DRAFT

JEFFERSON COUNTY

Shoreline Master Program Update – Cumulative Impacts Analysis

February 2009

Prepared for:

Jefferson County

Ecology Grant # G0600343

ESA Adolfson

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

This report analyses the cumulative impacts that can be expected to occur over time as Jefferson County implements its updated Shoreline Master Program (SMP) (known as Chapter 18.25 of the Jefferson County Code [JCC]). The County is in the process of updating the SMP to comply with the Washington State Shoreline Management Act[1] (SMA) and the Washington Administrative Code (WAC) implementing rules (WAC 173-26, also called the shoreline guidelines).

The County has prepared a Preliminary Draft SMP (PD SMP), which contains a wide range of policies and regulations to protect the County's shorelines from the adverse effects of future development including forest practices, residential development, and all other types of shoreline development and use. The PD SMP policies and regulations are consistent with the state shoreline guidelines and carry out the policy goals of the SMA. The PD SMP achieves ecological protection by:

- Assigning shoreline environment designations to shore segments based on the ecological conditions, type and intensity of land use and degree of shoreline modification (as described in Section 4);
- Ensuring that high quality, ecologically in-tact and environmentally sensitive areas receive the highest level of protection and are reserved for low intensity uses (as described in Section 4);
- Requiring that uses with a potential to cause significant ecological impacts are prohibited or allowed only with approval of a conditional use permit (as described in Sections 4 and 5);
- Ensuring that the uses allowed on each shore segment are appropriate considering the ecological sensitivity of the land, consistent with the Comprehensive Plan designations, and compatible with existing uses (as described in Section 4);
- Requiring that naturally vegetated buffers be maintained between lakes, rivers and marine waters and the adjoining upland uses/developments (as described in Section 5);
- Targeting specific development regulations to known threats facing the County's shorelines such as bulkheads and overwater structures (as described in Section 5); and
- Integrating shoreline regulations with applicable sections of the Jefferson County Code as well as relevant state and federal regulatory programs (as described in the Section 6).

The proposed regulations are—on the whole—more protective of the shoreline environment than the existing SMP. Under the PD SMP, more than 40 percent of the shoreline area in east Jefferson County would be designated Natural and an additional 29 percent would be designated Conservancy. All the shorelines in west Jefferson County are designated Conservancy. These designations help ensure that future development and use are compatible with state-mandated ecological protection goals.

[1] Revised Code of Washington (RCW) 90.58

The PD SMP protections will be enhanced and strengthened as a result of the other local, state and federal regulations that apply to shoreline use and development. The County also will seek to implement a Shoreline Restoration Plan (prepared as part of the County's SMP update effort), which identifies opportunities to improve or restore ecological functions that have been impaired as a result of past development activities.

Additional development will occur as envisioned by the SMA, but the new policies and regulations will require development to be located well landward of the ordinary high water line such that vegetated buffers are left in place to stabilize slopes, provide habitat, shade the nearshore beaches, provide organic nutrients, and reduce the potential for erosion which results in the need for shoreline armoring. Over time, the PD SMP, other regulations, and voluntary restoration efforts will prevent a net loss of shoreline ecological functions from existing baseline conditions. Taken together, the PD SMP and Shoreline Restoration Plan are expected to have a net beneficial effect on shoreline ecological processes and functions as restoration actions are implemented to improve degraded shorelines and as new properties are developed and existing properties redeveloped in accordance with the new policies and regulations.

The PD SMP also prevents cumulative impacts from occurring by requiring each shoreline use or development to mitigate adverse environmental impacts according to the standard mitigation sequence of first avoiding, then minimizing, then compensating for impacts or providing replacement resources. This means that each proposed development is responsible for indentifying potential impacts and implementing specific measures to offset those impacts such that the post development condition is no worse than the predevelopment condition. The PD SMP also requires that proponents of these mitigation measures post a bond or provide another type of financial assurance that the mitigation will be fully implemented. This is the first time such a requirement has been imposed in Jefferson County and it is expected to substantially improve mitigation outcomes and resulting ecological conditions.

Importantly, the SMP expressly prohibits any use /development that would cause a net loss of ecological functions or processes. As a result, the County must deny shoreline development proposals unless impacts are fully mitigated. Specific performance standards contained in the PD SMP that will prevent cumulative impacts from occurring are summarized in this document.

1.0 INTRODUCTION

Jefferson County is updating its Shoreline Master Program (SMP) (known as Chapter 18.25 of the Jefferson County Code [JCC]) to comply with the Washington State Shoreline Management Act[2] (SMA or the Act) and Washington Administrative Code (WAC) implementing rules (WAC 173-26 also called the state's shoreline guidelines). This report is an analysis of the cumulative impacts that may be expected to occur over time as the SMP is implemented[3].

1.1 Why Did the County Prepare this Report?

As part of this SMP Update effort, the County is required to evaluate the cumulative impacts of reasonably foreseeable future development to verify that proposed policies and regulations for shoreline management are adequate to ensure 'no net loss' of shoreline functions. The proposed Jefferson County SMP provides standards and procedures to evaluate individual uses or developments for their potential to impact shoreline resources on a case-by-case basis through the permitting process. The purpose of this report is to determine if impacts to shoreline ecological functions are likely to result from the aggregate of activities and developments in the shoreline that take place over time. This report is prepared as a requirement of the County's grant agreement with the state funding agency, the Washington Department of Ecology (SMA Grant No. G0600343). This analysis is not proposed for inclusion as regulatory code or as part of the Jefferson County Comprehensive Plan or the JCC development regulations.

1.2 What Are the State's Requirements?

According to the state shoreline guidelines, the County is required to evaluate and consider cumulative impacts of 'reasonably foreseeable future development' on the shorelines of the state as follows[4]:

> "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. 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."

In addition, the guidelines require evaluation of the effects caused by:

[2] Revised Code of Washington (RCW) 90.58

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

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

- Unregulated activities,
- Developments that are exempt from a shoreline substantial development permit, and
- Residential bulkheads, residential piers, and runoff from newly developed properties.

The guidelines also require that particular attention be paid to platting or subdividing property and installation of infrastructure that could establish a pattern for future shoreline development. This report contains a series of questions and answers designed to provide the required information.

1.3 What Does this Analysis Cover?

This report provides a planning level assessment of the potential cumulative impacts that can be expected to occur if the proposed Jefferson County SMP (Preliminary Draft SMP [PD SMP] dated December 3, 2008) is adopted and implemented. The assessment is limited to cumulative impacts of reasonably foreseeable future development in areas subject to SMA jurisdiction. Jefferson County's regulated shorelines include more than 250 miles of marine shoreline, approximately 238 miles of river shoreline, and 14 lakes (roughly 22 miles of lakeshore). There are nearly 6,200 existing parcels that potentially could be regulated in some way by the SMP[5]. Information on the number of developed versus vacant parcels potentially affected by the SMP is provided in Section 4.

On the east side of the County (east of the Olympic Mountains), there are marine, river/stream, and lake shorelines within SMA jurisdiction. On the west side, County-controlled shorelines within SMA jurisdiction are limited to rivers and streams[6]. The majority of this analysis is focused on east Jefferson County where most of the foreseeable development is expected to occur.

This analysis is focused on those allowed uses or developments that have the greatest potential for adverse impacts when considered in a long-range or aggregate manner. For example, signs are regulated under the SMP but are not considered in this context based on their limited size and effect on shoreline functions. The discussion of "development exempt from shoreline permitting" is focused on those foreseeable activities listed in WAC 173-27-040 with the greatest potential for adverse cumulative impacts. Not all activities that may be exempt from substantial development permits are discussed (e.g., watershed restoration plans and projects; hazardous material remediation, etc.). Additionally, exempt development activities are still subject to compliance with the SMP policies (e.g., to minimize impacts) and other regulations in place that protect shoreline resources (e.g., critical area regulations).

[5] In many cases, only a portion of the parcel is within shoreline jurisdiction and will be subject to the shoreline regulations.

[6] There are no lakes in west Jefferson County over 20 aces in size and the marine shore is in federal or tribal ownership.

According to the shoreline guidelines, the assessment of cumulative impacts occurs at both the **planning stage** (when the SMP is being developed) and at the **permitting stage** or the time individual development proposals are reviewed (once the SMP is adopted and implemented). The guidelines suggest that impacts of 'commonly occurring and planned development' be assessed at the planning stage "without reliance on an individualized cumulative impacts analysis." In contrast, developments that have un-anticipatable or uncommon impacts, which cannot be reasonably identified at the time of SMP development should be evaluated via the shoreline substantial development and conditional use permit processes to ensure that all impacts are addressed and that there is no net loss of ecological function after mitigation.[7]

The objective of the 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 'baseline' conditions. This assumes that impacts will occur, but that there are adequate measures in place to mitigate them such that the post development conditions are no worse *overall* than the pre-development conditions. For this planning level assessment, the baseline conditions are the conditions that are generally identified and described in the County's Final Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2008).

The Jefferson County PD 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. These project-level analyses will allow site-scale factors to be included in the assessment of baseline conditions to supplement the inventory information available for the County as a whole. To achieve no net loss, the SMP requires each project to mitigate impacts by avoiding, then minimizing adverse effects, then replacing damaged resources through compensatory mitigation efforts.

The PD SMP is under review by the County's Planning Commission and Board of Commissioners. Accordingly, this analysis may be revised if substantial revisions are made to the policies and regulations proposed in the PD SMP.

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

2.0 CURRENT CONDITIONS AND CIRCUMSTANCES

Jefferson County is located on the Olympic Peninsula in northwest Washington State (Figure 1). It stretches east from the Pacific Ocean across the Olympic Mountains to Puget Sound. To the north, it is bounded by Clallam County and the Strait of Juan de Fuca, to the southeast by Mason County, and to the southwest by Grays Harbor County.

This section briefly describes the current conditions and circumstances from two different perspectives: a broad, watershed-scale perspective and a narrower shoreline reach-scale perspective. Additional detailed information on shoreline conditions is found in the Final Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2008).

2.1 What Are the Current Watershed Conditions?

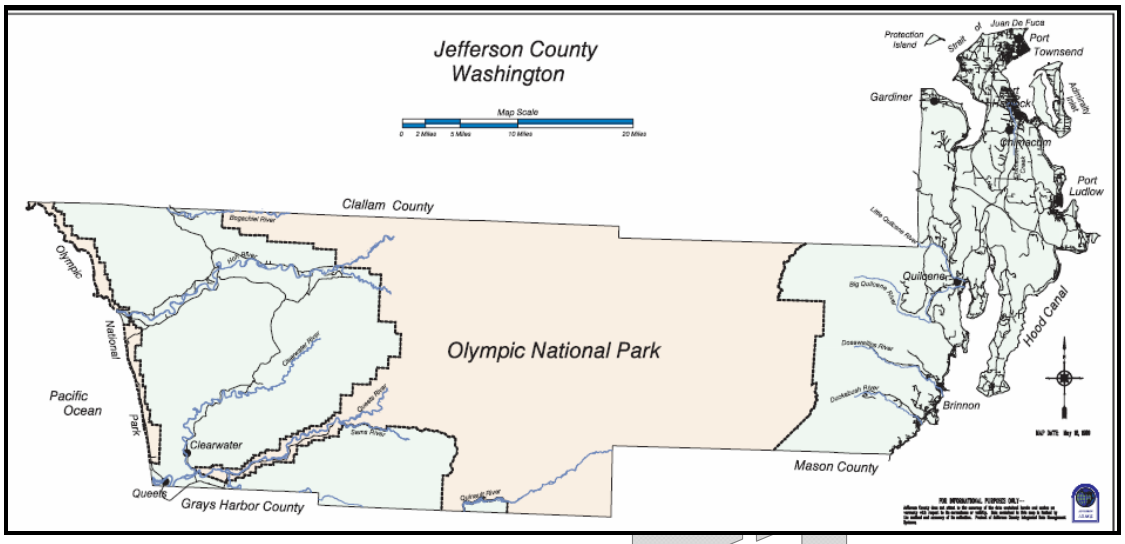
Jefferson County is sparsely populated. According to 2000 census data, the number of residents per square mile is less than one for vast areas of central and western Jefferson County. The majority of east Jefferson County has between 1 and 149 residents per square mile. Roughly one-third of the County's ~29,000 residents reside in Port Townsend, which is the County seat and only incorporated city[8]. Other population centers include Port Hadlock, Chimacum, and Irondale (the 'Tri-Area'), Port Ludlow, Brinnon, and Quilcene. The federal lands within Olympic National Park (ONP) and Olympic National Forest (ONF) encompass the center of the County. West of the Olympic Mountains, Jefferson County is very sparsely populated along the Hoh River and in the Kalaloch, Clearwater and Queets village centers. The western County is composed of mostly commercial and Washington Department of Natural Resources (WDNR)-owned timberlands.

