.1 Aquaculture

The level of potential impacts associated with future aquaculture use/development is somewhat difficult to assess. Commercial aquaculture is currently confined to a few areas of the marine shoreline and the likelihood of widespread expansions or increases in aquaculture operations within the foreseeable future is unknown. Aquaculture can cause adverse ecological impacts because it can disturb aquatic vegetation and substrates, introduce non-native organisms, introduce chemicals/nutrients, and require use of predator control devices which can harm birds and other wildlife. Aquaculture can also impact the visual and aesthetic qualities of the shoreline and potentially disrupt recreational use. These effects are more likely to occur with large-scale or intensive commercial operations such a fin fish or geoduck production than with recreational beach culturing or hand-harvest.

Aquaculture can also have beneficial effects on the shoreline. For example, clams and oysters contribute to improved water quality through filter feeding and provide habitat for other marine organisms. The net effect of aquaculture use on shoreline ecology depends on a variety of factors including the location of the aquaculture farm, the species cultivated, and the growing and harvest methods.

The SMP recognizes that aquaculture is a preferred and water-dependent shoreline use—one that is very important to the regional culture and economy. The SMP classifies the more intensive forms of aquaculture use/development as conditional uses, which means they will receive careful scrutiny and review to ensure that adverse effects can be mitigated. Other regulations specifically require that subtidal, intertidal, floating, and upland structures and apparatus be located, designed and maintained to avoid adverse effects on ecological functions and processes.

- The SMP includes other standards to limit the size, location and scale of structures used in aquaculture operations. For example, upland structures accessory to aquaculture use that do not require a waterside location or have a functional relationship to the water must be located landward of shoreline buffers and overwater work shelters and sleeping quarters accessory to aquaculture use/development are prohibited.

4.2 Forest Practices

Forest practices include the harvesting of timber and related activities involving the storage and transport of logs from the forest to the mills (road building, yarding, etc.). These activities have the potential to affect shorelines in a variety of ways. As noted in Chapter 3, the removal of forest cover in watersheds can alter hydrologic process related to infiltration and recharge, increase the volume of surface runoff, and lead to erosion and/or landslides as slopes become destabilized. Timber harvesting also eliminates habitat for forest-dwelling wildlife. The construction of forest roads can exacerbate these effects. When vegetation removal occurs close to the shore it can reduce large woody debris recruitment and decrease other organic inputs which provide important food chain support functions. Shoreline vegetation also plays a role in trapping and removing sediments, nutrients and other pollutants, so loss of vegetation can have adverse effects on water quality. Finally, forests provide cover, perching, nesting, foraging and migratory habitat for many species of birds, amphibians and mammals, which can be adversely affected as a result of timber harvest activities.

Forest practices typically do not involve much in-water work except when culverts or bridges must be installed at stream crossings. Similarly, forest practices do not typically involve shoreline armoring or over-water structures.

The SMP regulates non-harvest related forest practices such as road building, but does not regulate timber harvest. Harvest activities, except for Class IV conversions to non-forest uses, are regulated by the state Forest Practices Act (FPA; RCW 76.09) and not the SMA. Conversions of forest land to non-forestry uses must comply with the regulations of the proposed non-forest use and all other general regulations such as buffers (as described below). The SMP prohibits forest practices below the ordinary high water mark.

Effectively this means all forest practices conversions and activities require a shoreline substantial development or conditional use permit from the County. In reviewing a permit application, County staff would assess the non-harvest related actions to ensure they are compliant with the SMP and defer to Washington Department of Natural Resources (WDNR) to enforce timber harvest rules. The FPA would limit removal of trees within the riparian zone and control impacts related to erosion and sedimentation. Together the SMP and the FPA impose the maximum degree of regulation provided for under state law.

4.3 Residential Development

Construction of a single-family residence, when carefully sited and located outside of shoreline buffers, does not typically cause major adverse effects on shoreline functions. Most of the effects are caused by actions commonly associated with (accessory to) residential development including construction of bulkheads, removal of shoreline vegetation for views, use of fertilizers and other chemicals, alteration of natural drainage pathways, construction or docks/piers, and installation of septic systems. These actions typically cause a variety of impacts that affect habitat, water quality and hydrology functions (Table 4-2).

Table 4-2. Impacts Commonly Associated with Residential Development

Development Activity	Potential Impacts[19]
Vegetation clearing	• Simplification of habitat structure due to removal of large wood, overhanging branches, and boulders • Reduced bluff and beach stabilization, and increased erosion • Decreases in terrestrial food supply, shading, and protection from overhead predators due to clearing of marine riparian vegetation • Increased water temperatures due to loss of shoreline vegetation • Increased marine beach substrate temperatures during low tide in summer • Decreases in terrestrial food sources • Habitat fragmentation and disruption of wildlife travel corridors • Increased incidence of invasive species due to site disruption
Creation of lawns and impervious surfaces	• Increased pollutant load due to lakes and marine waters from nonnative landscaping requiring use of fertilizers and pesticides
In-water recreational activity	• Changes to substrate, increased forage fish egg mortality, and fish avoidance from propeller wash and grounding of boats during low tides • Substrate change and fish use impacts (avoidance) during low tides from propeller wash and grounding • Increased injury (lesions, tumors) to salmon and reduced prey and habitat due to water quality degradation from increased stormwater runoff and wastewater discharges • Chemical changes to the water column attributed to terrestrial and aquatic activities – directly affecting shellfish species and plankton (a major shellfish food source) • Introduced predator/parasite species
On-site septic systems	• Eutrophication due to leaky/failing septic systems reducing eelgrass cover due to increased shading from ulvoids and epiphytes • Contamination of shellfish harvest areas due to increased nutrients and bacteria • Algal blooms in lakes due to increased nutrients and bacteria
Noise and lighting	• Changes in fish and wildlife behavior patterns

Residential use is the second most common type of use along the County's shorelines and there are a large number of undeveloped parcels that are expected to develop over the next 20 years, particularly along the lower stream reaches and residential-zoned areas along the marine shoreline. As a result,

[19] The list of potential impacts is adapted from Protecting Nearshore Habitat and Functions in Puget Sound: An Interim Guide (EnviroVision et al., 2007)

residential development and the modifications that typically accompany it are expected to result in potential impacts to shoreline ecological functions in certain areas. The specific types of impacts related to residential development that are expected in Clallam County include:

- Buffer encroachment / modification;
- Subdivision / intensification of use;
- View clearing;
- Shoreline stabilization; and
- Floodplain encroachment.

These have the potential to impact key shoreline attributes (Figure 4-1). Chapter 5 provides data on the specific nature of these impacts and where they are most prevalent.

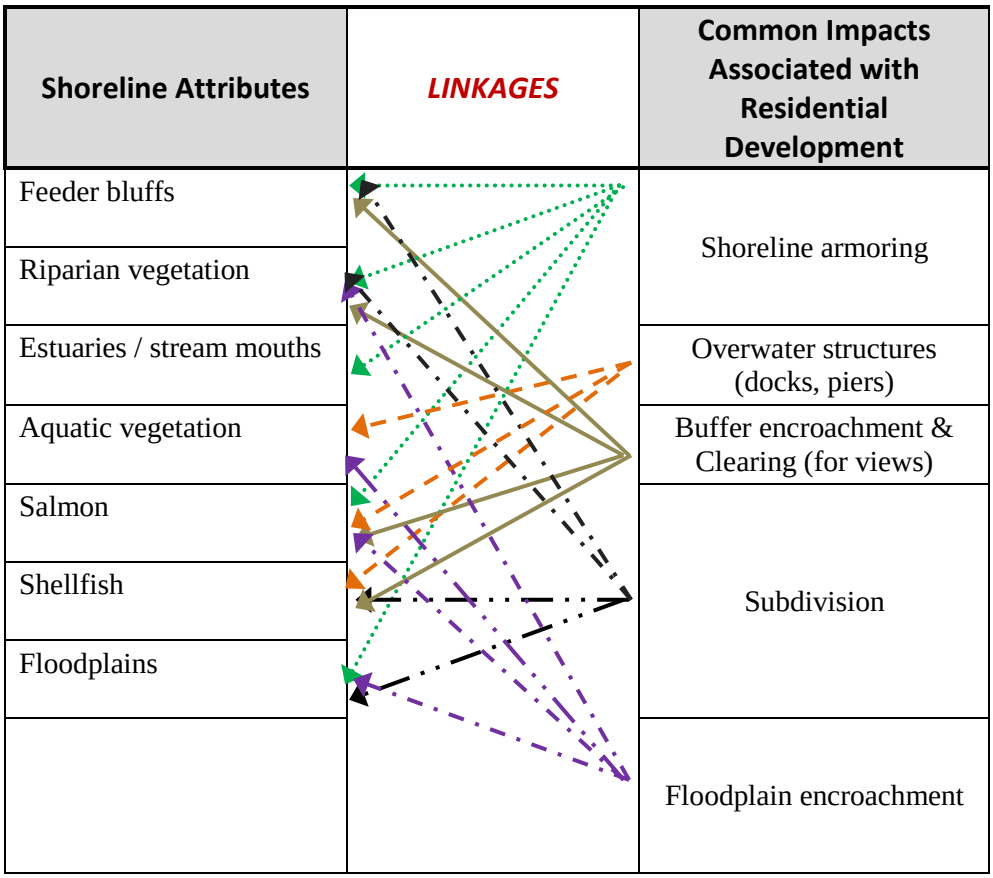

Figure 4-1. Common impacts associated with residential development and linkages to shoreline attributes

Actual shoreline impacts from residential development are dependent upon a variety of factor, such as development type (e.g. infill or subdivision) and zoning designation. In general, designations that allow

higher residential densities (such as 1 dwelling unit per 1 acre) have a greater risk of impacting shoreline functions as lower residential densities (such as 1 dwelling unit per 5 acres)

4.4 Transportation

Clallam County has many roads that parallel and/ or cross shoreline waterbodies including Old Olympic Highway, Strait View Drive, Ozette Lake Road, Quillayute Road, US Highway 101, and State Routes 110, 112, and 113. These and other roads can constrict channel movements, disconnect rivers from their floodplains, displace riparian vegetation, limit tidal exchange, impede the movement of fish and other animals, increase sediment deposition and contribute pollutants to lakes, rivers and marine waters.

Road improvement and maintenance projects have the potential to impact shoreline functions and processes especially when they involve widening or additional lanes, but the potential effects must be balanced with the need to maintain safety and mobility. Often environmental impacts can be controlled through effective use of best management practices. In some cases, road improvement projects can have beneficial effects such as removing fish passage barriers, incorporating stormwater treatment and detention and putting infrastructure on pilings instead of fill.

Based on policies and regulations set forth in the SMP, construction of new roads within the shoreline jurisdiction is unlikely. New roads must be located outside shoreline jurisdiction or as far away from the shoreline as possible and there are numerous standards related to road design to ensure that impacts are minimized and offset to the maximum extent.

5.0 Reasonably Foreseeable Future Shoreline Development and Use

Chapter 4 describes the typical ways that future development can impact or degrade shoreline ecological functions. This chapter examines potential impacts that are specific to Clallam County and describes where in the County potential impacts are believed to be most prevalent. Two different types of impacts are taken into account:

1. Impacts from existing development (meaning development that has already occurred but which continues to degrade the shoreline environment); and

2. Impacts from future (new) development (including infill development, redevelopment and new development in areas that are relatively undeveloped).

While both types of development have the potential to alter the existing conditions and impact ecological functions, this analysis focuses primarily on impacts from new development because that is what the SMP is designed to prevent and because new development tends to have a disproportionate effect on places are relatively high functioning (compared to developed areas).

To assess the level of potential impacts posed by new development, the amount of build-out that would occur based on parcel size, ownership, and proposed shoreline environment designations was evaluated. Specifically evaluated was the potential for intensification of use through subdivision / creation of new lots. Also considered, was whether the foreseeable development would be able to conform to the buffer requirements of the SMP.

Potentially dividable parcels within shoreline jurisdiction based on underlying zoning requirements were identified. The analysis accounted for maximum density / minimum lot size, lot dimensions and position relative to shoreline jurisdiction and proposed shoreline / critical areas buffers. For example, within the County's Rural Character Conservation 5 (RCC5) zone, the maximum allowable residential density is one dwelling unit per 4.8 acres (assuming a cluster development design is used), so a 45-acre parcel could theoretically be subdivided to create 9 total lots (an increase of 8 residential lots over existing condition)—assuming there are no other constraints. Also, in the RCC5 zone, the standard minimum lot width required for new lots is 400 feet. So if an existing 45-acre parcel is only 900 feet wide, it was assumed that only 1 new lot (as opposed to 3) would be created through subdivision. The analysis did not include new lots that could be created outside of shoreline jurisdiction, and assumed that no new lots would be created in areas that were entirely constrained by the proposed buffers because the SMP prohibits new lot creation in those circumstances. Although the analysis attempted to be as accurate as possible, it is difficult to get a precise estimate of development potential without detailed knowledge of parcel characteristics, economic conditions, and other factors. Results are summarized below (Note: all numbers are approximate).

5.1 Potential for New Development in WRIAs 17, 18 and 19

Using parcel data from the county assessor's office, aerial photography, information from the Shoreline Inventory and Characterization Report (ESA, 2012), zoning information and anecdotal information from Department of Community Development staff, portions of WRIAs 17, 18 and

19 that have the greatest potential for future development within the planning horizon of the SMP (~20 years[20]) were identified. These areas are distinguished by the following characteristics

High percentage of vacant (undeveloped) parcels;

Relatively undeveloped but zoned for higher-density development (e.g., maximum allowed densities of 1 unit per acre and/or smaller minimum lots sizes (< 43,560 SF) based on current zoning;

Mostly underdeveloped relative to the allowable zoning and eligible for additional lot creation through subdivision; and/or

Platted, but not fully built-out.

Such areas (referred to as Analysis Areas) occur as scattered segments along the marine shoreline, in patches along the lower reaches of a few of the major rivers and at Lake Sutherland (Table 5-1, Figures 5-1, 5-2 and 5-3). The Analysis Areas are subsets of the shoreline reaches identified in the Shoreline Inventory and Characterization Report and include all areas where future development is anticipated to be most intense. Whether the future development in these Analysis Areas poses potential impacts to cause a *net* loss of shoreline functions depends on multiple factors including specific nature of the development and the existing condition of the shoreline. These factors are considered in the analysis.

Table 5-1. Shoreline Analysis Areas and Proposed Shoreline Environment Designations (SEDs) with High Potential for New Development – WRIAs 17, 18, and 19

Marine Analysis Areas (Proposed SED)	River and Lake Analysis Areas (Proposed SED)
Discovery Bay bluffs (SR-C)	Clallam River (SR-C)
Diamond Point (SR-I)	Dungeness River (SR-C, some Natural)
Travis Spit (SR-C)	Elwha Tributaries (SR-C)
Sequim Bay (primarily SR-C)	Lake Sutherland (SR-I)
3 Crabs (primarily SR-I)	Lyre River (SR-C, some SR-I)
Dungeness Harbor (primarily SR-C)	McDonald Creek (SR-C)
Dungeness Bluffs (primarily SR-C)	Morse Creek (SR-I, SR-C, and Natural)
Morse Creek to Port Angeles (SR-C)	Pysht River (SR-C)
East Angeles Point (primarily SR-C; some Natural)	Salt Creek (SR-C)
Freshwater Bay (SR-C and SR-I)	
Whiskey Creek beach (SR-C; some Marine Waterfront)	
Lyre River vicinity (SR-C; some RC)	
Clallam Bay (Marine Waterfront, SR-I, SR-C, some Natural)	

[20] Twenty years is a typical land use planning horizon but SMPs are updated more frequently based upon the schedule mandated by the State Legislature. Thus adaptive management for no net loss will occur more frequently.

Marine Analysis Areas (Proposed SED)	River and Lake Analysis Areas (Proposed SED)
Hoko River vicinity (SR-C, SR-I, some Natural) Bullman Beach (SR-I)	
N = Natural ; RC = Resource Conservancy; SR-C = Shoreline Residential - Conservancy; SR-I = Shoreline Residential- Intensive; MW = Marine Waterfront;	

The Marine and Freshwater Analysis Areas (see Figures 5-1 thru 5-3) that represent areas of greatest potential shoreline development comprise a relatively small percentage of the area in WRIAs 17, 18 and 19 that is subject to SMP jurisdiction (approximately 37% of the total shoreline miles in WRIAs 17, 18, and 19). The majority of shorelines outside of these Analysis Areas have relatively low potential for new residential, commercial and/or industrial development (See Appendix B). This is generally true for the upper watersheds where public and privately owned resource lands are managed for timber production, conservation, and/or recreation. Development pressure in these areas is low because they are remote and either lack or are underserved by public infrastructure. For these reasons, areas outside of the Marine and Freshwater Analysis were not analyzed due to their low potential for shoreline development that would impact function.

In addition, many of the shoreline reaches outside of the Analysis Areas are zoned commercial forestry and designated under the SMP as a Resource Conservancy (ReC) shoreline environment. Marine and freshwater shorelines in the ReC are characterized by undeveloped public and private forest lands. Existing development is limited and isolated, and residential development potential is limited to low densities of 1 unit per 80 acres in most areas. A substantial portion of these lands will be subject to thinning, clearcutting and other harvest impacts, but forest harvest activities are largely un-regulated by the SMP and impacts were not factored into the cumulative impacts analysis (see scope of analysis in Section 1.2).

Figure 5-1. Analysis Areas for WRIAs 17, 18, and 19 marine and freshwater shorelines – east region.

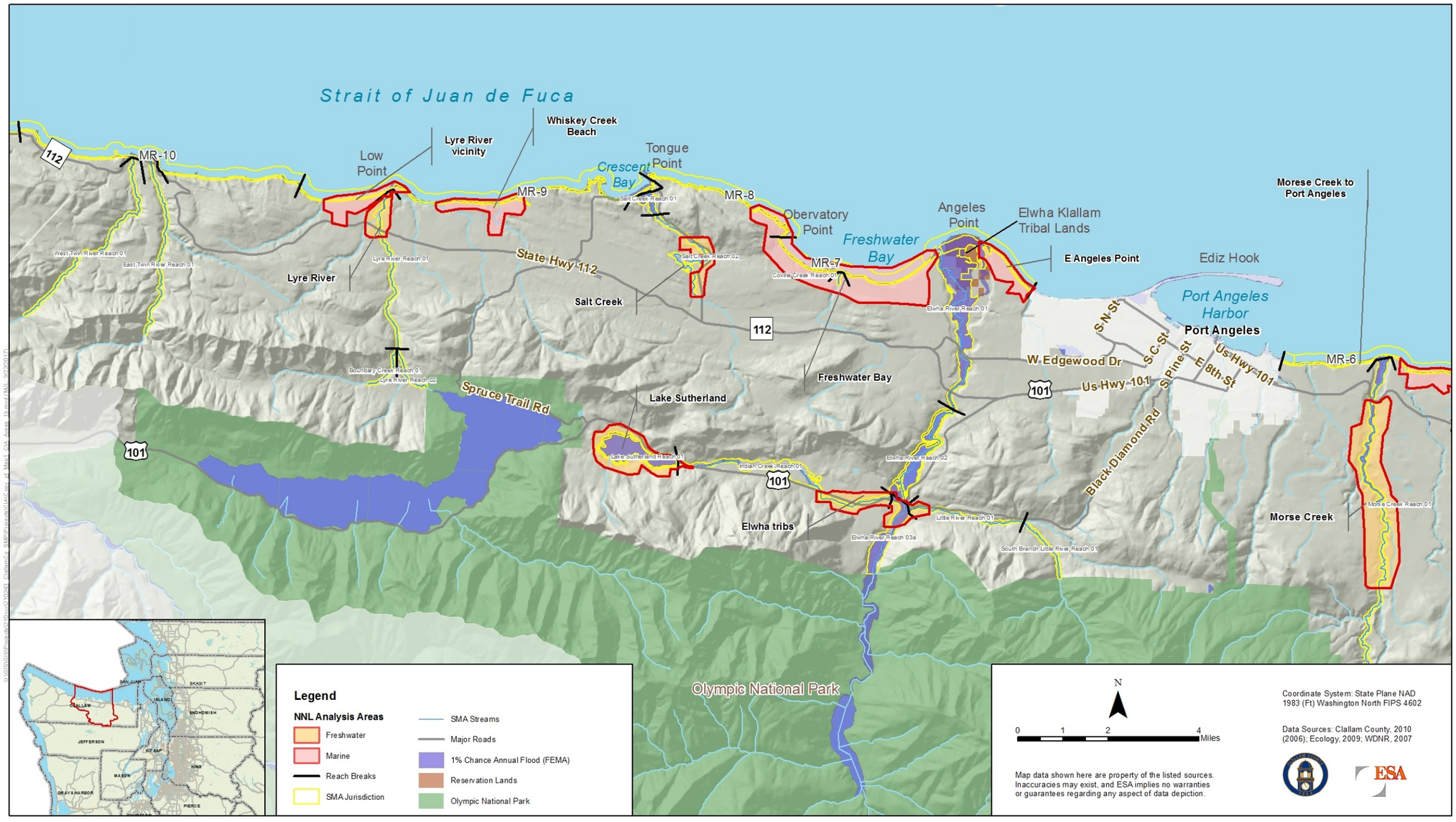

Figure 5-2. Analysis Areas for WRIAs 17, 18, and 19 marine and freshwater shorelines – central region.

Figure 5-3. Analysis Areas for WRIAs 17, 18, and 19 marine and freshwater shorelines – west region.

5.1.1 Marine Reach 1 – Diamond Point

The Diamond Point reach extends along Miller Peninsula, from the Clallam/Jefferson county line to the northwest corner of Sequim Bay. Land use along the shoreline is primarily undeveloped open space, with pockets of residential development. This is consistent with the zoning which is either Rural Low (R5), Urban Residential Low (URL), or open space.

Within this reach there are three Marine Analysis Areas (Figure 5-1) where the reasonably foreseeable future development pressure is considered high because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). Within these three Analysis Areas new development has the potential to impact shoreline functions if not carefully planned and designed. The Analysis Areas are:

- Discovery Bay Feeder Bluffs
- Diamond Point
- Travis Spit Vicinity

Between the Diamond Point and Travis Spit Vicinity Analysis Areas, the over 2-miles of marine shorelines are almost entirely located within Miller Peninsula State Park (undeveloped park land), managed by Washington State Parks (Figure 5-1). The exception being a large privately-owned parcel of over 30-acres in size between the Park and Diamond Point residential community. The proposed SMP will designate all of these areas Natural, requiring 175-foot habitat buffers for any new development. The potential for impacts to marine shoreline ecological functions in these areas is anticipated to be low to the presence of the State Park and low development potential in the shoreline jurisdiction.

The densest concentration of residential development is located in the Diamond Point vicinity, with sparser residential development landward of feeder bluffs along the Discovery Bay shoreline and in the Travis Spit vicinity / northeast Sequim Bay (Figure 5-1). These two residential areas are separated by an approximately 1-mile stretch of undeveloped Discovery Bay shoreline that is located within Miller Peninsula State Park.

Table 5-2. Reasonably foreseeable future development – Marine Reach 1- Diamond Point

Feature	Description
Analysis Area: Discovery Bay Feeder Bluffs (Figure 5-1)	
Zoning	Rural Low (R5)
Existing Shoreline Condition	Mix of developed and vacant residential waterfront lots consistent with the maximum residential density of 1 dwelling unit (du) per 4.8 acres in the R5 zone. Lot sizes are generally around 5-acres and characterized by deep lots (1,500 feet or greater) with shoreline widths of 150-175 feet. The nearshore area is >90% forested, with most homes set back >150 feet from inventoried priority feeder bluff exceptional and other feeder bluffs.

Feature	Description
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Use:** The primary potential for new development is infill of single-family residential homes and accessory uses on existing 5-acre, vacant lots. **Existing parcel pattern and subdivision potential:** There are 21 total parcels in the analysis area, 11 of which have existing development and are non-subdividable, and the remainder of which (10 parcels) are vacant and non-subdividable. There is no apparent subdivision potential. **Developed parcels:** Of the 11 parcels developed with residential use, 36% (4 parcels) have existing structures within proposed SMP hazard buffer area. **Vacant parcels:** Of the 10 vacant parcels, 30% (3 parcels) would likely be dimensionally constrained by proposed SMP buffer areas. Riparian vegetation is already altered on two of these lots (intact on one). **Potential for new shoreline modification:** There are no areas appropriate for new residential armoring or new overwater docks. The proposed SMP prohibits armoring of feeder bluff shorelines.
Summary of Anticipated Future Development	Intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces); New residential development on 10 vacant parcels (3 parcels where a reduced safety hazard buffer may be required). No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The large majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through clearing allowances for view / shoreline access corridors at or near the top of bluff. Limited impacts to feeder bluff and sediment transport processes are expected, as there is low likelihood for significant future shoreline modification.
Identified Restoration Opportunities	Remove pile wall at Eagle Creek
Necessary Restoration to Account for Potential Impacts	Revegetation of existing disturbed riparian / feeder bluff buffer areas (within Analysis Area, or potentially within opportunity areas in Diamond Point)
Analysis Area: Diamond Point (Figure 5-1)	
Zoning	Urban Residential Low Density (URL). This area is a designated Limited Area of More Intensive Rural Development (LAMIRD) under County comprehensive plan and zoning.

Feature	Description
Existing Shoreline Condition	The majority of the nearshore is developed with single-family residential development and accessory uses at or near the maximum residential density of 2 du/acre allowed within the URL zone. Minimal riparian forest along low bank (~ 3%); 90% forested along bluffs to the south and west of Diamond Point. Some armoring and docks along low bank, and residential development below the feeder bluffs to the south.
Proposed Shoreline Environment Designation	• Shoreline Residential – Intensive (marine shoreline in low bank areas of Diamond Point); • Shoreline Residential – Conservancy (high bank shorelines to the south and west of the point); • Natural – wetland and surrounding open space area associated with Diamond Point shoreline
Development Potential	**Use:** The primary potential for new development is infill of single-family residential homes and accessory uses on existing vacant lots and remodel/redevelopment on existing residential lots. Potential for placement of park models and recreational vehicles on constrained lots. **Existing Parcel Pattern and Subdivision Potential:** There are 149 total parcels in the Analysis Area, 116 of which have existing residential development and 32 are undeveloped. There is no apparent subdivision potential. **Developed Parcels:** Of the 116 parcels developed with residential use, 84% (98 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 32 undeveloped parcels, 69% (22 parcels) would likely be dimensionally constrained by proposed SMP buffer areas. Riparian vegetation is already altered on 13 of these lots (at least partially intact on 9). **Potential for New Shoreline Modification**: There is substantial potential for future shoreline armoring (16 parcels; 11% of total lots) and future residential docks; despite potential for residential docks, very few are anticipated due to past development patterns and the exposed nature of the shoreline. The proposed SMP prohibits armoring of feeder bluff shorelines (applicable to SR-C designated areas within this Analysis Area).
Summary of Anticipated Future Development	New development on currently vacant parcels (22% of lots), including buffer clearing and potential for narrow setbacks due to the number of dimensionally constrained lots. Intensified use on existing developed residential properties (redevelopment with larger structures; some additional riparian vegetation impact and more impervious surfaces); New armoring to protect residential development (existing and new development on constrained lots); some potential for future overwater structures (few if any anticipated) No other development or uses are anticipated.

Feature	Description
Potential Impacts Associated with Anticipated Development	Alteration to existing intact riparian vegetation (limited to 9 dimensionally constrained, undeveloped lots with at least partially intact riparian vegetation). View clearing allowances may additionally alter riparian vegetation; however, impacts are limited by existing altered condition. Diamond Point Analysis Area (along with the Three Crabs Vicinity) has the highest potential for new shoreline stabilization to protect residential development. Few if any new overwater structures are anticipated.
Identified Restoration Opportunities	Remove wharf piles along Diamond Point
	Remove fill, restore tidal prism of coastal lagoon/embayment at Diamond Point
	Revegetate disturbed riparian areas along Diamond Point, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs)
Analysis Area: Travis Spit Vicinity (Figure 5-1)	
Zoning	Rural Low (R5)
Existing Shoreline Condition	Mix of developed and vacant residential waterfront lots consistent with the maximum residential density of 1 dwelling unit (du) per 4.8 acres in the R5 zone. Lot sizes are generally around 5-acres and most lots are configured by deep lots to maximize waterfront ownership. Much of the nearshore is characterized by marine feeder bluffs, with some low bank areas along Paradise Cove and near Travis Spit. The nearshore area is > 90% forested along marine bluffs, generally not forested along low bank (~ 3%). Some armoring and docks along low bank.
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Use:** The primary potential for new development is for infill of single-family residential homes and accessory uses on vacant lots. Potential for some new shoreline residential lots along shoreline if eligible lots are subdivided. **Existing Parcel Pattern and Subdivision Potential:** There are 49 total parcels in the Analysis Area, 32 of which have existing residential development, 17 are undeveloped. <u>There is limited subdivision potential (11 new lots; 22% increase).</u> **Developed Parcels:** Of the 32 parcels developed with residential use, 75% (24 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 17 vacant parcels, 41% (7 parcels) would likely be dimensionally constrained by proposed SMP buffer areas. Riparian vegetation is generally intact on all seven of these parcels. **Potential for New Shoreline Modification**: There are no areas appropriate for new residential armoring, and only one parcel identified where a new residential dock may occur. The proposed SMP prohibits armoring of feeder bluff shorelines.

Feature	Description
Summary of Anticipated Future Development	Subdivision of existing residential lots and new development (22% increase in total lots). Potential for intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces). New residential development on 17 vacant parcels (7 parcels where a reduced safety hazard buffer may be required). No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through: intensified uses through subdivision; potential development on 7 existing dimensionally constrained parcels; and clearing allowances for view / shoreline access corridors. Limited impacts to feeder bluff and sediment transport processes are expected, as there is low likelihood for significant future shoreline modification.
Identified Restoration Opportunities	None identified
Necessary Restoration to Account for Potential Impacts	Revegetation of existing disturbed riparian / feeder bluff buffer areas (within Analysis Area [potentially on Travis Spit], or potentially within opportunity areas at Diamond Point or elsewhere in Sequim Bay)

5.1.2 Marine Reach 2 – Sequim Bay

The "Sequim Bay" reach contains 8.2 miles of marine shoreline which extends from the northeast corner of the bay (approximately one-mile south of Travis Spit) to just south of the John Wayne Marina located in the City of Sequim (See Analysis Area 4 on Figure 5-1). The reach also contains the mouths of Jimmycomelately and Dean creeks (these streams are not shorelines of the state, except where they enter Sequim Bay).

The dominant land use along the Sequim Bay shoreline is moderate- to low-density residential development (occurring throughout the reach). This is consistent with the zoning which is primarily Rural Neighborhood Conservation (NC). The Sequim Bay nearshore in this analysis area also includes the Sequim Bay State Park on the west shore of Sequim Bay. The nearshore area at the south end of Sequim Bay includes Jamestown S'Klallam Reservation and areas zoned Rural Center (CEN). The Rural Center (CEN) is a designated Limited Area of More Intensive Rural Development (LAMIRD), and allows for a mix of uses.

Foreseeable future development pressure is considered high throughout the Sequim Bay shoreline area because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). As such, the entire Sequim Bay marine reach is an Analysis Areas,

where new development has the potential to impact shoreline functions if not carefully planned and designed.