Parts of five Water Resources Inventory Areas (WRIAs) occur within Jefferson County. On the east side of the County, WRIA 16 (Skokomish-Dosewallips) drains to the Hood Canal and WRIA 17 (Quilcene-Snow) drains to Hood Canal, the Strait of Juan de Fuca, and Admiralty Inlet. WRIA 18 (Elwha-Dungeness) drains central and north parts of the County to the Strait of Juan de Fuca, and WRIA 20 (Sol Duc-Hoh) and WRIA 21 (Queets-Quinault) drain west to the Pacific Ocean. The headwaters of all five WRIAs are within the protected confines of the ONP.

WRIAs 16 and 17 include the most developed and populated areas of Jefferson County. These watersheds are characterized by widespread rural residential developments, commercial village centers around unincorporated population centers, rural and commercial forest lands, Master Planned Resort (MPR) communities, and agricultural lands.

[8] Port Townsend's shorelines are under the jurisdiction of the City, not the County. Therefore, this analysis does not asses impacts of development within Port Townsend.

Figure 1. Jefferson County, Washington.



Source: Jefferson County Integrated Data Management System

West of the ONP, there is limited development with rural populations concentrated along the Hoh River and in the Kalaloch, Clearwater and Queets village centers. The most common land use is commercial forestry, which occurs on private and WDNR-owned timberlands. Most of the land along the Pacific coastline is in federal or tribal ownership.

The landscape in east Jefferson County was shaped by glacial activity, which left layers of glacial and outwash sediments with little exposed bedrock. The marine shoreline is characterized mainly by steep bluffs carved out of these glacial sediments, often topped by stands of Douglas-fir and western hemlock. These bluffs, many of which are unstable and prone to erosion and landslides, border gravel and cobble beaches. As the bluffs erode, they contribute fine sediments which are carried by the prevailing waves and currents to depositional areas such as barrier beaches, spits, and other accretion shoreforms.

The rivers that drain the east and west slopes of the Olympic Mountains provide important spawning and rearing habitat for numerous salmon species including threatened stocks such as Puget Sound Chinook, bull trout, and Hood Canal summer chum. Major estuaries in eastern Jefferson County occur at Chimacum Creek, Shine, Mats Mats Bay, Thorndyke Bay, Duckabush and Dosewallips River deltas, Quilcene Bay, Tarboo Creek delta, Port Ludlow, and Discovery Bay. On the west coast of the County, there is a very productive estuary at the mouth of Goodman Creek. These areas provide critical ecological functions and biological resources including flood attenuation, nutrient retention and cycling, erosion/shoreline protection, food web support, and habitat structure/connectivity. Estuaries and deltas associated with watersheds where salmon spawn provide vital rearing habitat and serve as nurseries for a wide variety of aquatic species. Jefferson County's beaches also provide important habitat for sand lance and

surf smelt, which are vital food sources for salmon. The intertidal areas along the marine shore support extensive eelgrass beds and kelp forests.

Jefferson County is the third largest shellfish producing county in the state and has two of the largest shellfish hatcheries in the United States. Commercial aquaculture farms take advantage of clean productive waters, cobble and sand beaches, and mudflats in Hood Canal, Discovery Bay, Oak Bay, Quilcene Bay, Port Townsend Bay, and Dabob Bay to grow hardshell clams (butter clams, native littleneck, manila clams, cockles, and horse clams), geoduck, oysters (Olympia oysters and non-native Pacific oysters), shrimp, and crab. Tribal shellfish beaches are widely distributed throughout the east County. On the west shore, shellfish beds are found from the mouth of the Hoh River south past Kalaloch and near Strawberry Bay, Strawberry Point, and Tealwhit Head. There is also an active razor clam fishery on the County's west coast.

Overall, Jefferson County retains a relatively healthy amount of forest cover and impervious surface cover is relatively low. According to 2001 land cover data from the National Land Cover Dataset (provided through Coastal Change Analysis Program orCCAP at http://www.epa.gov/mrlc/nlcd-2001.html), impervious surface cover for subbasins in east Jefferson County ranged from nearly zero (e.g., in the Tunnel Creek and Trapper Creek subbasins) to 37 percent in more developed areas (in Port Townsend Bay). More recent data (Hood Canal Coordinating Council, 2006), which is based on higher resolution imagery show a similar range but slightly lower impervious percentages overall (Table 1). West Jefferson County has an even lower amount of impervious surface since forest is the dominant land cover and residential, commercial and industrial developments are relatively scarce.

In general, the conversion of pervious surface to impervious surface in Jefferson County has been gradual. In the period from 1991 to 2001, the total impervious surface cover in east Jefferson County (all subbasins) changed from about 2.8 to 3.0 percent. During this same timeframe, the County's total population grew by 29 percent and the number of housing units increased by sixty four percent Table 2.

Table 1. Impervious Surface Percentages for Subbasins in East Jefferson County (2006)

Subbasin Name	Impervious Area (acres)	Total Area (acres)	% Impervious
Port Townsend Bay	1209.1	5,437.8	22.2%
Chimacum Creek Lower	587.9	5,271.2	11.2%
Indian Island	301.1	2,765.7	10.9%
Quimper Peninsula	442.5	5,899.7	7.5%
Turner/Walkers Creek	239.2	3,473.4	6.9%
Marrowstone Island	266.8	4,029.8	6.6%
Discovery Bay East Shore Frontal	365.3	7,001.0	5.2%
Oak/Mats Mats Bay	248.3	5,150.0	4.8%
Discovery Bay West Shore Upper	231.9	4,890.5	4.7%
Port Ludlow	476.4	11,229.6	4.2%
Bolton Peninsula	116.7	4,167.9	2.8%
Chimacum Creek Middle	247.8	8,995.0	2.8%

Subbasin Name	Impervious Area (acres)	Total Area (acres)	% Impervious
Sequim Bay East Shore	177.9	6,636.0	2.7%
Chimacum Creek East Fork	105.4	4,122.3	2.6%
Leland Creek	160.9	6,625.6	2.4%
Squamish Harbor	236.3	9,932.4	2.4%
Tarboo Creek	170	7,985.8	2.1%
Chimacum Creek Upper	116.1	5,617.7	2.1%
Donovan Creek	53.3	2,919.4	1.8%
Discovery Bay West Shore Lower	98.7	5,789.6	1.7%
Toandos East Shore Frontal	98.4	6,367.6	1.5%
Toandos West Shore Frontal	109.2	7,271.4	1.5%
Little Quilcene Lower	81.6	5,670.2	1.4%
Andrews Creek	68.6	4,776.6	1.4%
Mcdonald Creek	19	1,506.9	1.3%
Schaerer Creek	55.2	4,446.1	1.2%
Big Quilcene River Lower	126.1	10,502.6	1.2%
Snow Creek	86.7	7,982.6	1.1%
Spencer/Marple Creek	45.2	4,211.3	1.1%
Duckabush River Lower	121.8	11,654.2	1.0%
Big Quilcene River Middle	21.2	2,451.5	0.9%
Devils Lake	31.6	3,950.4	0.8%
Thorndyke Creek	75.1	9,452.9	0.8%
Rocky Brook	30.1	5,680.0	0.5%
Dosewallips River Lower	60.5	14,022.0	0.4%
Salmon Creek Lower	10.6	3,604.1	0.3%
Townsend Creek	7.4	6,226.6	0.1%
Salmon Creek North	2.2	2,784.2	0.1%
Fulton Creek	4.2	5,358.4	0.1%
Dosewallips River Middle	3.1	4,713.7	0.1%
Big Quilcene River Upper	2.9	6,612.9	0.0%
Tunnel Creek South Fork	2	4,975.2	0.0%
Little Quilcene Upper	1.7	5,146.4	0.0%
Tunnel Creek	0.8	3,106.6	0.0%
Penny Creek	0.4	4,221.3	0.0%
Howe Creek	0	3,615.9	0.0%
Salmon Creek Upper	0	4,258.0	0.0%
Trapper Creek	0	1,643.5	0.0%
Tunnel Creek North Fork	0	6,707.9	0.0%
Port Townsend Bay	1209.1	5,437.8	22.2%
Chimacum Creek Lower	587.9	5,271.2	11.2%

1

Table 2. Changes in Population and Housing Units, 1990 to 2000[9]

	1990	2000	Percent Change
Population	20,146	25,953	29%
Housing Units	8,627	14,144	64%

Although development intensity in Jefferson County is relatively low when measured on a watershed basis, there are pockets of more intense development and the effects of forest clearing, floodplain and wetland fill, dike and levee construction, road building and other development activities are evident throughout the County. These activities have affected water flow patterns, water quality, sediment transport and other ecosystem processes and have altered the abundance, diversity, distribution, and movement of fish and wildlife species to a noticeable degree. Many of these changes are most pronounced near freshwater rivers and streams and on the marine shoreline where the majority of the County's residents live.

2.2 What Are the Shoreline Conditions?

Jefferson County's shorelines are in relatively good condition ecologically compared to more developed areas of the Puget Sound basin. Only about 10 percent of the marine shoreline in east Jefferson County is armored with a bulkhead (Figure 2) and visual estimates of oblique aerial photographs (taken in 2006) suggest that most of the major feeder bluffs are unarmored. Docks, piers and beach stairs mostly occur intermittently (roughly 2.7 structures per marine shoreline mile[10]) but there are pockets of heavily modified shore at Oak Bay, Brideghaven, Port Ludlow, Brinnon, Mystery Bay, and other localities. Most of the bays and shellfish beds remain open to harvest, so water quality is generally good.

The most common uses within shoreline jurisdiction are residential uses (primarily rural single family), forest practices, and park or public recreational uses (on public park lands). Other common uses include commercial aquaculture, resort development, and marinas. Roads and utilities occur within shoreline jurisdiction throughout the County. Commercial and industrial uses are uncommon on the shoreline.

Nearly all of the land abutting the County's marine shoreline is planned, platted, and designated for residential use. Rural Residential use at 1 unit per 5 acres (RR 1:5) is the most common land use designation on the County's eastern marine shore. Other common residential land use designations on the marine shore are Rural Residential at 1 unit per 10 acres (RR 1:10) and Rural Residential use at 1 unit per 20 acres (RR: 1:20). Small pockets of Commercial Forest and Rural Forest also occur on the marine shore south of Quilcene, on the west side of Tarboo Bay and on the Toandos Peninsula. The County Code limits residential development on these resource lands to one dwelling unit per 40 acres or one unit per 80 acres (JCC 18.15). There are no areas

[9] Data are from the United States Census Bureau at http://quickfacts.census.gov/qfd/states/53/53031lk.html

[10] This estimate was derived using data provided by the Point No Point Treaty Council (2006) and dividing the number of known structures by the number of marine shore miles.

designated for industrial or commercial use on the marine shore except for the Port Townsend Paper Mill, which is located just outside of the Port Townsend city limits.

Rural Residential use is also the dominant land use designation on the river shorelines in east Jefferson County. Portions of the Chimacum, lower Little Quilcene, middle Big Quilcene, Snow and Salmon Creeks also support agricultural uses.

Land use surrounding the lake shorelines is mainly designated Forest (Commercial, Rural, and Inholding Forest) or Parks/Preserves/Recreation (PPR). Only two lakes (Leland and Crocker) have substantial areas designated for Rural Residential use. The lake shorelines are mostly undeveloped lacking docks, bulkheads, and other shoreline modifications. There is a public boat launch at Lake Leland, and Lords Lake has a dam at the north end since it serves as a municipal water supply for Port Townsend. Recent logging has occurred around Peterson Lake and Sandy Shore Lake.

All of the County's shorelines have been affected to some degree by land cover changes, increases in impervious surface, vegetation clearing, and other actions taken in the water and near the water's edge. Table 3 summarizes some of the major biological and land use characteristics of the marine shoreline reaches in east Jefferson County.

Table 3. Summary of Shoreline Characteristics by Reach - East Jefferson County Marine Shoreline

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
A, B	Fulton Creek and Near Shore	Salmonid corridor, erosive/hazardous slopes, shellfish beds approved	Residential, forested, some parks and recreation	RR (1:5) with about half of the private shoreland area already subdivided; PPR	Low (0-10)	Low (0-10)	x	x	Mixture of Suburban and Conservancy	Conservancy with Priority Aquatic at Fulton Creek delta; otherwise Aquatic

[11] The reach refers to a segment of shore that has similar characteristics. Reaches have an alpha designation from A to LLL beginning near Fulton Creek and moving counter-clockwise to Discovery Bay. Reaches are depicted on the maps shown in Appendix C of the Final Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2008).

[12] Data are as reported in the Final Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2008)

[13] A, Agriculture (Local, Commercial); CC, Crossroad (Convenience, General, Neighborhood, Visitor); EPF, Airport Essential Public Facility; EPF, Waste Management Essential Public Facility; HI, Heavy Industrial; LI, Light Industrial (Commercial, Manufacturing); MPR, Master Planned Resort; PPR, Parks, Preserves, and Recreation; IF, Inholding Forest; CF, Commercial Forest; RF, Rural Forest; RR, Rural Residential; RVC, Rural Village Center; UGA, Port Townsend Urban Growth Area

[14] This is a qualitative estimate based on review of oblique aerial photography.

[15] Refer to the Official Shoreline Map for the actual designation.

[16] X indicates public land/tideland is present on this reach according to pubic records.

[17] Zoning designations are from JCC 18.15, Land Use Districts

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
C	Fulton Creek and Near Shore	Salmonid corridor, erosive/hazardous slopes, shellfish beds approved	Residential, forested	RR (1:5, 1:20), AL	Low (0-10)	Low (0-10)			Mixture of Conservancy (south end) and Suburban (north end)	Conservancy (south end) and Natural with Priority Aquatic (north end)
D	Duckabush River and Black Point	Salmonid corridor, small salt marsh, erosive/hazardous slopes, shellfish beds approved	Residential, agricultural land	RR (1:5), AL	Moderate (10-30)	Low (0-10)		x	Mixture of Conservancy (south end) and Suburban (north end)	Priority Aquatic with Natural and Shoreline Residential at north and south ends of reach; Conservancy: mid-reach; Shoreline Residential: north end of reach
E, F	Duckabush River and Black Point	Highly functioning, low stress, salmonid corridor, small salt marsh, erosive/hazardous slopes, shellfish beds approved or unclassified	Residential, forested, public tidelands	RR (1:5, 1:10, 1:20), AL (1:20)	Low (0-10)	Low (0-10)	x	x	Mixture of Natural (mouth of Duckabush) with Conservancy upstream along the Duckabush River and the southern edge of Black Point; and Suburban (Reach F)	Priority Aquatic with Natural (mapped along the Duckabush, its delta, and southern edge of Black Point); Natural and Shoreline Residential (mapped along Reach F)

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
G, H	Duckabush River and Black Point	Erosive/hazardous slopes, shellfish beds prohibited	Marina, rural residential	RR (1:5)	Heavy (100+)	Low (0-10)	x	x	Suburban	Shoreline Residential and High Intensity
I	Dosewallips River and Brinnon Shoreline	Salmonid corridor, shellfish beds approved, unclassified, restricted, or prohibited	Residential	RR (1:5)	Moderate (10-30)	Low (0-10)	p		Suburban	Shoreline Residential and High Intensity
J	Dosewallips River and Brinnon Shoreline	Salt marshes noted, some areas in this reach have erosive/hazardous slopes	Residential, parks and recreation, forested, village center, public tidelands	RR (1:5), PPR, AL (1:20), RVC, Olympic NF	Low (0-10)	Low (0-10)	x	x	Mixture of Conservancy (along Dosewallips River and shoreline), Natural (mapped at delta), and small areas of Suburban (along shoreline)	Priority Aquatic with Natural and Conservancy (along Dosewallips, its delta, and shoreline); Conservancy and Shoreline Residential (mapped along upper half of reach)

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
K, L	Jackson Shoreline	Highly functioning, salmonid corridor, salt marshes and lagoons noted, some areas in this reach have erosive/hazardous slopes	Residential, crossroad center, parks and recreation	RR (1:5, 1:20), CC, PPR, National WR	Moderate (10-30)	Low (0-10)	x	x	Suburban (mapped along most of Reach K and lower portion of L); Natural (mapped in K); Conservancy (mapped along most of L)	Priority Aquatic with Natural and Conservancy (western half of Reach K); Conservancy (mapped along eastern half of Reach K and all of L)
M, N	Quilcene Bay	Most reaches noted as highly functioning and low stress; salmonid corridor; lagoons noted in these reaches; erosive/hazardous slopes; shellfish beds approved or conditionally approved	Residential, forested, public tidelands	RR (1:5), PPR, CF, RF	Low (0-10)	Low (0-10)	x	x	Conservancy with small area of suburban	Priority Aquatic with Natural; Priority Aquatic with High Intensity (tip of Reach N)

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
O	Quilcene Bay	Most reaches noted as highly functioning and low stress; salmonid corridor; salt marshes, lagoons, and intertidal wetlands noted in these reaches; erosive/hazardous slopes; shellfish beds approved, unclassified, or conditionally approved	Residential, public parks and recreation	RR (1:5, 1:10, 1:20), AP (1:20), AL (1:10), PPR (small)	Moderately heavy (30-100)	Low (0-10)	x	x	Conservancy and Suburban; Urban (eastern edge of reach)	Priority Aquatic with Natural, Conservancy, and Shoreline Residential

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
P	Quilcene Bay	Most reaches noted as highly functioning and low stress; salmonid corridor; intertidal wetlands noted in these reaches; erosive/hazardous slopes; shellfish beds approved, unclassified, or conditionally approved	Residential	RR (1:5)	Low (0-10), also approx. 50 aquaculture beds	Low (0-10)		x	Urban and suburban (western edge of reach); Conservancy and Natural	Priority Aquatic with Shoreline Residential, Conservancy, and Natural
Q, R	Dabob Bay	Salmonid corridors present; shellfish beds approved; erosive/hazardous slopes; salt marshes, lagoons, and intertidal wetlands present	Residential, forested, public tidelands	RR (1:5, 1:20), PPR, CF, AL (small, 1:20), RF (small)	Moderate (10-30)	Low (0-10)	x	x	Conservancy	Priority Aquatic with Conservancy and Natural

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
S	Dabob Bay	Salmonid corridors present; shellfish beds approved; erosive/hazardous slopes; salt marshes, lagoons, and intertidal wetlands present	Residential, forested, military reservation	RR (1:5, 1:10, 1:20), CF, AL, Military Res., RF (small)	Low (0-10)	Moderate (10-30)	x	x	Conservancy	Priority Aquatic with Conservancy and Natural; Conservancy
T, U	Southern Toandos Peninsula, Thorndyke Bay, and Squamish Harbor	Most reaches noted as highly functioning and low stress; salmonid corridors present; shellfish beds approved; erosive/hazardous slopes; salt marshes and lagoons present; shellfish beds approved or prohibited	Residential, forested	RR (1:5, 1:10, 1:20), CF, RF	Moderately heavy (30-100)	Low (0-10)		x	Conservancy	Priority Aquatic with Natural (along shoreline); Natural and Conservancy (in harbor at reach T)

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
V	Southern Toandos Peninsula, Thorndyke Bay, and Squamish Harbor	Most reaches noted as highly functioning and low stress; salmonid corridors present; shellfish beds approved; erosive/hazardous slopes; salt marshes and lagoons present; shellfish beds approved or prohibited	Residential, forested, military reservation	RR (1:5, 1:10), Military Res., CF, RF, IF	Moderately heavy (30-100)	Moderate (10-30)	x	x	Conservancy; Suburban and Natural (along northern end of reach)	Priority Aquatic with Natural, Conservancy, and Shoreline Residential; no designation given along middle of reach; also Conservancy, Shoreline Residential, and a small area of High Intensity (mapped along upper half of Reach)

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	16		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
W	Southern Toandos Peninsula, Thorndyke Bay, and Squamish Harbor	Most reaches noted as highly functioning and low stress; salmonid corridors present; shellfish beds approved; erosive/hazardous slopes; salt marshes and lagoons present; shellfish beds approved	Residential	RR (1:5)	Moderate (10-30)	Moderate (10-30)	p	x	Natural (mouth of Duckabush River), with Conservancy (upstream along the Duckabush River and the southern edge of Black Point); Suburban (Reach F)	Priority Aquatic with Natural and Shoreline Residential: western end of reach; Shoreline Residential: eastern end of reach.
X	Hood Canal Bridge to Tala Point	Most reaches noted as highly functioning and low stress; salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved	Residential, public tidelands	RR (1:5, 1:10, 1:20)	Low (0-10)	Low (0-10)	x	x	Mixture of Conservancy and Conservancy with Natural	Mixture of Natural and Priority Aquatic with Natural and Conservancy

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
Y, Z	Hood Canal Bridge to Tala Point	Most reaches noted as highly functioning and low stress; salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved or unclassified	Residential, public tidelands	RR (1:5)	Low (0-10)	Low (0-10)		x	Conservancy and Natural	Mixture of Priority Aquatic with Natural and Conservancy (Reach Y), and Natural
AA	Hood Canal Bridge to Tala Point	Reach noted as highly functioning and low stress; salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved	Residential	RR (1:5, 1:20)	Moderate (10-30)	Moderate (10-30)	x	x	Mixture of Conservancy and Natural (south end), Suburban (mid-reach), and Conservancy (north end)	Mixture of Natural, Conservancy, and Shoreline Residential
BB, CC, DD	Port Ludlow	Salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds prohibited or unclassified	Residential, marina	RR (1:5, 1:20), MPR (Open Space, Recreation, Single family, Multi-family, Resort Complex/Community Facilities)	Heavy (100+)	Heavy (100+)		x	Mixture of Conservancy (east end of BB), Suburban, Urban, and Natural	Mixture of Conservancy, Shoreline Residential, Priority Aquatic with Shoreline Residential, and High Intensity

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
EE	Mats Mats Bay	Salmonid corridor; salt marshes present; unclassified, conditionally approved, or approved shellfish beds	Residential	RR (1:5, 1:10)	Moderately heavy (30-100)	Moderate (10-30)		x	Mixture of Suburban and Conservancy	Mixture of High Intensity, Conservancy, and Shoreline Residential
FF	Oak Bay	Salt marshes and lagoons present; shellfish beds approved	Residential	RR (1:5, 1:10)	Low (0-10)	Low (0-10)		x	Mixture of Suburban and Conservancy	Shoreline Residential
GG, HH, II	Oak Bay	Salt marshes and lagoons present; shellfish beds approved or unclassified	Residential	RR (1:5, 1:20)	Moderate (10-30)	Moderate (10-30)	x	x	Mixture of Suburban and Conservancy	Shoreline Residential and Priority Aquatic with Conservancy
JJ	South Indian Island and Marrowstone Island	Salt marshes and lagoons present; shellfish beds approved or unclassified	Military reserve	Military Reserve	Low (0-10)	Low (0-10)	x (some federal lands)	x	Mixture of Conservancy and Island	n/a

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
KK	South Indian Island and Marrowstone Island	Salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved or unclassified	Military reserve, public tidelands	Military Reserve, RR (1:5, 1:10, 1:20)	Low (0-10)	Low (0-10)	x (some federal lands)	x	Mixture of Conservancy and Natural	Mixture of Priority Aquatic, Priority Aquatic with Natural, Shoreline Residential and Natural
LL	South Indian Island and Marrowstone Island	Salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved or unclassified	Residential	RR (1:5, 1:10, 1:20)			x	x	Conservancy	Mixture of Conservancy and Natural
MM, NN	South Indian Island and Marrowstone Island	Salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds unclassified	Public Parks	PPR			x	x	Conservancy	Mixture of Conservancy and Natural
OO	South Indian Island and Marrowstone Island	Salt marshes present; erosive/hazardous slopes; shellfish beds approved, unclassified, or prohibited	Residential, public parks and recreation	RR (1:5), PPR			x	x	Conservancy	Mixture of Conservancy and Natural