Table 5-3. Reasonably foreseeable future development – Marine Reach 2 – Sequim Bay (entire reach)

Feature	Description
Analysis Area: Sequim Bay (Figure 5-1)	
Zoning	Primarily Rural Neighborhood Conservation (NC). The south-end of Sequim Bay in the vicinity of Jimmycomelately Creek is zoned Rural Center (CEN). The CEN zone is a designated LAMIRD under the County comprehensive plan and zoning. The south-end of the Bay also includes waterfront areas part of the Jamestown S'Klallam Reservation/Trust lands. Sequim Bay State Park approximately 5,000 feet of saltwater shoreline is situated along the southwest Sequim Bay and is zoned Public.
Existing Shoreline Condition	The predominant land use along the 8-plus miles of shoreline in this analysis area is single-family residential and accessory uses. The exception being the south-end of Sequim Bay which contains tribal offices and service buildings on the Jamestown S' Klallam Reservation (not subject to SMP) and mix of residential and natural/rural open spaces between the Sequim Bay and US 101. The Sequim Bay State Park contains developed public access to the shoreline including campground, boat launch and recreational piers. The nearshore area is approximately 70% forested. Existing setbacks vary. Docks and armoring are present in some locations.
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy Natural (at south end of Sequim Bay associated with Jimmycomelately Creek estuary and nearshore wetlands that were part of significant restoration of the nearshore and lower creek floodplain areas.
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are 148 total parcels in the Analysis Area, 127 of which have existing residential development; 17 are undeveloped (5 nonresidential parcels). There is limited subdivision potential (23 new lots; 16% increase). **Developed Parcels:** Of the 127 parcels developed with residential use, 23% (29 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 17 vacant parcels, only 1 parcel would likely be dimensionally constrained by proposed SMP buffer areas. Riparian vegetation is generally intact on this parcel. **Potential for New Shoreline Modification:** There is some potential for future shoreline armoring (10 parcels; 7% of total lots) and future residential docks; despite potential for residential docks, very few are anticipated due to past development patterns and the exposed nature of the shoreline. The proposed SMP prohibits new structural armoring of feeder bluff shorelines,

Feature	Description
Summary of Anticipated Future Development	Subdivision of existing residential lots and new development (16% increase in total lots); Intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces); New residential development on 17 vacant parcels (predominantly occurring consistent with standard buffers and other requirements of the proposed SMP); Some potential for new shoreline stabilization to protect residential development. Few if any new overwater structures are anticipated. No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through: subdivision (intensification of residential use); and clearing allowances for view / shoreline access corridors. Limited impacts resulting from shoreline modification are anticipated, as there is limited potential for new shoreline armoring and few residential docks are anticipated.
Identified Restoration Opportunities	Remove unnecessary shoreline armoring /bulkheads and creosote walls
	Remove dikes at south end of bay
	Restore tidal flushing to lagoon area south of John Wayne Marina
	Patches of disturbed vegetation are present along the bay; revegetate these areas, where possible.
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed. Additional opportunities to compensate impacts occur in Reach 3 (Removal of fill and armoring at Graysmarsh; revegetate the disturbed areas between Graysmarsh and Gibson spit, where possible)

5.1.3 Marine Reach 3 – Gibson Spit

The "Gibson Spit" reach contains 6.1 miles of marine shoreline, which extends from north of the John Wayne Marina in Sequim Bay to just north of Graysmarsh (Gierin Creek mouth) along the Strait of Juan de Fuca. The reach contains the northwestern shoreline of Sequim Bay and the estuaries of Bell and Gierin creeks (Bell and Gierin Creeks are not shorelines of the state, except where they enter the Strait of Juan de Fuca).

The Analysis Areas for this Reach includes the areas between the John Wayne Marina and Washington Harbor Road (near Gibson Spit) that are part of the Sequim Urban Growth Area (UGA). The marina is located within the City of Sequim. The approximately 1-mile plus of Sequim Bay shoreline north of the marina is characterized by city and county UGA residential

waterfront properties zoned urban residential. The residential waterfront lots are characterized by deep lots (500-700 feet) of moderate size (generally 1 to 3 acres) with homes located on waterfront side. These shoreline lots have potential for further division at urban residential densities (4 du per acre), however, it is not anticipated significant new residential lot creation will occur within the shoreline jurisdiction due to the established waterfront residential development lot pattern. The cumulative impacts for this residential zoned area were assessed as part of the Sequim Bay Analysis Area, detailed above.

The Analysis Area also includes approximately 1-mile of Sequim Bay shoreline that extends north of the UGA residential waterfront area and south of Washington Harbor Road and Gibson Spit. This part of the shoreline forms the northeastern part of the unincorporated UGA and is owned by the Battelle Memorial Institute, which is part of the Pacific Northwest National Laboratory. The shoreline area is mostly undeveloped, feeder bluffs and nearshore areas, although the area just south between the base of the bluff and Sequim Bay is the location of Battelle's waterfront research facilities. The Battelle shoreline properties are zoned Sequim Research Development Park (SRDP), which supports research facility development and expansion, but limits or prohibits other uses such as residential and commercial development. Battelle owns substantial areas of adjacent upland areas that should allow any new or significant major expansion of research and support facilities their property to occur outside of the nearshore areas and away from edges of feeder bluffs. Due to existing ownership and use patterns, presence of critical areas (i.e., marine feeder bluffs), and the protective standards of the proposed SMP, there is a low potential of future shoreline development in this 1-mile stretch of UGA shoreline. Outside of the Analysis area the land uses in the northern half of the reach (Washington Harbor Rd/Gibson Spit and northward) is primarily forestry and agriculture, with minimal existing shoreline development. Most of the reach is zoned agricultural, except for the spit area and mouth of Bell Creek which is rural low zoning. Throughout this area, undeveloped parcels are larger (20 acres average) and are currently working timber and agricultural lands with little to no existing residential development along the shoreline. Under current Agricultural zoning regulations, parcels in this area cannot be subdivided into lots less than 16- acres, so the potential for dense shoreline development in this area is unlikely. Additionally, much of nearshore is characterized by marine bluffs, or characterized by significant wetland and estuary habitats at the mouth of Gierin Creek (i.e., Graysmarsh) and Bell Creek (including Gibson Spit), that further limits development in nearshore areas.

The City of Sequim sewer outfall extends across a road/dike containing the cities outfall pipe across Washington Harbor. This lagoon at the mouth of Bell Creek and formed by the sediment transport processes creating the sand spits that form Washington Harbor retain substantial ecological functions and natural shoreline processes (e.g., spit formation) are still intact. Reducing impacts to tidal processes in the lagoon caused by the sewer dike crossing is one of the restoration efforts to increase ecological functions of the estuary/lagoon area known as Washington Harbor.

Most of the northern part of this reach is designated Shoreline Residential-Conservancy. The Bell Creek estuary (Washington Harbor) and Gibson Spit area and the large wetland complex associated with the mouth of Gierin Creek are designated as Natural shorelines.

5.1.4 Marine Reach 4 – Kulakala Point

The "Kulakala Point" reach contains 7.9 miles of marine shoreline, which extends from north of Graysmarsh (Gierin Creek mouth) to just east of the landward end of Dungeness Spit. The reach contains Dungeness Bay, Cline Spit, and Dungeness Harbor. The reach includes the Dungeness River delta (a shoreline of the state), and the mouth of Cassalery Creek. The creek is not a shoreline of the state, except where it enters the Strait of Juan de Fuca.

Within 300 feet of the shore, approximately half of the shoreland area contains forest and natural shrub and herbaceous vegetation. However, much of the vegetation directly bordering the shoreline has been removed to accommodate dense shoreline development, particularly along Three Crabs Road, Seashore Lane, Jamestown Road, and the south shore of Dungeness Harbor. Outside of the shoreland zone, the surrounding land consists of residential development and agriculture.

Within this reach there are two areas where the reasonably foreseeable future development pressure is considered high because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). Within these two Analysis Areas new development has the potential to impact shoreline functions if not carefully planned and designed. The Analysis Areas (Figure 5-1) are:

- Three Crabs Vicinity
- Dungeness Harbor

Outside of the Analysis Areas, Reach 4 includes large lots which are primarily preserved as open space (undeveloped parcels adjacent to the Dungeness River mouth that are owned or managed by WDFW, the North Olympic Land Trust, and Dungeness Farms (private) for fish and wildlife conservation purposes) or used for agriculture The SMP designates much of this area Natural, requiring 175-foot habitat buffers for any new development. Other areas (primarily rural areas with some agricultural use) are designated Shoreline Residential – Conservancy, and would require 100 to 150-foot habitat buffers. Due to existing ownership and use patterns, significant conservation and restoration efforts already underway, and protective standards of the SMP, there are limited potential impacts to marine shoreline ecological functions in these areas.

Table 5-4. Reasonably foreseeable future development – Marine Reach 4 – Kulakala Point

Feature	Description
Analysis Area: Three Crabs Vicinity (Figure 5-1)	
Zoning	Primarily Rural Low (R5) and Rural Neighborhood Conservation (NC);
Existing Shoreline Condition	Except for areas near the east-side of the Dungeness River mouth, most of the immediate marine shoreline is characterized by developed residential waterfront lots. Most waterfront residential lots along 3-Crabs Road east of the mouth of the Dungeness River are of shallow depth and small (less than 0.5 acres), with most of the area across the road being part of a large wetland complex. This residential density was established before current zoning of the area at 1 du per 5 acres. Further south along the marine waterfront, residential development is also close to the waterfront along Seashore Lane and Jamestown Beach/Jamestown Rd areas north and south of the mouth Cassalery Creek. However, many of these lots are larger (5 acres or larger), but are very long and narrow. This design (also referred to as spaghetti lots) complies with the 1 du per 4.8-acre zoning. In many cases, only the area near the waterfront is buildable, and the remainder of the lot is wetland or less desirable non-waterfront locations. The nearshore area is <3% forested, mostly built-out, most setbacks 50 feet or less, ~5% armored
Proposed Shoreline Environment Designation	Shoreline Residential - Intensive (Associated with the intensive residential developed waterfront areas). Natural or Shoreline Residential Conservancy (Associated with the large associated wetlands adjacent to the Dungeness River and landward of waterfront residential development are designated as natural or conservancy.)
Development Potential	**Use:** The primary potential for new development is redevelopment of residential sites related to single-family home expansions and/or replacement. **Existing Parcel Pattern and Subdivision Potential:** There are 112 total parcels in the Analysis Area, 108 of which have existing residential development, only 3 are undeveloped (1 nonresidential parcel). There is no apparent subdivision potential. Developed Parcels: Of the 108 parcels developed with residential use, 39% (42 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 3 undeveloped parcels, all have adequate buildable area outside of buffers in the proposed SMP. **Potential for New Shoreline Modification:** There is moderate potential for future shoreline armoring (14 parcels; 13% of total lots) and future residential docks; despite potential for residential docks, very few are anticipated due to past development patterns and the exposed nature of the shoreline.

Feature	Description
Summary of Anticipated Future Development	Intensified use on existing developed residential properties (redevelopment with larger structures; some additional riparian vegetation impact and more impervious surfaces); New armoring to protect residential development (existing and new development on constrained lots); some potential for future overwater structures (few if any anticipated) No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	Potential impacts are primarily associated with redevelopment of residential properties, including: intensification of uses (more impervious surfaces, more lawns, increased vegetation clearing within and outside of riparian buffers). Redevelopment in the 3 Crabs Vicinity also provides opportunity to improve condition (new structures built consistent with wider buffer standards; riparian enhancement). 3 Crabs Vicinity (along with Diamond Point Analysis Area) has the highest potential for new shoreline stabilization to protect residential development. Few if any new overwater structures are anticipated.
Identified Restoration Opportunities	Community sewage system along 3 Crabs Road
	Beneficial project in progress: Restore riparian habitat along streams in the 3 Crabs Road vicinity
	Restoration of tidal flushing channels in the 3 Crabs Road vicinity
	Reconfiguration of boat launch and groin at the north end of Sequim-Dungeness Way
	Removal of derelict structures east of Cline Spit
	Removal of armoring and dikes at Cline Spit to improve fish habitat and increase lagoon area (CGS)
	Revegetate the disturbed areas along Marine Drive, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed, and on implementing projects that remove shoreline armoring (addressing potential for new shoreline armoring along the marine shoreline). Additional opportunities to compensate impacts occur in Reach 3 (Removal of fill and armoring at Graysmarsh; revegetate the disturbed areas between Graysmarsh and Gibson spit, where possible).
Analysis Area: Dungeness Harbor (Figure 5-1)	
Zoning	Primarily Rural Moderate (R2) and some areas of Rural Neighborhood Conservation (NC). The Cline Spit and Dungeness Landing County Parks along Dungeness Bay are located on the eastern side of the analysis area. The R2 zoned areas of this reach are a designated LAMIRD under the County comprehensive plan and zoning.
Existing Shoreline Condition	The nearshore area is 20% forested, mostly on bluff face, some docks, setbacks vary. Mostly built out with single-family residential waterfront lots at a typical density of around 1 du/acre.

Feature	Description
Proposed Shoreline Environment Designation	Shoreline Residential - Conservancy
Development Potential	**Use:** The primary potential for new development is redevelopment of residential sites related to single-family home expansions and/or replacement. **Existing Parcel Pattern and Subdivision Potential: 58** total parcels in the Analysis Area, 54 of which have existing residential development, only 1 is undeveloped (3 nonresidential parcels). There is no apparent subdivision potential. **Developed Parcels:** Of the 54 parcels developed with residential use, 81% (44 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcel:** The one vacant residential parcel has adequate room to build outside of proposed standard SMP buffers. **Potential for New Shoreline Modification:** There are no areas appropriate for new residential armoring or new overwater docks. The proposed SMP prohibits armoring of feeder bluff shorelines.
Summary of Anticipated Future Development	Intensified use on existing developed residential properties (redevelopment with larger structures; some additional riparian vegetation impact and more impervious surfaces); No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	Potential impacts are primarily associated with redevelopment of residential properties, including: intensification of uses (more impervious surfaces, more lawns, increased vegetation clearing within and outside of riparian buffers). Redevelopment in the 3 Crabs Vicinity also provides opportunity to improve condition (new structures built consistent with wider buffer standards; riparian enhancement).
Identified Restoration Opportunities	Reconfiguration of boat launch and groin at the north end of Sequim-Dungeness Way
	Removal of derelict structures east of Cline Spit
	Removal of armoring and dikes at Cline Spit to improve fish habitat and increase lagoon area (CGS)
	Revegetate the disturbed areas along Marine Drive, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed. Additional opportunities to compensate impacts occur in Reach 3 (Revegetation of the disturbed areas between Graysmarsh and Gibson spit, where possible)

5.1.5 Marine Reach 5 – Dungeness Spit

The "Dungeness Spit" reach contains 15.7 miles of marine shoreline. The reach includes the entire spit, including Graveyard Spit, and a small portion of the landward end of the spit. Nearly the entire reach is within the Dungeness National Wildlife Refuge.

Given that the majority of the reach is a publicly owned national wildlife refuge the potential of future development impacts is very low. The main challenge in this Reach is minimizing impacts of public recreational use of the spit and nearshore areas. The few privately owned parcels in this reach land cannot be subdivided under current zoning regulations. The existing homes are located more than 300 feet back from the shoreline; therefore, there is a low chance of future armoring. Due to existing ownership and use patterns, and protective standards of the SMP, potential impacts to marine shoreline ecological functions throughout all of Reach 5 is considered very low.

5.1.6 Marine Reach 6 – Green Point

The "Green Point" reach contains 11.4 miles of marine shoreline, which extends along the Strait of Juan de Fuca from just west of Dungeness Spit to the Port Angeles city limits. The reach also contains the mouths of McDonald, Siebert, Morse, and Lees creeks. McDonald and Morse Creeks are shorelines of the state. The other streams that intersect this reach are not shorelines of the state, except where they enter the Strait of Juan de Fuca. The western end of this reach (west of Morse Creek) is within the Port Angeles urban growth area and may eventually be annexed by the City. According to the City's shoreline master program, this area would have a dual/parallel designation of Urban Conservancy Recreation along the water and Shoreline Residential inland if it were annexed.

The predominant shoretype in the reach is bluff backed beach, with smaller portions of barrier beach and barrier estuary. Over 70% of this reach is mapped as feeder bluff or feeder bluff exceptional (Figure 5-4).

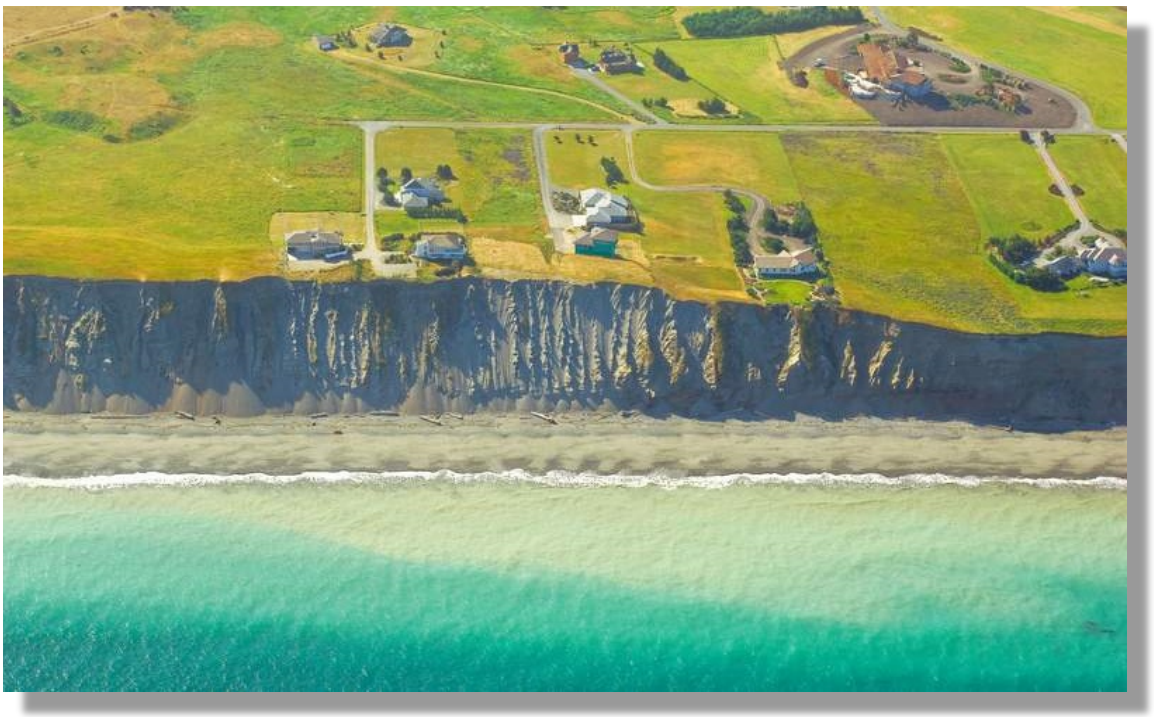

Figure 5-4. Segment of exceptional feeder bluff west of Dungeness Spit lacking native riparian forest cover. Note proximity of existing homes to edge of retreating bluffs (Photo: Ecology Coastal Atlas)

Approximately one-third of the shoreland area in the Green Point reach is forested, and another third contains natural shrub and herbaceous vegetation. These vegetated areas generally occur at the stream mouths and at the top-of-bluff area near Siebert Creek, near the east side of Bagley Creek, and within the unincorporated Port Angeles UGA area near the Olympic Discovery Trail. Forest cover is generally absent in the heavily developed areas. The forest cover that remains in the reach helps stabilize the erosive bluffs.

Within this reach there are two large areas, that extend across the majority of the Green Point reach, where the reasonably foreseeable future development pressure is considered high because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). The major development pressure is residential, which would occur landward of the marine bluff edge. Within these two Analysis Areas (Figures 5-1 and 5-2), new development has the potential to impact shoreline functions if not carefully planned and designed. The Analysis Areas are:

- Dungeness Bluffs (Figure 5-1)
- Morse Creek to Port Angeles (substantially within the Port Angeles UGA) (Figure 5-2)

In the limited areas outside of these two Analysis Areas, Reach 6 includes large lots which are primarily preserved as open space / park lands (publically owned areas of the Dungeness Recreation Area and private open space around the mouth of Morse Creek). The proposed SMP designates these areas SR – C, and would require 100 to 150-foot habitat buffers. Due to existing

ownership and use patterns and protective standards of the proposed SMP, there are limited potential impacts to marine shoreline ecological functions in these areas.

Table 5-5. Reasonably foreseeable future development – Marine Reach 6 – Green Point

Feature	Description
Analysis Area: Dungeness Bluffs (Figure 5-1)	
Zoning	Primarily Rural Low (R5) from the Dungeness Recreation Area County Park to Siebert Creek. A limited area of Rural (R1) zoning occurs adjacent to the County Park. Primarily Rural Character Conservation (RCC 3 or RCC5) between Siebert Creek and Morse Creek. Rural (R1) zoning occurs for approximately 0.8 miles along the top of the marine bluff just west of Siebert Creek associated with an established residential community. R1 zoning also is at and near the mouth of Morse Creek as part of an established planned unit residential development (see also Morse Creek Freshwater Analysis). These R1 zoned areas are designated Limited Areas of More Intensive Rural Development LAMIRD.
Existing Shoreline Condition	Most of the analysis area is marine feeder bluffs with adjacent low density, single-family residential development typical of R5 (1 du/4.8 ac) and RCC (1 du/10 ac.) zoned areas. This reach also includes pockets of intensive residential development (1 du/ac. or > density) along the bluff top. A number of shoreline bed and breakfast inns along the marine bluff are found in this reach, especially along Finn Hall Road. Approximately 15% of the nearshore area is forested as most lots adjacent to marine bluffs have experienced significant clearing of vegetation for views. Several areas continue to have large blocks of forest land in the vicinity of Siebert Creek and just west of Morse Creek, The marine bluffs and waterward areas are largely unmodified shoreline.
Proposed Shoreline Environment Designation	Shoreline Residential - Conservancy Natural (at mouth/estuary area of Siebert Creek)

Feature	Description
Development Potential	**Use:** The primary potential for development is for low density single-family residential infill along top of marine bluff. Marine nearshore areas at the mouth of Morse Creek are addressed in Section 5.1.14, Freshwater Reaches. **Existing Parcel Pattern and Subdivision Potential:** There are 213 total parcels in the Analysis Area, 141 of which have existing residential development, with 68 undeveloped residential lots (4 nonresidential parcel). Subdivision potential is limited (11 new possible lots). Developed Parcels: Of the 141 parcels developed with residential use, 70% (99 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 68 undeveloped parcels, 25% (17 parcels) are dimensionally constrained such that new development would likely be required within the standard buffers proposed by the SMP. 8 of these 17 parcels have intact riparian vegetation that could be impacted when new development occurs. **Potential for New Shoreline Modification:** There are no areas appropriate for new residential armoring or new overwater docks. The proposed SMP prohibits armoring of feeder bluff shorelines.
Summary of Anticipated Future Development	Intensified use on existing developed residential properties (redevelopment with larger structures; some additional riparian vegetation impact and more impervious surfaces); No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	**Highest potential for riparian alteration and feeder bluff impacts** comes through: new development on existing vacant residential lots. Additional potential impacts are associated with redevelopment of residential properties, including: intensification of uses (more impervious surfaces, more lawns, increased vegetation clearing within and outside of riparian buffers). Redevelopment along the Dungeness Bluffs shoreline also provides opportunity to improve condition (new structures built consistent with wider buffer standards; riparian enhancement).
Identified Restoration Opportunities	Siebert Creek ecosystem protection (HWS)
	Restore Morse Creek estuary
	Revegetate disturbed areas along the bluffs, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs.
Analysis Area: Morse Creek to Port Angeles (Figure 5-2)	
Zoning	The marine bluffs and waterward are zoned open space. Landward of the top of bluff is zoned either Urban Residential. This analysis reach is part of the unincorporated eastern Port Angeles Urban Growth Area (PAUGA). Rural (R1) zoning is found at and near the mouth of Morse Creek as part of an established planned unit residential development (see also Morse Creek Freshwater Analysis).

Feature	Description
Existing Shoreline Condition	The marine bluff face along this entire analysis area reach is generally forested due to the armoring of the waterfront to protect the former railroad grade (now Olympic Discovery Trail) that parallels the shoreline at the base of the bluff. Areas landward of the top of bluff are characterized by residential development (mostly single-family residential). Overall, the reach is approximately 30% forested, due to much of the vegetation along top of bluff having been cleared associated with residential development.
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Use:** The primary potential for development is for single-family residential infill and redevelopment near the top of the marine bluff. Areas between the base of the bluff and water will continue to be used for public recreation purposes as part of the Olympic Discovery Trail. The face of the bluff will remain as open space. Marine nearshore areas at the mouth of Morse Creek are addressed in Section 5.1.14, Freshwater Reaches. **Existing Parcel Pattern and Subdivision Potential:** 98 total parcels in the Analysis Area, 77 of which have existing residential development, 14 are undeveloped (7 nonresidential parcels). This analysis area has the highest potential subdivision potential (60 new lots possible) of all the marine analysis areas. However, as noted below, low likelihood of significant creation of new bluff frontage lots due to existing development pattern. **Developed Parcels:** Of the 77 parcels developed with residential use, the majority have existing structures within proposed SMP buffer areas. **Vacant Parcel:** The large majority of vacant residential parcels have adequate room to build outside of proposed standard SMP buffers. **Potential for New Shoreline Modification:** There are no areas appropriate for new residential armoring or new overwater docks. The proposed SMP prohibits armoring of feeder bluff shorelines.
Summary of Anticipated Future Development	Intensified use on existing developed residential properties (redevelopment with larger structures; some additional riparian vegetation impact and more impervious surfaces); No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	**Highest potential for riparian alteration and feeder bluff impacts** comes through: intensified uses through subdivision (as well as development on existing vacant residential lots). Residential subdivision is not anticipated to occur at levels approaching the maximum potential amount (most parcels are already developed, with structures situated at the center of 1 - .5 acre residential properties). Additional potential impacts are primarily associated with redevelopment of residential properties, including: intensification of uses (more impervious surfaces, more lawns, increased vegetation clearing within and outside of riparian buffers).
Identified Restoration	Siebert Creek ecosystem protection

Feature	Description
Opportunities	Restore Morse Creek estuary
	Revegetate disturbed areas along the bluffs, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs.

5.1.7 Marine Reach 7 – Angeles Point

The "Angeles Point" reach contains 7.3 miles of marine shoreline, which extends from the western Port Angeles city limits to just south of Observatory Point. The reach contains Freshwater Bay, the estuary of the Elwha River (a shoreline of statewide significance) and the mouth of Colville Creek (a shoreline of the state).

Shoretypes within the reach are primarily bluff backed beach and Elwha River delta shores. Within 300 feet of the shore, more than half of the shoreland area contains forest cover, and another quarter is natural shrub and herbaceous vegetation. These vegetation communities, along with the wetland habitat at the Elwha River estuary, provide habitat for a diversity of species.

Land ownership within the reach is 58% private, 18% public, and 24% tribal. The majority of the private and tribal-owned land is used for residential development, with some agriculture land present. Within this reach there are two areas where the reasonably foreseeable future development pressure is considered high because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). Within these two Analysis Areas new development has the potential to impact shoreline functions if not carefully planned and designed. The Analysis Areas are:

- East Angeles Point (Figure 5-2)
- Freshwater Bay (Figure 5-2)

The above two marine shoreline Analysis Areas in Reach 7 exclude Tribal Reservation/Trust lands in the vicinity of the Elwha River mouth and Angeles Point, which are not subject to the County's SMP. They also exclude areas along and in the immediate vicinity of the west mouth of the Elwha River, which contain wetland and lagoon areas and also a popular public access point along the levee to beaches at the river mouth and east-side of Freshwater Bay. The SMP designates these areas Natural, requiring 175-foot habitat buffers. Due to existing ownership and use patterns, wetlands, and protective standards of the SMP, potential impacts to marine shoreline ecological functions in these designated Natural areas is very low.

Table 5-6. Reasonably foreseeable future development – Marine Reach 7 – Angeles Point

Feature	Description
Analysis Area: East Angeles Point (Figure 5-2)	
Zoning	Mix of Rural Low (R5), Rural Neighborhood Conservation (NC) and Rural Character Conservation -3 (RCC3)
Existing Shoreline Condition	The east part of the reach consists of single-family residential homes on lot sizes typically between 2.5 and 5 acres, with relatively narrow and deep lots to maximize residential view sites along the marine bluff. Bordering this residential area is Lower Elwha Tribal subdivision along approximately 2,000 feet of marine bluff. The Tribe setback residential lots away from the bluff with the marine bluff and substantial buffer from top of the bluff is protected as open space and forested. Bordering this Tribal development and the main reservation along the Elwha River and Angeles Point is approximately 4,000 feet of shoreline that is part of 3 lots, between 20 and 30 acres in size, and zoned RCC3 (1 du/10 acres). The lot adjacent to the reservation has been recently purchased by a non-profit and is planned for conservation and public access. Overall, the analysis area (excluding Tribal lands) is approximately 40% forested coverage with the south end of the analysis area mostly built out. Existing building setbacks generally > 100 feet.
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy and Natural

Feature	Description
Development Potential	**Use:** New development would likely consist of single-family residential on the few remaining vacant bluff top lots and residential additions and redevelopment on existing developed lots. **Existing Parcel Pattern and Subdivision Potential:** Within the R5 and NC zoned areas of the Analysis Area, there are 24 total parcels, 16 of which have existing residential development; 8 are undeveloped. There is no apparent subdivision potential. The large majority of parcels have intact riparian forest, suggesting high potential for impact through view corridor / shoreline access allowances. Two of the 3 large (20-30 acres) lots zoned RCC3 just east of and adjacent to the Lower Elwha Klallam Reservation at Angeles Point have subdivision potential at either 1 du/10 acres or higher density if meet cluster development design principles. If divided, there is low likelihood of any potential impacts to existing marine shoreline ecological functions based on allowed low densities and ability to locate new building sites outside of shoreline/bluff buffers and coastal floodplain areas. The other parcel abuts the Reservation and is an approximately 30-acre lot containing nearly 1,000 feet of marine shoreline and has been purchased by a non-profit for conservation and public access. **Developed Parcels:** Of the 16parcels developed with residential use, 36% (4 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 8 vacant parcels, none would be dimensionally constrained by proposed SMP buffer areas. **Potential for New Shoreline Modification:** There are no areas appropriate for new residential armoring or new overwater docks.
Summary of Anticipated Future Development	Intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces); New residential development on 8 vacant parcels (predominantly occurring consistent with standard buffers and other requirements of the proposed SMP); Riparian impacts associated with view corridor / shoreline access allowances provided in the SMP. No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through clearing allowances for view / shoreline access corridors.
Identified Restoration Opportunities	Restore stream mouth and reconfigure shoreline armoring/fill associated with boat ramp.
	Revegetate disturbed areas along Angeles Point, where possible

Feature	Description
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; encourage or incentivize voluntary restoration of riparian buffers on private property.
Analysis Area: Freshwater Bay (Figure 5-2)	
Zoning	The eastern edge of Freshwater Bay near the Elwha River is zoned Rural (R1), a designated residential LAMIRD under County comprehensive plan and zoning, that allows for a residential density of 1 du per acre. The rest of the Freshwater Bay shoreline is a mix of low density rural zones including Rural Character Conservation 3 (RCC3), Rural Neighborhood Conservation (NC), and Rural Low Mixed (RLM). The RCC3, NC and RLM zones allow for residential densities of 1 du per 5 acres or less, but allow for density increases using cluster design principles. The Freshwater Bay County Park on the west-side of the Bay contains approximately 1,450 feet of shoreline and is zoned Parks and Recreation (PR).
Existing Shoreline Condition	Approximately 40% of overall nearshore area is forested and much of the development of around Freshwater Bay consists of low bank residential on the east-end with home development near the top of bluff throughout the remainder of the analysis area. However, the amount of forest cover and density of homes varies greatly. The residential LAMRID at the east-end of the Bay is the only extensive low bank area and is substantially built out on lot sizes generally between 0.5 and 1 acre, with sparse forest cover between homes and water. In contrast, the shoreline area immediately east of the LAMIRD to Colville Creek is characterized by large ownerships (30 acres and higher) and is mostly undeveloped with contiguous tracts of riparian forested areas on and adjacent to bluff face. Between Colville Creek and the County Park, residential lots are typically between 2.5 and 5 acres. The County Park on the west-end of the Bay contains a boat ramp and parking lot, with most of the 1,450 feet of shoreline area characterized by forested, bluff backed beach. Shorelines west of the County Park and extending around Obstruction Point are characterized by 5-acre lots on top of high rocky marine bluffs (see also Section 5.1.8, Marine Reach 8).
Proposed Shoreline Environment Designation	Shoreline Residential – Intensive (R1 zoned LAMIRD areas) Shoreline Residential – Conservancy (most of Bay shoreline) Natural (at mouth of Coville Creek)

Feature	Description
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 122 total parcels in the Analysis Area, 77 of which have existing residential development, 44 are undeveloped (1 nonresidential parcel). This analysis area has some subdivision potential (11 new lots possible). The area with the most potential for shoreline divisions are the larger undeveloped ownerships (20 acres or greater) west of Colville Creek. These lots are zoned RLM and RCC3 and would allow for conventional divisions into 5 or 10 acre lots, with potential of density bonus through cluster subdivision designs. Subdivision in this part of the Bay shoreline to existing marine shoreline ecological functions based on allowed low densities and ability to locate new building sites outside of shoreline/bluff buffers and coastal floodplain areas. **Developed Parcels:** Of the 77 parcels developed with residential use, 25% (17 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 44 vacant parcels, only 5 would be dimensionally constrained by proposed SMP buffer areas. Of these, 3 parcels have existing intact riparian buffer (that would be impacted). **Potential for New Shoreline Modification**: There is some potential for future residential docks; despite this potential, very few are anticipated due to past development patterns and the exposed nature of the shoreline. No apparent potential for new armoring related to minor development.
Summary of Anticipated Future Development	Moderate potential for subdivision and development on existing vacant lots; Intensified use on existing developed residential properties (redevelopment with larger structures; some additional riparian vegetation impact and more impervious surfaces); No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through clearing allowances for view / shoreline access corridors, as well as development outside of buffer areas on existing vacant parcels and future parcels created through subdivision. Additional potential impacts are primarily associated with redevelopment of residential properties, including: intensification of uses (more impervious surfaces, more lawns, increased vegetation clearing within and outside of riparian buffers).
Identified Restoration Opportunities	Restore stream mouth and reconfigure shoreline armoring/fill associated with boat ramp.
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs.