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
PP, QQ, RR	South Indian Island and Marrowstone Island	Salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds conditionally approved	Residential	RR (1:5, 1:10)			x	x	Conservancy	Mixture of Conservancy (north end of PP), Shoreline Residential, Priority Aquatic with Shoreline Residential, and Priority Aquatic with High Intensity
SS	South Indian Island and Marrowstone Island	Highly functioning Reaches; salt marshes and lagoons present; shellfish beds approved	Residential, military reserve	RR (1:5), Military Res.			x (some federal lands)	x	Mixture of Conservancy and Island	Priority Aquatic with Natural
TT, UU	South Indian Island and Marrowstone Island	Highly functioning Reaches; salt marshes and lagoons present; shellfish beds approved, unclassified, or prohibited	Residential, military reserve, public tidelands	Military reserve			x (some federal lands)	x	Island	Priority Aquatic (along reach TT) and n/a

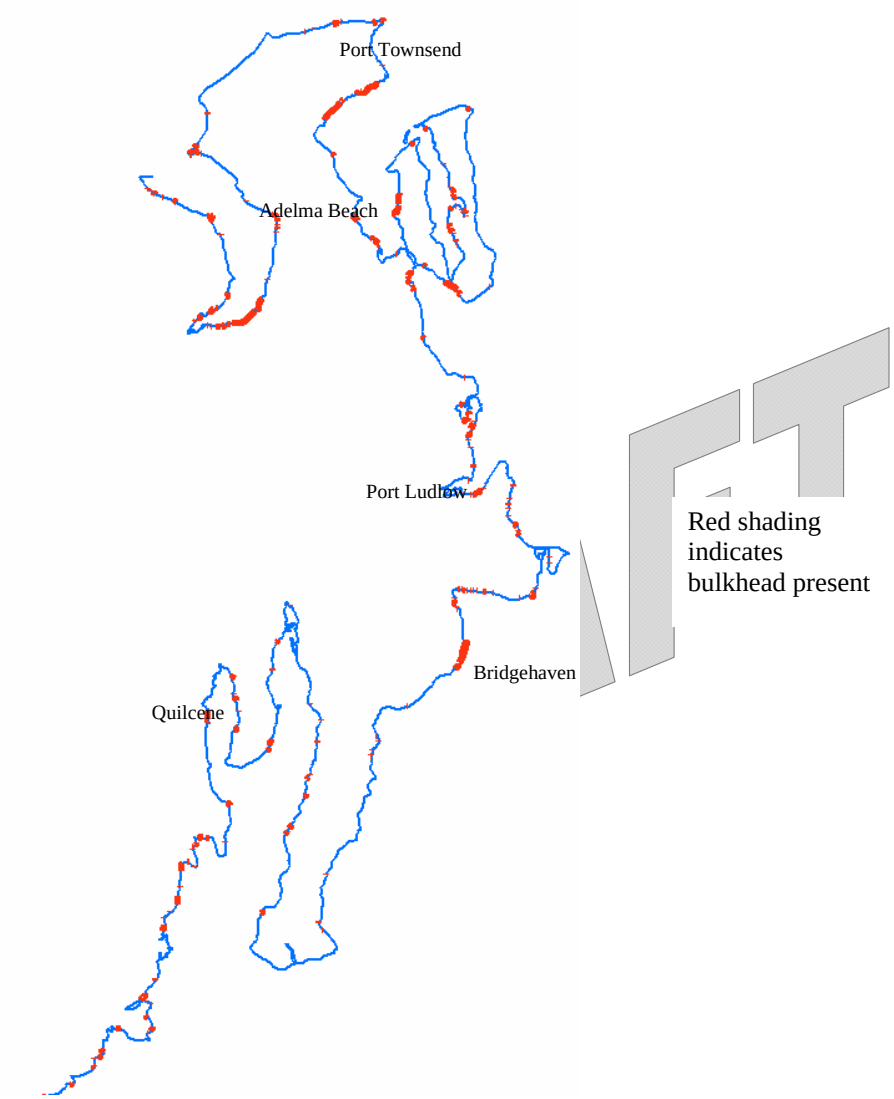
Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	[16]		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
VV	Indian Island (Rat Island)	Highly functioning Reaches; salt marshes present; shellfish beds unclassified or prohibited	Unzoned	Unzoned			x (some federal lands)	x	Island	n/a
WW, XX	Indian Island (Navy)	Highly functioning, low stress reaches; saltmarshes present; erosive/hazardous slopes; shellfish beds approved, prohibited, or unclassified	Military reserve, public tidelands	Military Res.			x (some federal lands)	x	Mostly Island, small area of Suburban (south end of XX)	Mostly n/a, small area of Shoreline Residential (south end of XX)
YY, ZZ, AAA	Port Townsend Bay	Salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved, prohibited, or unclassified	Residential, rural village center, marina	RR (1:5), RVC			x	x	Mixture of Suburban, Urban, and Conservancy	Mixture of Shoreline Residential, High Intensity, Natural, and Priority Aquatic with Conservancy

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	16		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
BBB	Port Townsend Bay	High function, low stress; salmonid refuge; salt marshes and lagoons present; erosive hazardous slopes, shellfish beds unclassified	Residential, public parks and recreation	RR (1:5, 1:10), PPR			x	x	Mixture of Conservancy, Natural, and Conservancy and Suburban	Mixture of Natural and Priority Aquatic with Natural
CCC	Port Townsend Bay (portion outside of City)	Lagoons and erosive/hazardous slopes present; shellfish beds approved, unclassified, prohibited	Residential, industrial, parks and recreation, urban growth area	RR, PPR, HI, PT UGA			x	x	Mixture of Conservancy and Urban (outside of Port Townsend); no designations for Port Townsend	Mixture of Natural and High Intensity (outside of Port Townsend); no designations for Port Townsend
DDD, EEE	City of PT shoreline	Highly functioning, low stress reaches; erosive/hazardous slopes present; shellfish beds approved, unclassified, prohibited	Residential, urban area	RR (1:5, 1:10, 1:20), PT UGA			x	x	Natural and Suburban (west end of EEE); no designations for Port Townsend	Natural; no designations for Port Townsend

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	16		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
FFF	Strait of Juan de Fuca and Discovery Bay	Highly functioning Reaches; salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved or unclassified	Residential	RR (1:5, 1:10, 1:20), AL (1:20), NC				x	Mixture of Conservancy and Natural and Suburban	Mixture of Natural, Shoreline Residential, and High Intensity
GGG, HHH	Strait of Juan de Fuca and Discovery Bay	Highly functioning Reaches; salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved	Residential	RR (1:5; 1:20)					Mixture of Conservancy, Suburban, Natural, and Urban	Mixture of Shoreline Residential, Priority Aquatic with Natural, Shoreline Residential, and Conservancy
III, JJJ	Strait of Juan de Fuca and Discovery Bay	Highly functioning Reaches; salt marshes and lagoons present; erosive/hazarous slopes; shellfish beds approved or unclassified	Residential, crossroad center, forested	RR (1:5, 1:20), NC, CF			p	x	Mixture of Conservancy, Suburban, and Natural	Mixture of Shoreline Residential and Priority Aquatic with Natural, Shoreline Residential, High Intensity, Conservancy

Reach[11]	Waterbody	Biological Characteristics[12]	Existing Land Use[13]		Shoreline Modifications[14]		Public Lands[15]		Environment Designations	
	16		Use	Zoning / Density[17]	In-water Structures	Bank Structures	Uplands	Tide lands	Existing	Proposed
KKK	Strait of Juan de Fuca and Discovery Bay	Highly functioning Reaches; salt marshes present; erosive/hazarous slopes; shellfish beds approved	Residential	RR (1:10; 1:20)					Conservancy	Priority Aquatic with Natural and Conservancy
LLL	Strait of Juan de Fuca and Discovery Bay	Highly functioning Reaches; salt marshes and lagoons present; erosive/hazardous slopes; shellfish beds approved	Residential	RR (1:5, 1:10, 1:20)				x	Mixture of Conservancy and Natural	Mixture of Conservancy and Priority Aquatic with Natural and Conservancy
Island X	Sitting in Strait of Juan de Fuca	Located within a national wildlife refuge; lagoons and erosive/hazardous slopes present; shellfish beds approved or unclassified	Wildlife refuge	National WR			x	x	Mixture of Natural and Conservancy	No Designation

Figure 2. Marine Shores with Bulkheads or Other Types of 'Hard' Armoring - East Jefferson County



3.0 NATURAL PROCESSES

This section briefly describes the coastal and upland processes affecting shoreline conditions within Jefferson County. Additional information is found in the Final Shoreline Inventory and Characterization Report (ESA Adolfson et al., 2008).

3.1 What Are the Relevant Coastal Processes?

Key processes at work in the marine nearshore environment include:

- Circulation processes, including tides and currents;
- Water quality processes for nitrogen, phosphorus, and pathogens;
- Beach processes including coastal erosion, net shore-drift, coastal bluff landslides and fluvial influences; and
- Climate change including temperature, precipitation and runoff, and sea level rise.

These processes form the physical shape of the shoreline, influence nutrient dynamics, and create the other biogeochemical conditions that sustain the marine ecosystem.

The marine circulation patterns in east Jefferson County are typical of a fjordal estuary. Freshwater from local rivers typically flows seaward at the surface, with colder, more saline water from the Pacific Ocean flowing along the bottom. Areas with strong winds, deep water, ocean intrusions, and currents coupled with freshwater inputs produce well-mixed conditions (as in Port Townsend Bay) whereas shallower areas of low wind mixing and low current exchange produce seasonally stratified conditions with poor circulation and high levels of dissolved oxygen (as in Discovery Bay and Hood Canal).

Water quality in the nearshore and marine waters of Jefferson County is affected by inputs of nutrients and organic matter from adjacent uplands, streams, rivers, and groundwater seeps, as well as from nearshore bottom sediments and mixing with deeper ocean waters via upwelling and estuarine circulation. In general, inputs from natural sources of nitrogen and phosphorus are several orders of magnitude greater than anthropogenic sources in Puget Sound (Harrison et al., 1994). However, in areas such as Hood Canal, anthropogenic inputs have been shown to far exceed what can be contributed naturally (Fagergren et al., 2004).

Nutrient loads from streams and rivers entering the nearshore depend on the magnitude of river discharge as well as upland land use. Major human sources of nutrients include agricultural operations (animal manure, fertilizers), wastewater treatment plants, and stormwater runoff from residential landscapes (Embrey and Inkpen, 1998 as cited in Fagergren et al., 2004). Major anthropogenic sources of nutrients in Hood Canal include sewage, stormwater runoff, chum salmon carcasses from hatchery returns, agricultural waste, and forestry (Fagergren et al., 2004).

Enclosed bays or inlets and areas with reduced mixing and circulation (such as Mats Mats Bay, Kilisut Harbor, Hood Canal, and Discovery Bay) are vulnerable to excess nutrients from human sources. Nutrient levels in these protected waters can result in low levels of dissolved oxygen,

which can be detrimental to marine organisms. Shellfish beds can become contaminated and forage fish, salmonids, shorebirds and seabirds, and marine mammals can be harmed.

The same processes that control nutrient inputs and dispersion also influence concentrations of pathogens, pollutants, and toxins in nearshore waters of Jefferson County. Riparian buffers offer discernible water quality protection from nearshore nutrient sources. The effectiveness of riparian buffers for protecting water quality depends on a number of factors, including soil type, vegetation type, slope, annual rainfall, type and level of pollution, surrounding land uses, and sufficient buffer width and integrity. Soil stability and sediment control are directly related to the amount of impervious surface and vegetated cover.

Jefferson County's beaches are shaped by three main influences: wave energy, sediment sources, and relative position of the beach within a drift cell. Wave energy is controlled by fetch, or the open water over which winds blow without any interference from land. Winds and waves originating from the south are the strongest and most prevailing in Puget Sound. These wind-generated waves intermittently erode beaches and the toe of coastal bluffs, contributing to bluff landslides. Coastal bluffs (referred to as feeder bluffs) are the primary source of sediment for most Jefferson County beaches.

Tidal range also affects beaches over time such that coastal erosion rates tend to increase with decreasing tidal range. The majority of coastal erosion in the region occurs when high-wind events coincide with high tides and act directly on the backshore and bluffs (Downing, 1983).

Many Jefferson County bluffs are quite susceptible to coastal landslides as a result of wave exposure. Undercutting of the toe of the bluff is usually the long-term driver of bluff recession (Keuler, 1988). Windstorms that create significant wave attack of the bluff toe can directly trigger bluff failures. The greatest density of landslides occurs on the east and west shores of the Toandos Peninsula, east and west Marrowstone Island, north Indian Island, north of Point Ludlow, Point Wilson to Cape George, northeast Discovery Bay, and from Port Townsend to Kala Point. Landslides also occur around the following headlands: Quatsap Point, Fisherman's Point, Termination Point, Point Hannon to Tala Point, Kinney Point, and South Point.