5.1.8 Marine Reach 8 – Observatory Point

The "Observatory Point" reach contains 4.9 miles of marine shoreline, which extends from Observatory Point to Tongue Point, along the Strait of Juan de Fuca. Virtually the entire shoreline of this reach consists of rocky platform shore. The rocky shoreline is relatively stable compared to most of the reaches to the east; minimal landslide or erosion hazards are mapped within the reach. There are no identified shorelines modifications (such as armoring or docks) identified within the reach.

Under current zoning regulations, only 6% of the reach has potential for new residential development. Private development within the reach is limited to moderate-density residential development in the east third of the reach where: parcel sizes range from approximately 3 to 5 acres, existing parcels cannot be further subdivided under current zoning, and most homes are set back over 200 feet from the shoreline. A significant amount of forest coverage remains on the developed parcels. Potential development would consist of residential infill adjacent to existing developed parcels. As a result, this area is not as likely to experience shoreline development impacts as other reaches to the east. For the eastern most parcels within this reach (west of Freshwater Bay County Park and Obstruction Point area), cumulative impacts are assessed as part of the Freshwater Bay Analysis Area (See Section 5.1.7 above).

The majority of Marine Reach 8 is state forest lands (also part of Striped Peak Recreation Area) that extend from the low density residential areas around Observatory Point (west side of Freshwater Bay) to the Clallam County Salt Creek Recreational Area. At the western end of the reach, surrounding Tongue Point, is the Salt Creek Recreation Area, one of the County's premier marine parks. Approximately 65% of the shoreline in this reach is publicly owned, and can be accessed from these recreation areas

Given that the majority of the reach is a publicly owned and managed as park and/or resource land – and that limited remaining areas are largely built-out - the potential for future development impacts is very low. The proposed SMP designates these areas Resource Conservancy or Natural, requiring 150 to 175-foot habitat buffers. Due to existing ownership and use patterns and protective standards of the proposed SMP, there are limited potential impacts to marine shoreline ecological functions in these areas.

5.1.9 Marine Reach 9 – Crescent Bay / Low Point

The "Crescent Bay-Low Point" reach contains 10.7 miles of marine shoreline, which extends from the east end of Crescent Bay to approximately 2 miles west of Low Point. The reach contains shoreline along Crescent Bay, the mouths of Salt, Whiskey, and Murdock creeks, and the Lyre River estuary. Salt Creek and the Lyre River are shorelines of the state.

Shoretypes within the reach are primarily bluff backed beach. Within 300 feet of the shore, more than half of the shoreland area contains forest cover, and another quarter is natural shrub and herbaceous vegetation. These vegetation communities, along with the wetland habitat at the Salt Creek estuary, provide habitat for a diversity of species.

Land uses and ownership within the shoreland area vary throughout the reach. The eastern end of Crescent Bay is within the Clallam County Salt Creek Recreation Area zoned Parks and

Recreation (PR). The remainder of Crescent Bay and shoreline is part of a large private forest and recreational ownership. Adjacent to the County Park (separated by Salt Creek) is a campground (the Crescent Beach and RV Park) zoned Tourist Rural. The campground/resort area also allows for public day use access to Crescent Beach for a fee. Except for the County Park and private campground/RV park on the east of the Bay, the rest of the shoreline is characterized by sandy beach that transitions quickly into steep, forested slopes. The exception is small residential area on west-side of Crescent Bay. The Crescent Beach Road (a public road) directly parallels most of Crescent Bay at the edge of the beach and base of forested slopes. Due to existing ownership/use and protective standards of the proposed SMP, there are limited potential impacts to marine shoreline ecological functions along Crescent Bay.

The shorelines west of Crescent Bay to the mouth of Whiskey Creek are generally in large private or public ownerships, including over 1-mile contiguous stretch of state forest lands. Except for the shoreline area in the immediate vicinity of Whiskey Creek, these areas are zoned Commercial Forest (CF) and CFM5. The land at the west end of the reach (west of Murdock Creek) is also publicly owned commercial forest land. The remaining land within this reach is zoned Commercial Forest Residential or Rural Low (R5). Parcels vary in area, with an average size of approximately 5 acres. A breakwater, associated with a boat ramp, is located at the Whiskey Creek Campground. The breakwater is the only mapped shoreline modification within the reach. Based current ownership, management and zoning, this part of Marine Reach 9 is expected to remain primarily as forest lands.

Further west within this shoreline reach there are two areas where the reasonably foreseeable future development pressure is considered high because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). Within these two Analysis Areas new development has the potential to impact shoreline functions if not carefully planned and designed. The Analysis Areas (see Figure 5-2) are:

- Whiskey Creek Beach
- Lyre River Vicinity

In the areas outside of these two Analysis Areas, Reach 9 includes large lots which are primarily owned by WDNR as public forest lands, with some areas of privately-owned land. The proposed SMP designates these areas Resource Conservancy, requiring 150-foot habitat buffers. Due to existing ownership and use patterns and protective standards of the proposed SMP, there are limited potential impacts to marine shoreline ecological functions in these areas.

Table 5-7. Reasonably foreseeable future development – Marine Reach 9 – Crescent Bay / Low Point

Feature	Description
Analysis Area: Whiskey Creek Beach (Figure 5-2)	
Zoning	Rural Low (R5) and Rural Neighborhood Commercial (RNC)
Existing Shoreline Condition	>90% forested; armoring at Whiskey Creek Resort
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy Marine Waterfront (small area around Whiskey Creek Resort)
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are 27 total parcels in the Analysis Area, 12 of which have existing residential development; 14 are undeveloped (1 nonresidential parcel). Subdivision could result in the creation of approximately 4 new lots. The large majority of parcels have intact riparian forest, suggesting high potential for impact through view corridor / shoreline access allowances. **Developed Parcels:** Of the 12 parcels developed with residential use, 67% (8 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 14 vacant parcels, 5 are dimensionally constrained such that new development would likely have to occur within the standard buffer area proposed by the SMP. **Potential for New Shoreline Modification:** Only one lot was identified with potential for new shoreline armoring and a new residential dock.
Summary of Anticipated Future Development	Intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces); New residential development on 14 vacant parcels and/or on the minimal number of lots that could be created through subdivision. (predominantly occurring consistent with standard buffers and other requirements of the proposed SMP); Minimal potential for new shoreline modification.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through clearing allowances for view / shoreline access corridors. Additional potential impacts are primarily associated with redevelopment of residential properties, including: intensification of uses (more impervious surfaces, more lawns, increased vegetation clearing within and outside of riparian buffers).

Feature	Description
Identified Restoration Opportunities	Removal of shoreline armoring at mouth of Whiskey Creek
Necessary Restoration to Account for Potential Impacts	Identified restoration projects are focused on removing shoreline modifications; whereas anticipated impacts will likely occur landward of the shoreline (riparian clearing / land cover changes). Restoration should focus on ensuring riparian areas are enhanced when buffer averaging is proposed; encourage or incentivize voluntary restoration of riparian buffers on private property.
Analysis Area: Lyre River Vicinity (Figure 5-2)	
Zoning	R2, R5, CFM5, RNC
Existing Shoreline Condition	>90% forested. Most homes set back >200’
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy Shoreline Residential – Intensive (immediately east of Lyre River mouth) Resource Conservancy (western end of Analysis Area)
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 38 total parcels in the Analysis Area, 20 of which have existing residential development, 16 are undeveloped (2 nonresidential parcels). Subdivision could result in the creation of approximately 12 new lots. Moderate potential for impact through view corridor / shoreline access allowances. **Developed Parcels:** Of the 20 parcels developed with residential use, 45% (9 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 16 vacant parcels, only 2 would be dimensionally constrained by proposed SMP buffer areas. Of these, 1 parcel has existing intact riparian buffer (that would be impacted). **Potential for New Shoreline Modification:** There is some potential for future residential docks; despite this potential, very few are anticipated due to past development patterns and the exposed nature of the shoreline. No apparent potential for new armoring related to minor development.
Summary of Anticipated Future Development	Potential for subdivision and development on existing vacant lots; Intensified use on existing developed residential properties (redevelopment with larger structures; some additional riparian vegetation impact and more impervious surfaces); No other significant development or uses are anticipated.

Feature	Description
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through clearing allowances for view / shoreline access corridors, as well as development outside of buffer areas on existing vacant parcels and future parcels created through subdivision. Additional potential impacts are primarily associated with redevelopment of residential properties, including: intensification of uses (more impervious surfaces, more lawns, increased vegetation clearing within and outside of riparian buffers).
Identified Restoration Opportunities	Removal of soldier pile wall at western side of the Lyre River mouth
Necessary Restoration to Account for Potential Impacts	Identified restoration projects are focused on removing shoreline modifications; whereas anticipated impacts will likely occur landward of the shoreline (riparian clearing / land cover changes). Restoration should focus on ensuring riparian areas are enhanced when buffer averaging is proposed; encourage or incentivize voluntary restoration of riparian buffers on private property.

5.1.10 Marine Reaches 10 (Twin Rivers), 11 (Deep Creek), 12 (Pysht River), 13 (Pillar Point) and 14 (Slip Point)

Most of the land within the shoreland area in Reaches 10 through 14 is privately owned and managed as timber land. Some state forest land also occurs along the shoreline. The shorelands within all reaches are largely undeveloped.

The vast majority of these reaches is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. The proposed SMP designates these areas Resource Conservancy, requiring 150-foot habitat buffers. Due to existing ownership and use patterns and protective standards of the proposed SMP, there are limited potential impacts to marine shoreline ecological functions in Reaches 10, 11, 12, 13, and 14.

5.1.11 Marine Reach 15 – Clallam Bay

The "Clallam Bay" reach contains 5.7 miles of marine shorelines which extends along Clallam Bay from Slip Point to Sekiu Point, within the Clallam Bay Sekiu urban growth area. The reach also contains the Clallam River estuary and the mouth of Falls Creek. The Clallam River is a shoreline of the state.

The eastern half of the shoreline in this reach consists of low beaches (barrier estuary and barrier beach), with bluff backed beach in the western portion. Most of the Clallam Bay shoreland area is within a tsunami hazard zone and FEMA coastal and/or river 100-year floodplain.

This is one of the more heavily developed reaches in western Clallam County so the shoreline vegetation has been significantly altered. Only about one-quarter of the shoreland area contains forest cover, with natural shrub and herbaceous vegetation located along the Clallam River. The remainder of the shorelands contains developed and lawn/landscaped area.

Major land uses within the shoreland area include open space, roads, lodging, high-density residential, and commercial. Over 90% of the shoreland area is privately owned. Foreseeable future development pressure is considered high throughout the Clallam Bay shoreline area because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). As such, the entire reach was assessed as an Analysis Areas, where new development has the potential to impact shoreline functions if not carefully planned and designed.

Table 5-8. Reasonably foreseeable future development – Marine Reach 15 – Clallam Bay

Feature	Description
Analysis Area: Clallam Bay (Figure 5-3)	
Zoning	UC
Existing Shoreline Condition	10% forested, areas of armoring and breakwaters, several overwater structures, setbacks vary
Proposed Shoreline Environment Designation	Marine Waterfront (western half of Bay) Shoreline Residential – Intensive (primarily at eastern end of Bay Shoreline Residential – Conservancy and Natural (areas surrounding the mouth of the Clallam River)
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are approximately 47 total parcels in the Analysis Area, 31 of which have existing residential development; 6 are undeveloped (approximately 10 nonresidential parcels). Subdivision could result in the creation of approximately 8 new lots. **Developed Parcels:** Of the 31 parcels developed with residential use, 61% (19 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 6 vacant parcels, only 1 parcel would likely be dimensionally constrained by proposed SMP buffer areas. Riparian vegetation is generally intact on this parcel. **Potential for New Shoreline Modification**: There is minimal potential for future shoreline armoring related to residential development (1 parcel). There is moderate potential for future residential docks (associated with as many as 13 lots); despite potential for residential docks, very few are anticipated due to past development patterns and the relatively exposed nature of the shoreline There is some potential for water related commercial development within the Marine Waterfront area over the next 5 to 10 years.

Feature	Description
Summary of Anticipated Future Development	New development associated with the few remaining vacant lots, and on new lots created through potential subdivision; Intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces); New residential development on 17 vacant parcels (predominantly occurring consistent with standard buffers and other requirements of the proposed SMP); Some potential for new shoreline modification and overwater coverage associated with any new residential docks. No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration and feeder bluff impacts** comes through: subdivision (intensification of residential use); and intensification of use on existing, developed lots (many of which are closer to the shoreline than would be allowed by the proposed SMP).
Identified Restoration Opportunities	Removal of derelict creosote piling within the Clallam River estuary
	Enhancement of forage fish spawning beaches within Clallam Bay
	Potential removal of hard shoreline armoring where not necessary within Clallam Bay
	Revegetate disturbed areas along Clallam Bay, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed. The restoration opportunities focused on removing derelict shoreline modifications and beach enhancement could provide significant opportunity if future shoreline modification is proposed (overwater / in-water structures); no such projects are currently proposed or anticipated in the immediate future.

5.1.12 Marine Reach 16 – Sekiu-Kydaka Point and Marine Reach 17 – Shipwreck Point

The "Sekiu-Kydaka Point" reach contains 5.7 miles of marine shoreline, which extends along the Strait of Juan de Fuca from Sekiu Point to Kydaka Point. This reach includes a very small segment of the western Clallam Bay-Sekiu urban growth area. The "Shipwreck Point" reach contains 6.9 miles of marine shoreline, which extends from Kydaka Point to the Jansen Creek mouth. The reach also contains portions of the Hoko and Sekiu River estuaries, and the mouths of Jansen and Olson Creeks. The Hoko and Sekiu rivers are shorelines of the state.

Under current zoning regulations, the large majority of shorelands within these reaches is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow

single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. The proposed SMP designates these areas Resource Conservancy, requiring 150-foot habitat buffers. Due to existing ownership and use patterns and protective standards of the proposed SMP, there are limited potential impacts to marine shoreline ecological functions in these areas of Reaches 16 and 17.

The western portion of Reach 16 is zoned for very low density residential development (R20), and contains many vacant 1 to 2 acre lots. Some of these lots are have narrow water frontages (approximately 100 feet). Development in these lots could result in relatively dense shoreline development. Extending immediately west into Reach 17, moderate density residential development occurs in the vicinity of the Hoko River mouth. Foreseeable future development pressure is considered high through this area because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). As such, the Hoko River vicinity was assessed as an Analysis Areas.

Table 5-9. Reasonably foreseeable future development – Marine Reaches 16 and 17

Feature	Description
Analysis Area: Hoko River Vicinity (Figure 5-3)	
Zoning	Mostly R1 and R2
Existing Shoreline Condition	60% forested, some armoring along low bank shoreline; setbacks generally >100’
Proposed Shoreline Environment Designation	Shoreline Residential – Intensive (west of Hoko River mouth) Shoreline Residential – Conservancy Natural – Immediately surrounding the Hoko River estuary
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are 58 total parcels in the Analysis Area, 40 of which have existing residential development; 15 are undeveloped (approximately 3 nonresidential parcels). Subdivision could result in the creation of approximately 3 new lots. **Developed Parcels:** Of the 40 parcels developed with residential use, 55% (22 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 15 vacant parcels, only 1 parcel would likely be dimensionally constrained by proposed SMP buffer areas. Riparian vegetation is generally intact on this parcel. **Potential for New Shoreline Modification**: There is no apparent potential for future shoreline armoring related to residential development. There is moderate potential for future residential docks (associated with as many as 18 lots); despite potential for residential docks, very few are anticipated due to past development patterns and the relatively exposed nature of the shoreline.

Feature	Description
Summary of Anticipated Future Development	New development associated with remaining vacant lots, and on new lots created through potential subdivision; Intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces); Some potential for overwater coverage associated with any new residential docks. No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration impacts** comes through: subdivision (intensification of residential use); and intensification of use on existing, developed lots (many of which are closer to the shoreline than would be allowed by the proposed SMP).
Identified Restoration Opportunities	Investigate potential setback of revetment and structures west of Hoko River mouth
	Replace undersized culvert at Olson Creek mouth
Necessary Restoration to Account for Potential Impacts	Identified restoration projects are focused on removing shoreline modifications; whereas anticipated impacts will likely occur landward of the shoreline (riparian clearing / land cover changes). Restoration should focus on ensuring riparian areas are enhanced when buffer averaging is proposed; encourage or incentivize voluntary restoration of riparian buffers on private property.

5.1.13 Marine Reach 18 - Rasmussen (Bullman Creek)

The "Rasmussen (Bullman Creek)" reach extends along the Strait of Juan de Fuca from just west of the mouth of Jansen Creek to the Makah Nation boundary. The reach also contains the mouths of Rasmussen/Bullman, and Snow Creeks.

The predominant land usage within the reach is timber, with residential, lodging, and open space land at the west end of the reach. Throughout commercial forestry lands, zoning regulations allow single-family dwellings, but at a maximum density of one dwelling per 80 acres. The proposed SMP designates these areas Resource Conservancy, requiring 150-foot habitat buffers. Due to existing ownership and use patterns and protective standards of the proposed SMP, there is limited potential to impact marine shoreline ecological functions in these areas.

A pocket of higher density residential development is located at Bullman Beach, and most of the homes are fairly close to the shoreline (approximately 50 feet; Figure 5-5). A few of the homes are protected by shoreline armoring. The entire residential area is within mapped tsunami and coastal floodplain hazard areas. Foreseeable future development pressure is considered high through this area because of existing lot patterns, future development potential based on underlying zoning, and the potential impacts such development could have on shoreline ecological components (and functions). As such, Bullman Beach was assessed as an Analysis Area.

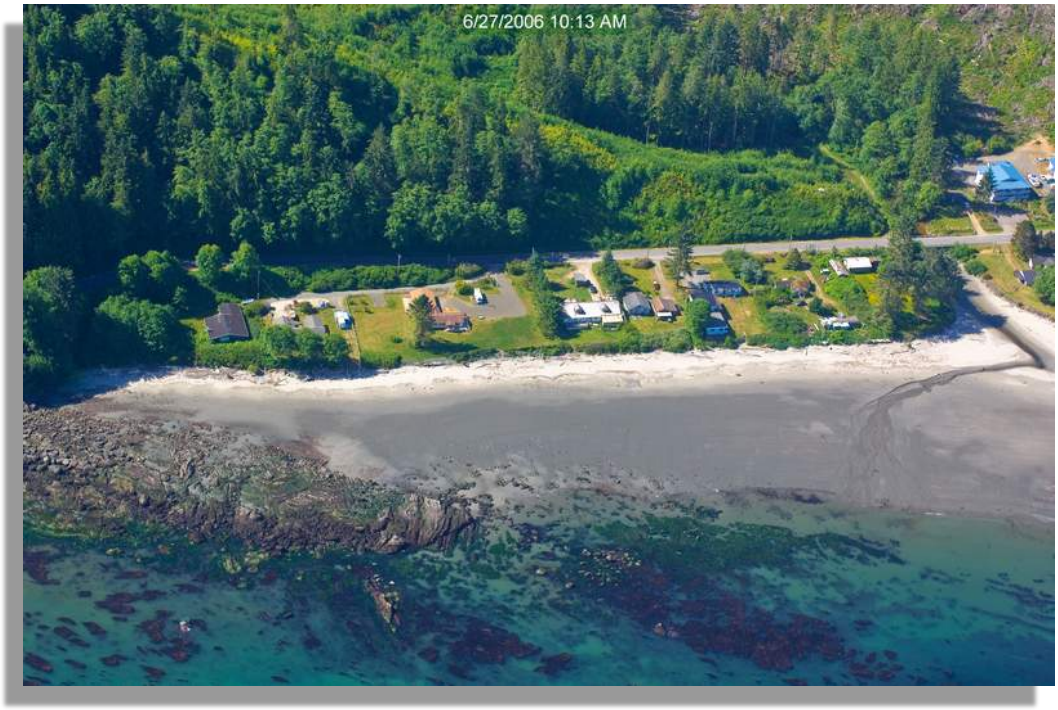

Figure 5-5. Pocket of residential development at Bullman Beach (Photo: Ecology Coastal Atlas)

Table 5-10. Reasonably foreseeable future development – Marine Reach 18 – Rasmussen (Bullman Creek)

Feature	Description
Analysis Area: Bullman Beach (Figure 5-3)	
Zoning	R1
Existing Shoreline Condition	<10% forested, some armoring present, setbacks 75' and greater. Mostly built out
Proposed Shoreline Environment Designation	Shoreline Residential – Intensive

Feature	Description
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are 21 total parcels in the Analysis Area, 15 of which have existing residential development; 6 are undeveloped. No apparent potential subdivision was identified for this area. **Developed Parcels:** Of the 15 parcels developed with residential use, 27% (4 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcels:** Of the 6 vacant parcels, 2 parcels would likely be dimensionally constrained by proposed SMP buffer areas. Riparian vegetation is generally intact on these parcels. **Potential for New Shoreline Modification**: There is no apparent potential for future shoreline armoring related to residential development. There is moderate potential for future residential docks (associated with as many as 20 lots); despite potential for residential docks, very few are anticipated due to past development patterns and the exposed nature of the shoreline.
Summary of Anticipated Future Development	New development associated with remaining vacant lots. Intensified use on existing developed residential properties (redevelopment with larger structures; more vegetation impact and more impervious surfaces); Some potential for overwater coverage associated with any new residential docks (little to none is actually anticipated). No other development or uses are anticipated.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development would occur consistent with proposed SMP buffer provisions, limiting potential impacts to feeder bluffs and riparian vegetation. **Highest potential for riparian alteration** comes through: intensification of use on existing developed lots (several of which are closer to the shoreline than would be allowed by the proposed SMP).
Identified Restoration Opportunities	Enhancement of forage fish spawning beaches at Bullman Beach
	Revegetate disturbed areas along Bullman Beach, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced whenever development triggers shoreline habitat mitigation requirements. Encourage or incentive voluntary riparian restoration on private residential properties.

5.1.14 Freshwater Reaches

We assessed each of the nine identified freshwater Analysis Areas along the many freshwater reaches in WRIA 17, 18 and 19. The following tables provide the results of the analysis, and detail restoration opportunities that are appropriate to alleviate identified potential impacts from potential cumulative impacts.

Table 5-11. Reasonably foreseeable future development – Dungeness River Analysis Area

Feature	Description
Analysis Area: Dungeness River (Figure 5-1)	
Zoning	mostly R5
Existing Shoreline Condition	>80% forested, levees present along lower river, existing setbacks vary
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 277 total parcels in the Analysis Area, 203of which have existing residential development, 74 are undeveloped (11 nonresidential parcels). This analysis area has moderate subdivision potential (19 new lots possible). Potential view / shoreline access clearing impacts are moderate in this Analysis Area (possible effect on intact riparian vegetation for 14% of total parcels). **Developed Parcels:** Of the 203 parcels developed with residential use, a substantial portion has existing structures within proposed SMP buffer areas (115 parcels). The assessed buffer area for Dungeness included the CMZ, consistent with requirements of the SMP. **Vacant Parcel:** Of the 74 vacant parcels, approximately 45% would be dimensionally constrained by proposed SMP buffer areas. Of these, 26 parcels have existing intact riparian buffer (that would be impacted if development were to occur). **Floodplain / CMZ Development on Existing Vacant Lots:** Moderate potential - 4% of parcels with potential for future floodplain and 12% of parcels with potential for future CMZ development. **Potential for New Shoreline Stabilization**: There is low potential for new stabilization related to minor (residential) development (5 parcels).
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots, with a considerable portion occurring on lots dimensionally constrained by buffers of the proposed SMP. Substantial potential for riparian forest loss (buffer clearing on constrained lots, and other lots through view / access allowances); Moderate potential for floodplain / CMZ development Limited potential for future shoreline stabilization (protection of existing development
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with new residential development on constrained lots, as well as modifications allowed through view / access corridor allowances. The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes.

Feature	Description
Identified Restoration Opportunities	*In-progress project*: Dungeness River floodplain restoration project (HWS). Project elements include Rivers End acquisition (complete), dike setback and channel reconstruction, Ward Road reconfiguration, railroad bridge trestle replacement, Dungeness Meadows dike reconfiguration, Ribson side channel restoration, and upper Haller dike setback
	Dungeness River dike setbacks and logjams (HWS)
	Lower Dungeness River channel re-meander and engineered log jam placement (HWS)
	Riparian conservation for landowners
	Setback/removal of structures in channel migration zone
	Revegetate disturbed riparian areas, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs. Any floodplain / CMZ development permits should ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-12. Reasonably foreseeable future development – McDonald Creek Analysis Area

Feature	Description
Analysis Area: McDonald Creek (Figure 5-1)	
Zoning	R1, R2, RCC5
Existing Shoreline Condition	>90% forested; stream flows through a forested ravine with little existing development; existing residential structures setbacks vary – typically 200 or more feet from the shoreline
Proposed Shoreline Environment Designation	Shoreline Residential - Conservancy
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 137 total parcels in the Analysis Area, 109 of which have existing residential development, 28 are undeveloped. 11 new lots could be created through future subdivision potential. **Developed Parcels:** Of the 109 parcels developed with residential use, only 17 have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 28 vacant parcels, only 3 would be dimensionally constrained by proposed SMP buffer areas. **Floodplain / CMZ Development on Existing Vacant Lots:** No apparent potential for future residential floodplain or CMZ development. **Potential for New Shoreline Stabilization**: There is no apparent potential for new stabilization related to minor (residential) development.

Feature	Description
Summary of Anticipated Future Development	Moderate potential for development on existing vacant lots and on new lots created through subdivision; however majority would occur outside of required standard buffers.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes.
Identified Restoration Opportunities	Fish passage barrier removal
	Channel restoration
	Revegetate disturbed riparian areas, where possible
Necessary Restoration to Account for Potential Impacts	No major potential impacts from future development are identified in this Assessment Area; as development on vacant parcels occurs (or if new residential lots are created through subdivision), the County should ensure shoreline ecological functions are protected by enforcing standards included in the SMP. Otherwise the County should implement identified opportunities as shoreline development and redevelopment occur – especially if development impacts intact riparian vegetation (view / shoreline access clearing; limited development on constrained lots).

Table 5-13. Reasonably foreseeable future development – Morse Creek Analysis Area

Feature	Description
Analysis Area: Morse Creek (Figure 5-1 and 5-2)	
Zoning	R1, R2, RCC5
Existing Shoreline Condition	>90% forested, existing setbacks vary
Proposed Shoreline Environment Designation	Natural (upstream two thirds of Analysis Area) Shoreline Residential – Conservancy / Shoreline Residential – Intensive (upstream of SR 101)

Feature	Description
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 199 total parcels in the Analysis Area, 131of which have existing residential development, 68 are undeveloped. This analysis area has substantial subdivision potential (46 new lots possible). Potential view / shoreline access clearing impacts are high. **Developed Parcels:** Of the 131 parcels developed with residential use, a substantial portion have existing structures within proposed SMP buffer areas (34 parcels). **Vacant Parcel:** Of the 68 vacant parcels, approximately 29% would be dimensionally constrained by proposed SMP buffer areas. Of these 20 parcels, the majority have intact riparian buffer (that would be impacted if development were to occur). **Floodplain / CMZ Development on Existing Vacant Lots:** Low potential for future residential floodplain or CMZ development (although there is substantial existing residential use within the mapped floodplain and CMZ areas) **Potential for New Shoreline Stabilization**: There is high potential for new stabilization related to minor (residential) development (33 parcels).
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots, as well as additional residential use through subdivision. Substantial potential for riparian forest loss (buffer clearing on constrained lots, and other lots through view / access allowances); High potential for future shoreline stabilization (primarily protection of existing development).
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with new residential development on constrained lots, as well as modifications allowed through view / access corridor allowances. The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffers and safety buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes. Additional impacts associated with potential for new shoreline stabilization to protect existing residential structures.
Identified Restoration Opportunities	Large woody debris restoration
	Property acquisition / conservation easements
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer development occurs, and in-channel habitat is enhanced if new shoreline hardening is permitted; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs. Need for additional in-stream restoration (in-channel and bank habitat enhancement; removal of unnecessary revetments) if new stabilization is permitted.

Table 5-14. Reasonably foreseeable future development – Elwha Tributaries Analysis Area

Feature	Description
Analysis Area: Elwha Tributaries (Figure 5-2)	
Zoning	mostly R5
Existing Shoreline Condition	>90% forested, existing residential setbacks vary
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 44 total parcels in the Analysis Area, 21of which have existing residential development, 23are undeveloped (5 nonresidential parcels). This analysis area has high subdivision potential (11 new lots possible). Potential view / shoreline access clearing impacts are substantial in this Analysis Area (possible effect on intact riparian vegetation for 45% of total parcels). **Developed Parcels:** Of the 21parcels developed with residential use, 8 have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 23 vacant parcels, only 3 would be dimensionally constrained by proposed SMP buffer areas. Of these, 2 parcels have existing intact riparian buffer (that would be impacted if development were to occur). **Floodplain / CMZ Development on Existing Vacant Lots:** No apparent potential for future residential floodplain or CMZ development. **Potential for New Shoreline Stabilization**: There is moderate potential for new stabilization related to minor (residential) development (5 parcels).
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots; however, majority would occur outside of required standard buffers. Substantial potential for riparian forest loss through view / access allowances; Moderate potential for future shoreline stabilization (protection of existing development
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with modifications allowed through view / access corridor allowances. The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes. Additional impacts associated with potential for new shoreline stabilization to protect existing residential structures.
Identified Restoration Opportunities	Supporting restoration efforts upstream (along the Lake Sutherland shoreline)
	Revegetate disturbed riparian areas, where possible

Feature	Description
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs. Need for additional restoration of River shoreline (removal of unnecessary shoreline stabilization) if new stabilization is permitted.

Table 5-15. Reasonably foreseeable future development – Lake Sutherland Analysis Area

Feature	Description
Analysis Area: Lake Sutherland (Figure 5-2)	
Zoning	mostly R1
Existing Shoreline Condition	>50% forested, many overwater structures, extent of existing shoreline modification is unknown, however appears common from review of aerial photography. Setbacks vary (30 feet to more than 100 feet).
Proposed Shoreline Environment Designation	Shoreline Residential – Intensive
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 267 total parcels in the Analysis Area, 203 of which have existing residential development, 32 are undeveloped (1 nonresidential parcel). This analysis area has limited subdivision potential (18 new lots possible). Potential view / shoreline access clearing impacts are limited to 10.5% of total parcels). **Developed Parcels:** Of the 234 parcels developed with residential use, 159 have existing structures within proposed shoreline habitat buffer. **Vacant Parcel:** Of the 27 vacant parcels, only 5 would be dimensionally constrained by proposed 35-foot minimum buffer. Of these, 4 parcels have existing intact riparian buffer (that would be impacted if development were to occur). **Potential for New Shoreline Stabilization**: None apparent Potential for New Residential Docks: Substantial potential (47 parcels; 17% of total parcels)
Summary of Anticipated Future Development	Moderate potential for development on existing vacant lots; however, majority would occur outside of required standard buffers. Substantial potential for riparian and shoreline impacts associated with intensified use on residential lots (redevelopment, resulting in more impervious surface, vegetation impacts); Substantial potential for additional future overwater structures (residential docks)

Feature	Description
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP habitat buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes. Intensified use and limited new development on vacant parcels would increase potential impacts to lake water quality and riparian condition. Overwater coverage and associated modification to shoreline (habitat impacts; related water quality impacts)
Identified Restoration Opportunities	Shoreline stewardship information programs
	Septic system maintenance/remediation
	Revegetate disturbed riparian areas along Lake Sutherland, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs.

Table 5-16. Reasonably foreseeable future development – Salt Creek Analysis Area

Feature	Description
Analysis Area: Salt Creek (Figure 5-2)	
Zoning	R5, RLM
Existing Shoreline Condition	>80% forested, setbacks generally more than 200 from the stream shoreline
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 16 total parcels in the Analysis Area, 8 of which have existing residential development, 8 are undeveloped. 7 new lots could be created through future subdivision potential. **Developed Parcels:** Of the 8 parcels developed with residential use, none have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 8 vacant parcels, only 1 would be dimensionally constrained by proposed SMP buffer areas. **Floodplain / CMZ Development on Existing Vacant Lots:** No apparent potential for future residential floodplain or CMZ development. **Potential for New Shoreline Stabilization**: No apparent potential for new stabilization related to minor (residential) development
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots; however majority would occur outside of required standard buffers.

Feature	Description
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes.
Identified Restoration Opportunities	In-progress example project: Large woody debris placement, phase II (HWS)
	Fish passage improvements / barrier correction projects
	Salt Creek estuary restoration, involves installing openings in existing dike road (HWS)
	Revegetate disturbed riparian areas, where possible
Necessary Restoration to Account for Potential Impacts	No major potential impacts from future development are identified in this Assessment Area; as development on vacant parcels occurs (or if new residential lots are created through subdivision), the County should ensure shoreline ecological functions are protected by enforcing standards included in the SMP. Otherwise the County should implement identified opportunities as shoreline development and redevelopment occurs – especially if development does occur that impacts intact riparian vegetation (view / shoreline access clearing; limited development on constrained lots).

Table 5-17. Reasonably foreseeable future development – Lyre River Analysis Area

Feature	Description
Analysis Area: Lyre River (Figure 5-2)	
Zoning	R2, R5, RNC
Existing Shoreline Condition	>80% forested; residential structures setback 150 or more feet from the shoreline
Proposed Shoreline Environment Designation	Shoreline Residential - Conservancy Shoreline Residential – Intensive (west bank near the mouth)
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 22 total parcels in the Analysis Area, 12of which have existing residential development, 10 are undeveloped. 6 new lots could be created through future subdivision potential. **Developed Parcels:** Of the 12 parcels developed with residential use, only 3 have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 10 vacant parcels, only 1 would be dimensionally constrained by proposed SMP buffer areas. **Floodplain / CMZ Development on Existing Vacant Lots:** Low potential for future residential floodplain or CMZ development. **Potential for New Shoreline Stabilization**: There is low potential for new stabilization related to minor (residential) development (only 1 lot).
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots; however majority would occur outside of required standard buffers.

Feature	Description
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes.
Identified Restoration Opportunities	Estuary protection and restoration; involves property purchase and potential revegetation and stream channel restoration (HWS)
Necessary Restoration to Account for Potential Impacts	No major potential impacts from future development are identified in this Assessment Area; as development on vacant parcels occurs (or if new residential lots are created through subdivision) , the County should ensure shoreline ecological functions are protected by enforcing standards included in the SMP.

Table 5-18. Reasonably foreseeable future development – Pysht River Analysis Area

Feature	Description
Analysis Area: Pysht River (Figure 5-3)	
Zoning	R5
Existing Shoreline Condition	>70% forested, setbacks vary, SR 112 parallels the shoreline through much of the Analysis Area
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 31 total parcels in the Analysis Area, 11 of which have existing residential development, 20 are undeveloped. 6 new lots could be created through future subdivision potential. **Developed Parcels:** Of the 11 parcels developed with residential use, 4 have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 20 vacant parcels, 5 would be dimensionally constrained by proposed SMP buffer areas. **Floodplain / CMZ Development on Existing Vacant Lots:** Moderate potential for future residential floodplain or CMZ development. **Potential for New Shoreline Stabilization**: There is substantial potential for new stabilization related to minor (residential) development (on as many as 6 parcels).
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots and on new lots created through subdivision; however, majority would occur outside of required standard buffers. High potential for future shoreline stabilization (primarily protection of existing development).

Feature	Description
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes. Additional potential impacts associated with potential for new shoreline stabilization to protect existing residential structures.
Identified Restoration Opportunities	In-progress example project: Floodplain acquisition and restoration, involves property acquisition, engineered log jam placement, and floodplain restoration (HWS)
	In-progress example project: Large woody debris restoration (HWS)
	Revegetate disturbed riparian areas, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer development occurs, and in-channel habitat is enhanced if new shoreline hardening is permitted; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs. Need for additional in-stream restoration (in-channel and bank habitat enhancement; removal of unnecessary revetments) if new stabilization is permitted.

Table 5-19. Reasonably foreseeable future development – Clallam River Analysis Area

Feature	Description
Analysis Area: Clallam River Figure 5-3	
Zoning	R4 (majority), R2, UC
Existing Shoreline Condition	>60% forested, significant armoring (along SR 112), setbacks vary
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy

Feature	Description
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 33 total parcels in the Analysis Area, 9 of which have existing residential development, 24 are undeveloped (1 nonresidential parcel). This analysis area has substantial subdivision potential (22 new lots possible). Potential view / shoreline access clearing impacts are substantial in this Analysis Area (possible effect on intact riparian vegetation for 48.5% of total parcels). **Developed Parcels:** Of the 9 parcels developed with residential use, 78% (7 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 24 vacant parcels, 9 would be dimensionally constrained by proposed SMP buffer areas. Of these, 6 parcels have existing intact riparian buffer (that would be impacted). **Floodplain / CMZ Development on Existing Vacant Lots:** Moderate potential - 12% of parcels with potential for future floodplain and CMZ development **Potential for New Shoreline Stabilization**: There is moderate potential for new armoring related to minor (residential) development (6 parcels).
Summary of Anticipated Future Development	Substantial potential for subdivision and development on existing vacant lots; Substantial potential for riparian forest loss (buffer clearing on constrained lots, and other lots through view / access allowances); Substantial potential for floodplain / CMZ development Moderate potential for future shoreline stabilization (protection of existing development
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with new residential development on constrained lots, as well as modifications allowed through view / access corridor allowances. The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation, channel migration, and floodplain processes. Additional potential impacts associated with potential for new shoreline stabilization to protect existing residential structures.
Identified Restoration Opportunities	Riparian revegetation
	Tributary culvert replacement
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement landward of feeder bluffs. Any floodplain / CMZ development permits should ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible. Need for additional restoration of River shoreline (removal of unnecessary revetments) if new stabilization is permitted.

5.2 Potential for New Development in WRIA 20

Using parcel data from the county assessor's office, aerial photography, information from the Shoreline Inventory and Characterization Report, zoning information and anecdotal information from Department of Community Development staff, portions of WRIA 20 that have the greatest potential for future development within the planning horizon of the SMP (~20 years[21]) were identified (Figure 5-6).

These areas are distinguished by the following characteristics:

- Relatively undeveloped but zoned for residential development (e.g., maximum allowed densities of 1 unit per acre and/or smaller minimum lots sizes (< 43,560 SF) based on current zoning;
- Eligible for additional lot creation through subdivision; and/or
- Platted, but not fully built-out.

Such areas occur along the lower Quillayute River shoreline, along the Bogachiel River in/near the Forks Urban Growth Area (right bank), along the Calawah River in/near the Forks Urban Growth Area (primarily left bank), along the Lake Pleasant shoreline, along the Sol Duc River near Lake Pleasant, and along the upper Sol Duc River (residential areas). Whether the future development in these areas may potentially cause a net loss of shoreline functions depends on multiple factors including specific nature of the development and the existing condition of the shoreline. These analysis areas are presented in Subsection 5.2.1 where occurring within unincorporated areas of WRIA 20, and Subsection 5.2.2 where occurring primarily within the Forks Urban Growth Area (Forks UGA).

The remaining areas of WRIA 20 are expected to remain relatively undeveloped by comparison. Most of the WRIA 20 shorelands are DNR-managed or privately owned and managed as timber land. These shorelands are generally uninhabited and unmodified; where modifications do occur, they are limited to stream crossings (bridges and culverts) for public roadways and forest roads. Most of the timber lands are zoned for Commercial Forestry. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. The proposed SMP designates these areas Resource Conservancy, requiring 150 foot buffers. Due to existing ownership and use patterns and protective standards of the proposed SMP, there are limited potential impacts to shoreline ecological functions in these areas.

In WRIA 20, nine areas were identified as having the highest potential for development. These Analysis Areas are presented in the following tables.

[21] Twenty years is a typical land use planning horizon but SMPs are updated more frequently based upon the schedule mandated by the State Legislature. Thus adaptive management for no net loss will occur more frequently.

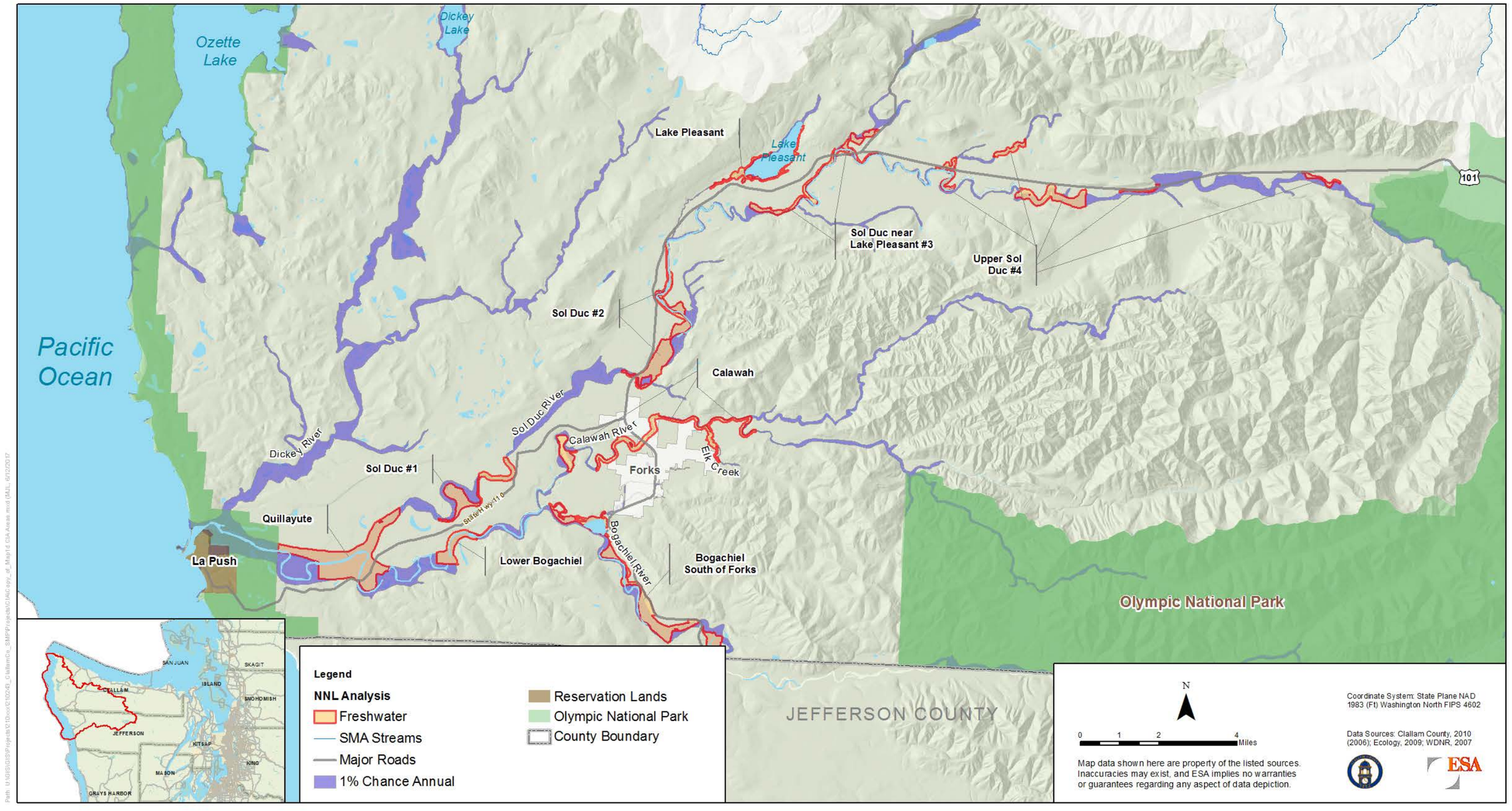

Figure 5-6. Analysis Areas for WRIA 20.

Table 5-20. Reasonably foreseeable future development – Quillayute River Analysis Area

Feature	Description
Analysis Area: Quillayute River and the Lower Sol Duc and Bogachiel River just above their confluence with the Quillayute River) (Figure 5-6)	
Zoning	The majority of this Analysis Area is zoned either Rural Neighborhood Conservation (NC) or Western Region Rural Low (RW5). The area also includes Quillayute Residential (QR) and Western Region Rural Center (WRC).
Existing Shoreline Condition	Predominantly forested and rural / agricultural; setbacks on developed properties vary, generally greater than 300 feet. Armoring is very limited. Known armoring occurs at two bridge crossings, along a Bogachiel River channel meander to protect the LaPush Road and several private properties, and some limited armoring near the confluence of the three rivers to protect a public boat ramp and small resort.
Proposed Shoreline Environment Designation	Predominantly Shoreline Residential – Conservancy; Small area of Shoreline Residential – Intensive (QR zoned area)
Development Potential	**Use:** Most new shoreline uses are expected to be single-family residential or private recreation properties (e.g., small cabin, second home). However, no significant shoreline development pressure is anticipated due to low development pressure, remoteness, large floodplains, and active channel migration zone (CZM). Also, potential for added small-scale recreational uses (e.g., cabin rentals, camping, bed and breakfast inns) catering to tourism with related to fishing, hunting, and close proximity to ocean beaches and Olympic National Park. **Existing Parcel Pattern and Subdivision Potential:** There are a total of 171 parcels in the Analysis Area, 62 of which have existing development; 109 are undeveloped. Due to the wide floodplain corridor extending through shoreline jurisdiction, this analysis area has no subdivision potential. **Developed Parcels:** Of the 62 developed parcels, 15% (9 parcels) have existing structures within proposed SMP buffers. **Vacant Parcels:** Of the 109 vacant parcels, 8 are dimensionally constrained by proposed SMP buffers, so development could occur landward of the buffers. **Floodplain / CMZ Development on Existing Vacant Lots:** There are 61 vacant lots within CMZ and 45 within the floodplain of Quillayute/Bogachiel. **Potential for New Shoreline Stabilization**: Of the 171 total parcels, 20 were identified with potential for new shoreline armoring.
Summary of Anticipated Future Development	Substantial potential for subdivision and development on existing vacant lots (up to 185 new lots), but pressure to create new lots may be relatively low; Nearly a third of the existing undeveloped parcels could request buffer clearing for view / shoreline access; Substantial potential for floodplain / CMZ development on vacant lots.

Feature	Description
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with view / access corridor clearing allowances. The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, minimizing potential impacts to riparian vegetation. Moderate potential for riparian alteration comes through clearing allowances for view/shoreline access. New residential subdivisions within floodplain / CMZ areas would be required to meet SMP standards for land divisions, meaning that all lots must include a buildable area outside of the floodplain and CMZ.
Identified Restoration Opportunities	Riparian revegetation on ~10 large private parcels with existing rural residential / agricultural use.
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs. Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-21. Reasonably foreseeable future development –Lower Bogachiel River Analysis Area

Feature	Description
Analysis Area: Lower Bogachiel River (Figure 5-6)	
Zoning	Western Region Rural Low (RW5)
Existing Shoreline Condition	Predominantly forested and rural / agricultural; setbacks on developed properties vary, generally greater than 300 feet
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy

Feature	Description
Development Potential	**Use:** Most new shoreline uses are expected to be single-family residential or private recreation uses (e.g., cabin or second home). However, no significant shoreline development pressure is anticipated due to very low growth pressure in WRIA 20 (especially in this analysis area), and presence of a wide floodplain and channel migration zone (CMZ). **Existing Parcel Pattern and Subdivision Potential:** There are a total of 34 parcels in the Analysis Area, 17 parcels are undeveloped; and 17 are developed parcels. Floodplain extent limits subdivision potential within this analysis area; that said, subdivision could result in the creation of approximately 16 new lots at residential densities of 1 du per 5 acres (a 53% increase). Potential for impact through view corridor/shoreline access allowances. **Developed Parcels:** Two parcels with existing development in proposed SMP buffers. **Vacant Parcel:** No vacant parcels dimensionally constrained by proposed SMP buffer areas, so most development could occur landward of the buffers. **Floodplain / CMZ Development on Existing Vacant Lots:** Of the 17 vacant lots 5 lots are within CMZ and 4 are within the floodplain of the Bogachiel River. **Potential for New Shoreline Stabilization**: Only one parcel identified with potential for new shoreline armoring.
Summary of Anticipated Future Development	Substantial potential for subdivision and development on existing vacant lots; however, given location and existing pattern little of this future development may occur in the foreseeable future; Potential for riparian forest loss (buffer clearing for view / access allowances as new development occurs) with possible effect on intact riparian vegetation for two-thirds of total parcels; Low potential for floodplain / CMZ development and forest loss within the floodplain / CMZ.
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with view / access corridor allowances; The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation; New residential development within floodplain / CMZ areas would be required to meet SMP standards for land divisions, meaning that all lots must include a buildable area outside of the floodplain and CMZ.
Identified Restoration Opportunities	Riparian revegetation on ~10 large private parcels with existing rural residential / agricultural use.
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; Focus on encouraging or incentivizing voluntary buffer enhancement; Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-22. Reasonably foreseeable future development – Bogachiel River South of Forks Analysis Area

Feature	Description
Analysis Area: Bogachiel River South of Forks (Figure 5-6)	
Zoning	Includes urban and rural zoned areas along the Bogachiel River between the Forks Urban Growth Area (UGA) and the Jefferson County line. Most of this analysis area is located between the river and US 101 and zoned Western Region Rural Low (RW5), whereas across the river are thousands of acres of undeveloped forest lands zoned Commercial Forest. Where US 101 crosses the Bogachiel River near the Jefferson County line, there is a small area of mixed rural zoning on the left bank of the river that includes RW5, Tourist Commercial (TC), and the Rural (R1) zones. Additional areas are zoned Western Region Rural (RW1), Rural Moderate (R2), and Urban Residential Low Density (URL).
Existing Shoreline Condition	Predominantly forested and rural / agricultural; little apparent armoring, setbacks on developed properties vary, but are generally greater than 300 feet.
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy Small area of Shoreline Residential – Intensive (Kallman / Hollow Roads)
Development Potential	**Use:** Most new shoreline uses are expected to be single-family residential or private recreation uses (e.g., cabin or second home). However, no new significant nearshore development pressure is anticipated due to very low growth pressure in WRIA 20, remoteness, wide floodplain and channel migration zone (CMZ). Residential densities anticipated to remain at very low densities throughout most of this analysis area. **Existing Parcel Pattern and Subdivision Potential:** There are 126 existing parcels in the Analysis Area, 39 of which are developed and 87 that are undeveloped. Floodplain extent limits subdivision potential within this analysis area; that said, subdivision could result in the creation of approximately 42 new lots (a 33% increase). Most large lots are vacant and forested; several areas support agricultural use. Actual pressure to create new lots may be low. Approximately 30- existing small lots within SR-I area (along Kallman / Hollow Rds.). Less than 5 of these lots are developed. All undeveloped lots are forested. **Developed Parcels:** Five parcels with residential use have existing structures within proposed SMP buffers. **Vacant Parcel:** Of the 87 vacant parcels, only 5 would be dimensionally constrained by proposed SMP buffer areas. Of these, 2 parcels have existing intact riparian buffer that would be impacted. **Floodplain / CMZ Development on Existing Vacant Lots:** Of the 87 vacant lots 27 lots are within CMZ and 21 are within the floodplain of the Bogachiel. **Potential for New Shoreline Stabilization**: Of the 126 existing parcels there are 12 parcels identified with potential for new shoreline armoring..

Feature	Description
Summary of Anticipated Future Development	Substantial potential for subdivision and development on existing vacant lots; however, given existing pattern there may be minimal pressure to create new in the foreseeable future; Potential for riparian forest loss (buffer clearing for view / access allowances as new development occurs); Substantial potential for floodplain / CMZ development and forest loss within the floodplain / CMZ.
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with through view / access corridor allowances; The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation; New residential development within floodplain / CMZ areas would be required to meet SMP standards for land divisions, meaning that all lots must include a buildable area outside of the floodplain and CMZ.
Identified Restoration Opportunities	Revegetate disturbed riparian areas, where possible; Shoreline stewardship education program for property owners; Riparian conservation for landowners;
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; Focus on encouraging or incentivizing voluntary buffer enhancement; Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-23. Reasonably foreseeable future development – Calawah Analysis Area (excluding areas within the City of Forks)

Feature	Description
Analysis Area: Calawah (Figure 5-6)	
Zoning	This analysis area includes the Calawah River and the lower reach of Elk Creek (tributary of Calawah River) shoreline that abuts or flows through the City of Forks and its Urban Growth Area (UGA). The Analysis Area presented in this table is focused on areas outside of City of Forks limits (see Table 5-29 for areas within the City). Most of the Analysis Areas is within the UGA, where zoning is predominantly Urban Residential Low, with some areas of Urban Center, Urban Low Density, and Industrial. On area outside of the UGA is included to the west of the City, zoned as Rural Low – Western Region. The Analysis Area does not include Commercial Forest lands that abut much of the north bank of the Calawah River and upper reaches of Elk Creek, due to the lack of existing and anticipated development in these areas.
Existing Shoreline Condition	Predominantly forested and rural; little apparent armoring, setbacks on developed properties vary, generally greater than 300 feet along Calawah and ~50 to75 feet along Elk Creek

Feature	Description
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy Shoreline Residential – Intensive (Elk Creek and Calawah River shorelines west of Elk Creek)
Development Potential	**Use:** Most new shoreline uses are expected to be single-family residential and located outside of floodplain and CMZ. However, even though an UGA, significant residential development and subdivision of the UGA shoreline area is not expected during the planning period (20 years) based on Forks UGA population projections which show continued very low growth. **Existing Parcel Pattern and Subdivision Potential:** 80 existing parcels, 59 of which are undeveloped and 21 are developed. Most large lots are vacant and forested; several areas support agricultural use. This analysis area has substantial subdivision potential, as approximately a third of these larger lots extend outside of the floodplain and could be subdivided. Potential subdivision could result in the creation of approximately 185 new lots (an increase of more than 200%). Actual pressure to create new lots may be low. Existing residential use primarily focused along Merchants Rd and Elk Creek. Potential view / shoreline access clearing impacts are substantial in this Analysis Area (possible effect on intact riparian vegetation). **Developed Parcels:** Of the 21 developed parcels, 43% (9 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 59 vacant parcels, 6% (10 parcels) would be dimensionally constrained by proposed SMP buffer areas. Of these, 3 parcels have existing intact riparian buffer (that would be impacted). **Floodplain / CMZ Development on Existing Vacant Lots:** There are 11 vacant lots within the CMZ of the Calawah and 1 vacant lot within the floodplain of the Calawah. **Potential for New Shoreline Stabilization**: Of the 80 parcels in the Analysis Area, 15 are identified with potential for new shoreline armoring.
Summary of Anticipated Future Development	Substantial potential for subdivision and development on existing vacant lots. Given location within Forks and Forks UGA, and associated urban residential zoning, there is a higher likelihood of development impacts in this analysis area compared to other WRIA 20 areas. The Forks UGA is the only UGA in WRIA 20. Potential for riparian forest loss (buffer clearing for view / access allowances as new development occurs).

Feature	Description
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with modifications allowed through view / access corridor allowances; The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions. Due to location within the Forks UGA, there is a substantial potential for loss of riparian vegetation outside of proposed buffers as growth occurs. This is generally limited to the south shoreline of the Calawah River located within the UGA. Most of the opposite shore (north shore) are designated commercial forest lands with either none or very limited development pressure. Additional potential impacts associated with potential for new residential development within floodplain / CMZ areas.
Identified Restoration Opportunities	Revegetate disturbed riparian areas, where possible; Shoreline stewardship education program for property owners; Riparian conservation for landowners;
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; Focus on encouraging or incentivizing voluntary buffer enhancement; Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-24. Reasonably foreseeable future development – Sol Duc #1 (Lower) Analysis Area

Feature	Description
Analysis Area: Sol Duc #1 (Lower) (Figure 5-6)	
Zoning	Western Region Rural Low (RW5)(primary) and Commercial Forest (CF)
Existing Shoreline Condition	Predominantly forested and rural residential; setbacks on few developed properties approximately 100 feet
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy Resource Conservancy (right bank areas zoned CF)

Feature	Description
Development Potential	**Use:** Most new shoreline uses are expected to be single-family residential or private recreation uses (e.g., cabin or second home) on existing large rural lots (5 acres or greater). Any land division of shoreline ownerships would be at a maximum density of 1 du per 4.8 acres. Most of the right bank associated with this analysis area is zoned CF and expected to remain as forest land with either none or minimal conversions to non-forestry uses. **Existing Parcel Pattern and Subdivision Potential:** There are 32 parcels in the Analysis Area, 28 of which are undeveloped and 4developed parcels. Floodplain extent limits subdivision potential within this analysis area; that said, subdivision could result in the creation of approximately 17 new lots (a 53% increase). Even for lots with potential for subdivision, most are vacant and forested with low development pressure. Actual pressure to create new lots is likely low. **Developed Parcels:** Two parcels with existing development in proposed SMP buffers. **Vacant Parcel:** One vacant parcel would be dimensionally constrained by proposed SMP buffer areas. This parcel does not have existing intact riparian buffer (that would be impacted). **Floodplain / CMZ Development on Existing Vacant Lots:** Of the 28 vacant parcels, 60% (17 parcels) were identified within CMZ of Sol Duc. Four parcels were identified within the floodplain of Sol Duc. **Potential for New Shoreline Stabilization**: Only one parcel was identified with potential for new shoreline armoring.
Summary of Anticipated Future Development	Shoreline development pressure in this analysis area is anticipated to remain very low during the planning period based on past growth trends, very low population growth rate in WRIA 20, and remoteness of analysis area. Residential densities anticipated to remain very low throughout this analysis area, with any new land divisions limited to densities of 1 du per 4.8 acres and 1 du per 80 acres in the RW5 and CF zoned areas, respectively. Infill of previously subdivided areas along the right bank of Sol Duc in the northern part of this Analysis Area likely, but these lots generally not eligible for further division and are characterized by deep lots affording opportunities to locate infill development outside of shoreline buffers and floodplain. Potential for riparian forest loss (buffer clearing for view / access allowances as new development occurs for two-thirds of total parcels). Substantial potential for floodplain / CMZ development and forest loss within the floodplain / CMZ.
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with new residential development through view / access corridor allowances; The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, minimizing potential impacts to riparian vegetation; New residential development within floodplain / CMZ areas would be required to meet SMP standards for land divisions, meaning that all lots must include a buildable area outside of the floodplain and CMZ.

Feature	Description
Identified Restoration Opportunities	No identified restoration opportunities.
Necessary Restoration to Account for Potential Impacts	Focus on encouraging or incentivizing voluntary buffer enhancement. Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-25. Reasonably foreseeable future development – Sol Duc #2 (Steelhead Ave / Gaydeski Rd) Analysis Area

Feature	Description
Analysis Area: Sol Duc #2 (Steelhead Ave / Gaydeski Rd) (Figure 5-6)	
Zoning	Mix of Quillayute Residential (QR),Western Region Rural (R1), Rural Neighborhood Conservation (NC), Western Region Rural Low (RW5), Tourist Commercial (TC) and Commercial Forest (CF).
Existing Shoreline Condition	Predominantly forested and rural residential; no apparent significant armoring, setbacks on few developed properties approximately 100 feet
Proposed Shoreline Environment Designation	Shoreline Residential – Intensive (in the vicinity of Steelhead Ave, Hammer Way and Rainy Ranch Road) Shoreline Residential – Conservancy Resource Conservancy (significant areas of left bank)
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are a total of 133 existing parcels in this Analysis Area, 55 of which are developed and 78 are undeveloped. Floodplain extent limits subdivision potential within this analysis area; that said, there is moderate subdivision potential that could result in the creation of approximately 56 new lots (a 42% increase). Actual pressure to create new lots is likely low. **Developed Parcels:** Of the 55 developed parcels, 51% (28 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 78 vacant parcels, 10 are dimensionally constrained by proposed SMP buffer areas such that new development would likely have to occur within the standard buffer area proposed by the SMP. Of these, 3 parcels have existing intact riparian buffer (that would be impacted). **Floodplain / CMZ Development on Existing Vacant Lots:** There are 28 existing vacant lots within the CMZ and 17 within the floodplain of Sol Duc. **Potential for New Shoreline Stabilization**: 31 parcels have been identified with potential for new shoreline armoring.

Feature	Description
Summary of Anticipated Future Development	Substantial potential for subdivision and development on existing vacant lots; Potential for riparian forest loss (buffer clearing for view / access allowances as new development occurs); Substantial potential for floodplain / CMZ development and forest loss within the floodplain / CMZ; Moderate potential for new shoreline armoring to protect existing homes and future development on small lots.
Potential Impacts Associated with Anticipated Development	Riparian impacts associated with modifications allowed through view / access corridor allowances; Existing platting of both developed and undeveloped parcels within floodplain / CMZ areas could necessitate future shoreline armoring – would result in impacts to riparian vegetation, channel migration, and floodplain processes; Additional potential impacts to floodplain processes associated with potential subdivision on large forested lots.
Identified Restoration Opportunities	Revegetate disturbed riparian areas, where possible; Shoreline stewardship education program for property owners.
Necessary Restoration to Account for Potential Impacts	Focus on encouraging or incentivizing voluntary buffer enhancement; Ensure shoreline modification is only permitted when consistent with SMP; require channel / bank restoration as mitigation for any new modification; Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-26. Reasonably foreseeable future development – Sol Duc #3 (Pleasant Meadows Lane / Storman Norman Lane / Rixon Road, south of Lake Pleasant) Analysis Area

Feature	Description
Analysis Area: Sol Duc #3 (Pleasant Meadows Ln / Storman Norman Ln / Rixon Rd; South of Lake Pleasant) (Figure 5-6)	
Zoning	NC, RW5, RWI, WRC, CF
Existing Shoreline Condition	Predominantly forested; areas of clearing and existing residential development; setbacks vary
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 86 total parcels in the Analysis Area, 29 of which are developed, and 57 undeveloped. As with other Sol Duc analysis areas, floodplain extent limits subdivision potential; that said, there is moderate subdivision potential that could result in the creation of approximately 46 new lots (a 53% increase). Actual pressure to create new lots is likely low. **Developed Parcels:** Of the 29 developed parcels, 38 % (11 parcels) have existing structures within proposed SMP buffer areas. **Vacant Parcel:** Of the 57 vacant parcels, 7 are dimensionally constrained by proposed SMP buffer areas. This parcel does not have existing intact riparian buffer (that would be impacted). **Floodplain / CMZ Development on Existing Vacant Lots:** There are 10 existing vacant lots within the CMZ of Sol Duc. No vacant lots are within the floodplain. **Potential for New Shoreline Stabilization**: 17 parcels have been identified with potential for new shoreline armoring.
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots – will be able to occur consistent with proposed shoreline buffers. Moderate potential for riparian forest loss through view / access allowances; Moderate potential for floodplain / CMZ development; Limited potential for future shoreline stabilization (protection of existing development) – highest potential for lots along Storman Norman Lane.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation; New residential development within floodplain / CMZ areas would be required to meet SMP standards for land divisions, meaning that all lots must include a buildable area outside of the floodplain and CMZ.
Identified Restoration Opportunities	Revegetate disturbed riparian areas, where possible; Shoreline stewardship education program for property owners; Riparian conservation for landowners; Setback/removal of structures in channel migration zone, where possible.

Feature	Description
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement. Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-27. Reasonably foreseeable future development – Sol Duc #4 (Upper, including Bear Creek) Analysis Area

Feature	Description
Analysis Area: Sol Duc #4 (Upper, including Bear Creek) (Figure 5-6)	
Zoning	RW5, TC (SR-I area at west end), RW1 (SR-I area along Riverside Rd), NC
Existing Shoreline Condition	Partially forested; many areas of clearing and existing residential development; setbacks vary
Proposed Shoreline Environment Designation	Shoreline Residential – Conservancy Shoreline Residential – Intensive (two areas)
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** 102 total existing parcels in the Analysis Area, 53 parcels with existing residential development (mostly in western-most pocket, including area designated SR-I), and 49 undeveloped parcels. As with other Sol Duc analysis areas, floodplain extent limits subdivision potential; that said, there is low to moderate subdivision potential that could result in the creation of approximately 39 new lots (a 38% increase). Actual pressure to create new lots is likely low. **Developed Parcels:** Of the 53 parcels developed with residential use, 40% (21 parcels) have existing structure within proposed SMP buffers. **Vacant Parcel:** Of the 49 vacant parcels, 8 are dimensionally constrained lots (due to platted depth and proposed SMP buffer areas) mostly along Riverside Rd. Of these, 5 parcels have existing intact riparian buffer (that would be impacted). **Floodplain / CMZ Development on Existing Vacant Lots:** There are 18 vacant lots that are within the mapped CMZ area. Only two parcels are within the floodplain area. CMZ is narrower along Bear Creek segment. **Potential for New Shoreline Stabilization**: There are 29 existing parcels that have potential for new shoreline armoring.