Areas where bluff strata are composed of an unconsolidated, permeable layer (sand), underlain by a relatively impermeable layer (such as dense silt or clay) are also prone to landslides. As water seeps through the permeable layer and collects above the impermeable layer, a zone of weakness or 'slip-plane' is created. This bluff configuration is fairly common in eastern Jefferson County.

Rivers and streams act as agents of change on the marine landscape. Rivers influence the nearshore by locally decreasing the salinity of the water, and by providing sediment to beaches, which helps form marshes, distributary channels, shallow water deltaic habitats, sandflats and mudflats. Rivers also affect the abundance and density of aquatic plants (e.g., eelgrass) and animals.

Marine environments are increasingly affected by global changes in temperature, precipitation, and sea level. Major effects of global climate change include the following (Casola et al., 2005b and King County, 2006):

- Rising sea levels could inundate low lying areas, and increase coastal flooding and erosion.
- Landslides and freshwater flooding may also increase along with winter precipitation.
- Stream flow, stormwater runoff, and water temperature will likely be affected by changes in air temperature and precipitation. Winter flows in low elevation rivers are likely to increase while higher elevation rivers are likely to see an increase in 'wet season' flows.
- Summer base flows in river systems that depend on snowmelt may decrease as temperatures warm and snowpack decreases.
- The timing of peak runoff will also likely change, occurring earlier in the spring. This has the potential to greatly impact fish and other biota adapted to coldwater habitat during the warm, dry months of summer.

3.2 What Are the Relevant Upland (Freshwater) Processes?

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 shoreline ecosystems.

Hydrologic processes operate via two main pathways: infiltration and groundwater recharge. In healthy watersheds, precipitation infiltrates the soil and moves down slope (or laterally) as subsurface flow, feeding streams, lakes, and wetlands. Some water percolates deeper into the geologic deposits eventually recharging groundwater. In glaciated landscapes like Jefferson County, areas with glacial outwash and recessional outwash have a relatively high capacity for infiltrating precipitation and are identified as important infiltration and recharge areas (Winter, 1988).

Surface runoff and peak flows are inversely correlated to infiltration and recharge so development actions that reduce infiltration increase the magnitude and frequency of runoff and peak flow events. Two of the most fundamental development actions in this regard are the conversion of pervious surfaces to impervious surfaces and the loss of mature forest cover.

Impervious surfaces can impact infiltration in all areas of a watershed, but are particularly harmful in areas that have naturally high infiltration/recharge capacity (e.g., permeable deposits on low slopes such as the Chimacum Creek valley and Leland Creek valley). Similarly, the loss of mature forest cover can have adverse effects anywhere in the County, but it is particularly damaging in areas of moderate to high elevation (e.g., headwaters of most of the major rivers in Jefferson County). When these areas are cleared, the amount of surface runoff increases substantially (relative to the amount of infiltration) because of the additional snow on the ground and the increased snowmelt that occurs in the absence of vegetative cover. The loss of surface water storage potential can also affect hydrologic processes. Land use can directly impact water storage through the filling of floodplains, wetlands, and/or hyporheic zones, or indirectly decrease storage by disconnecting rivers from their floodplains.

Precipitation is the primary source of groundwater recharge. However, alterations to flow paths and groundwater extraction influence the availability of groundwater for maintaining ecological functions during the summer low-flow period. Draining areas of shallow groundwater via

ditching, pumping, or other practices shortens the groundwater flow paths and decreases retention time. Consequently, the availability of groundwater for discharge to streams during low runoff periods decreases. Shallow soils in the mountains limit groundwater recharge. River valleys and outwash plains in the lowlands contain much deeper, porous soils that store large quantities of water.

Water quality processes in upland areas are affected by nutrient inputs resulting from certain land uses. Fertilizer originating from various land uses (such as commercial forest lands, agricultural, and/or residential areas) can be a potential source of increased nitrogen inputs to freshwater aquatic ecosystems. In addition, fecal waste generated from septic tanks, agriculture, waterfowl/pet waste can also contribute excess nitrogen and other nutrients.

In general, areas that promote water and sediment retention and/or predation by microorganisms, such as floodplains, riparian areas, depressional wetlands, and permeable deposits draining into surface waters via subsurface flow or groundwater recharge, are important areas for nitrogen, phosphorus, and pathogen removal.

In upland areas, erosion of steep slopes and/or landslides have a major influence on sediment processes. Landslide hazard areas are common in the western Olympic Mountains and foothills, where relief is more extreme and precipitation is high. Surface erosion areas are mainly located in/along the Big and Little Quilcene Rivers, Dabob Bay, Hood Canal, and Tala Point. Localized erosion of streambanks and lakeshores are also important sediment sources.

Sediment and hydrologic processes are closely linked to the movement and transport of organic materials into and through freshwater systems. Bank erosion, channel migration and landslides are a major source of large woody debris to streams.

4.0 FUTURE DEVELOPMENT

Reasonably foreseeable future development in Jefferson County is likely to maintain the existing use patterns described in the Section 2 of this report. This section describes the types of development that are expected given the proposed SMP provisions, existing development patterns, shoreline characteristics, and parcel attributes. The following section (Section 5) describes the how the PD SMP will shape and influence future development in a manner that prevents cumulative adverse impacts.

4.1 What Types of Future Development Will Be Allowed?

The types of future development allowed on County shorelines will vary depending on the Shoreline Environment Designation (SED) assigned to each shore segment once the SMP is adopted. The PD SMP assigns SEDs to shore segments based on three general factors:

- The ecological condition of the shoreline,
- The extent and degree of shoreline modification, and
- The type and intensity of existing land use.

Specific consideration was given to the presence of the following key ecological and land use attributes:

- Degree of Ecological Function (function score as identified by Diefenderfer et al., 2006)
- Degree of Alteration/Stress (stressor score as identified by Diefenderfer et al., 2006)
- Salmonid Nodal Corridor/ Refugia (as identified by May and Peterson, 2003)
- Nearshore Salmonid Refugia (as identified by May and Peterson, 2003)
- Salmonid use
- Salt Marsh / Lagoon / Intertidal Wetland Presence (as identified by Todd et al., 2006)
- Feeder Bluff Presence (evident on oblique aerial photos)
- Terrestrial Priority Species Use
- Erosive/ Hazardous Slope/Channel Migration Zone (CMZ) Presence
- Land Use Designation (and assessor's information on parcel density and vacant parcels)
- Public Land / Tidelands
- Commercial Shellfish Status

The following environment designations are assigned to the County's shorelands or upland areas landward of the ordinary high water mark (see Article 4 of the PD SMP for a complete description):

- **High Intensity** (HI) for shorelines that are either presently supporting industrial uses or intensive water-dependent uses such as marinas and port facilities or planned for such.

Examples include the Port Townsend Paper Mill site, the Herb Beck Marina, and the Pleasant Harbor Marina. Allowed uses are generally limited to water-dependent port and industrial uses.

- **Shoreline Residential** (SR) for areas of the County that are characterized by relatively high density (RR 1:5) single family residential uses, or planned for such. Examples include Bridgehaven, Beckett Point, Shine/Squamish Harbor, and portions of the Port Ludlow, Oak Bay, and Brinnon shorelines. Residential uses are allowed but most accessory uses require a conditional use permit.
- **Conservancy** (C) for shorelines that are characterized by lower density residential development (RR 1:10 and RR 1:20), resource lands, publically owned shorelines, shorelines that have potential to be restored, and other shorelines that are relatively undisturbed and maintain high levels of ecological function. Examples include all of the rivers in east and west Jefferson County; most of the east shore of Marrowstone Island, Tala Point, Pulali Point, Whitney Point and Jackson Cove. Residential uses are allowed but most accessory uses require a conditional use permit (CUP). Resource-based uses such as aquaculture (some require a CUP) and forestry are allowed. Low-intensity, water-oriented commercial and industrial uses are allowed with a conditional use permit.
- **Natural** (N) for those areas that are mostly ecologically intact and therefore currently performing important or irreplaceable functions that would be damaged by human activity; shorelines that contain undisturbed wetlands, estuaries, feeder bluffs, unstable slopes, coastal dunes, and/or accretional spits; shorelines that have particular scientific and/or educational value; and/or shorelines that have development limitations or pose human health and safety risks due to the presence of environmental hazards. Examples include Fisherman's Point, much of the west shore of the Toandos Peninsula, Thorndyke Bay, the major river delta areas on Hood Canal, and the east shore of Discovery Bay. Low intensity single family residential uses are allowed with a conditional use permit. Aquaculture and low-intensity public water-oriented recreation are also allowed. All other uses and shoreline modifications are prohibited.

The SEDs are designed so that the uses allowed on each shore segment are appropriate considering the ecological condition and sensitively of the land and water. As a result, the type and intensity of uses allowed in areas designated Natural and Conservancy are tightly controlled since these areas are the most sensitive to future development and the most vital to protect. Coincidentally, the Comprehensive Plan designations and existing uses are compatible with the SEDs.

For each SED, the PD SMP identifies:

- Permitted uses and developments – These are uses and developments that are consistent with the SMA. 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.

4.2 How Will the Proposed Shoreline Designations Protect the Shores?

The PD SMP proposes SEDs that reflect the shoreline ecology and are consistent with the shoreline guidelines (WAC 173-26-211). As such, these designations will help protect ecological functions and values and accommodate preferred and water-dependent shoreline uses. The proposed SEDs ensure that the vast majority of the County's shorelines will be reserved for relatively low intensity uses. In east Jefferson County, approximately 41 percent of the total shoreline miles (lakes, rivers and marine shorelines) are proposed to be designated Natural because of their unique and/or ecologically valuable traits. An additional 29 percent of the shore would be designated Conservancy, which is the second most protective designation. The Shoreline Residential designation accounts for approximately 17 percent of the shore and High Intensity accounts for only 5 percent (Figure 3).

On the marine shore, Natural is the most common designation followed by Conservancy and Shoreline Residential. The majority of the river shorelines are proposed to be designated Conservancy; slightly fewer river miles would be designated Natural and a very small percentage would be designated Shoreline Residential. All of the lakes except Leland, Sandy Shore and Mill Pond and half of Crocker Lake are designated Natural; the remaining lakeshore are designated Conservancy except for Mill Pond, which is an existing industrial pond used as a aeration pond at the Port Townsend Paper Mill (Figure 4). In west Jefferson County all shorelines (100 percent) are proposed to be designated Conservancy.

In-water areas adjacent to (waterward of) the shorelands are proposed to be designated Aquatic or Priority Aquatic. The Priority Aquatic designation is assigned to waters and their underlying bedlands deemed vital for salmon and shellfish. These waters are to be protected to the highest degree possible and restored where feasible. The Aquatic designation is assigned to all other waters to protect, restore, and manage their unique characteristics. Of the river and marine waters, approximately 126 miles (51 percent) are designated Priority Aquatic and approximately 118 miles (49 percent) are designated Aquatic. One hundred percent of the lake shoreline waters are designated Aquatic.

Table 4 shows how the Priority Aquatic and Aquatic designations are paired with the adjoining upland designation. Approximately 60 percent of the Natural marine shores have a corresponding in-water designation of Priority Aquatic and 50 percent of the river shores have a corresponding Aquatic designation. The percentage of Conservancy shorelines that have a corresponding Priority Aquatic designation is similarly high--24 percent for marine shores and 38 percent for river shores.