Feature	Description
Summary of Anticipated Future Development	Substantial potential for development on existing vacant lots – most will be able to occur consistent with proposed shoreline buffers; somewhat constrained lots along Riverside Rd may require narrower shoreline buffer allowances. Moderate potential for riparian forest loss through view / access allowances; Moderate potential for floodplain / CMZ development; Substantial potential for future shoreline stabilization (protection of existing development) – highest potential for lots within SR-I areas.
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation; New residential development within floodplain / CMZ areas would be required to meet SMP standards for land divisions, meaning that all lots must include a buildable area outside of the floodplain and CMZ; Existing and future development on existing small lots (SR-I areas) may require shoreline stabilization.
Identified Restoration Opportunities	Revegetate disturbed riparian areas, where possible; Shoreline stewardship education program for property owners; Riparian conservation for landowners; Setback/removal of structures in channel migration zone, where possible.
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement; Ensure shoreline modification is only permitted when consistent with SMP; require channel / bank restoration as mitigation for any new modification; Any floodplain / CMZ development permits would require special study to assess hazards and ensure impacts to riverine and floodplain processes are minimized and mitigated to the extent feasible.

Table 5-28. Reasonably foreseeable future development – Lake Pleasant / Lake Creek Analysis Area

Feature	Description
Analysis Area: Lake Pleasant (Figure 5-6)	
Zoning	QR, NC, WRC
Existing Shoreline Condition	Less than 30% forested (primarily along east lake shore and portions of Lake Creek to the southwest of the lake); approximately 25 overwater structures; extent of existing shoreline modification is unknown, however appears common to residential development from review of aerial photography. Setbacks vary (30 feet to more than 100 feet); lumber mill immediately south of the lake – shoreline frontage associated with mill appears to be private recreational use.

Feature	Description
Proposed Shoreline Environment Designation	Shoreline Residential – Intensive
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are a total of 134 existing parcels, 63 of which are developed for residential use and 71 are undeveloped. This analysis area has moderate to substantial subdivision potential due primarily to several large lots along the eastern lake shoreline and along Lake Creek; potential subdivision could result in 85 new lots (a 63% increase). **Developed Parcels:** Out of 63 developed residential lots, 40% (26 parcels) have existing structures within proposed SMP buffers. **Vacant Parcel:** Out of 71 vacant lots, 24 lots would be dimensionally constrained by proposed SMP buffers. Of these, 7 lots have existing intact riparian buffer (that would be impacted). **Potential for New Shoreline Stabilization**: None **Potential for New Residential Docks:** Substantial potential (many existing lots without a dock) could result in 70 lots with new docks.
Summary of Anticipated Future Development	Potential view / shoreline access clearing impacts are limited – most parcels are already cleared Potential for development on existing vacant lots; however, majority would occur outside of required buffers; Some potential for riparian and shoreline impacts associated with intensified use on residential lots (redevelopment, resulting in more impervious surface, vegetation impacts); Substantial potential for additional future overwater structures (residential docks).
Potential Impacts Associated with Anticipated Development	The majority of anticipated development, including future parcels created through subdivision, would occur consistent with proposed SMP buffer provisions, limiting potential impacts to riparian vegetation. Intensified use and limited new development on vacant parcels would increase potential impacts to lake water quality and riparian condition; Overwater coverage and associated modification to shoreline (habitat impacts; related water quality impacts).
Identified Restoration Opportunities	Shoreline stewardship information programs
	Septic system maintenance/remediation
	Revegetate disturbed riparian areas along Lake Pleasant, where possible
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement.

Table 5-29. Reasonably foreseeable future development – City of Forks Area (including shorelands of the Calawah River and Elk Creek)

Feature	Description
Analysis Area: City of Forks (Figure 5-6)	
Zoning	Calawah River and Elk Creek shorelands pass in and out of City of Forks municipal limits, with adjoining areas of UGA and other unincorporated County lands to the north and east of the City (adjoining areas within County jurisdiction detailed in Table 5-16). Zoning within the City includes Very Low Density Residential District (FR1), Low Density Residential District (FR2), Moderate Density Residential District (FR3), and Moderate Density Commercial District (FC2).
Existing Shoreline Condition	Predominantly forested and rural; little apparent armoring, setbacks on developed properties vary, generally greater than 300 feet along Calawah
Proposed Shoreline Environment Designation	Shoreline Residential – Intensive
Development Potential	**Existing Parcel Pattern and Subdivision Potential:** There are a total of 12 existing parcels within the City of Forks, 3 of which are developed and 9 are undeveloped. This area has no subdivision potential, as all shoreland areas within the City are generally mapped as floodplain. **Developed Parcels:** Out of 3 developed residential lots, 1 parcel has existing structures within proposed SMP buffers. **Vacant Parcel:** None of the vacant lots in this area would be dimensionally constrained by proposed SMP buffers. **Floodplain / CMZ Development on Existing Vacant Lots:** There are no lots that occur entirely within the mapped CMZ/floodplain area. **Potential for New Shoreline Stabilization**: Only one parcel has been identified with potential for new shoreline armoring.
Summary of Anticipated Future Development	Potential for development on existing vacant lots; however, all would occur outside of required buffers; Limited potential for riparian and shoreline impacts associated with intensified use on residential lots (redevelopment, resulting in more impervious surface, vegetation impacts);
Potential Impacts Associated with Anticipated Development	Limited potential new development on vacant parcels and limited impacts to riparian vegetation.
Identified Restoration Opportunities	Revegetate disturbed riparian areas, where possible; Shoreline stewardship education program for property owners; Riparian conservation for landowners;
Necessary Restoration to Account for Potential Impacts	Implementation of identified opportunities as shoreline development and redevelopment occurs; focus on ensuring riparian areas are enhanced when buffer averaging is proposed; and encouraging or incentivizing voluntary buffer enhancement.

6.0 Implications of Future Development on Shoreline Functions

This section describes the implications of the foreseeable development on shoreline functions within the marine and freshwater Analysis Areas (see Figures 5-1, 5-2, 5-3 and 5-6) described in Chapter 5.

6.1 Amount of New Development

6.1.1 WRIAs 17, 18 and 19

This section summarizes the amount of new development that is expected to occur within the marine and freshwater Analysis Areas (Figures 5-1 – 5.3) jurisdiction of the SMP within WRIA's 17, 18 and 19. This does not include new lots that could be created outside of shoreline jurisdiction, and assumes that no new lots would be created in areas that were entirely constrained by the proposed buffers because the SMP prohibits new lot creation in those circumstances. (Note: all numbers are approximate).

Marine Analysis Areas

- **Majority of marine shoreline parcels are developed**: In all marine Analysis Areas, the majority of residential parcels are occupied, meaning they contain existing residential structures and associated improvements (approximately 880 residential parcels are occupied, whereas 315 are undeveloped). The large majority (88%) of these occupied parcels are not subdividable. Although some of the parcels may be redeveloped and there may be ongoing impacts associated with the existing development, the potential for substantial new impacts is low in the foreseeable future.

- **The number of new shoreline lots that could be created through future subdivision is modest overall:** It was estimated that approximately 136 new potential shoreline lots that could be created through subdivision along the Strait of Juan de Fuca. This represents an approximate 11% increase in the number of residential lots.

  The majority of subdivision potential occurs in the Analysis Area between Morse Creek and the City of Port Angeles. The marine shoreline between the City of Port Angeles and Morse Creek is approximately 2-miles and except for the mouth of Morse Creek is part of Port Angeles Urban Growth Area (UGA). Approximately 60 new lots could be created in this area, which is predominantly zoned for urban densities (Urban Very Low Density [VLD] and Urban Low Density [LD]) landward of the marine bluff. This represents 44% of potential new lots for all marine Analysis Areas. However, no significant residential subdivision is not anticipated to occur because most parcels are already developed, with structures situated at the center of small lots. Any new lot creation would be landward of the top of marine bluff and associated buffers. The marine bluff and base of bluff to the water is zoned Open Space and has no potential for creation of new building sites in these areas

- **Potential for new lots is low to moderate in all other marine Analysis Areas**:

    - Sequim Bay – 23 new lots (16% increase)
    - Travis Spit – 11 new lots (22% increase)
    - Clallam Bay – 8 new lots (22% increase)
    - Freshwater Bay – 11 new lots (13% increase)
    - Lyre River Vicinity – 12 new lots (32% increase)
    - Whiskey Creek Beach – 4 new lots (15% increase)
    - Dungeness Bluffs – 11 new lots (< 10% increase)
    - Hoko River Vicinity– 3 new lots (<10% increase)

Some of the Analysis Areas will experience no new lot creation: This is true for Discovery Bay Bluffs, Diamond Point, 3 Crabs, Dungeness Harbor, and East Angeles Point, and Bullman Beach.

Freshwater Analysis Areas

- **Majority of freshwater shoreline parcels are developed:** In all freshwater Analysis Areas, the majority of residential parcels are occupied, meaning they contain existing residential structures and associated improvements (approximately 738 residential parcels are occupied, whereas 287 are undeveloped). The large majority (92%) of these occupied parcels are not subdividable. Although some of the parcels may be redeveloped and there may be ongoing impacts associated with the existing development, the potential for substantial new impacts is low in the foreseeable future.

- **All of the freshwater Analysis Areas have some potential for subdivision**. The total number of new lots is estimated to be up to 140 (13% potential increase from existing conditions), with the greatest possible increases – by number of new lots – occurring in the Morse Creek and Clallam River Analysis Areas:

    - Clallam River – 22 new lots (67% increase)
    - Elwha Tributaries – 11 new lots (25% increase)
    - Lyre River – 6 new lots (27% increase)
    - Morse Creek – 46 new lots (23% increase)
    - Pysht River – 6 new lots (29% increase)
    - Salt Creek – 7 new lots (44% increase)
    - Lake Sutherland – 18 new lots (< 10% increase)
    - Dungeness River – 19 new lots (< 10% increase)
    - McDonald Creek – 11 new lots (< 10% increase)

6.1.2 WRIA 20 – Unincorporated Areas

- **Over half of WRIA 20 Analysis Area parcels are undeveloped:** In almost all WRIA 20 Analysis Areas, the majority of residential parcels are undeveloped, meaning they provide opportunity for future residential development (primarily at rural densities). Approximately 563 parcels (62%) of analysis area parcels that allow for residential development are vacant, whereas 346 (38%) are developed. Half or more of parcels are

developed in only two of the Analysis Areas: Sol Duc River #4 (48% undeveloped) and Lower Bogachiel River (50% undeveloped). For the majority of these undeveloped parcels, lots are of ample size to allow for future development that complies with proposed SMP buffer requirements and limitations on development within floodplain and CMZ areas (see Sections 6.2, 6.3, and 6.8 for details). In addition, recent development trends and anticipated growth within western Clallam County suggest that low levels of new development on undeveloped lots will occur.

- **Nearly all of the WRIA 20 Analysis Areas (Figure 5-6) have potential for subdivision, although it is generally limited by the wide extent of mapped floodplains associated with WRIA 20 rivers**. The potential for new shoreline lot creation through subdivision suggests a 46% potential increase throughout all Analysis Areas, with greatest potential for subdivision within the Calawah River Analysis Area (primarily within UGA areas surrounding Forks) and the Lake Pleasant Analysis Area:

    - Quillayute River – no new lots due to floodplain extent throughout shoreline jurisdiction (0% increase)
    - Lower Bogachiel River – 16 new lots (47% increase)
    - Calawah River and Elk Creek (excluding City of Forks) – 125 new lots (136% increase)
    - Bogachiel River, South of Forks – 42 new lots (33% increase)
    - Sol Duc River #1 – 17 new lots (53% increase)
    - Sol Duc River #2 – 56 new lots (42% increase)
    - Sol Duc River #3 – 46 new lots (53% increase)
    - Sol Duc River #4 – 39 new lots (38% increase)
    - Lake Pleasant – 78 new lots (58% increase)

  The actual pressure to create new shoreline lots is relatively low given current population and population projections and growth trends for this remote part of the County. In addition, the SMP, including integrated critical areas protection standards, require new lots to have building sites outside of 100-year floodplain, channel migration zones, and both shoreline and critical area (e.g., wetlands) buffers. Many of the stream reaches in WRIA 20 have wide floodplains and channel migration zones. Due to these factors, there is low likelihood that new lot creation for development along WRIA 20 shorelines will result in significant impacts to stream and lake ecological functions.

- WRIA 20 shorelines located outside of the Analysis Areas are predominantly undeveloped private and public forest lands. Most of these areas are zoned Commercial Forest (CF) and under the SMP are designated as a Resource Conservancy shoreline environment. Any new residential development will be isolated and based on existing lot sizes at very low densities. Any new lot creation for residential development would be subject to a minimum lot size of 80 acres. Due to existing ownership and use patterns and protective standards of the SMP, there is a low development potential outside of Analysis Areas. In addition, most Resource Conservancy shorelines will continue to remain undeveloped forest lands. It is anticipated that most of these reaches will remain undeveloped forest lands, with any non-forestry development being isolated with no significant potential for cumulative impacts to shoreline functions.

The majority of the County's WRIA 20 shorelines are proposed to have a Conservancy designation. Approximately 80 percent would be designated Resource Conservancy (including all WRIA 20 shorelands with Commercial Forest zoning) and 19 percent would be designated Shoreline Residential – Conservancy (predominantly shorelands with Rural Very Low zoning).

6.1.3 WRIA 20 – City of Forks

- There are a total of 12 existing parcels within the City of Forks, three of which are developed and nine are undeveloped. All of the parcels include areas that extend outside of shoreline jurisdiction.

- There is no potential for subdivision to create new lots within the City's shoreline jurisdiction, as all shoreland areas are generally mapped as floodplain and/or CMZ.

6.2 Effect of Proposed Buffers on Existing and New Development

6.2.1 WRIAs 17, 18 and 19

The effect of SMP buffers on existing and new development was evaluated within marine and freshwater Analysis Areas. Development that occurs landward of the protective buffers is presumed to have less potential impact on ecological functions as compared to development within the buffers when all other factors are equal.

Using aerial photography and GIS, the SMP shoreline buffer extents on each parcel were assessed whether there were existing structures in the buffer and whether the undeveloped parcels were constrained or unconstrained by the proposed buffers. Both shoreline habitat buffers and approximate safety buffers were considered based on the site characteristics as well as the applicable shoreline environment designation[22]. Parcels were identified as 'constrained' when the buffer encompassed nearly the entire property, or where there was less than 50-feet of parcel depth landward of the proposed buffer. Here are the key findings of that analysis (Note: all numbers are approximate):

Marine Analysis Areas

- **A high percentage of parcels have structures within the proposed buffers:** The majority of Analysis Areas have a substantial portion of existing structures within proposed SMP standard and/or hazard buffers (Table 6-1). Half of the Analysis Areas have 50% or more of existing residential structures that would become legal

[22] For purposes of the analysis summarized in this section, additional Clallam County environmental buffer requirements, such as wetland and tributary stream buffers required by integrated Critical Areas standards, were not assessed. It was determined feasible to complete geospatial analysis of the SMP's proposed shoreline habitat buffers and safety buffers; however, uncertainty on the locations and extent of associated Critical Areas limited ability to provide this review. That said, assessment summarized in Subsections 6.5 and 6.8 does consider potential for future development within forested areas, floodplain areas, and channel migration zones extending outside of shoreline habitat buffer and safety buffer areas.

nonconforming structures (grandfathered structures), with the highest percentages identified in the Diamond Point, Travis Spit, Dungeness Harbor, Dungeness Bluffs, and Morse Creek to Port Angeles Analysis Areas (all to the east of Port Angeles).

Table 6-1. Existing Development within the Proposed SMP Buffers for Marine Analysis Area Parcels - WRIAs 17, 18 and 19

Marine Analysis Areas	Number of Developed / Occupied Parcels	Developed / Occupied Parcels with Structures in the Buffer
Discovery Bay Bluffs	11	4
Diamond Point	116	97
Travis Spit	32	24
Sequim Bay	127	29
3 Crabs	108	42
Dungeness Harbor	54	44
Dungeness Bluffs	141	99
Morse Creek to Port Angeles	77	59
East Angeles Point	16	4
Freshwater Bay	77	19
Lyre River vicinity	17	8
Whiskey Creek beach	12	8
Clallam Bay	31	19
Hoko River vicinity	38	21
Bullman Beach	15	4

- **Two areas have high potential for new development in the buffer -- Diamond Point and Dungeness Bluffs:** Compared to other Analysis Areas, there are substantial numbers of vacant parcels at Diamond Point and Dungeness Bluffs that are constrained by the buffers. Developments on these parcels would likely require a variance and there is a reasonable expectation that they would be eligible for such given the surrounding development. At Diamond Point, over two-thirds of the 32 vacant parcels are constrained such that new residential development would occur within 50 feet of the ordinary high water mark (in the proposed habitat buffer) (Table 6-2). At Dungeness Bluffs, there are 17 vacant parcels where new development would likely occur within the buffer.

Table 6-2. Vacant Parcels with Potential for New Development within the Proposed Marine Buffer - WRIAs 17, 18 and 19

Marine Analysis Areas	Number of Vacant / Undeveloped Parcels	Vacant / Undeveloped, Parcels Constrained by Proposed Buffer
Discovery Bay bluffs	10	3
Diamond Point	32	22
Travis Spit	17	7
Sequim Bay	16	1
3 Crabs	3	1
Dungeness Harbor	1	0
Dungeness Bluffs	68	17
Morse Creek to Port Angeles	7	2
East Angeles Point	8	0
Freshwater Bay	44	5
Lyre River vicinity	16	2
Whiskey Creek beach	14	5
Clallam Bay	6	1
Hoko River vicinity	15	1
Bullman Beach	6	2

Freshwater Analysis Areas

- **368 total parcels have structures within the proposed buffers:** This represents approximately 49% of all freshwater shoreline parcels that are occupied. These lots are predominantly focused in three Analysis Areas: Lake Sutherland, Dungeness River, and Morse Creek (Table 6-3)

- **71 existing, undeveloped parcels have potential for new development within the proposed buffers** (approximately 25% of all freshwater shoreline parcels that are undeveloped). Lots do not have adequate depth to allow for future residential development to occur outside of shoreline jurisdiction. The undeveloped lots predominantly occur in two Analysis Areas: Dungeness River and Morse Creek. This may create increased pressure for shoreline armoring (to reduce damage from flooding and erosion) in these areas (Table 6-4).

Table 6-3. Existing Development within the Proposed SMP Buffers for Freshwater Analysis Area Parcels- WRIAs 17, 18 and 19

Freshwater Analysis Areas	Number of Developed / Occupied Parcels	Number of Developed / Occupied Parcels Constrained by Proposed buffer
Clallam River	9	7
Dungeness River	203	115
Elwha tributaries	21	8
Lake Sutherland	234	159
Lyre River	12	3
McDonald Creek	109	17
Morse Creek	131	34
Pysht River	11	4
Salt Creek	8	0

Table 6-4. Vacant Parcels with Potential for Development within the Proposed SMP Buffers for Freshwater Analysis Area Parcels - WRIAs 17, 18 and 19

Freshwater Analysis Areas	Number of Vacant / Undeveloped Parcels	Number of Vacant / Undeveloped Parcels Constrained by Proposed Buffer
Clallam River	24	9
Dungeness River	74	24
Elwha tributaries	23	3
Lake Sutherland	32	5
Lyre River	10	1
McDonald Creek	28	3
Morse Creek	68	20
Pysht River	20	5
Salt Creek	8	1

6.2.2 WRIA 20 – Unincorporated Areas

For WRIA 20 Analysis Areas, existing and new development was evaluated consistent with the approach for WRIAs 17, 18 and 19. Development that occurs landward of the protective buffers is presumed to have less potential to impact ecological functions as compared to development within the buffers when all other factors are equal.

- **Approximately 33% of developed parcels have structures within the proposed shoreline buffers:** There are relatively few of these parcels within the Quillayute River, Lower Bogachiel River, Bogachiel River, South of Forks, and Sol Doc River #1 Analysis Areas, and higher levels of existing development within proposed shoreline buffers for the other Analysis Areas (Table 6-5).

Table 6-5. Existing Development within the Proposed SMP Buffers for Freshwater Analysis Area Parcels- WRIA 20

Freshwater Analysis Areas	Number of Developed / Occupied Parcels	Number of Developed / Occupied Parcels Constrained by Proposed buffer
Quillayute River	62	9
Lower Bogachiel River	17	2
Calawah River and Elk Creek (excluding City of Forks)	21	9
Bogachiel River, South of Forks	39	5
Sol Duc River #1	4	2
Sol Duc River #2	55	28
Sol Duc River #3	29	11
Sol Duc River #4	53	21
Lake Pleasant	63	26

- **Only 13% of undeveloped parcels have potential for new development within the proposed SMP buffers:** In most Analysis Areas there is ample area outside of the shoreline buffers to accommodate new development. Analysis Areas with higher numbers of constrained vacant parcels include the Calawah River and Elk Creek, and Lake Pleasant (Table 6-6).

Table 6-6. Vacant Parcels with Potential for Development within the Proposed SMP Buffers for Freshwater Analysis Area Parcels – WRIA 20

Freshwater Analysis Areas	Number of Vacant / Undeveloped Parcels	Number of Vacant / Undeveloped Parcels Constrained by Proposed Buffer
Quillayute River	109	8
Lower Bogachiel River	17	0
Calawah River and Elk Creek (excluding City of Forks)	59	10
Bogachiel River, South of Forks	87	5
Sol Duc River #1	28	1
Sol Duc River #2	78	10
Sol Duc River #3	57	7
Sol Duc River #4	49	8
Lake Pleasant	71	24

- **WRIA 20 – City of Forks**

- Of the three developed lots within shoreline jurisdiction, only one has an existing structure within proposed shoreline buffer areas (this lot also has significant room for additional development outside of the buffer).

- None of the vacant lots would be dimensionally constrained by proposed shoreline buffers; as such, any future development on these properties would be consistent with the SMP's proposed shoreline buffer requirements.

6.3 Riparian Vegetation Impacts from New Development

6.3.1 WRIAs 17, 18 and 19

For all undeveloped parcels in marine and freshwater Analysis Areas considered to be 'constrained' by the full buffer extent, the vegetation condition (using aerial photos and vegetation maps) was assessed and determined if new development would impact forested riparian areas. Undeveloped, constrained parcels with existing riparian forest cover were coded for potential riparian buffer / forest cover loss. This yielded locations and a count of parcels where riparian / forest cover loss could occur. Key findings are summarized as follows (Note: all numbers are approximate):

Marine Analysis Areas

- **Most Analysis Areas have low potential for riparian forest loss**: Most of the marine Analysis Areas including Discovery Bay Bluffs, Freshwater Bay, Hoko River vicinity, Lyre River vicinity, and Sequim Bay would have minimal potential for forest cover loss due to new development. This is because there are very few constrained parcels and the parcels that are constrained already have structures. In these cases, the assumption is that there will be minimal additional clearing compared to areas where new development could occur within the buffer. There is virtually no potential for forest cover loss at 3 Crabs, Clallam Bay, Dungeness Harbor, East Angeles Point, and Morse Creek to Port Angeles for the same reason. There is moderate potential or forest cover loss due to new development in the following areas:

    - Diamond Point – 10 parcels (6.7% of total parcels and 31% of vacant parcels);
    - Travis Spit – 7 parcels (14.3% of total parcels and 41% of vacant parcels).
    - Dungeness Bluffs – 8 parcels (3.8% of total parcels and 12% of vacant parcels);
    - Whiskey Creek Beach – 5 parcels (18.5% of total parcels and 36% of vacant parcels).

Freshwater Analysis Areas

- **Clallam Bay, Pysht River, Dungeness River and Morse Creek Analysis Areas have the greatest potential for loss of forest cover:**

    - Clallam River – 6 parcels (18% of total parcels)
    - Pysht River – 5 parcels (16% of total parcels)
    - Dungeness River – 27 parcels (10% of total parcels)
    - Morse Creek – 18 parcels (9 % of total parcels)

- **There is little to moderate potential forest cover loss in most Analysis Areas:**

    - Elwha Tributaries – 3 parcels (7% of total parcels)
    - Lake Sutherland 4 parcels (1 % of total parcels)
    - Lyre River 1 parcel (5 % of total parcels)
    - McDonald Creek 3 parcels (2% of total parcels)
    - Salt Creek – no potential for riparian forest loss identified

6.3.2 WRIA 20 – Unincorporated Areas

Analysis of potential impacts to riparian vegetation within WRIA 20 freshwater Analysis Areas was completed consistent with the approach for WRIAs 17, 18 and 19. The following summary is focused on the undeveloped lots that would be constrained by proposed shoreline buffers.

- **All WRIA 20 Analysis Areas have low potential for riparian buffer loss**: Most of the Analysis Areas would have minimal potential for forest cover loss due to new development. This is because there are very few constrained parcels and new homes will be constructed outside of the shoreline buffer. In these cases, the assumption is that there

will be minimal additional clearing compared to areas where new development could occur within the buffer.

- **There are no Analysis Areas where future riparian buffer impacts are anticipated in greater than 5% of existing parcels:**

    - Sol Duc River #4 – 5 parcels (5% of total parcels)
    - Lake Pleasant – 7 parcels (5% of total parcels)
    - Calawah River and Elk Creek (excluding City of Forks) – 4 parcels (4% of total parcels)
    - Bogachiel River South Fork – 2 parcels (2% of total parcels)
    - Sol Duc River #2 – 3 parcels (2% of total parcels)
    - No parcels identified within Quillayute River, Lower Bogachiel River, Sol Duc River #1 and Sol Duc River #3 Analysis Areas

6.3.3 WRIA 20 – City of Forks

- Within the City's shoreline jurisdiction, there is potential for new development on vacant parcels (and redevelopment on parcels with existing structures); however, most development would occur outside of shoreline jurisdiction due to the extent of the mapped floodplain and Ecology CMZ. As such, there is limited potential for riparian and shoreline impacts even if intensified use of these parcels does occur.

6.4 Riparian Buffer / Forest Cover Loss Due to Clearing for View / Access Corridors

6.4.1 WRIAs 17, 18 and 19

For all undeveloped parcels in the marine and freshwater Analysis Areas, the view and shore access allowances in the SMP were evaluated to determine if they would result in significant riparian buffer/ forest cover loss. The analysis also included potential future lots that could be created through subdivision (as summarized in Section 6.1). This yielded locations and a count of parcels where riparian buffer / forest cover loss could occur due to view/access clearing. Key findings are summarized as follows (Note: all numbers are approximate):

Marine Analysis Areas

- **Most areas have moderate potential for riparian impacts associated with view corridor allowances**; a total of 155 parcels (12.5% of total parcels; 50% of vacant parcels) were counted that have moderate potential for view corridor impacts to riparian forest as future development occurs. These parcels primarily occur within nine of the marine Analysis Areas:

    - Diamond Point – 16 parcels (10.7% of total parcels and 50% of vacant parcels);
    - Discovery Bay Bluffs – 9 parcels (43% of total parcels and 90% of vacant parcels);
    - Travis Spit – 14 parcels (14.3% of total parcels and 41% of vacant parcels);
    - Dungeness Bluffs – 23 parcels (10.8% of total parcels and 34% of vacant parcels);

- Freshwater Bay – 25 parcels (20.5% of total parcels and 57% of vacant parcels);
- Hoko River Vicinity – 15 parcels (26% of total parcels and 100% of vacant parcels);
- Lyre River Vicinity – 7 parcels (18% of total parcels and 44% of vacant parcels);
- Sequim Bay – 11 parcels (7% of total parcels and 69% of vacant parcels);
- Whiskey Creek Beach – 10 parcels (37% of total parcels and 71% of vacant parcels).

- **There is no potential for buffer forest cover loss as a result of the view corridor allowance in some areas:** View clearing / access allowances are not expected to result in riparian cover loss within the 3 Crabs, Dungeness Harbor, and Morse Creek to Port Angeles Analysis Areas because forest cover has already been cleared from the buffers in these areas.

Freshwater Analysis Areas

- **Most Analysis Areas have moderate potential for forest cover loss as a result of the view corridor allowance** (meaning more than 15% of the total lots would experience forest cover loss**);** a total of 225 parcels (22% of total parcels) were identified with moderate potential for view corridor impacts to riparian forest as future development occurs. The majority of these parcels are currently undeveloped (186 out of 225).

  - Elwha Tributaries (45%)
  - Clallam River (48.5%)
  - Lyre River (45.5%)
  - Morse Creek (34.2%)
  - McDonald Creek (17.5%)
  - Pysht River (35.5%)
  - Salt Creek (50%)

  However, the County anticipates few requests for use of this allowance within the riverine Analysis Areas, where views are generally a lower priority than along lake and marine shorelines.

- **Two Analysis Areas have low potential forest cover loss as a result of the view corridor allowance** (meaning less than 15% of the total lots would experience forest cover loss**):**

  - Dungeness River (14.4%)
  - Lake Sutherland (10.5%)

6.4.2 WRIA 20 – Unincorporated Areas

Analysis of potential impacts to riparian vegetation within WRIA 20 freshwater Analysis Areas was completed consistent with the approach for WRIAs 17, 18 and 19. The following summary

is focused on the undeveloped lots where future development could result in riparian forest loss due to clearing for view corridor and access allowances.

- **Most WRIA 20 Analysis Areas have moderate to high potential for riparian impacts associated with view and access allowances** (meaning more than 15% of the total lots would experience forest cover loss).

    - Lower Bogachiel River – 9 parcels (26% of total parcels)
    - Calawah River and Elk Creek (excluding City of Forks) – 30 parcels (38% of total parcels)
    - Bogachiel River, South of Forks – 27 parcels (21% of total parcels)
    - Sol Duc River #1 – 23 parcels (72% of total parcels)
    - Sol Duc River #2 – 37 parcels (28% of total parcels)
    - Sol Duc River #3 – 20 parcels (23% of total parcels)
    - Sol Duc River #4 – 23 parcels (23% of total parcels)
    - Lake Pleasant – 20 parcels (20% of total parcels)

    Although most lots could accommodate new development outside of the shoreline buffers, some buffer clearing to provide for views and shoreline access could occur. That said, the County anticipates few requests for use of this allowance within the riverine Analysis Areas, where views are generally a lower priority than along lake and marine shorelines. For this reason, potential impacts from the view corridor allowance are likely most reasonable to expect along Lake Pleasant.

- **One Analysis Area has low potential forest cover loss as a result of the view corridor allowance** (meaning less than 15% of the total lots would experience forest cover loss**):**

    - Quillayute River – 24 parcels (14% of total parcels)

6.4.3 WRIA 20 – City of Forks

- There is no anticipated potential for riparian buffer impacts due to clearing for view or access corridors (none of the 9 undeveloped parcels within City were identified with potential for use of this allowance). The Calawah River corridor through Forks is associated with a wide, well vegetated floodplain; given the environmental constraints and existing development patterns occurring in shoreline jurisdiction, clearing requests for access and/or view corridors are not expected to occur.

6.5 Potential Forest Cover Loss Outside of Proposed Buffers

6.5.1 WRIAs 17, 18 and 19

For undeveloped parcels that have developable area outside of the proposed buffer but still within shoreline jurisdiction, the potential for non-riparian forest cover loss (vegetation impacts outside of the proposed buffers) was evaluated based on existing vegetation conditions (primarily using air photo interpretation). This produced a list of locations and a count of parcels where

non-buffer forest cover loss could occur due to new development. Findings are summarized as follows (Note: all numbers are approximate):

Marine Analysis Areas

- **There are only a few areas that would experience forest cover loss outside of required buffer areas, and fewer than 10% of the total parcels in each analysis area would be affected**:
    - Bullman Beach (2 undeveloped parcels)
    - Hoko River Vicinity (5 undeveloped parcels)
    - Clallam Bay (1 undeveloped parcel)
    - Freshwater Bay (5 undeveloped parcels)
    - Lyre River Vicinity (1 undeveloped parcel)

Freshwater Analysis Areas

- **There are only a few areas that would experience forest cover loss outside of required buffer areas, and the number of total parcels affected in each analysis area is generally low to moderate** (the portion of parcels affected compared to total parcels is less than 10% for each area, except for the Elwha Tributaries Analysis Area, where 34% of total parcels would be affected**)**:
    - Elwha Tributaries (15 undeveloped parcels)
    - Lake Sutherland (19 undeveloped parcels)
    - Morse Creek (13 undeveloped parcels)
    - McDonald Creek (2 undeveloped parcels)

6.5.2 WRIA 20 – Unincorporated Areas

Analysis of potential impacts to forest vegetation cover outside of proposed shoreline buffer zones was completed consistently for all freshwater Analysis Areas across the County.

- **In WRIA 20 Analysis Areas, the SMP would allow for moderate to high levels of forest cover loss outside of required buffer areas:**
    - Quillayute River – 52 parcels (30% of total parcels)
    - Lower Bogachiel River – 12 parcels (32% of total parcels)
    - Calawah River and Elk Creek (excluding City of Forks) – 30 parcels (38% of total parcels)
    - Bogachiel River, South of Forks – 37 parcels (29% of total parcels)
    - Sol Duc River #1 – 23 parcels (79% of total parcels)
    - Sol Duc River #2 – 38 parcels (29% of total parcels)
    - Sol Duc River #3 – 19 parcels (22% of total parcels)
    - Sol Duc River #4 – 27 parcels (26% of total parcels)
    - Lake Pleasant – 29 parcels (22% of total parcels)

In most of the WRIA 20 Analysis Areas, proposed buffers are far narrower than existing vegetated riparian corridors, so there is moderate to high potential for loss of riparian vegetation outside of proposed buffers. The relatively wide forested corridors generally extend across mapped floodplain and CMZ areas. These areas have experienced low development pressure, and the County does not expect development pressure to increase in the foreseeable future. As such, actual potential for loss of existing forest outside of buffer zones is likely relatively low across WRIA 20 Analysis Areas.

In all areas where impacts to existing forest cover could occur outside of shoreline buffers, but within shoreline jurisdiction, other protections within the updated SMP (and other County Code land use standards) would be implemented to minimize the extent of impacts. The vegetation conservation standards (see Section 7.3) and clearing and grading / water quality protections (see Section 7.5) are primary provision that would limit and minimize impacts from allowed forest clearing activities outside of required shoreline habitat and safety buffer areas.

6.5.3 WRIA 20 – City of Forks

- The Calawah River corridor through Forks is associated with a wide, well vegetated floodplain / CMZ. Given these environmental constraints and existing pattern of development (occurring predominantly on the portions of properties extending outside of shoreline jurisdiction), there is little anticipated potential for forest loss, even outside of required shoreline buffer areas.

6.6 Potential for Riparian Buffer/ Forest Cover Enhancement

6.6.1 WRIAs 17, 18 and 19

The SMP requires enhancement of riparian vegetation / forest cover through planting anytime development on a dimensionally constrained parcel occurs within a degraded buffer. Enhancement is required when development proposal use buffer averaging, common-line buffer allowances, or require a shoreline variance (buffer modification required exceeding allowances provided by the proposed SMP).

It was evaluated how often the requirement for enhancement would likely be triggered when development occurs on dimensionally constrained, undeveloped parcels. This was done by identifying undeveloped, constrained parcels with limited existing forest canopy within the buffer area. Within the Analysis Areas, parcels in this circumstance are relatively uncommon. Results are summarized as follows (Note: all numbers are approximate):

Marine Analysis Areas

- **The potential for increases/enhancement of forest cover is limited to relatively few lots.** This occurs in the following Analysis Areas: Diamond Point (<1% of lots); Dungeness Bluffs (4 % of lots); Lyre River Vicinity (9% of lots). No lots with potential increase were identified in the other marine Analysis Areas.

Freshwater Analysis Areas

- **There is potential for increase in forest cover on relatively few lots in the following Analysis Areas:** Clallam River (6% of lots); Dungeness Rivers (1% of lots); Morse Creek (1% of lots). No lots with potential increase were identified in the other freshwater Analysis Areas**.**

6.6.2 WRIA 20 – Unincorporated Areas

Analysis of potential for enhancement of riparian forest conditions within proposed shoreline buffer zones was completed consistently for all freshwater Analysis Areas across the County.

- **In WRIA 20 Analysis Areas, there is limited potential for increase in forest cover in the Analysis Areas.** There are very few existing constrained lots with the WRIA 20 Analysis Areas (within approximately 1.4% of total parcels); therefore, there are very few instances where riparian enhancement would be triggered. Analysis Areas with highest potential for required enhancement actions include:

  - Lake Peasant – 6 parcels (4% of total parcels)
  - Sol Duc River #4 – 4 parcels (4% of total parcels)
  - Calawah River and Elk Creek – 2 parcels (3% of total parcels)

  As new development occurs outside of required shoreline buffers, and areas within buffers are protected, there is opportunity for improved riparian conditions over time (successional growth and maturation of protected shoreline buffer zones).

6.6.3 WRIA 20 – City of Forks

- As in unincorporated shoreline areas of WRIA 20, there is limited potential for increase in forest cover within the City's shoreline jurisdiction. There are no existing constrained lots along the Calawah River or Elk Creek within the City; therefore, there are no anticipated instances where riparian enhancement would be triggered. That said, as new development occurs outside of required shoreline buffers, and areas within buffers are protected, there is opportunity for improved riparian conditions, including through maturation of existing riparian vegetation and voluntary restoration actions, over time.

6.7 Impacts from New Shoreline Modifications (Armoring and Dock/Piers)

6.7.1 WRIAs 17, 18 and 19

There is no single comprehensive inventory of shoreline armoring that covers all of Clallam County, however the Shoreline Inventory and Characterization Report (ESA, 2012) includes a fairly complete summary of the available data and maps depicting shoreline armoring in WRIAs 17, 18 and 19–especially along the marine shoreline. Compared to other marine shorelines in Puget Sound, Clallam County has a relatively low percentage of shoreline armoring amounting to less than 10% of the total shoreline miles.

Available data along with satellite photography and Ecology's shoreline oblique photography was used to try to estimate the potential for new shoreline armoring. On marine shorelines, it was assumed that only low bank shorelines would have potential new shoreline armoring because the SMP prohibits armoring of feeder bluffs, and requires all new development to be set back from the top of coastal bluffs (100-foot standard buffer; 150-foot exceptional feeder bluff buffer – see Chapter 6 for additional details).

It was assumed that developed parcels without existing mapped armoring would seek approval for new armoring in the foreseeable future if the existing structure occurred within 50 feet of the ordinary high water mark. The reason behind this assumption was that such parcels would experience risks due to storm surges and other climate-induced events. For undeveloped parcels without existing mapped armoring, the potential for new shoreline armoring was assumed if the lot was constrained such that new structures would be located with 50 feet of the water.

To gauge the potential impacts associated with new docks on the marine shoreline, it was conservatively assumed that all parcels on low bank shorelines that did not currently have a dock had potential for new docks. This is likely a gross over-estimation since the exposed shores along the Straits are not generally conducive for residential docks. Docks are somewhat more likely in the bays and other semi-protected areas but if past history is any indication, the potential for dock proliferation is low across the entire marine shoreline.

Data concerning the presence of stream bank armoring in Clallam County is scant, so it was assumed that any parcel along a shoreline stream that had an existing structure within 50 feet of the ordinary high water mark, or within 100 feet of the ordinary high water mark for in mapped channel migration zones had potential for new bank armoring. For undeveloped parcels, it was assumed potential for new bank armoring if the lot was constrained such that a new structure could occur within 50 feet of the shore or 100 feet of the shore if there was a mapped channel migration zones. In reality, the likelihood of such occurrences is tempered by the SMP policies and regulations which strictly limit development in channel migration zones, but to the analysis accounts for potential variances.

It was assumed there would no new residential dock construction on shoreline streams in Clallam County. It is possible there may be isolated cases of dock construction on rivers or streams, but there is no reasonable foreseeable dock construction given the nature of the rivers and the past development history.

At Lake Sutherland, it was assumed that all residential parcels without an existing dock had for potential new private recreation / residential docks. It was also assumed there would be no new armoring on Lake Sutherland because it was assumed the SMP preference for bioengineered stabilization would apply in these situations.

Results are summarized as follows (Note: all numbers are approximate):

Marine Analysis Areas

- **The potential for new armoring is limited to approximately 83 parcels.** Overall, the potential for new armoring is minimal except within the Diamond Point and 3 Crabs Analysis Areas (Table 6-7).

- **The number of new docks could be quite high, but actual dock construction is expected to be modest**. Although there are numerous parcels at Diamond Point, Sequim Bay, 3 Crabs and Bullman Beach that could accommodate a new dock, the rate of dock construction in these areas has historically been very low because of the exposed nature of the shoreline in these areas. Actual dock construction is expected to be much less than shown in Table 6-7

Freshwater Analysis Areas

- **The potential for new armoring could result in a substantial impact in the Clallam River, Morse Creek, and Pysht River Analysis Areas. Other Analysis Areas with some potential for impact include Dungeness River, Elwha River, and Lyre River** (Table 6-8)**.**

- **Approximately 47 of the 267 parcels along the Lake Sutherland shoreline (17%) have potential for new residential docks**. Lots with potential for new docks are split relatively evenly between occupied properties (25 with potential for new docks) and vacant lots (21 with potential for new docks); however, the large majority (95%) of existing docks occur on occupied parcels (Figure 6-1).

Table 6-7. Parcels within Marine Analysis Areas with Potential for New Shoreline Modifications - WRIAs 17, 18 and 19

Analysis Area	Total Parcels	New Armoring		New Dock	
		Number of Parcels	Percentage	Number of Parcels	Percentage
Disco Bay bluffs, Dungeness Bluffs, Dungeness Harbor, Morse Creek to Port Angeles, East Angeles Point	No potential for future shoreline modification identified - no areas suitable for new residential armoring / docks				
Diamond Point	149	16	11%	60	40%
Travis Spit	49	0	0%	1	2%
Sequim Bay	148	10	7%	97	66%
3 Crabs	112	14	13%	96	86%
Freshwater Bay	122	0	0%	39	32%
Lyre River vicinity	38	0	0%	5	13%
Whiskey Creek beach	27	1	4%	1	4%
Clallam Bay	37	1	3%	13	35%
Hoko River vicinity	58	0	0%	18	31%
Bullman Beach	21	3	14%	20	95%
Total	**761**	**83**	**11%**	**657**	**86%**

Table 6-8. Parcels within Freshwater Analysis Areas with Potential for New Shoreline Modifications- WRIAs 17, 18 and 19

Analysis Area	Total Parcels	New Armoring[23]	
		Number of Parcels	Percentage
Clallam River	33	6	18%
Dungeness River	277	5	2%
Elwha Tributaries	44	4	9%
Lake Sutherland	267	0	0%
Lyre River	22	1	5%
McDonald Creek	137	0	0%
Morse Creek	199	33	17%
Pysht River	31	6	19%
Salt Creek	16	0	0%
Total	**1026**	**55**	**5%**

[23] Assumed that new armoring could be permitted if an existing structure (or a future structure on an existing constrained lot) occurs within 50 feet of OHWM, or within 100 feet of OHWM if there is a mapped CMZ. Assumed that new armoring would not occur for parcels bordering Lake Sutherland, as bank erosion potential is limited in this lake environment.

Figure 6-1. Shoreline parcels on Lake Sutherland with potential for new residential docks (highlighted in blue).

6.7.2 WRIA 20 – Unincorporated Areas

Analysis of potential for new shoreline modifications within WRIA 20 Analysis Areas was completed consistently with analysis methods for WRIAs 17, 18 and 19.

- **In WRIA 20 Analysis Areas, the potential for new armoring could result in a substantial impact in the Calawah River and Elk Creek, and Sol Duc River #2, #3, and #4 Analysis Areas** (meaning that greater than 15% of parcels could require new armoring to protect existing development or future development on constrained lots).

- **The potential for new armoring is relatively low within other WRIA 20 Analysis Areas (Table 6-9).** The large majority of existing and future development is not likely to require shoreline stabilization in these areas.

Table 6-9. Parcels within Freshwater Analysis Areas with Potential for New Shoreline Modifications-WRIA 20

Analysis Area	Total Parcels	New Armoring[24]	
		Number of Parcels	Percentage
Quillayute River	171	20	12%
Lower Bogachiel River	34	1	3%
Calawah River and Elk Creek (excluding City of Forks)	80	15	19%
Bogachiel River, South of Forks	126	12	10%
Sol Duc River #1	32	1	3%
Sol Duc River #2	133	31	23%
Sol Duc River #3	86	17	20%
Sol Duc River #4	102	29	28%
Lake Pleasant	134	0	0%
Total	**898**	**126**	**14%**

- **Approximately 70 of the 134 parcels (52%) within the Lake Pleasant Analysis Area have potential for new residential docks**. Lots with potential for new docks are split

[24] Assumed that new armoring could be permitted if an existing structure (or a future structure on an existing constrained lot) occurs within 50 feet of OHWM, or within 100 feet of OHWM if there is a mapped CMZ. Assumed that new armoring would not occur for parcels bordering Lake Pleasant, as bank erosion potential is limited in this lake environment.

relatively evenly between occupied properties (30 with potential for new docks) and vacant lots (40 with potential for new docks).

6.7.3 WRIA 20 – City of Forks

- Only one of the 12 parcels extending into the City's shoreline jurisdiction was identified with potential for new shoreline armoring. This property, occurring along the west bank of Elk Creek, includes several existing structures within the mapped Ecology CMZ (and within the shoreline buffer).

6.8 Impacts from Development in Floodplains and Channel Migration Zones (river / stream shorelines only)

6.8.1 WRIAs 17, 18 and 19

The potential for new development to impact mapped floodplains and channel migrations zones was evaluated using existing FEMA 100-year floodplain maps and channel migrations zone (CMZ) maps prepared by Ecology. These maps sets are not comprehensive meaning that there are rivers/streams with no mapped floodplain and rivers/streams where the potential for channel migration has not been assessed or documented. There are also issues with the maps that are available in that the floodplain maps have known inaccuracies and the channel migration maps are coarse-scale planning level maps. Nonetheless, these data sets were used as best available information to identify existing undeveloped parcels located within the mapped floodplains.[25]

Results are summarized as follows (Note: all numbers are approximate):

- **Development within floodplains and CMZs is limited primarily to two of the Analysis Areas, with the small percentages of parcels affected in three other Analysis Areas.** The relatively high percentages in the Clallam River and Pysht River Analysis Areas are due to the few number of undeveloped parcels overall, and do not suggest a significant potential impact to floodplain / channel migration habitat and hydrology (Table 6-10).

[25] Recently released Preliminary Draft Flood Insurance Rate Maps (Preliminary DFIRMs) from FEMA will likely improve the County's ability to accurately assess the extent of existing and potential future development within floodplain areas. The Preliminary DFIRMs were only provided for coastal flood zones and along some rivers and streams. Any future analysis of shoreline development and cumulative impacts should ensure use of best available data sources and geospatial information.

Table 6-10. Percent of parcels within Freshwater Analysis Areas with Potential for Future Floodplain and CMZ Development- WRIAs 17, 18 and 19

Freshwater Analysis Area	Total Parcels	Potential Floodplain Development (% of total)	Potential CMZ Development (% of total)
Clallam River	33	12%	12%
Dungeness River	277	4%	12%
Lyre River	22	5%	5%
Morse Creek	199	3%	10%
Pysht River	31	10%	13%

6.8.2 WRIA 20 – Unincorporated Areas

Analysis of potential for new floodplain / CMZ development impacts within WRIA 20 Analysis Areas was completed consistently with analysis methods for WRIAs 17, 18 and 19.

- **In WRIA 20 Analysis Areas, there is a high potential for development within floodplains and CMZs in all of the Analysis Areas except Lake Pleasant (Table 6-11).**

Table 6-11. Percent of parcels within Freshwater Analysis Areas with Potential for Future Floodplain and CMZ Development- WRIA 20

Freshwater Analysis Area	Total Parcels	Potential Floodplain Development (% of total)	Potential CMZ Development (% of total)
Quillayute River	171	64%	64%
Lower Bogachiel River	34	12%	15%
Calawah River and Elk Creek (excluding City of Forks)	80	1%	14%
Bogachiel River, South of Forks	126	17%	21%
Sol Duc River #1	32	41%	41%
Sol Duc River #2	133	13%	21%
Sol Duc River #3	86	0%	12%
Sol Duc River #4	102	2%	18%
Lake Pleasant (2 identified floodplain parcels downstream of outlet)	134	1%	0%

There are wide CMZs mapped along most of the WRIA 20 rivers, so a large percentage of the existing lots occur within areas that are frequently flooded and/or subject to channel migration hazards. These areas would require special study before they could be developed, and the SMP would require development to occur outside of the floodplain and CMZ where there is available area.

In addition, the wide floodplain / CMZ areas around WRIA 20 rivers have experienced low development pressure. The County does not expect development pressure in these areas to increase in the foreseeable future. As such, actual potential for future development within floodplain and CMZ areas is likely relatively low across WRIA 20 Analysis Areas.

6.8.3 WRIA 20 – City of Forks

- All of the 12 parcels extending into the City's shoreline jurisdiction have adequate room to focus future development outside of mapped floodplain and Ecology CMZ areas.

7.0 PROTECTIVE PROVISIONS OF THE SMP

The County's SMP is designed to address the potential impacts to shoreline ecological functions that are present in Clallam County. The SMP provides comprehensive policies and regulations that work together to ensure that future uses and developments do not result in cumulative adverse impacts. This chapter describes the protective elements of the SMP and the role they play in achieving no let loss. This is a summary of the SMP regulations; refer to the SMP for a full description of the regulations.

7.1 Mitigation Sequencing

Mitigation sequencing is one of the main mechanisms for achieving no net loss. Mitigation sequencing is a common hierarchical protocol for avoiding and minimizing impacts associated with individual development proposals and actions[26]. Mitigation sequencing requires all proposed uses and developments to: 1) avoid adverse impacts, 2) include measures to minimize impacts, and 3) compensate for any impacts that cannot be avoided or minimized. The SMP (Section 8.3) specifies that the Administrator shall require compensatory mitigation for development proposals that:

- Do not fully conform to one or more of the dimensional requirements, performance standards, and/or design criteria in the SMP; or

- Result in measureable damage, loss and/or displacement of a wetland, aquatic habitat conservation area, wildlife habitat conversation area, flood storage or conveyance area, or critical aquifer recharge area; or

- Result in measureable damage, loss and/or displacement of 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

In instances where impacts to ecological functions have the potential to occur all reasonable efforts must be taken to avoid, and where unavoidable, minimize and mitigate impacts such that no net loss of shoreline ecological functions is achieved.

In mitigation sequencing, possible adverse impacts are avoided altogether by not taking a certain action or parts of an action, or by moving the action. For example, a development project adjacent to a wetland would be required to avoid construction activities that could directly impact (vegetation removal or draining) or indirectly impact (increased sedimentation or runoff) the wetland habitat.

When adverse impacts to ecological functions are unavoidable, the magnitude or severity of the impact resulting from an activity must be minimized. This may include reducing or eliminating

[26] Per WAC 173-26-201(2)(e)

certain elements of a development proposal (e.g., fewer lots within a subdivision), scaling back the size or scope of a development proposal (e.g., building a smaller residential structure, re-aligning a road to avoid damaging valuable habitats), implementing design alternatives or strategies that require less in-water work, or are timed to avoid impacting sensitive species (e.g., "fish / salmon work windows"), and a variety of other measures. In most cases, development proponents develop plans and implement mitigation sequencing consistent with the SMP and other land use standards, and by considering ways to avoid, minimize, and rectify impacts based on the specific parcel characteristics, the functional needs of the development, and other factors. County planning staff support this effort by interpreting the County's adopted standards, and reviewing proposals (applications and plans) to ensure that minimum requirements are achieved.

When avoiding or minimizing impacts is unfeasible, the development proponent must provide compensation for the impact. This may include includes replacing damaged resources (e.g., re-establishing or enhancing a wetland), reseeding or replanting impacted areas, restoring water quality and quantity, or otherwise improving the ecological functions such that there is no net loss *for that development proposal*. Mitigation sites must be monitored and maintained until they achieve the desired functions and fully compensate for the impacts.

7.2 Shoreline Environment Designations (SEDs)

The SMP proposes six shoreline environment designations (SEDs) that reflect the ecological conditions of the shoreline ecology and are consistent with the Shoreline Guidelines (WAC 173-26-211) (Table 7-1). The designations recognize that there are a range of ecological conditions along the shoreline. Areas that are the least altered and have the highest integrity with respect to existing functions are designated Natural. Areas that are very minimally altered with high ecological integrity (including areas that have no structures or modifications, but that are designated and are used for timber production or other resources) have a Conservancy designation: either Resource Conservancy if they are designated resource lands, or Shoreline Residential – Conservancy if they are rural residential lands. Areas that are more noticeably altered and have diminished functional integrity are designated Shoreline Residential – Intensive (if they are supported primarily residential uses) or Marine Waterfront (if they are supporting water-related recreational uses).

The shoreline environment designations were developed by the County over a 15-month period between 2011 and 2013. Feedback from an Advisory Committee and from the general public was taken into account in developing and assigning the proposed designations. Table 7-1 summarizes the six SED's assigned to County shorelines (see Chapter 2 of the SMP for a complete description and SED maps in Exhibit A of the SMP).

Table 7-1. Proposed Shoreline Environment Designations for Clallam County

Designation	Application	Defining Characteristics	Example Locations
Natural	Applied to lands that are not zoned for Commercial Forestry and are considered generally undevelopable because of ecological characteristics or hazardous conditions.	• Densely forested riparian or floodplain habitat; • Largely free of development and modification; existing residential development is scattered at low densities; • Mostly undeveloped and unaltered estuarine wetland or marine spit habitat; • Mostly encumbered by erosion or landslide hazards, including areas of feeder bluff and channel migration;	North end of Miller Peninsula; Gibson and Travis spits, at the north end of Sequim Bay; Areas being actively restored on the lower Dungeness River; Lower Elwha River; and Salt Creek estuary.
Resource Conservancy	Applied to lands managed primarily for timber production, habitat conservation, wilderness or outdoor recreational use.	• Dispersed, scattered or relatively isolated residential or recreational developments; • High percentages of closed-canopy forest and minimal constrains to overbank flood or channel migration. Forest fragmentation or conversion of forest cover to other land cover types is minimal	Upper Dungeness River and tributaries; Most of the western County freshwater shorelines, including the Twin Rivers, the majority of the Pysht River, and the mid- to upper- Hoko River and tributaries; Most of the western County marine shoreline, including the area between Low Point and Clallam Bay and the shoreline along Highway 112 west of Clallam Bay; Dickey River; North Fork Calawah River; Umbrella Creek; Trout Creek; Mid- to Lower reaches of Big River; Crooked Creek; Sol Duc River near Forks urban growth area.

Designation	Application	Defining Characteristics	Example Locations
Shoreline Residential – Conservancy	Applied to rural shorelines and unincorporated urban growth area shorelines. These shorelines support a mixture of existing residential uses, including some platted lands with moderate potential for future development.	• Minimal shoreline modifications; • Partially encumbered by landslide, flooding or channel migration hazards but with sufficient developable area outside of hazard zones to support rural residential uses; • Less intensively developed compared to Shoreline Residential – Intensity; • Properties zoned Commercial Forest that are adjacent to non-commercial forest zoned parcels which meet criteria above; • Public lands providing moderate levels of shoreline access that are adjacent to parcels which meet criteria above.	Sequim Bay; Agricultural and low-density residential areas along the Dungeness River; Dungeness bluffs; Freshwater Bay; Lower Clallam and Hoko Rivers; East bank of the Bogachiel River, south of Forks; Upper reaches of Big River; Sol Duc River upstream and downstream of Forks urban growth area
Shoreline Residential – Intensive	Applied to shorelines that have moderate- to high-density shoreline residential use, including urban growth areas and areas designated as limited areas of more intensive rural development.	Moderately to mostly developed with existing residential use occurring on relatively small rural residential lots, or with recreational and transportation uses; Native forest cover has been cleared or highly fragmented with areas of minimal native riparian vegetation; Shoreline is armored with structural armoring because of exposure to strong wind and wave action.	Diamond Point; Dungeness Meadows subdivision along the Dungeness River; 3 Crabs Road vicinity; 4 Seasons Ranch vicinity along Morse Creek; Bullman Beach; Lower Elk Creek, within the Forks Urban Growth Area; South and east shoreline of Lake Pleasant; South bank of Bogachiel River, across from Bogachiel State Park

Designation	Application	Defining Characteristics	Example Locations
Marine Waterfront	Applied to shorelines: 1) within or bordering urban growth areas; or 2) characterized as moderately to mostly developed with existing intensive, water-oriented commercial or recreational uses or transportation uses.	Native forest cover has been cleared or is highly fragmented with minimal native riparian vegetation; Shoreline is modified with overwater and in-water structures supporting water-oriented uses; or Shoreline is armored with structural armoring.	Marlyn Nelson County Park (Port Williams); Western Clallam Bay shoreline (Sekiu)
Aquatic	Applied to all shoreline waters waterward of the ordinary high water mark together with their underlying lands and their water column.		All SMA streams, lakes and marine waters extending out to the state boundary (three nautical-mile limit). The waters of the Pacific Ocean below the ordinary high water mark.

Table 7-2 shows the percent of "shorelands" associated with each SED. Shorelands include those areas landward of the freshwater and marine reaches subject to the Clallam County SMP that include within 200 feet of the ordinary high water mark (OHWM) and floodway, 100-year floodplain, and associated wetlands. The general location and extent of SED's is shown on the maps contained in Exhibit A of the Draft SMP. Shorelands with the Olympic National Park, Tribal Reservation/Trust lands, and the cities of Sequim and Port Angeles are not included.

Table 7-2. Percent of Shorelands Associated with Each Proposed Shoreline Environment Designation

Designation	Acres	Percent Coverage (Approximate)
Natural	3,594	8%
Resource Conservancy	28,332	65%
Shoreline Residential – Conservancy	10,156	23%
Shoreline Residential – Intensive	1,226	3%
Marine Waterfront	91	1%

Clallam County also contains hundreds of miles of river, lake and Pacific Ocean coastline that are not subject to the SMP due to their location within Olympic National Park (ONP). These

shorelines represent largely intact natural systems that are protected with either none or minimal human alteration. A number of major river systems subject to the Clallam

Many County SMP rivers and streams originate in Olympic National Park including the Dungeness River, Gray Wolf River, Morse Creek, Little River, Elwha River, Sol Duc River, Bogachiel River, and Quillayute River. Under the County SMP, retention and restoration of ecological functions along these river shorelines is a goal as they leave the ONP and flow towards the Pacific Ocean or Strait of Juan de Fuca. Protection and restoration of ecological functions of these reaches is a high priority and most of the shoreline jurisdiction is designated as Natural, Resource Conservancy, or Shoreline Residential--Conservancy (see Table 7-2). For example, the Elwha River shoreline downstream of US 101 bridge that is part of the Elwha River Restoration Project is designated as Natural as well as the lower Dungeness River corridor where ongoing restoration efforts are occurring to restore habitat and floodplain connectivity. The SMP will help to ensure protection of existing ecological function and restore and enhance hydrologic and fish/wildlife, recreational corridors that don't stop at the ONP boundary.

For each designation, the SMP identifies:

- Permitted uses and developments – These are uses and developments that are consistent with the SMA such as residential development and water-dependent development. Such uses/developments require a shoreline substantial development permit, a shoreline conditional use permit, a shoreline variance, and/or a statement that the use/development is exempt from a shoreline substantial development permit.

- Prohibited uses and developments – These are uses and developments that are inconsistent with the SMA and which cannot be allowed through any permit or variance.

- Minimum shoreline habitat buffers and safety buffers – Vegetative buffers and safety buffers are established for each shoreline environment designation, with the exception of the Aquatic designation. Buffers are intended to protect shoreline ecological functions while supporting other priority uses of the shoreline.

The ecological condition and sensitivity of the land and water were considered when determining the appropriate uses to allow for each designation. As a result, the type and intensity of uses allowed in areas designated Natural, Shoreline Residential – Conservancy and Resource Conservancy are tightly controlled since these areas are the most sensitive to future development and the most vital to protect. Conversely, a broader range of uses are allowed in Marine Waterfront and Shoreline Residential – Intensive since the ecological functions are less sensitive or have already been altered by past development. Existing and planned development patterns were considered as well to ensure the designations are compatible with existing and future land uses.

There are several land uses and development activities that are prohibited in all designations due to their potential to have a substantial impact to shoreline ecological functions or public health and safety. For example, floating homes and overwater residences are prohibited in all designations. This avoids the immediate and long term impacts associated with overwater shading, substrate modifications, and degradation of water quality.

Parking as a primary (or stand-alone) use is also prohibited in all designations. Parking is not a preferred or water-related use and can unnecessarily impact on shoreline habitat (displacement and fragmentation), water quality (runoff from pollution-generating impervious surface) and hydrology (reduced infiltration) functions. Parking associated with another allowed use (such as a parking lot associated with a marina in Clallam Bay) is allowed as long as the buffer, clearing and grading and other SMP requirements are met.

Conditional uses are activities that can be allowed in specific instances as long as they do not result in an overall degradation of the quality or health of the shoreline environment. These uses warrant a high level of scrutiny due to variations in their scope, scale, location, and their potential for impacts to shoreline ecological functions, public health, and safety.

7.2.1 Comparison of Current and Proposed SEDs

There are five SEDs in the County's existing SMP (adopted in 1976), which are Natural, Conservancy, Rural, Suburban, and Urban. Table 7-3 describes the purpose of each of the designations as outlined in the 1976 SMP, and the criteria by which the designations were applied.

Table 7-3. Existing SED Designations (1976 SMP)

Designation	Objective/ Purpose	Designation Criteria
Natural	To preserve, maintain or restore such a shoreline as a natural resource relatively free of human influence; to discourage or prohibit those activities which might destroy or degrade the natural characteristics which make these shorelines unique and valuable.	The "Natural" designation is distinguished by one or more of the following criteria: 1) The presence of some unique or cultural features considered valuable because of its natural or original condition. 2) A shoreline which is relatively intolerant of intensive human use. 3) A shoreline which is valuable for historical, cultural, scientific or educational considerations by virtue of its natural, unaltered original condition. 4) A shoreline which should be maintained or restored in its original condition for the benefit and pleasure of future generation. 5) A shoreline which, based on local citizen opinion, and the needs of the people of the rest of the state, should be preserved in its original condition.

Designation	Objective/ Purpose	Designation Criteria
Conservancy	To accommodate uses which are non-consumptive of the physical and biological resources of the area, and activities and uses of a non-permanent nature which do not substantially degrade the existing character of the areas.	The "Conservancy" designation is designed to protect, conserve and manage existing resources and valuable historic areas to ensure a continuous flow of recreational benefits to the public and to achieve a sustained resource utilization. This environment includes shorelines with steep slopes presenting erosion and slide hazards, areas prone to flooding, and areas which cannot provide adequate water supply or sewage waste disposal.
Rural	To protect agricultural shorelines from urban expansion, function as a buffer between urban expansion, function as a buffer between urban areas, and restrict intensive development along shorelines presently in an undeveloped state.	The "Rural" designation applies to shorelines that are presently marked by intensive agricultural or recreational use, or which has the potential of becoming prime farm land.
Suburban	To recognize the desirability of shoreline areas for residential use and protect such areas from intensive urban and industrial development.	The "Suburban" designation is defined as an area of moderate density residential use and recreational-residential use, consisting primarily of single family permanent or recreational residences. Also included in the Suburban designation are those shoreline areas where water supplies and/or sewage disposal methods may be adequate for moderate density residential uses, but inadequate for intense commercial or industrial uses. Such areas are generally topographically unsuited for agricultural uses; topographically, climatologically, or botanically unsuited for sustained yield forest management; historically residential; and are not presently or potentially "natural" areas.
Urban	To ensure optimum utilization of shorelines occurring within urbanized areas by providing for intensive public use and by managing development so that it enhances and maintains the shorelines for a multiplicity of urban uses	The "Urban" designation is defined as an area of high intensity land use, including residential, commercial, and industrial development. This environment does not necessarily include all shorelines within an incorporated city, but it is partially suitable to those areas which are presently subjected to intensive use pressure, as well as those areas planned to accommodate urban expansion.

In general, areas that are currently designated as Natural (such as Dungeness Spit and the lower Elwha River) are also designated as Natural under the proposed SMP, with the exception of shorelands zoned and managed as commercial forests (which are proposed to be designated as Resource Conservancy). Areas currently designated as Conservancy (such as upper Morse Creek and Deep Creek) are generally proposed to be designated as Resource Conservancy or Shoreline Residential-Conservancy, depending upon the underlying zoning and current land uses.

Areas currently designated as Rural (such as Freshwater Bay and the Dungeness River) are generally proposed to be designated as Shoreline Residential-Conservancy except in areas where smaller-lot development is prevalent (such as Diamond Point); these areas are proposed to be designated as Shoreline Residential-Intensive. Areas generally designated as Suburban are (such as Lake Sutherland) are generally proposed to be designated as Shoreline Residential-Intensive. Areas currently designated as Urban are generally proposed to be designated as Shoreline Residential-Intensive as well, with the exception of the Clallam Bay-Sekiu marine waterfront (which is proposed to be designated as Marine Waterfront).