Figure 3. Approximate Percent of Shorelines in each Shoreline Environment Designation - East Jefferson County[18]

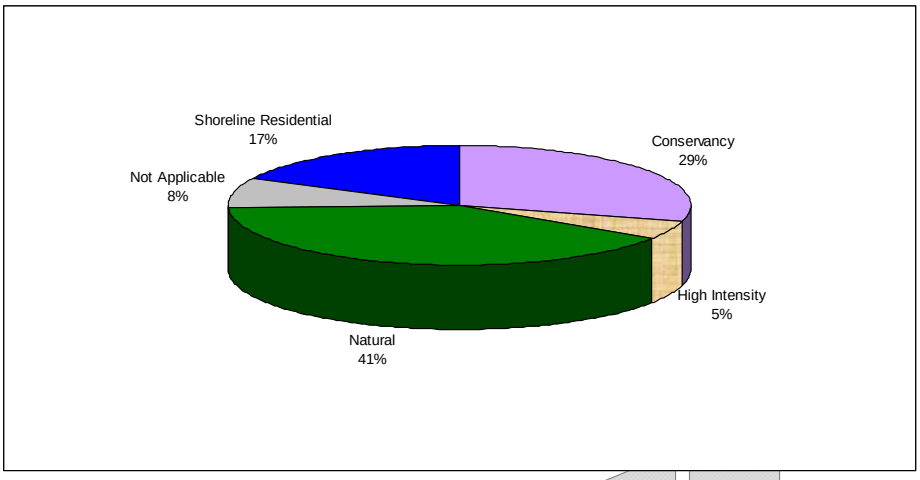
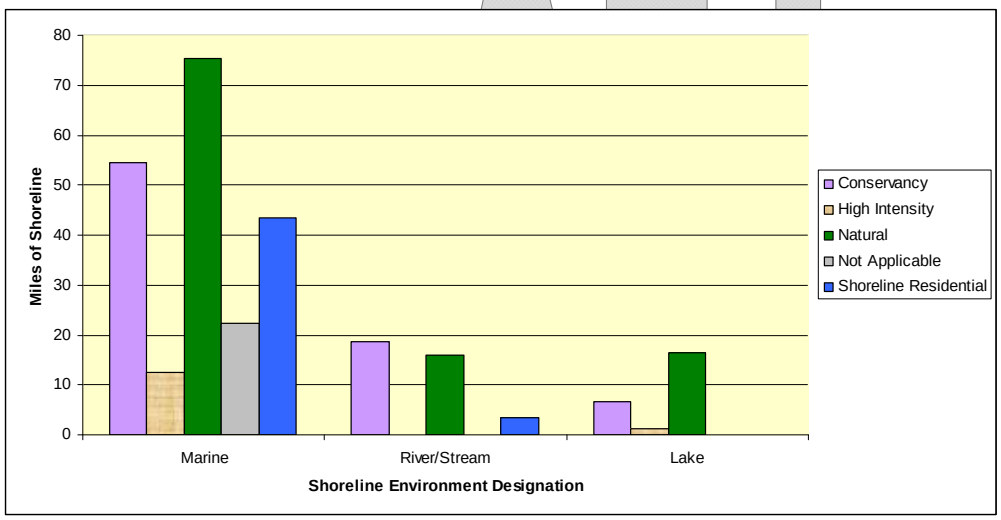


Figure 4. Miles of Marine, River, and Lake Shoreline in each Shoreline Environment Designation - East Jefferson County[19]



[18] Not Applicable (NA) refers to shorelines that are not subject to County jurisdiction. This includes federally owned lands and lands within the City of Port Townsend.

[19] Not Applicable (NA) refers to shorelines that are not subject to County jurisdiction. This includes federally owned lands and lands within the City of Port Townsend.

Table 4. Priority Aquatic Designations Paired with Upland SEDs – East Jefferson County

Upland Designation	Percent of Marine Shore Miles Designated Priority Aquatic[20]	
	Marine	Freshwater
Natural	59	50
Conservancy	24	38
Shoreline Residential	13	12
High Intensity	1	0

4.3 Where Will Future Development Occur?

Future development will likely be concentrated in east Jefferson County on the marine shoreline on parcels that are undeveloped and/or underdeveloped. According to county assessor's data approximately 30 percent of all of the existing parcels on the marine shoreline in east Jefferson County are vacant (have no structure/improvements). Development on these vacant parcels can be expected to occur over time depending on demand for housing, job availability, and other factors. The PD SMP contains a full range of policy and regulatory provisions to protect shoreline functions in the face of this expected future development. These provisions include buffer and setback requirements, vegetation conservation requirements, restrictions on shoreline armoring and overwater structures, and other measures as described in this section. Even development that is exempt from a shoreline substantial development permit must comply with these provisions and the County reviews all development proposals, including exempt developments, to ensure that exempt uses meet the SMP standards.

The majority of the vacant parcels occur in areas that are designated Natural (Figure 5). Single family residential development on shores that are designated Natural is allowed but requires a conditional use permit. In addition, there are strict limits on accessory structures, docks, and other appurtenances associated with these developments. These requirements and the other PD SMP regulations pertaining to buffers, setbacks, vegetation conservation, and other issues help prevent cumulative impacts and maintain shoreline functions while also allowing preferred uses.

County assessor's data also indicate that approximately 40 percent of the total river shoreline parcels in east Jefferson County are vacant. Approximately 51 percent of the vacant parcels are designated Natural and 40 percent of the vacant parcels are designated Shoreline Residential (Figure 6). The vacant parcels are likely candidates for future development but the standards of the PD SMP will maintain ecological functions while allowing for residential development.

[20] Areas that are not assigned a Priority Aquatic designation below the ordinary high water line are designated Aquatic.

Figure 5. Percent of Existing Vacant Parcels in Shoreline Jurisdiction by Shoreline Environment Designation - East Jefferson County Marine Shorelines[21]

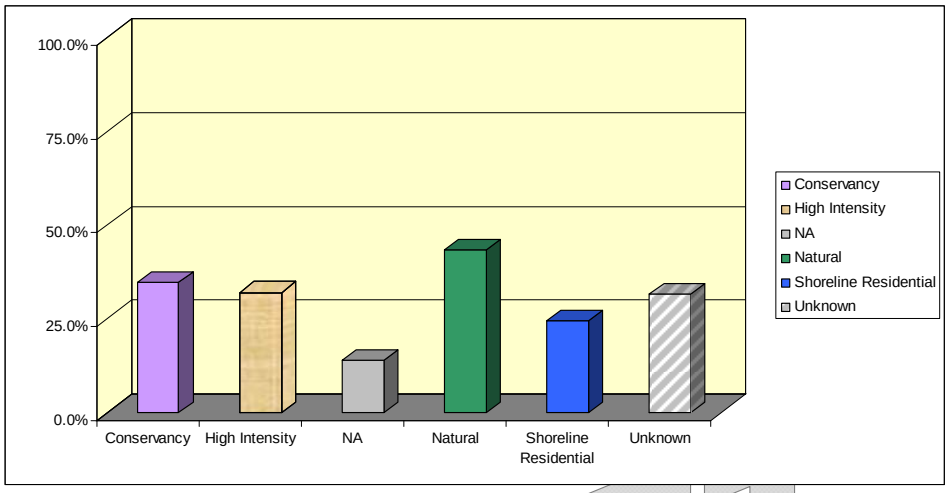
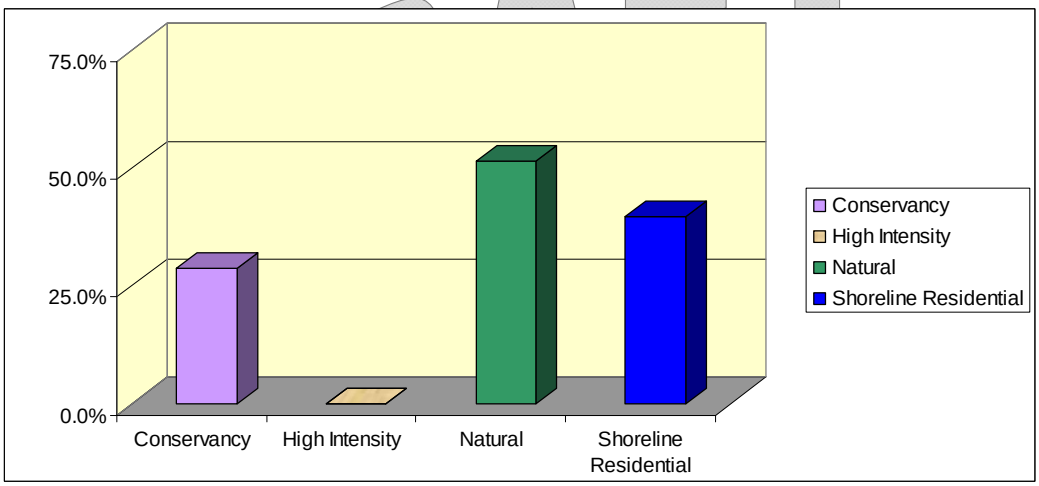


Figure 6. Percent of Existing Vacant Parcels in Shoreline Jurisdiction by Shoreline Environment Designation - East Jefferson County River Shorelines[22]



[21] Not Applicable (NA) refers to shores that are not under County jurisdiction. This includes lands in federal ownership and land within the City of Port Townsend. Unknown are parcels for which no data are available.

[22] Not Applicable (NA) refers to shores that are not under County jurisdiction. This includes lands in federal ownership and land within the City of Port Townsend. Unknown are parcels for which no data are available,

4.4 What Types of Development Will Occur on Marine Shores?

Since nearly all of the land on the marine shoreline is designated for rural residential use, future development is expected to consist mainly of single family residences and normal appurtenances such as a driveway, septic systems, garages, landscaping, etc. In addition, single family residential developments often include proposals for docks or other types of moorage (e.g., mooring buoys), beach stairs or trams, boathouses, and other types of accessory structures that are not considered 'normal appurtenances.' Residential use is a preferred shoreline use according to the Shoreline Management Act.

In addition to single family residential use, the following types of use/development can be expected on the marine shoreline:

- Master Planned Resorts (MPRs) – This includes possible expansion of the Port Ludlow MPR (much of it is vested under existing regulations), and a new MPR at Pleasant Harbor.
- Marinas – This includes continued marina use at existing marinas (Port Hadlock, Port Ludlow, Herb Beck, etc), and possible expansion of the Pleasant Harbor marina (in conjunction with the Pleasant Harbor MPR).
- Commercial Aquaculture – This includes modifying or expanding existing aquaculture in Discovery Bay, Oak Bay, Quilcene Bay, Port Townsend Bay, and Dabob Bay and developing new farms and related uses.

4.5 What Types of Development Will Occur on River Shores?

In east Jefferson County, future development on river shoreline is expected to include a variety of uses. Existing and ongoing agricultural use is expected to continue on portions of the Chimacum, lower Little Quilcene, middle Big Quilcene, Snow and Salmon Creek shoreland areas. These agricultural lands are used mainly for grazing and their ongoing use for agricultural purposes is generally unregulated by the County's SMP (consistent with the state's shoreline guidelines).

On the major rivers draining to Hood Canal, the dominant future land uses are expected to include forest practices on the upper reaches and low density rural residential development of one house per 10 acres or one house per 20 acres on the middle and lower reaches. Public recreation uses will continue to occur at Dosewallips State Park and other parks and there will be some continued commercial use associated with Rural Village Centers on the Dosewallips and Little Quilcene Rivers (these occur at the outer margins of shoreline jurisdiction and comprise a very small percentage of the shoreline area).

4.6 What Types of Development Will Occur on Lake Shores?

The shorelines of all of the lakes except Leland, Sandy Shore, Mill Pond and half of Crocker Lake are designated Natural, which provides the highest level of protection possible and limits the type and intensity of future development/use that can occur (Table 5). However, commercial forest land surrounds most of the County's lakes, so these lands would be subject to timber harvest, construction of forest roads, and other forestry-related activities in accordance with State

Forest Practices Act (FPA) rules. The PD SMP allows forest practices on all County shorelines consistent with the state shoreline guidelines.

The shorelands of Anderson Lake and Gibbs Lake are mainly publically owned park land. Development on these shores consists mainly of low-intensity recreation use and is not expected to change substantially in the foreseeable future. Only Crocker Lake, Lake Leland and Rice Lakes have sizeable portions of their shores in private ownership with potential for rural residential use. Single family residential development may be allowed as a conditional use on these lakes, but accessory dwelling units and most accessory structures would be prohibited (see Section 5 of this report for more information). Shoreline modifications including docks and bulkheads associated with residential use would be prohibited on these Natural shorelines.

Table 5. Expected Future Development on Shoreline Lakes

Lake	PD SMP Proposed Environment Designation	Expected Development/Use
Anderson Lake	Natural	Low intensity public recreation use including public docks and launch ramps for non-motorized watercraft
Crocker Lake	Conservancy (east shore) / Natural (west shore)	Low density residential use; no shoreline modifications or overwater structures
Gibbs Lake	Natural	Low intensity public recreation use including public docks and launch ramps for non-motorized watercraft
Lake Leland	Conservancy	Low density residential use; no shoreline modifications or overwater structures
Lords Lake	Natural	Forest practices
Mill Pond	High Intensity	Industrial use; continued use of the aeration pond within the Paper Mill site
Peterson Lake	Natural	Forest practices
Sandy Shore Lake	Conservancy	Forest practices
Tarboo Lake	Natural	Forest practices
Wahl Lake	Natural	Forest practices
Ludlow Lake	Natural	Forest practices
Teal Lake	Natural	Forest practices
Rice Lake	Natural	Low density residential use; no shoreline modifications or overwater structures

4.7 What Affect Will Land Subdivision Have on the Shoreline?

It is difficult to predict how many existing parcels would be subdivided but estimates and past trends suggest that subdivision of land is not expected to create large number of new parcels (Table 6). To obtain an estimate of the number of new lots that would be created through subdivision, the authors of this report calculated the number of existing rural residential lots on the marine shoreline that could be divided into multiple parcels based on parcels size and land use designation. A parcel designated RR1:5 was assumed to be subdividable into two lots if it were at least 10 acres in size, three lots if it were at least 15 acres in size, and so on. Similar estimates were made for lots designated RR 1:10 and RR 1:20. The estimates were then

correlated to the proposed shoreline environment designation. Overall, the number of existing lots eligible for subdivision based on size and land use designation is very low; less than one percent in most cases.

The likelihood of subdivision is assumed to be similarly low on the river and lake shores which tend to have a higher percentage of resource lands designated as Commercial or Rural Forestry (with corresponding residential densities of 1:80 and 1:40 respectively) This suggests that Jefferson County will retain a very rural character with low density residential development in the absence of re-designating lands or consolidating parcels and creating new plats.

Table 6. Rural Residential Parcels that Can Potentially be Subdivided by Shoreline Environment Designation - East Jefferson County Marine Shore

	Able to be Subdivided		Unable to be Subdivided	
SED	**# of Parcels**	**Percent**	**# of Parcels**	**Percent**
Conservancy	10	0.78%	1179	92.3%
High Intensity	1	0.40%	60	23.7%
Natural	19	1.29%	1318	89.2%
Shoreline Residential	1	0.04%	2137	91.6%
Unknown	16		179	

5.0 EFFECTS OF DEVELOPMENT

Shoreline development is known to cause a number of deleterious effects on shoreline resources. In most cases adverse effects can be managed or offset through careful planning, compliance with appropriate regulations, use of best management practices and low impact development techniques, and effective compensatory mitigation measures. The PD SMP employs of all of these tools to prevent cumulative adverse impacts on shoreline functions.

As described in Section 4, much of the foreseeable development on Jefferson County's rivers and lakes will be related to forest practices. Most of the development on the marine shores will be single family residential development. These and other foreseeable future development actions will impact the shoreline. However, significant adverse impacts and cumulative adverse impacts will be prevented if the PD SMP is implemented as intended. This section describes potential effects of common development actions that could substantially alter the County's shorelines and explains how the PD SMP mitigates potential adverse effects.

5.1 What Are Some of the Main Tools for Protecting Shoreline Functions?

Critical Areas Regulations and Shoreline Buffers

The PD SMP fully integrates the County's critical areas regulations in JCC 18.22, which were adopted in 2008 to protect wetlands, fish and wildlife habitat conservation areas, landslide hazard areas, channel migration zones, and other critical areas consistent with best available science. The PD SMP establishes a protective buffer on all shorelines consistent with JCC 18.22. All new shoreline uses and developments, including preferred uses and uses exempt from shoreline permit requirements, must be located landward of the standard buffer plus a 10-foot-wide building setback. The standard buffer extends landward in all horizontal directions from the ordinary high water mark of the shorelines as follows:

- **Marine shores –** the standard buffer is 150 feet.
- **Lake shores –** the standard buffer is 100 feet.
- **Stream/River shores –** the standard buffer is 150 feet.

To ensure that the standard buffers protect the adjacent water bodies, the buffers must be well-vegetated. The PD SMP requires at least eighty (80) percent of the buffer area to be maintained in a predominantly natural condition. Up to twenty (20) percent of the buffer area, or at least 15 linear feet of the water frontage, whichever is greater, may be retained for 'active use' and for shoreline access, provided that such areas are located to avoid areas of greater sensitivity and habitat value.

To accommodate uses and developments that require a location on the water or near the water's edge, some uses/developments may be permitted or conditionally allowed within the shoreline buffer provided they are water-dependent, water-related, or water-enjoyment uses/developments. In order to be approved, the amount and extent of buffer modification must be the minimum

needed to accommodate the use/development. Examples of water-oriented uses/developments allowed within the buffer are as follows (most of these require a conditional use permit):

- Boating facilities accessory to a single family residential development including rails, docks, piers and floats;
- Small (≤ 300 square feet) boathouses accessory to a single-family residential development provided that certain criteria are met;
- Public access structures such as docks, piers, floats or pedestrian beach access structures accessory to commercial, industrial, port or other allowed uses/developments; and
- Certain utilities and essential public facilities that require a water-side location.

Vegetation Conservation Standards

In addition to requiring new development to observe the shoreline buffers standards noted above, the PD SMP requires new developments to preserve nearshore and riparian vegetation. Proponents of all new shoreline uses or developments are required to submit site design plans to County staff for review to ensure that the layout of structures and uses minimizes vegetation clearing and maintains native vegetation. To minimize conflicts between vegetation conservation and the desire to have expansive shoreline views, the PD SMP states that no property owner is guaranteed an unobstructed view of the water or any specific feature near or far. No more than twenty-five percent of the limbs on any single tree may be removed and no more than twenty-five percent of the canopy cover in any single stand of trees may be removed for view purposes. In addition, limbing and crown thinning must comply with National Arborist Association pruning standards.

Comment [PC1]: Q on the regulation - 25% at one time, total/cumulative, per year? Consider clarifying the timeframe

Comment [mec2R1]: SMP does not specify a time limit

5.2 How Do Forest Practices Typically Affect Shorelines?

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 Section 3, the removal of forest cover in watershed 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, riparian and nearshore vegetation provides 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.

5.3 How Does the SMP Prevent Impacts from Forest Practices?

The PD SMP regulates non-harvest related development actions such as road building, but generally does not regulate timber harvest. Harvest activities, except for Class IV conversions to non-forest uses, are left to the purview of the state Forest Practices Act (RCW 76.09). That standard is consistent with the state shoreline guidelines which state: "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[23]." Nevertheless, the PD SMP limits selective commercial cutting on shorelines of statewide significance to thirty percent of the merchantable timber volume in any ten (10) year period as required by the SMA (RCW 90.58.150). 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 PD SMP prohibits forest practices below the ordinary high water mark and requires a conditional use permit for forest roads on slopes exceeding 35 percent.

Effectively this means all forest practices conversions and activities require a shoreline substantial development or conditional use permit from the County. In reviewing the permit application, County staff would assess the non- harvest related actions to ensure they are compliant with the SMP and defer to 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.

5.4 How Does Residential Development Affect Shorelines?

In and of itself, residential development probably does not have major adverse effects on shoreline resources. Most of the effects are caused by actions commonly associated with residential development and use including construction of bulkheads, removal of shoreline vegetation, use of fertilizers and other chemicals, alteration of natural drainage pathways, construction or docks/piers, boating activities and the like. These actions typically cause a variety of impacts that affect physical processes and can damage fish and wildlife species and their habitats.

Shoreline armoring is a concern with many types of shoreline development but is especially common with residential development. Shoreline property owners, especially on rivers and marine shores, often feel compelled to 'armor' their land against the erosive effects of wind, waves and currents using conventional concrete or riprap structures. However, bulkheads can disrupt sediment generation and net shore-drift patterns and adversely affect shoreline morphology and habitat function. Bulkheads along feeder bluffs inhibit or eliminate sources of beach sediment for drift cells. Beaches in front of armored shorelines can lose fine sediment through the increased wave reflection off of vertical or near vertical walls. Over time a heavily armored shore can lose its beach because the sediment sustains the beach is no longer reaching it or is not staying on the beach. In a drift cell where bulkheads prevent bluff sediment from

[23] WAC 173-26-241(3)(e)

reaching the intertidal zone, the depositional beach at the terminus of the drift cell often experiences accelerated erosion even if it is miles 'down drift' from the armored bluff. These alterations can ultimately change the structure of the habitat from mixed-fine substrate communities (that often support eelgrass) to coarser substrate communities with less habitat value for young migrating salmon. Other consequences are habitat fragmentation, loss of migratory corridors, and degradation of foraging habitat. Bulkheads and other types of fills can also force juvenile salmon into deeper water, where the risk of predation may be significantly higher.

Other shoreline modifications such as bulkheads, groins, piers, ramps, and docks are also common—although not necessarily unique to—residential development. These structures affect the prey base for salmonid fishes. Because forage fish such as surf smelt and sand lance depend on suitable beach substrates, they are particularly vulnerable to shoreline modifications and processes affecting sediment input, transport, or deposition. Direct impacts include loss of shoreline/riparian vegetation, burying of habitat by structures, damage from equipment working in an area while eggs are incubating on the beach, and substrate coarsening and lowering of the beach profile in front of bulkheads (MacDonald et al., 1994). Indirect impacts occur primarily through disruption of sediment transport and/or sediment impoundment, and water quality degradation (Long et al., 2005). Surf smelt and sand lance require intact riparian vegetation, which provides shade and microclimate control for spawning areas (Rice, 2006). Pacific herring vary slightly in that their spawning is primarily in the lower intertidal and shallow subtidal zones, and therefore their habitat requirements are focused on vegetation such as eelgrass or algae.

Eelgrass and kelp beds are susceptible to alterations associated with residential land use. This includes altered sediment processes, reduced light penetration caused by overwater structures, and poor water quality. Since kelp and eelgrass provide essential feeding, rearing, and refuge areas for juvenile salmon, alterations can be harmful to young fishes. Species of birds and fish that depend upon juvenile salmon as prey can also be affected. Other threats to eelgrass and kelp from residential development include erosion/sedimentation from construction activities, increased water temperature due to lack of shade, pollutant loading, excessive nutrient inputs, and the introduction of invasive exotic plants (PSAT, 2001).

Removal of shoreline vegetation, which often accompanies residential development, reduces shade and large woody debris recruitment potential, which impacts the supply of prey resources for juvenile and resident salmon and decreases in-stream habitat complexity in river systems. Failure to maintain or plant vegetation along bluffs can decrease root strength and increased likelihood of future landslides (Ziemer and Swanston, 1977; Bishop and Stevens, 1964). Bluffs with significant modifications to both the natural drainage regime and vegetation are particularly susceptible to landsliding.

Residential and attendant recreational use of the shorelines pose additional threats to shoreline functions. Potential impacts on shorelines include noise impacts to fish and wildlife and spreading exotic species of plants and plankton. Additional potential impacts to shorelines where motorized water craft are allowed include increased wave energy and shoreline erosion, direct physical injury due to contact with people and watercraft, re-suspension of contaminated sediments and/or increased turbidity caused by propeller scour, and possible introduction of

chemical pollutants from boat emissions. Table 7 summarizes common effects of residential development.

Table 7. Common Effects of Residential Development on Shoreline Resources

Development Activity	Potential Impacts[24]
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 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
Shoreline armoring	• Loss of backshore habitat • Changes in beach substrate character and downcutting • Loss of substrate appropriate for eelgrass and kelp attachment or growth • Substrate change from changes in wave energy and other physical processes • Changes in juvenile salmonid prey diversity and abundance due to alterations in beach/river substrate and structure • Altered shellfish settlement and growth due to changes in sediment loads and size
Dock/Pier construction	• Substrate modification due to piling placement and grounding of boats and/or structures • Changes to substrate structure/vegetation due to accumulation of shell fragments adjacent to pilings resulting in decreased habitat available for herring spawning • Loss of marine vegetation from shade impacts of boats and floats, and scouring from buoy anchors causing reductions in spawning, rearing, and refugia habitat available to forage fish • Decreased survival, due to desiccation, for herring eggs spawned on pilings at high tide elevations • Reduction or loss of eelgrass and kelp beds due to shading by over-water structures • Altered juvenile salmon migration behavior and increased predation due to shading from overwater structures • Disruption of salmon migration and feeding areas due to noise and turbidity associated with construction activity
Creation of lawns and impervious surfaces	• Increased pollutant load due to lakes, rivers and marine waters from non native 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

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

Development Activity	Potential Impacts[24]
	• 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

5.5 How Does the SMP Prevent Impacts from Residential Development?

The PD SMP prevents impacts caused by residential development by limiting the size, scale and location of residential structures, by controlling subdivision patterns so that newly created lots can be developed with minimal impacts on shoreline ecology and by restricting the types of accessory uses/structures that are allowed including docks, bulkheads, beach stairs and boathouse. Some of the specific regulations include the following:

- Residential developments are required to avoid adverse impacts on shoreline processes, aquatic habitat, biological functions, water quality, aesthetics, navigation, and neighboring uses.
- Residential developments must comply with the shoreline buffer and vegetation retention requirements noted above. This means that new homes and appurtenances must be at least 100 feet (lakes) or 150 feet (rivers and marine shores) from the ordinary high water line.
- Residential developments that can be reasonably expected to require shoreline armoring during the useful life of the structure or one hundred years, whichever is greater are prohibited.
- Residential developments that can be reasonably expected to require structural flood protection within a channel migration zone or floodway during the useful life of the structure or one hundred years, whichever is greater, are prohibited.
- Cluster development and appropriate low impact development practices are required for development sites constrained by critical areas and/or shoreline buffers.
- Overwater or floating residential developments are prohibited.
- Subdivision is not allowed to create any lot that would require armoring or flood control in order to be 'buildable'; or

- Effects of residential development are also mitigated via the stormwater, and overwater structure regulations described below.