7.3 Shoreline Buffers and Vegetation Conservation

In addition to limiting the types of uses allowed, each shoreline environment designation has corresponding shoreline habitat buffers and safety buffers (Table 7-4). The intent of establishing shoreline habitat buffers and safety buffers for each designation is to ensure that structures in the shoreline area are placed a suitable distance from the ordinary high water mark to protect existing ecological functions and maintain public safety. Buffers also provide physical separation from marine waters or freshwater and proposed development, which reduces need for shoreline stabilization and helps retain riparian vegetation.

Table 7-4. Summary of Shoreline Buffer Requirements (See SMP Section 6.3, Table 6-1 and 6-2)

	Marine Waterfront	Shoreline Residential – Intensive	Shoreline Residential – Conservancy	Resource Conservancy	Natural
Standard Buffer (measured from the ordinary high water mark)					
Minor New Development[1] *(Buffer varies depending on lot depth)*	50-75 feet	50-75 feet	100-125 feet	150 feet	175 feet
Major New Development[2] and Land Divisions	100 feet	100 feet	150 feet	150 feet	175 feet
Additional Buffer for Safety					
Freshwater Shorelines *(Applies to areas located in mapped*	N/A	Landslide Hazard Area: 50 feet Channel Migration Zone: *Based upon stream- or site-specific assessment*			

	Marine Waterfront	Shoreline Residential – Intensive	Shoreline Residential – Conservancy	Resource Conservancy	Natural
channel migration zones. *Buffers measured from the outer edge of the standard buffer.)*					
Marine Shorelines *(Buffer measured from the top of the bluff- varies based on the type of bluff.)*	Feeder Bluff Exceptional: 150 feet Feed Bluff or Feeder Bluff Talus: 100 feet Other Landslide Hazard Area: 50 feet				
Shoreline-specific Buffer					
Lake Sutherland	New development must be at least 35 feet landward of the OHWM.				

[1]Minor new development applies to single-family development or low intensity, water-dependent recreational use on existing lots of record. To be considered minor new development, the proposal must be below certain thresholds for clearing, impervious surface and structural footprint areas.

[2]Major new development applies to any development that does not qualify as minor new development.

To ensure that the buffers protect the full range of shoreline habitat, water quality and hydrologic functions, buffers must be maintained in a predominantly well vegetated and undisturbed condition. The SMP defines this to mean an average density of at least 150 woody stems per acre or 55 percent areal cover of woody vegetation. The vegetated areas must comprise at least 80 percent of the buffer area. The remaining 20 percent, or at least fifteen linear feet of the water frontage, whichever is greater, may be retained as an 'active use' area (meaning its primary purpose is for the enjoyment and use of the property owners not protection of the habitat or hazard area).

To minimize conflicts between vegetation conservation and the desire to have expansive shorelinebs, the SMP states that development proposals that involve extensive vegetation removal to create views or expansive lawns should not be allowed and that property owners should not assume that an unobstructed view of the water is guaranteed.

The SMP allows limited and selective tree removal, pruning, and/or limbing in the buffer to create a view of the shoreline, as long as the buffer condition following selective clearing conforms to the stem density and/or percent cover targets defined in the SMP. The Administrator may approve a greater area or amount of clearing if the development proponent provides a view clearance plan prepared by a qualified ecologist, forester, arborist, or landscape architect. The view clearance plan must identify and describe the location and extent of the proposed tree removal, pruning, or limbing.

For properties within designated landslide or erosion hazard areas, the view clearance plan must be prepared by an engineering geologist or geotechnical engineer to ensure that the proposed

removal, pruning, and/or limbing will not cause or exacerbate hazards associated with soil or slope instability.

Because the same buffers will apply to a wide variety of parcel conditions and land configurations (even within the same shoreline designation), the SMP allows some flexibility in administering the buffer requirements. There are a limited set of circumstances under which the County can allow buffer modifications without requiring a shoreline variance or additional compensatory mitigation. The flexibility is available only when: 1) that the amount and extent of buffer modification is the minimum necessary to accommodate the allowed use; and 2) the modification is located within pre-existing disturbed areas with low habitat value (meaning areas that have been cleared or altered, areas dominated by invasive species, areas that do not support priority habitats or species, etc.) or within the allowed active use area; and 3) will not impact geologically hazardous areas.

One type of flexibility is buffer averaging. Shoreline buffers may be averaged provided the total area of buffer remains the same and the buffer meets the stem density or percent cover targets described above. If the existing vegetation conditions do not meet the stem density or percent cover targets, then the buffer would need to be enhanced though planting. To minimize impacts on shoreline functions, the SMP limits the extent of the buffer than can be reduced through averaging to 40 percent of the buffer length along the shore frontage and the width of the buffer can only be reduced by up to 25 percent. Even with some allowance for averaging, the remaining buffers are sufficiently wide to protect the habitat functions of the adjacent shorelines. (the smallest minimum buffer through averaging ranges from 25 to 131 feet).

Shoreline safety buffers may also be averaged. Standards differ for marine and freshwater shorelines:

- Marine shorelines – the total area of buffer must remain the same and the buffer must meet the required stem density or percent cover targets. If the existing vegetation conditions do not meet the stem density or percent cover targets, then the buffer would need to be enhanced accordingly. The applicant must submit a geotechnical report and a geologist's estimate of when the residence would be undermined. The reduced portion of the buffer is limited to 40 percent of the buffer length along the shore frontage. The width of the buffer can be reduced for single-family residence equivalent to the estimated annual rate of erosion times 75 plus allowance for bank recession equal to the largest documented landslide in the vicinity. In no instances can the safety buffer be reduced to less than 50 feet.

- Freshwater shorelines – the same requirements for averaging safety buffers along marine shorelines apply to freshwater shorelines except that instead of a geotechnical report and geologist's estimate of when the residence would be undermined, documentation is required showing that the parcel is protected from channel movement or the risk of channel migration during the next 100 years is minimal. Estimating annual rates of erosion is not required for freshwater shorelines.

The common-line setback is another type of buffer flexibility. With the common-line setback, new residences on vacant lots with legally established residences on both sides may be set back

from the ordinary high water mark to a common line drawn between the nearest corners of the adjacent residences (instead of following the standard habitat buffer requirement). A similar allowance is provided when a legally established residence is only present on one side of the proposed site. Parcels located in mapped channel migration zones, or in landslide or erosion hazard areas are not eligible for the common line buffer. This option cannot be used to deviate from wetland or non-SMA stream buffers.

Certain modifications may be made within shoreline buffers as long as they conform to the dimensions and design specifications prescribed in the SMP (Table 7-5). The specifications are intended to limit the size and scale of these features and ensure they are located and constructed in the least environmentally damaging ways.

- View corridors;
- Private pathways;
- Hazard tree removal;
- Invasive species management;
- Boat launches, docks, piers and floats accessory to an approved single-family residential development;
- Boathouses accessory to an approved recreational development;
- Public trails and public access improvements; and
- Utilities and essential public facilities that are water-dependent or water-related.

Table 7-5.Summary of Modifications allowed in Shoreline Buffers (See SMP Chapter 6)

Allowed Modification	Rationale for Allowance	Summary of Potential Impacts
Clearing for view corridors (not more than 20% of the buffer)	It reasonable to provide property owners an allowance for views. By specifying a reasonable threshold, the goal is to promote compliance and minimize unauthorized view clearing.	See Chapter 5 of this document for detailed discussion
Private pathways	It is reasonable to provide property owners a way to access the water. Providing some accommodate promotes compliance and unauthorized trail constriction.	Pathways must be located within the active use area and cannot exceed 6 feet in width and be made of pervious material. These specifications limit impacts to a minimal level.
Hazard tree removal	Hazard tree removals are typically isolated or infrequent instances that are triggered by	SMP contains requirements to document presence of the hazard to prevent abuse of the allowance

Allowed Modification	Rationale for Allowance	Summary of Potential Impacts
	human safety concerns. Not a source of widespread impact.	
Invasive species management	Removing invasive species enhances shoreline conditions.	This activity is generally beneficial. The SNP requires large removal projects (> 0.25 acre) to include a vegetation management plan.
Boat launches, docks, piers and floats accessory to an approved single-family residential development;	Shoreline Guidelines consider docks associated with a single-family development to be a water—dependent use and is designed to minimize impacts.	The SMP requires docks to be designed and constructed to avoid and minimize shading and other impacts on nearshore habitats and processes. Docks also must be spaced and oriented to minimize hazards and obstructions and designed to avoid the need for maintenance dredging. See Chapter 5 of this document for additional details.
Public trails and public access improvements; and	Public access is a primary policy goal of the SMA so some accommodation for public access is appropriate.	Depending on site conditions, siting some or all of a portion of a public access trail in the buffer can occur without causing significant impact and the impacts are offset by the benefits provided.
Utilities and essential public facilities that are water-dependent or water-related	By definition, water-dependent and water-related facilities must be located near the water. With some utilities and other types of essential public infrastructure it is impossible to avoid crossing or encouraging on shoreline buffers without creating substantial economic or logistical obstacles	Depending on site conditions, siting some or all of a portion of a utility in the buffer can occur without causing significant impact and the impacts are offset by the benefits provided.

Pedestrian beach access structures accessory to an approved single-family residential development are allowed to be located within the shoreline buffer (without a variance), but they require compensatory mitigation if they are shown to cause adverse impacts. To minimize the potential for impacts, individual beach access structures are prohibited in new subdivisions (only shared access structures are allowed). Structures must be located in the least environmentally damaging location on a given site, be designed to minimize the amount of clearing/grading, and must not destabilize slopes. Access structures are prohibited in areas mapped as Feeder Bluff or Exceptional Feeder Bluff. No structure is allowed on any type of shoreline if it is likely to require structural shoreline stabilization in the foreseeable future.

Other water-dependent and water-related uses are allowed within the buffer if they provide compensatory mitigation. These types of uses are not required to fully avoid impacts (because by definition they need to be located close to the water) so the first step of the mitigation sequence is not applicable. They are still required to minimize impacts but unlike the modifications listed above, they are reasonably likely result in more than minimal impacts. As a result, compensatory mitigation is required so that the individual actions do not cause a net loss of functions.

7.4 Critical Areas

Critical area protections must be included in the SMP as required by RCW 36.70A.480. SMPs are required to incorporate protections for critical areas that assure no net loss of shoreline ecological functions necessary to sustain shoreline natural resources. Regulations for wetlands, aquatic habitat conservation area, wildlife habitat conservation areas, geologically hazardous areas, frequently flooded areas and critical aquifer recharge areas that occur within shoreline jurisdiction are established in Chapter 7 of the SMP. These buffers vary from (and are generally more protective than) the critical areas buffers that are applied outside of shoreline jurisdiction, and were developed consistent with review of existing shoreline conditions, associated functions, and protections needed to meet no net loss of shoreline ecological functions (ESA, 2012; Parks, 2015).

Critical area buffers are required to protect critical areas such as wetlands, aquatic habitat conservation areas and landslide hazard areas. Critical area buffers are shown in Table 7-6.

Table 7-6. Summary of buffer requirements for wetlands, aquatic habitat conservation areas and landslide hazard areas (see Chapter 7 of the SMP)

Critical Area		Standard Buffer
Wetlands *(Buffer varies depending upon level of habitat function and adjacent land use intensity)*	Class I	300-50 feet
	Class II	300-50 feet
	Class III	150-40 feet
	Class IV	50-25 feet
Aquatic Habitat Conservation Area	Type F Waters	100 feet
	Type Np Waters	80 feet
	Type Ns Waters	50 feet

Critical Area	Standard Buffer
Geologically Hazardous Areas	Development on marine bluffs mapped as unstable slope, unstable slope-recent slide, unstable slope-old slide, feeder bluff or exceptional feeder bluff and development in channel migration zones must conform to shoreline safety buffer requirements. All other landslide hazard areas must maintain a 50-foot buffer from the top, toe and edge.

Buffers are generally required to be left undisturbed but there are some exceptions that allow for buffer alterations:

Buffer averaging is allowed for wetlands, aquatic habitat conservation areas and landslide hazard areas provided the total area of buffer remains the same, the buffer meets certain vegetation density and cover targets, and a specified minimum width is maintained for the reduced portion of the buffer.

Buffer reduction is allowed on sites lacking well-vegetated buffers for wetlands and aquatic habitat conservation areas provided the reduced buffer is planted and enhanced to meet certain vegetation density or cover targets, a specified minimum width is maintained, and the reduced portion does not exceed a specified length of the buffer.

The County also designates wildlife habitat conservation areas, frequently flooded areas and critical aquifer recharge areas and establishes standards and use limitations to conserve and protect underground waters and aquifers and minimize flood losses. Standards and limits on certain uses for these critical areas are described in Table 7-7 below.

Table 7-7. Summary of Requirements for wildlife habitat conservation areas, frequently flooded areas and critical aquifer recharge areas

Critical Area	Standards and Use Limitations
Class I and II Wildlife Habitat Conservation Areas	New uses and developments on or adjacent to sites with known locations of Class I wildlife species must submit a habitat management plan (HMP). Buffers set forth by other critical area standards are considered to be the minimum to protect Class I Wildlife species, except when a HMP sets forth additional measures. Major new development in Class II wildlife habitat conservation areas may have to submit a HMP. This requirement is to be determined during the SEPA threshold determination on the project or by the Administrator.

Critical Area	Standards and Use Limitations
Frequently Flooded Areas	Critical facilities are prohibited within areas designated as frequently flooded. New land divisions containing frequently flooded areas must be consistent with the requirement to minimize flood damage; must have utilities and common facilities located and constructed to minimize flood damage; must have adequate drainage provided to reduce exposure to flood damage; and where base flood elevation data is not provided or available, it must be generated for development proposals that contain at least 50 lots or 5 acres (whichever is less). All such new land divisions must also show building sites located outside of the 100-year floodplain for all created legal lots. Land disturbing activities are prohibited within floodways unless a civil engineer demonstrates that such activities would not result in more than a one-foot increase in flood levels during a base flood discharge. Cumulative effect of existing and anticipated development should be considered. Repairs, reconstruction or structure improvements of residential structures which do not increase the ground floor area or do not exceed 50% of the market value of the structure are allowed in floodways. Residential, commercial and industrial buildings are prohibited in special flood hazard areas unless placed on lots of land platted by a final plat approved and recorded prior to December 10, 1980 for the Dungeness and Elwha Rivers and the effective date [insert date] for all other special flood hazard areas. If a portion of an existing lot lies outside the flood hazard area, building must be directed to the nonhazard portion to the maximum extent feasible.
Critical Aquifer Recharge Areas	Facilities with storage tanks or vaults used for storing chemicals, biological hazards, dangerous wastes, or solids or liquids identified as a risk to groundwater quality must be designed so as to prevent releases to the ground, groundwaters, or surface waters; use material in the storage containment area which is compatible with stored substance; provide for release detection; provide written response and spill notification procedures to the local fire district; and be contained in an impervious containment area equal to the volume of the tank to avoid overflow. The use of fertilizers, herbicides, pesticides or other chemicals for vegetation management must adhere to best management practices to prevent impacts to water quality and water supply. A mitigation plan must be prepared when application of such chemicals covers five or more acres.

Critical area buffers are intended to protect aquatic habitats and priority species as well as protect water quality. Protection and restoration of wetland and stream buffers is important for improvement of water quality and maintenance of cool water for salmon recovery. Protection of existing native vegetation and enhancement of degraded riparian areas is a key component in protecting water quality and improving in-stream habitat for listed salmon to support salmon recovery.

7.4.1 Channel Migration Zones (CMZs)

In addition to shoreline safety buffers and shoreline-specific buffers that under certain circumstances require development to be located outside of channel migration zones as described above, the Clallam County SMP establishes the following standards to address potential risks to life and property and impacts to ecological functions and processes:

- If County maps indicate that a potential CMZ exists on or adjacent to a proposed use of development site, applications shall either locate the proposal landward of the mapped CMZ, or a submit a CMZ study that demonstrates that the proposed use or development site has minimal risk of channel migration during the next 100 years.

- Flood control structures must be placed landward of CMZs except when the primary purpose of such structures is to improve ecological functions.

- Revetments are prohibited in CMZs.

Limiting development within channel migration zones maintains riverine processes and provides long-term protection for instream habitat functions.

7.5 Clearing and Grading and Protection of Water Quality

Clearing and grading standards are established in Section 5.2 of the SMP. These standards work in concert with the water quality standards in SMP Section 5.4 to prevent impact caused by stormwater runoff. Clearing and grading must be located, designed and carried out to minimize land disturbance to the minimum necessary for the intended development. Best management practices must be used to minimize erosion and exposed areas must be revegetated or stabilized. Net shore-drift toward sensitive marine environments (e.g., spits, estuaries, river deltas) must not be impeded. Proposals for fill must submit a description of proposed means to control surface runoff and a temporary erosion and sediment control (TESC) plan.

Best management practices which serve to prevent or reduce the movement of sediments, nutrients, or other pollutants from the land to surface or ground water; or to otherwise protect water quality from potential adverse effects serve to protect critical areas and reduce erosive potential from near or adjacent projects. For example, silt fences placed between the grading and clearing activity and a critical area help capture and store water and sediment runoff that would otherwise have entered the critical area. The clearing and grading standards will result in minimal impacts to soils, water quality, and native vegetation

The SMP requires all shoreline uses and developments shall use effective temporary erosion and sediment control methods during project construction. Project proponents must submit a TESC plan for County review and approval prior if they meet any of the following criteria:

- Disturb seven thousand (7,000) square feet or more of land;
- Result in slopes over twenty-five percent (25%) and greater than five (5) feet in height;
- Impound water exceeding a volume of one (1) acre-foot;
- Divert existing drainage courses; or
- Involve clearing and grading in an erosion hazard area or on slopes steeper than twenty-five percent (25%).

Developments that disturb less than one (1) acre and do not meet any other of the above criteria are exempt from the TESC requirements if they can demonstrate to the Administrator that no significant increase in offsite runoff will be produced.

The SMP also required that shoreline development proposal take specific actions to protect water quality as follows. These are first-of-their kind water quality standards for Clallam County which should contribute to noticeable improvements in water quality conditions compared to existing conditions:

- Residential development with up to two thousand (2,000) square feet of new or replaced impervious surface - All new, replaced, and disturbed topsoil must be amended with organic matter, roof runoff must be routed to a drywell or, if a dry well is not appropriate for site conditions, runoff must be dispersed to a vegetated area, a rain garden or bioswale, an infiltration system or permeable pavement. Project proponents must submit a one page drainage plan showing how stormwater runoff will be controlled and design standards implemented.
- Single-family residential development with more than 2,000 SF of new or replaced impervious surface, other residential development which disturbs more than seven thousand (7,000) square feet of land or generates two thousand (2,000) to five thousand (5,000) square feet of impervious surface, and all commercial development smaller than five thousand (5,000) square feet in size that do not use hazardous substances - All new developments shall provide for on-site stormwater management according to the Clallam County Small Project Drainage Manual, or equivalent best management practices and stormwater standards. In addition to other requirements, all new, replaced, and disturbed topsoil must be amended with organic matter.
- All industrial development; commercial and residential development which generates more new or replaced impervious surface than is allowed in Tier 2, converts three-quarters acre or more of native vegetation to lawn or landscaped areas, or converts 2.5 acres or more of native vegetation to pasture; and all commercial projects that use hazardous substances – must provide a stormwater management site plan prepared by a licensed engineer must be prepared in accordance with the Ecology Stormwater Management Manual for Western Washington, as adopted by the County. In addition to other requirements, all new, replaced, and disturbed topsoil must be amended with organic matter.

7.6 Shoreline Stabilization

Regulations for shoreline stabilization are organized in 8 different categories corresponding to the type of structure: 1) existing structural shoreline armoring; 2) subdivisions and existing lots without structures; 3) new or expanded shoreline stabilization; 6) bulkheads; 7) revetments; 8) breakwaters, jetties and seawalls; and 9) application requirements. The following summarizes regulations within key categories.

Existing structural shoreline stabilization can be replaced in kind if there is a demonstrated need to protect public transportation infrastructure, essential public facilities, or primary/principle uses or structures from erosion caused by currents, tidal action, or waves.[27]. The replaced structure must perform the same stabilization function as the existing structure and must not encroach further waterward than the existing structure (unless the residence was occupied prior to 1992—in which case limited waterward encroachment may be allowed).

Subdivisions must be designed to assure that development or use of the lots will not require structural shoreline armoring in the foreseeable future. Shoreline armoring to protect a platted lot where no primary/principle use or structure presently exists is prohibited.

The SMP allows new or expanded shoreline stabilization only when necessary to support an enhancement or restoration project; to support a hazardous substance remediation project; to protect public transportation infrastructure or essential public facilities when non-structural stabilization options are infeasible; or to protect a water-oriented use or an existing, lawfully established, principal structure where a geotechnical analysis documents that the structure is in danger from shoreline erosion. All new or expanded structural shoreline stabilization must demonstrate that erosion is not being caused by upland conditions, landslides or sloughing; nonstructural measures are infeasible; the design is the least environmentally damaging alternative; unavoidable adverse impacts are mitigated according to the prescribed mitigation sequence; and the size of the stabilization measures is limited to the minimum necessary.

The shoreline stabilization regulations mirror the suggested standards in the WAC and are therefore assumed to be sufficient to prevent cumulative impacts on shoreline functions. The regulations place considerable limitations on new and expanded shoreline stabilization structures, which will substantially reduce future impacts to the marine and freshwater environments.

The outright prohibition on new structural shoreline stabilization along feeder bluff shorelines will ensure that impacts to natural erosion and sedimentation processes are avoided. Limitations and design standards for all shoreline stabilization, including provisions for replacement shoreline stabilization, ensure that where stabilization is determined necessary, impacts will be mitigated to the greatest extent feasible.

[27] Out-buildings, accessory structures and undeveloped lands are not primary/principal uses or structures

7.7 Role of the Shoreline Restoration Plan

During the SMP Update Process, the County developed a Shoreline Restoration Plans that provides recommendations for restoring the County's shorelines as well as a framework under which shoreline restoration can be successfully achieved (Clallam County, 2016). The Restoration Plan builds on and incorporates information from the County's Final Shoreline Inventory and Characterization Reports and other ongoing local and regional efforts to understand and manage the County's diverse shorelines. As required by the Shoreline Guidelines, the Restoration Plan includes the following key elements of the shoreline restoration planning process:

- Identification of degraded areas, impaired ecological functions, and sites with potential for ecological restoration.
- Identification of existing and ongoing projects and programs that are currently being implemented which are designed to contribute to local restoration goals (such as capital improvement programs [CIPs] and watershed planning efforts [WRIA habitat/recovery plans]).
- Identification of additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs.
- Establishment of overall goals and priorities for restoration of degraded areas and impaired ecological functions.
- Identification of timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals.
- Establishment of 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 (e.g., monitoring of restoration project sites).

The Restoration Plan identifies shorelines that are high priorities for restoration, shorelines that have good restoration potential, and specific actions that can be taken throughout the County to improve shoreline conditions. Examples of restoration actions identified in the plan include areas where shoreline vegetation can be enhanced through planting, areas where overwater structures can be removed or replaced with more environmentally friendly designs, areas where bulkheads could be replaced by soft shore bioengineered stabilization, culverts that can be removed/replaced to restore fish passage, and salt marsh habitats than can be restored through fill removal. As components of the plan are implemented voluntarily or as mitigation for development impacts, the County expects to see a gain in shoreline ecological functions, which will counteract some of the effects of past and expected future development to improve conditions over time.

7.8 Other Programs that Protect Shorelines

Several county, state, and federal programs and regulations work in concert with the SMP to protect shorelines and accommodate appropriate shoreline uses. In addition, there are established

non-regulatory programs that provide resources and implement restoration actions that have and will continue to enhance and protect the County's shorelines. The following regulatory and non-regulatory programs will continue to support the overall goals and policies of the County's SMP and have beneficial effects on shoreline functions and processes.

7.8.1 Clallam County Code (CCC)

Various sections of the CCC regulate development in ways that benefits the County's diverse shoreline environments. Regulations are focused on surface water management, flood damage prevention, clearing and grading activities, land use and development standards including management of environmentally critical areas, and low impact development techniques.

The County adopted its first comprehensive plan in 1967, and has made several updates to the plan to identify long-range planning goals and policies that address issues of a county-wide nature. Issues that have been identified through this process include the management of forest and mineral lands, urban growth and sprawl, transportation, economic development, affordable housing, natural, historical and cultural resources, utilities and capital facilities (CCC 31.01.300). The plan also fulfills the County's responsibilities to manage growth as mandated by the Growth Management Act (GMA).

The current Comprehensive Plan, adopted August 28, 2007, provides guidance for development within the unincorporated areas, as well as those lands held by the State. Although the County works cooperatively with the Tribes to achieve common goals, the Comprehensive Plan does not cover tribal trust lands.

CCC Title 33 establishes zoning districts in the County. These districts, which generally follow land use designations established in the Comprehensive Plan, include 6 resource and public zones, 13 rural zones, 7 urban zones, 13 commercial zones, and 2 industrial zones.

The CCC also establishes a special shellfish district to protect shellfish resources. The legal boundaries of the district include the Dungeness Watershed and those waters influenced by it through the irrigation system, and other independent tributaries to the Strait of Juan de Fuca from Bagley Creek east to and including the Sequim Bay Watershed. This encompasses the Dungeness and Graywolf rivers, the creeks of Bagley, McDonald, Matriotti, Meadowbrook, Cooper, Cassalery, Gierin, Bell, Johnson, Dean, Jimmycomelately, Chicken Coop and their tributaries.

7.8.2 City of Forks Municipal Code (FMC)

As the CCC does for unincorporated areas of the County, various sections of the FMC regulate development in ways that support protection of the Calawah River and Elk Creek shorelines; as well as these shorelines and the Bogachiel River shoreline where they occur within the Forks UGA. FMC regulations are focused on surface water management, flood hazard management, clearing and grading activities, land use and development standards including management of environmentally critical areas.

7.8.3 Water Resources Inventory Area (WRIA) Plans

Watershed planning occurs under enabling legislation passed in 1998 (Watershed Management Act, RCW 90.82). It is closely tied to planning for other water and watershed resources, including local land use planning and other federal, state, regional, and local laws, regulations, and planning initiatives. The watershed planning process provides a framework for locally based resource management. The primary goals of local watershed planning are to assess the status of water resources within each WRIA and determine how to address competing demands for water. The statute states one of its purposes is "*...to develop a more thorough and cooperative method of determining the current water situation in each water resource inventory area of the state and to provide local citizens with the maximum possible input concerning their goals and objectives for water resources management and development*" (RCW 90.82.005).

The WRIA 18 Elwha-Dungeness Watershed Plan was adopted by the Clallam County Board of Commissioners in 2005. The WRIA 18 Initiating Governments include Clallam County, the City of Port Angeles, the Elwha Klallam Tribe, the Jamestown S´Klallam Tribe, and the Agnew Irrigation District. The WRIA 17 Quilcene-Snow planning area within Clallam County includes Sequim Bay and Miller Peninsula. These areas have been incorporated into the planning area WRIA 18. A Draft WRIA 19 Lyre-Hoko Watershed Plan was issued in 2008. The WRIA 19 Initiating Governments include Clallam County, the Lower Elwha Klallam Tribe, the Makah Tribe, and the Clallam Public Utility District. Portions of WRIA 20 Sol Duc-Hoh planning area fall within Clallam County, but are not included in the current SMP update planning area.

7.8.4 State and Federal Regulations

In addition to local regulations and non-regulatory organizations and agencies, a number of state and federal agencies have regulatory jurisdiction over resources in the County's shoreline jurisdiction. As with local requirements, state and federal regulations apply throughout the County and substantially reduce the potential for cumulative impacts to shorelines. The major state and federal regulations affecting shoreline-related resources include, but are not limited to:

- Endangered Species Act (ESA): The federal ESA addresses the protection and recovery of federally listed species. Depending on the listed species, the ESA is administered by either the National Oceanic and Atmospheric Administration National Marine Fisheries Service or the United States Fish and Wildlife Service (collectively called 'the Services') Many of the County's shoreline waterbodies provide critical migration, spawning, and rearing habitat for threatened salmon species. Any project that has a 'federal nexus' (meaning it requires a federal permit, occurs on federal land or uses federal funding) must be reviewed to ensure that effects of the project will not result in a 'take' of listed species. The Services require project to implement specific conservation measures to ensure that listed species are not jeopardized.
- Clean Water Act (CWA): The federal CWA requires states to set standards for the protection of water quality. It also regulates excavation and dredging in waters of the U.S., including lakes, streams, and wetlands. Certain activities affecting shorelines, including all in-water work requires a permit from the U.S. Army Corps of Engineers (Corps) and/or Washington State Department of Ecology under Section 404 and Section 401 of the CWA, respectively. Aquaculture operations, construction of bulkheads, docks,

launching ramps, beaches, and shoreline restoration projects all have the potential to require permits under Section 404 and Section 401. The Corps and Ecology review all projects and require mitigation for adverse impacts.

- National Pollutant Discharge Elimination System (NPDES) (also under the federal Clean Water Act): Ecology regulates activities that result in wastewater discharges to surface water from industrial facilities or municipal wastewater treatment plants. NPDES permits are also required for stormwater discharges from industrial facilities and construction sites of one or more acres.
- Rivers and Harbors Act Section 10: The federal Rivers and Harbors Act requires any project that creates an obstruction or alteration in, over, or under navigable U.S. waters to obtain a permit. Permits are issued by the Corps for construction and maintenance of docks, piers, pilings, bulkheads, and certain other in-water and over-water structures. Corps standards for Section 10 approval will dictate construction techniques, materials, and size and bulk allowed for construction of docks, piers, shoreline armoring, and other in-water / over-water structures. The Corps also requires mitigation for adverse effects caused by these construction activities.
- Hydraulic Project Approval (HPA): The Washington Department of Fish and Wildlife regulates activities that use, divert, obstruct, or change the natural flow of the beds or banks of waters of the state and may affect fish habitat. Projects in the shoreline jurisdiction requiring construction below the ordinary high water mark could require an HPA. These projects would include construction of docks, bulkheads, culverts, and other in-water structures. Projects creating new impervious surface that could substantially increase stormwater runoff to waters of the state may also require approval.
- Aquatic Land Leasing: Much of the aquatic lands (tidelands) within Clallam County are publically owned and managed by DNR. A DNR authorization to use state-owned aquatic lands is required if a project will occur on or over state-owned aquatic lands.

8.0 TRACKING AND RESPOND TO CHANGES IN SHORELINE FUNCTION

The proposed policies and regulations in the SMP provide effective tools for managing future shoreline use and development in Clallam County. The Proposed SMP will have a positive influence on the size, location, design, and operation of future shoreline uses and developments, reducing the potential for impacts that those uses and developments could pose to shoreline functions. That said, rural residential use will continue to put pressure on the marine, lake and lower river shores and forestry will continue to put pressure on river shores in the upper watersheds.

Anticipating these and other future uses, the SMP contains specific regulations aimed at preventing impacts related to vegetation clearing, armoring, buffer encroachment, overwater structures, floodplain encroachment, subdivision, etc. These regulations were developed based on a detailed inventory of shoreline conditions and assessment of the shoreline ecological functions and processes. This chapter offers some initial conclusions about the potential for cumulative impacts and some recommendations for how to track and respond to development actions to ensure no net loss.

8.1 Does the SMP Fully Address Potential Cumulative Impacts?

Based on the review of the SMP policies and regulations and this Report's analysis of the areas of the County where future development is most likely to occur (i.e., Analysis Areas), the SMP will be effective in preventing cumulative impacts on habitat, hydrology and water quality functions *provided that it is effectively implemented*. This conclusion is based upon:

- Most new development will be located outside of protective buffers.
    - Most new development will not trigger riparian buffer clearing because there is ample space to locate structures outside of the buffers. Exceptions to this occur along portions of Morse Creek and the Dungeness River. Within the Morse Creek Analysis Area (primarily within the reach extending upstream from the SR 101 crossing), infill development will occur on existing parcels constrained by proposed habitat buffers. In the Dungeness River Analysis Area, the proposed SMP requires new development to occur landward of the mapped channel migration zone. There are a relatively high number of existing parcels within this zone. As development occurs in these areas, the SMP includes allowances for buffer averaging and/or reduction (including reduction of the CMZ buffer area); allowances are only available when technical analysis is provided that ensures impacts are mitigated to the highest extent feasible and that development would not create new hazards (to human property and safety).
    - The SMP provides provisions allowing limited and selective tree removal, pruning and/or limbing within the buffer to create a view of the shoreline; however, extensive vegetation removal to create views or expansive lawns is not

allowed. The SMP states that property owners should not assume that an unobstructed view of the water is guaranteed.

- Although development of existing parcels along Diamond Point will not be able to conform to the proposed buffers, this area generally lacks riparian buffer vegetation, so clearing impacts are not a serious concern. Development of existing parcels along the Dungeness Bluffs also will not be able to conform to the proposed buffers. These areas also lack riparian buffer vegetation, so clearing impacts are not a serious concern. This area is mapped as feeder bluff and there is evidence of active erosion. The SMP would require new developments within this area to have a detailed geotechnical review, which gives the County ample means to ensure that impacts are fully mitigated.

- The SMP provides reasonable assurances that there will be only a few areas that would experience forest cover loss outside of required buffer areas (fewer than 10% of the total parcels in the Analysis Areas-See Figures 5-1 – 5-4 and 5-6).

- The SMP effectively prevents cumulative impacts due to subdivision. The potential for new lot creation along the marine shoreline is relatively low and mostly confined to the areas between Morse Creek and the City of Port Angeles. Parcels along Travis Spit, Lyre River, Clallam Bay, and Sequim Bay will likely also be subdivided. On the rivers, there is potential for new lot creation along the Clallam River, Lyre River, Morse Creek Salt Creek, Bogachiel River, Calawah River (outside of the Forks city limits), and Sol Duc River. Most of these areas are designated Shoreline Residential – Conservancy, which means that the new development will generally be 125 feet or more from the ordinary high water mark. Subdivisions are considered Major New Development and the SMP requires that new lots have adequate buildable areas outside of buffers and critical areas so development on these lost will generally not result in buffer encroachment or riparian buffer clearing. These standards appear adequate to prevent cumulative impacts from new lot creation.

- The SMP effectively addresses the potential impacts of armoring along feeder bluffs, but may not fully prevent cumulative impacts of armoring on low bank marine shores. Because the lots on low bank shores are small and constrained, new developments may not be able to set back far enough to be protected from erosion. The bioengineered stabilization techniques (preferred in the SMP) may not be feasible in these areas, so additional bulkheading is expected. Other strategies may be required to offset these impacts.

8.2 Tracking and Responding to Development Actions

In order to fully ensure that the SMP achieves no net loss the County needs tools and procedures for assessing the effects of development proposals and evaluating them against the assumptions made in this analysis. To that end, a development tracking checklist was created for planning staff to use while administering the program (Appendix A). The checklist allows the County to consider the effects of development proposal on specific functions, record information pertaining to the selected indicators of function and show compliance with the SMP standards. The

checklist can serve a dual purpose as a statement of exemption form. The goal is that by using the checklist the County can monitor their decision-making and provide transparency with respect to meeting the no net loss standard.

As part of the SMP update effort, the Olympic Natural Resources Center (2012) conducted a boat survey of the streams within the City of Forks and its UGA; the survey included a series of photographs of riparian areas. To qualitatively track changes in City shoreline conditions throughout time, the photo survey could be repeated in the future, and compared to the 2012 photos.

8.3 Final Thoughts

This analysis assesses changes to shoreline conditions that may affect shoreline functions and show how that assessment has been used to shape policies and regulations in the SMP. The no net loss standard discussed here is specific to the Shoreline Management Act, as local governments are held accountable for achieving this standard through SMPs.

Development actions within the narrow ribbon of land and water under the jurisdiction of local shoreline master programs are only a subset of the actions that can affect ecological functions. There is need to better differentiate ecological changes that occur due to SMA-regulated development from those that occur due to actions outside shoreline jurisdiction. This can be a substantial challenge. It is difficult to conclusively determine cause and effect when accounting for and managing functional losses across a suite of regulatory and non-regulatory programs, including the County's SMP, integrated Critical Areas protections, and various other CCC standards, as well as regional restoration efforts and WRIA plans, and state and federal regulations.

In completing this analysis, a number of other challenges were encountered that can hopefully be addressed in future County SMP updates and re-assessment of cumulative impacts and implications for no net loss from past and future development.

- Lack of data – There is a paucity of data that can be measured systematically and repeatedly at the parcel and reach scales to inform assessment of ecological functions. Most of the data available concerning species presence and water quality conditions is spatially and/or temporally intermittent, and frequently has been collected using varied protocols. Data on shoreline modifications is lacking, especially along rivers. The ability to comprehensively tie shoreline management decisions to changes in shoreline attributes will be better feasible with additional, more comprehensive, and standardized data.

- Tradeoffs – Achieving no net loss implies tradeoffs being made between impacts and mitigation/restoration. These tradeoffs need further consideration.

- Baseline Conditions – Present conditions do not account for much of the ecological function that has been lost already.

- Climate Change – Future assessments of no net loss will need to take into account implications of climate change.

9.0 REFERENCES

Bjorn, T.C. and D.W. Reiser. 1991. Habitat Requirements of Salmonids in Streams. In Meehan, W.R., ed. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society Special Publication 19.

Booth, D.B., Hartley, D., and Jackson, R. 2002. Forest cover, impervious surface area, and the mitigation of stormwater impacts. Journal of American Water Resources Association, 38, 835-845

Clallam County. 2016. *Clallam County Draft Shoreline Restoration Plan*. Originally prepared by ESA, 2013. Updated by Clallam County Community Development Department, February 2016.

Coastal Geologic Services. 2011. Clallam County Feeder Bluff and Accretion Shoreform Mapping, Prepared for ESA.

Donnelly, R. and J. M. Marzluff. 2004. Importance of reserve size and landscape context to urban bird conservation. Conservation Biology 18: 733-745.

Dunn, P. and K. Ewing. 1997. Ecology and Conservation of the South Puget Sound Prairie Landscape. The Nature Conservancy.

EnviroVision et al. 2007. *Protecting Nearshore Habitat and Functions in Puget Sound: An Interim Guide.*

ESA. 2012. *Clallam County Shoreline Inventory and Characterization Report*. March 2012.

Hart Crowser Inc., et al. 2007. *Phase 1: Initial Estimate of Toxic Chemical Loadings to Puget Sound*. 2007, Washington State Department of Ecology: Olympia, WA.

Horner, R.R., and C.W. May. May. 2000. Watershed Urbanization and the Decline of Salmon in Puget Sound streams. Center for Urban Water Res. Management, University of Washington, Seattle, Washington.

Horner, Richard R., Derek B. Booth, Amanda Azous, and Christopher W. May. 1997. Watershed determinants of ecosystem functioning. In Effects of watershed development and management on aquatic ecosystems, L. A. Roesner, ed. New York: American Society of Civil Engineers.

Kaye JP, Groffman PM, Grimm NB, et al. 2006. A distinct urban biogeochemistry? Trends Ecol Evol 21: 192–99.

Latterell, J.J., Naiman, R.J., 2007. Sources and dynamics of large logs in a temperate floodplain river. Ecological Applications 17, 1127–1141.

May, C.W., E.B. Welch, R.R. Horner, J.R. Karr, and B.W. Mar. 1997. Quality Indices for Urbanization Effects in Puget Sound Lowland Streams. Wat. Res. Tech. Rep 154. Washington Department of Ecology, Olympia Washington.

McDade, M.H., F.J. Swanson, W.A. McKee, J.F. Franklin, and J. Van Sickle. 1990. Source Distances for Coarse Woody Debris entering Small Streams in Western Oregon and Washington. Can. J. For. Res. 20:326-330.Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of Riparian Vegetation on Aquatic Ecosystems with Particular Reference to Salmonid Fishes and Their Food Supply. USDA Forest Service General Technical Report MR-43. Contributed paper, Symposium on the Importance, Preservation and Management of the Riparian Habitat, July 9, 1977, Tucson, Arizona.

Murphy, M.L. and K.V. Koski. 1989. Input and Depletion of Woody Debris in Alaska Streams and Implications for Streamside Management. N. Am. J. Fish. Mang. 9:427-436.

Olympic Natural Resources Center (2012). City of Forks SMA Shoreline Inventory. Available at: http://www.onrc.washington.edu/MarinePrograms/SMAportal.html

Parks, D. 2015. Bluff Recession in the Elwha and Dungeness Littoral Cells, WA. Published in Environmental & Engineering Geoscience, Vol. XXI, No. 2, May 2015. Washington State Department of Natural Resources.

Point No Point Treaty Council. 2011. Riparian land cover dataset (GIS data).

Schlenger, P., A. MacLennan, E. Iverson, K. Fresh, C. Tanner, B. Lyons, S. Todd, R. Carman, D. Myers, S. Campbell, and A. Wick. In Review. 2010. Strategic Needs Assessment Report. Prepared for the Puget Sound Nearshore Ecosystem Restoration Project. Technical Report. 2010-XX.

Shaffer, A. and Ritchie, T. 2008. Nearshore function of the central Strait of Juan de Fuca for juvenile fish, including Puget Sound Chinook salmon. 41 pp.

Simenstad, C. and B. Nightingale. 2001. Executive Summary-Over-water Structures: Marine Issues, White paper, Prepared for Washington Department of Fish and Wildlife, Washington Department of Ecology, and Washington Department of Transportation, Olympia.

Van Sickle, J. and S.V. Gregory. 1990. Modeling Inputs of Large Woody Debris to Streams from Falling Trees. Can. J. For. Res. 20:1593-1601.

Wecker, M., & Gentry, R. 2012. *WRIA 20 Inventory and Characterization Report (ICR)* (Revised Draft). University of Washington Olympic Natural Resources Center.

APPENDIX A: SHORELINE CHECKLIST & STATEMENT OF EXEMPTION FORM

CLALLAM COUNTY
Department of Community Development
223 East 4th Street, Suite 5
Port Angeles Washington 98362
360-417-2420

Shoreline Checklist & Statement of Exemption Form

for Ensuring Consistency with SMP Policies and Regulations and No Net Loss Policy

Checklist Purpose

The purpose of this checklist is to demonstrate consistency with the policies and regulations of Clallam County's Shoreline Master Program. The checklist helps identify and track the implications of a shoreline use/development on the ecological functions and processes in accordance with the SMP. The checklist applies to all use/development proposals within marine and freshwater shoreline jurisdiction.

Date _____ **Permit #**_____

Landowner Information

Name:_____
Address:_____
City:_____ **State:**____ **Zip Code:**_____
Telephone:_____
E-Mail:_____

Applicant or Agent Information (if different than landowner)

Name:_____
Address:_____
City:_____ **State:**____ **Zip Code:**_____
Telephone:_____
E-Mail:_____

Project Information

Project Name:_____
Project Location/Street Address:_____
State:___ **Zip Code:**_____
Tax Parcel Number: _____
Type of Ownership: Federal____**, State**_____**, Local**_____**, Tribal**_____**, Private**_____

Type of Shoreline:

☐ Marine ☐ River ☐ Lake

Name of the adjacent waterbody:_____
Name of the shoreline reach (from Inventory and Characterization):_____
Shoreline Environment Designation:_____

What type of shoreline approval does the project require?

☐ Shoreline exemption ☐ Substantial development permit
☐ Conditional use permit ☐ Variance

Project Description

Briefly summarize the purpose of the project:

Indicate the project category/primary use (provide use category consistent with those listed in SMP Table 2-1 and / or Table 2-2; several potentially common examples: 'Residential – Single family', 'Residential – Subdivision', 'Boating facilities – Public boat launch', 'Restoration – ecological restoration', or 'Utility – Stormwater facilities'): _____

Rapid Review – Single family and other developments exempt from an SSDP

1. **Does the project exceed the thresholds of 'Minor New Development'? (Section 6.3, Regulation 2)** ☐ Yes ☐ No
2. **Is the existing shoreline buffer modified or unvegetated to an extent that it is inconsistent with the buffer condition requirements of SMP Section 6.3, Regulation 4? (less than 80% vegetated, and less than 150 woody stems per acre or 55 % areal cover of woody vegetation)** ☐ Yes ☐ No
3. **Does the project require shoreline buffer averaging? (Section 6.4, Regulation 1)** ☐ Yes ☐ No
4. **Does the project require shoreline safety buffer averaging? (Section 7.13, Regulation 4)** ☐ Yes ☐ No
5. **Will development include view clearance, shoreline access, or other modification within a standard habitat buffer or safety buffer? (Allowances under Sections 6.5 and 6.6)** ☐ Yes ☐ No
6. **Does the project include shoreline stabilization (of any kind)? (See Tables 2-1 and 2-2, Section 4.6)** ☐ Yes ☐ No
7. **Does the project include boating facilities (of any kind)? (See Tables 2-1 and 2-2, Section 4.2)** ☐ Yes ☐ No
8. **Will the project permanently impact any wetland or wetland buffers? (Sections 7.4, 7.5, and 7.6)** ☐ Yes ☐ No
9. **Marine Only - Does the project require a geotechnical report due to proposed development's proximity to on-site or adjacent landslide hazard areas, including feeder bluffs and exceptional feeder bluffs? (Sections 7.12, 7.13, and 7.14)** ☐ Yes ☐ No
10. **Freshwater Only – Will elements of the project occur within the regulatory floodplain (Sections 7.15 and 7.16)** ☐ Yes ☐ No
11. **Freshwater Only – Will elements of the project occur within a channel migration zone safety buffer such that the proposal requires documentation by an experienced geologist, engineering geologist, or professional engineer? (Section 7.14, Regulation 11)** ☐ Yes ☐ No

If the answer is 'No' to all of the above questions, there is likely minimal potential for net loss of ecological function associated with the project. In such instances, additional review included in the **'Detailed Review'** section of this Checklist may be unnecessary – please skip to the **'Summary'** section.

If any of the Rapid Review questions were answered 'Yes', please complete all of the associated 'Detailed Review' sections that follow.

Detailed Review

Complete all sections that apply based on 'Rapid Review' questions and responses. For all responses, reference specific sections in technical reports completed for the project, as needed and relevant.

1. ☐ Answered 'Yes' that project exceeds the thresholds of 'Minor New Development' (Section 6.3, Regulation 2

How much new impervious surface will be created?: _____ acres

How much new pollution generating impervious surface will be created?: _____ acres

How much forest canopy would be permanently impacted throughout shoreline jurisdiction?: _____acres

Describe approach to minimize impacts to forest canopy throughout shoreline jurisdiction (Section 6.2, Regulation 8):

_____

_____

Describe approach to treat stormwater, and detail consistency with SMP Water Quality and Water Management regulations (Section 5.4.2):

_____

_____

2. ☐ Answered 'Yes' that existing shoreline buffer modified or unvegetated to an extent that it is inconsistent with the buffer condition requirements of SMP Section 6.3, Regulation 4 (less than 80% vegetated, and less than 150 woody stems per acre or 55 % areal cover of woody vegetation).

Describe current buffer condition (forested, shrub dominated, cleared; dominant invasive species; existing structures); include percent vegetated, and density of woody stems and/or aerial coverage of woody vegetation: _____

_____

Describe any existing structures or modifications within the buffer (if any):_____

_____

Are existing structures or modifications to be utilized as part of the proposed use / development?

☐ Yes ☐ No

Describe approach to restore and/or enhance the buffer such that it meets minimum buffer condition requirements of the SMP: _____

_____

3. ☐ Answered 'Yes' that development will occur within standard habitat buffer or safety buffer areas (Rapid Review Questions 3, 4, and 5).

Development will occur within a ☐ Habitat buffer? ☐ Safety buffer? [Check all that apply]

Describe current buffer condition (forested, shrub dominated, cleared; dominant invasive species; existing structures); include percent vegetated, and density of woody stems and/or aerial coverage of woody vegetation – reference back to Detailed Review Part 2, if already completed:

_____

_____

Describe any existing structures or modifications within the buffer (if any) – reference back to Detailed Review Part 2, if already completed:_____

_____

If proposed, is buffer averaging consistent with SMP allowances? (Sections 6.5 and 6.6).
☐ Yes ☐ No

If 'Yes', document how averaging will occur as to not degrade existing buffer conditions (highlight conditions of reduced areas, proposed mitigation / restoration actions) – reference Habitat Management Plan completed for the project (for habitat buffer averaging): _____

_____

_____

If safety buffer reduction is proposed, has reduction been verified / approved by qualified professional consistent with SMP? ☐ Yes ☐ No

If 'No', see geotechnical report requirements in Section 7.14; a geotechnical evaluation and report must be completed and approved by the County before safety buffer averaging can be permitted. If 'Yes', also see 'Detailed Review' section #7.

Describe proposed project elements / alterations to occur within the buffer area: _____

_____

Describe approach to minimize buffer impacts and provide buffer restoration / enhancement areas – reference Habitat Management Plan completed for the project when appropriate:

_____

_____

4. ☐ Answered 'Yes' that development will include shoreline stabilization. (Tables 2-1 and 2-2, Section 4.6; Rapid Review Question 6)

Development will require: ☐ structural shoreline stabilization (revetment / bulkhead / riprap)?

☐ Bioengineered shoreline stabilization? [Check all that apply] ***Note: Gabions are prohibited outright.***

The proposal is for: ☐ Replacement of existing stabilization (Section 4.6.3); ☐ New or expanded shoreline stabilization (Section 4.6.5)

Note: Land divisions must be designed as to assure that development or use of the established lots will not require structural shoreline armoring in the foreseeable future (Section 4.6.4, Regulation 1)

Note: New structural shoreline armoring is prohibited on shorelines mapped as feeder bluff (Section 4.6.5, Regulation 3)

Describe current shoreline conditions (Does existing armoring occur? Is existing erosion evident?):

_____

_____

How much new shoreline armoring is proposed?: _____

Will existing armoring be removed or replaced as part of the proposal? ☐ Yes ☐ No

If 'Yes', how much (linear feet of removal / linear feet of replacement): _____

What development / use necessitates shoreline armoring?:_____

Has applicant applied for other permits for shoreline stabilization?: ☐ Yes ☐ No

REPLACEMENT SHORELINE STABLIZATION STRUCTURES: Is the proposed structure consistent with criteria of Section 4.6.3? (Including, but not limited to: the existing structure no longer adequately serves its purpose and the replacement structure would perform the same stabilization function as existing structure, with no additions or increases in size; structure is not located waterward of the OHWM of the existing structure, unless as allowed for residences occupied prior to Jan 1, 1992; structure is designed, located, sized, and constructed to minimize effects on shoreline processes and fish and wildlife habitat)
☐ Yes ☐ No

NEW OR EXPANDED SHORELINE STABILIZATION STRUCTURES (Section 4.6.5)

Document how non-structural shoreline stabilization measures have been considered, including relocating structures away from the water, enhancing vegetation, managing drainage and runoff, and other measures (Section 4.6.2, Regulation 2):_____

_____

Is the proposed shoreline stabilization consistent with the criteria for allowances for such structures under Section 4.6.5 Regulation 2? ☐ Yes ☐ No

Where structural shoreline stabilization is proposed, summarize how alternatives to structural shoreline stabilization were determined to be infeasible or insufficient; and how the stabilization design is the least environmentally damaging alternative? _____

_____

Detail how unavoidable adverse impacts are to be mitigated (consistent with the SMP prescribed mitigation sequence) such that there is no net loss of shoreline ecological functions or processes (in completing this response, detail the specific type of shoreline stabilization proposed and consistency with the regulations of 4.6.6 [bulkheads], 4.6.7 [revetments]; 4.6.8 [breakwaters, jetties and seawalls]; reference studies or other application materials prepared for the proposed shoreline stabilization):

_____

_____

5. ☐ Answered 'Yes' that development will include boating facilities (Tables 2-1 and 2-2, Section 4.2; Rabid Review Question 7)

Development includes (check the boating facility that applies)

Accessory to Residential Development: ☐ Dock, pier, float, and/or lift; ☐ Mooring buoy;

☐ Other_____ (specify)

Non-residential boating facility: ☐ Dock, pier, float, and/or lift; ☐ Mooring buoy; ☐ Public boat launch;

☐ Marina; ☐ Float plane moorage; ☐ Other_____ (specify)

Does existing overwater structure exist on the site?: _____

_____

Has applicant applied for other permits for proposed boating facility?: ☐ Yes ☐ No

If yes, summarize mitigation required for state and/or federal permits: _____

_____

Will existing overwater structures be removed or replaced as part of the proposal? ☐ Yes ☐ No

If 'Yes', how much (linear feet of removal / linear feet of replacement): _____

Is overwater structure in the proposed location a-typical to conditions / development on neighboring and/or nearby properties?: ☐ Yes ☐ No **If 'Yes', document how proposed overwater structure is necessary where it has not been needed and/or does not occur along neighboring shoreline areas:** _____

_____

Document consistency with requirements for proposed boating facility (Sections 4.2.2 [Marinas]; 4.2.3 [Boat launches] 4.2.4 [Piers, Docks, and Floats, Non-residential]; 4.2.5 [Piers, Docks, Floats, and Lifts, Accessory to Residential Development and Private Recreational Use]; 4.2.6 [Mooring buoys]); attach materials and reference here: _____

Summarize approach to minimize shoreline impacts / restore temporary impacts associated with construction and ongoing use of proposed boating facility(s):_____

_____

6. ☐ Answered 'Yes' that development will require wetland impacts. (Sections 7.4, 7.5, and 7.6; Rapid Review Question 8)

Development will require: ☐ Permanent wetland impacts; ☐ Permanent buffer impacts; ☐ Temporary wetland and/or wetland buffer impacts

Describe wetland(s) that will be impacted (category): _____

_____

Has applicant applied for other permits for wetland alteration?: ☐ Yes ☐ No

If yes, summarize mitigation required thru other permits: _____

_____

Describe how 'all reasonable measures have been taken to avoid adverse effects on wetland functions and values', as required by SMP: _____

_____

Summarize impacts and compensatory mitigation approach consistent with Sections 8.3 and 8.5; cite and reference Wetland Mitigation Plan:

_____

_____

_____

7. ☐ Marine Only - Answered 'Yes' that development requires a geotechnical report due to proposed development's proximity to on-site or adjacent landslide hazard areas, including (but not limited to) feeder bluffs and exceptional feeder bluffs? (Sections 7.12, 7.13, and 7.14; Rapid Review Question 9)

Development will occur within: ☐ Feeder bluff or exceptional feeder bluff; ☐ other landslide hazard area; ☐ Shoreline safety buffer for exceptional feeder bluff; ☐ Shoreline safety buffer for feeder bluff ☐ Shoreline safety buffer for other marine-shoreline associated landslide hazard area ☐ Critical area buffer [Check all that apply]

Describe current safety and/or critical area buffer condition (forested, shrub dominated, cleared; dominant invasive species; existing structures); include percent vegetated, and density of woody stems and/or aerial coverage of woody vegetation – reference back to Detailed Review Part 2, if already completed:

_____

_____

Describe proposed alterations within landslide hazard areas (if applicable) (detail consistency with allowances within 7.14):_____

Describe proposed alterations within landslide hazard area buffer (detail consistency with allowances within 7.13):_____

_____

Provide name of geotechnical report and qualified professional: _____

_____

Describe how proposal location, design, construction, and ongoing use and maintenance avoids impacts to the marine shoreline landslide hazard area(s) to the greatest extent feasible. Impact avoidance measures could include: reducing the number, size or scale of buildings, driveways and other features; altering the configuration or layout of the proposed development; using environmentally favorable construction materials; implementing special drainage or runoff management practices; foregoing construction of accessory structures; preserving native vegetation; and other reasonable measures:_____

_____

Would the proposed use impact natural sediment and erosion processes integral to the health and sustainability of marine nearshore ecosystems?: _____

8. ☐ **Freshwater Only - Answered 'Yes' that development will occur within the regulatory floodplain. (Sections 7.15 and 7.16; Rapid Review Question 10)**

Verify that no land disturbing activities would occur within the floodway (unless permitted by the SMP).(Section 7.16, Regulation 6): _____

9. ☐ **Freshwater Only - Answered 'Yes' that elements of the project will occur within a channel migration zone safety buffer such that the proposal requires documentation by an experienced experienced geologist, engineering geologist, or professional engineer to allow development within the standard safety buffer (Section 7.14, Regulation 11)**

Describe current CMZ condition (signs of recent and/or active channel migration, forested, shrub dominated, cleared; dominant invasive species; existing structures):

_____

Provide name of report and qualified professional: _____

_____

Describe proposed project elements / alterations to occur within the CMZ standard safety buffer area:

_____

Verify that safety buffer averaging is consistent with limitations included under Section 7.13, Regulation 4 (never reduced to less than 35 feet; reduced portion of the buffer cannot exceed forty percent (40%) of the buffer length): ☐ Yes ☐ No

Summary / Conclusion

Provide any additional information needed to verify that the project is not expected to result in a net loss of shoreline ecological functions: _____

_____

_____

Applicant: Based on available information, the project is not expected to result in a net loss of shoreline ecological functions. ☐ Yes ☐ No

Signature: _____ Date: _____

County Reviewer: Based on available information, the project is not expected to result in a net loss of shoreline ecological functions. ☐ Yes ☐ No

Signature: _____ Date: _____

APPENDIX B: SHORELINE AREAS WITH LOW POTENTIAL FOR FUTURE DEVELOPMENT

Table B-9-1. Marine Reaches with Low Potential for New Development (Highlighted in Green) -

Marine Reach	Percent of Total Shoreline Length (~131 Total Miles)	Primary Anticipated Future Use / Development	Development Potential
1– Diamond Point	9.5% (12.5 miles)	Residential	Moderate to High
2 – Sequim Bay	6.2% (8.2 miles)	Residential	Moderate to High
3 – Gibson Spit	4.6% (6.1 miles)	Residential	Moderate to High
4 – Kulakala Point	6% (7.9 miles)	Residential	Moderate to High
5 – Dungeness Spit	12% (15.7 miles)	Ongoing Protection as Wildlife Refuge	Low
6 – Green Point	8.7% (11.4 miles)	Residential	Moderate to High
7 – Angeles Point	5.5% (7.3 miles)	Residential	Moderate to High
8 – Observatory Point	3.7 % (4.9 miles)	Ongoing Forestry (Except Freshwater Bay vicinity)	Low
9 – Crescent Bay / Low Point	8.1% (10.7 miles)	Residential	High
10 – Twin Rivers	5.6% (7.4 miles)	Ongoing Forestry	Low
11 – Deep Creek	4% (5.3 miles)	Ongoing Forestry	Low
12 – Pysht River	1.8% (2.4 miles)	Ongoing Forestry	Low
13 – Pillar Point	1.6% (2.1 miles)	Ongoing Forestry	Low
14 – Slip Point	5.2% (6.8 miles)	Ongoing Forestry	Low
15 – Clallam Bay	4.3% (5.7 miles)	Moderate Density Urban Uses	Low to Moderate
16 – Sekiu River /Kydaka	4.3% (5.7 miles)	Ongoing Forestry	Low
17 – Shipwreck Point	5.2% (6.9 miles)	50% Ongoing Forest / 50% Residential	Moderate to High
18 – Rasmussen /Bullman Creek	3.5% (4.6 miles)	Predominantly Ongoing Forestry (Except Bullman Beach)	Low (Except Bullman Beach is Moderate)
All Reaches with Low Development Potential (5, 8, 10, 11, 12, 13, 14, 16, 18)	**42 % (55 miles)**	**Primarily Ongoing Forestry**	**Low**

Table B-9-2. Freshwater Reaches with Low Development Potential (Highlighted in Green)[28]

Freshwater Reach	Percent of Total Shoreline Length (~191 Total Miles)	Primary Anticipated Future Use / Development	Development Potential
Quilcene Snow (WRIA 17) – 0.7 % of total WRIA 17, 18, and 19 length within Clallam County			
Little Quilcene River	0.7% (1.3 miles)	Ongoing Forestry	Low
Elwha-Dungeness (WRIA 18) – 40.7% of total WRIA 17, 18, and 19 shoreline length within Clallam County			
Canyon Creek	0.9% (1.7 miles)	Ongoing Forestry	Low
Dungeness River			
Reach 1	0.5% (0.9 miles)	Ongoing Protection	Low
Reaches 2 and 3	4.8% (9.0 miles)	Residential	Moderate to High
Reach 4, 5 and 6	8.2% (15.7 miles)	Ongoing Forestry	Low
Elwha River			
Reaches 1 and 2	3.9% (7.4 miles)	Ongoing Protection	Low
Reach 3	1.1% (2.1 miles)	Residential	Moderate
Gray Wolf River	4.3% (8.3 miles)	Ongoing Forestry	Low
Indian Creek			
Lower 2.0 miles	1.1% (2.0 miles)	Residential	Moderate
Upper 3.5 miles	1.8% (3.5 miles)	Ongoing Forestry, Rural Residential	Low
Lake Sutherland	2.6% (5.0 miles)	Residential	Moderate to High
Little River	1.5% (2.8 miles)	Predominantly ongoing forestry	Low
McDonald Creek			
Lower 5.0 miles	2.6% (5.0 miles)	Residential	Moderate to High
Upper 2.6 miles	1.4% (2.6 miles)	Ongoing Forestry	Low
Morse Creek			
Lower 1.1 miles	0.6% (1.1 miles)	Residential redevelopment	Low (lots are built-out)
Middle 5.3 miles	2.8% (5.3 miles)	Residential	Moderate to High
Upper 2.8	1.5% (2.8 miles)	Ongoing Forestry	Low

[28] In WRIA 20, the primary anticipated use of regulated shoreline areas outside of the Analysis Areas (see Figure 5-6) is ongoing forestry.

Freshwater Reach	Percent of Total Shoreline Length (~191 Total Miles)	Primary Anticipated Future Use / Development	Development Potential
Royal Creek	0.2% (0.3 miles)	Predominantly ongoing forestry	Low
Silver Creek	0.4% (0.7 miles)	Ongoing Forestry	Low
South Branch Little River	0.8% (1.6 miles)	Ongoing Forestry	Low
Lyre-Hoko (WRIA 19) – 58.6% of total WRIA 17, 18, and 19 shoreline length within Clallam County			
Bear Creek	1.5% (2.8miles)	Ongoing Forestry	Low
Boundary Creek	0.6% (1.1 miles)	Ongoing Forestry	Low
Brownes Creek	0.1% (0.2 miles)	Ongoing Forestry	Low
Bullman Creek	0.2% (0.4 miles)	Predominantly Ongoing Forestry	Low
Charley Creek	0.5% (0.9 miles)	Predominantly Ongoing Forestry	Low
Clallam River			
Reaches 1 – 3	2.5% (4.8 miles)	Residential	Moderate to High
Reach 4	3.5% (6.7 miles)	Ongoing Forestry	Low
Coville Creek (assessed as part of the Freshwater Bay Analysis Area)	0.1% (0.3 miles)	Residential	Moderate to High
Deep Creek	3.0% (5.8 miles)	Ongoing Forestry	Low
East Twin River	2.3% (4.4 miles)	Ongoing Forestry	Low
Ellis Creek	0.5% (1.0 miles)	Ongoing Forestry	Low
Green Creek	0.4% (0.7 miles)	Ongoing Forestry	Low
Herman Creek	1.6% (3.1 miles)	Ongoing Forestry	Low
Hoko River	12.7 % (24.3 miles)	Predominantly Ongoing Forestry, Rural Residential in Reaches 1, 2 and 3	Low (limited development potential in shoreline areas)
Last Creek	0.05 % (0.02 miles)	Ongoing Forestry	Low
Little Hoko River	2.4% (4.6 miles)	Ongoing Forestry and Protection	Low
Lyre River *Lower 1.3 miles (w/in Reach 1)*	0.7% (1.3 miles)	Residential	Moderate to High
Majority of Reach 1, all Reach 2	2.1% (4.0 miles)	Ongoing Forestry	Low
North Branch Herman Creek	0.6% (1.1 miles)	Ongoing Forestry	Low

Freshwater Reach	Percent of Total Shoreline Length (~191 Total Miles)	Primary Anticipated Future Use / Development	Development Potential
North Fork Sekiu River	2.7% (5.2 miles)	Ongoing Forestry	Low
Old Royal Creek	0.2% (0.4 miles)	Predominantly Ongoing Forestry	Low
Pysht River			
Reach 1	1.0% (1.9 miles)	Residential	Moderate to High
Reach 2	2.9% (5.5 miles)	Ongoing Forestry	Low
Reach 3	0.8% (1.5 miles)	Residential	Moderate to High
Reach 4	2.8% (5.4 miles)	Ongoing Forestry	Low
Salmonberry Creek	0.6% (1.1 miles)	Ongoing Forestry	Low
Salt Creek			
Lower 3.3 miles	0.7% (3.3 miles)	Ongoing Forestry and Protection	Low
Upper 1.4 miles	2.1% (1.5 miles)	Residential	Moderate
Sekiu River	3.0% (5.7 miles)	Predominantly Ongoing Forestry	Low
South Fork Pysht River	2.4% (4.5 miles)	Ongoing Forestry	Low
South Fork Sekiu River	1.5% (2.9 miles)	Ongoing Forestry	Low
West Twin River	2.8% (5.3 miles)	Ongoing Forestry	Low
ALL REACHES WITH LOW DEVELOPMENT POTENTIAL	**78.4% (149.4 miles)**	**Primarily Ongoing Forestry**	**Low**