5.6 What Effects Can Agriculture Have on the Shoreline?

Agriculture usually involves ground-disturbing activities such as tilling, pasturing, mowing, and harvesting crops. In addition, agriculture often involves applying fertilizers and raising animals. Potential effects of these activities on shorelines are erosion and sedimentation, introduction of nutrients and bacteria to surface and ground water systems, and loss of habitat/habitat fragmentation. These effects can often be mitigated by using best management practices and maintaining buffers between the agricultural activity and the shoreline waterbody.

5.7 How Does the SMP Prevent Impacts from Agriculture?

In Jefferson County a relatively small percentage of the land under shoreline jurisdiction is in active agricultural use. Existing agricultural uses on agricultural lands would generally not be regulated by the SMP because the shoreline guidelines indicate that "master programs shall not require modification of or limit agricultural activities occurring on agricultural lands."

However, the PD SMP contains provisions to address new agricultural activities on land not meeting the definition of agricultural land, conversion of agricultural lands to other non-agricultural uses, and other development on agricultural land that does not meet the definition of agricultural activities. These provisions require that vegetated buffers be maintained adjacent to all shoreline waterbodies and that specific vegetation conservation standards be implemented to limit clearing (see below for more information on buffers and vegetation conservation). The PD SMP also controls where new agriculture can occur. In areas designated Natural new agricultural activities are prohibited, except that grazing may be allowed as long as they do not expand or alter agricultural practices in a manner inconsistent with the purpose of the designation. To prevent water quality impacts caused by agricultural activity, the PD SMP requires that manure spreading be conducted in a way that prevents animal wastes from entering water bodies or wetlands adjacent to water bodies. Manure spreading is not allowed within the floodway or within 25 feet of the ordinary high water mark of any shoreline, whichever is greater. Confinement lots, feeding operations, lot wastes, manure storage or stockpiles, and storage of noxious chemicals also are not allowed within floodways or within 200 feet of the ordinary high water mark of any shoreline, whichever is greater. Finally, bridges, culverts and/or ramps must be provided to enable livestock to cross streams without damaging or eroding the streambed or banks.

5.8 What Affects Can Aquaculture Have on the Shoreline?

Aquaculture has the potential to 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 may be more likely to occur with large-scale or intensive commercial operations 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.

5.9 How Does the PD SMP Prevent Impacts from Aquaculture?

The PD SMP recognizes that aquaculture is a preferred and water-dependent shoreline use—one that is very important to the regional culture and economy. As a result, The PD SMP seeks to protect valuable aquaculture lands from impacts of incompatible uses through application of the Priority Aquatic and Natural designations (see Section 4.2). The PD SMP also classifies most aquaculture uses/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. In addition, aquaculture facilities/farms must be separated from one another a sufficient distance to prevent cumulative effects on ecological functions and processes and adjoining land uses. The County will determine what constitutes a sufficient distance in consultation with state and federal agencies and Tribes based on the specific characteristics of the waterbody, reach, drift cell, and uplands in the vicinity of the farm/facility. 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. The PD SMP limits the height of floating/hanging aquaculture structures and associated equipment to 6 feet above the water's surface. To prevent adverse effects on marine flora, aquaculture use and development must be sited so that shading and other adverse impacts to existing red/brown macro algae (kelp), and eelgrass beds are avoided. Also helical anchors or similar devices must be used to minimize substrate when attaching structures to the bed or bottomlands. To prevent impacts on wildlife, non-lethal, non-harmful measures must be used to control birds and mammals. Finally, aquaculture use and development must avoid use of chemicals, fertilizers and genetically modified organisms (except when allowed by state and federal law) to prevent water quality degradation.

5.10 How Does the SMP Prevent Stormwater Impacts?

The effects of stormwater runoff on shoreline functions are well documented. To mitigate these effects, the PD SMP includes a number of standards that promote the use of low impact development (LID) techniques. For example, parking areas at marinas and other shoreline recreation facilities must meet County stormwater management standards and must, where feasible, incorporate pervious pavement, bioswales, and other low impact development practices. Residential developments are required to employ clustering techniques and LID measures where sites are constrained by critical areas and/or shoreline buffers. Finally, all public transportation facilities are required to employ pervious materials and other appropriate low impact development techniques where soils and geologic conditions are suitable and where such measures would measurably reduce stormwater runoff.

5.11 How are Bulkheads (Shoreline Armoring) Regulated?

The PD SMP imposes strict limits on construction of new bulkheads (or other types of structural shoreline stabilization or armoring) and expansion of existing bulkheads on residential properties to prevent adverse effects on net shore-drift, beach formation, juvenile salmon migratory habitat and other shoreline functions. Bulkheads can be allowed only when necessary to protect an existing primary structure associated with an approved shoreline use/development, public transportation infrastructure, and/or essential public facilities when other alternatives are infeasible. Before approving a request for a new bulkhead, the County must find that there is evidence from a qualified geotechnical engineer that an existing primary structure is in imminent danger of damage caused by currents, wind or waves and not by improper drainage, vegetation removal, or other upland conditions. The PD SMP requires that a range of alternatives be considered before bulkheads are approved including allowing the shoreline to retreat naturally, increasing the building setback and/or relocating the structure, and using flexible/natural materials and other 'soft-shore' methods (bioengineered shoreline stabilization). The County also requires mitigation for impacts associated with bulkhead construction.

The PD SMP prohibits bulkheads on lots that have no structures and requires that subdivisions be designed to preclude the need for future shoreline stabilization. Thus, the decades old practice of using structural means to extend or level property or preserve residential laws/landscaping, which is evident on much of the Puget Sound shoreline but relatively uncommon in Jefferson County due to existing prohibitions, is strictly prohibited by the PD SMP.

A relatively small percentage (less than 10 percent) of the County's shoreline are armored, and the PD SMP allows existing structures to be replaced only when specific conditions are met. Replacement structures are allowed when there is a demonstrated need to protect public transportation infrastructure, essential public facilities, or primary structures and only when the replacement structure:

- Is designed, located, sized, and constructed to assure no net loss of ecological functions.
- Performs the same stabilization function of the existing structure and does not require additions to or increases in size.
- Does not extend waterward of the ordinary high water mark or existing structure unless the residence was occupied prior to January 1, 1992, and there are overriding safety or environmental concerns[25].

Regardless of whether a proposed bulkhead is new or a replacement of an existing structure, it can only be approved through a conditional use permit. This allows for detailed review of all bulkhead proposals to ensure they are consistent with the PD SMP goal of ensuring no net loss of ecological functions. Furthermore, bulkheads associated with residential use is prohibited on shores designated Natural, which equates to approximately 41 percent of the marine shoreline and much of the river shorelines. Residential bulkheads are also prohibited in all Aquatic and

[25] This is consistent with RCW 90.58.100.

Priority Aquatic areas (below the ordinary high water mark). These protections should prevent future loss of nearshore habitat and other adverse effects caused by shoreline armoring.

5.12 How Does the SMP Prevent Impacts Caused by Over-water Structures?

Moorage Associated with Private Residential Use

Docks, piers, floats, and boat lifts are also regulated by the PD SMP so that the adverse effects of over-water structures are minimized. The proliferation of docks and other moorage facilities is a concern in Jefferson County, but perhaps less so than in other areas of the Puget Sound for the following reasons:

- The County's rivers are not very suitable for motorized boating so docks on river shores are relatively uncommon;
- Large expanses of the marine shore are characterized by steep and often unstable bluffs, so access to the shore from the properties at the top of the bluff is limited.
- Outside of bays and coves, much of the County's marine shore is subject to high energy waves and currents, making them less conducive to moorage facilities.

Nevertheless, the majority of the waterfront property in Jefferson County is privately owned residential land and public marina facilities are relatively scarce so there will continue to be pressure to build private residential docks and piers. Anticipating this, the SMP only allows private moorage when ecological impacts are mitigated and when the cumulative effects of dock, pier, float and lift proliferation are shown to be negligible. Docks, piers, floats, and boat or jet ski lifts must be designed and constructed to avoid impacts on nearshore habitats and processes so the PD SMP prescribes the size, location, design, and type of materials that can be used to construct these facilities. To minimize shading, the width of docks and floats is limited to 4 feet (materials that will allow light to pass through the deck are required for widths over four feet) and open grating or reflective panels must be used on walkways or gangplanks in nearshore areas. The PD SMP also prohibits covers on the over-water portion of all residential docks. Docks and piers must be spaced and oriented to avoid a 'wall' effect that would block or baffle wave patterns, currents, littoral drift, or movement of aquatic life. Also, docks, piers, floats and lifts must be constructed of materials that will not adversely affect water quality or aquatic life and they must be located in areas that do not require maintenance dredging.

To limit the number of new overwater structures, each residential development is allowed a maximum of one dock/pier and one float and one boat/jet ski lift. In addition, residential developments of more the four units must provide shared moorage facilities.

The SMP also regulates other types of private boating facilities including boat lunches and mooring buoys. Private boat launches only allowed when there are no available public boat launches within a reasonable distance and there is a limit of one private boat launch facility or structure per residential parcel.

Private boat launches must be designed and constructed using methods that have been approved by state and federal resource agencies as the best currently available. Therefore, rail and track systems are preferred over concrete ramps or similar facilities.

These standards should limit the number, size, and placement of new overwater structures which is especially important on County's marine shorelines, where these structures can disrupt net shore-drift, displace migratory habitat for juvenile salmon, create habitat for salmon predators and cause other harmful effects.

Marinas

Jefferson County has relatively few marinas (eight including marinas in the City of Port Townsend). Development of new marinas and/or expansion of existing marinas could help to offset demands for private residential moorage, and could provide public access benefits, but impacts must be carefully controlled. The SMP allows marina development only when the proponent demonstrates to the County's satisfaction that all of the following conditions are met:

- The proposed location is the least environmentally damaging alternative; and
- Potential adverse impacts on shoreline processes and ecological functions are mitigated to achieve no net loss; and
- The project includes ecological restoration measures to improve baseline conditions over time; and
- The area has adequate water circulation and flushing action; and
- The proposed location will not require dredging or excavation/filling of wetlands; and
- Suitable public infrastructure is available or can be made available to support the marina.

Recognizing that some areas of the County are inappropriate for marina development, the SMP prohibits marinas on lakes; river point and channel bars or other accretional beaches; areas of active channel migration; and areas where flood hazards would be created or exacerbated. When allowed, marinas must use open pile or floating breakwater designs, which have less impact than solid breakwaters.

Marinas pose risks to water quality, so the PD SMP requires all marinas to provide pump-out, holding, and/or waste treatment facilities and services that are conveniently located and sited to ensure easy access, prevent lengthy queues and allow full compliance with waste disposal regulations. Vessel-mounted pump-out services and hard-plumbed stations at each slip are preferred over portable pump-out equipment. In addition, marinas must provide adequate restroom and sewage disposal facilities in compliance with applicable health regulations. Restrooms must be available twenty-four hours a day for use by any patron of the marina facility; the need for restrooms must be determined based on the number of slips and percentage

of live-aboard vessels within the marina. Garbage and recycling receptacles must be provided and maintained by the marina operator at several locations convenient to users.

5.13 What Effects Will Non-conforming Development Have?

Existing lawfully established uses, buildings and/or structures that do not meet the specific standards of the PD SMP will be allowed to continue as legal 'non-conforming' uses. The PD SMP specifies how and when these uses must come in to compliance if they are subject to expansion or modification or if they are affected by flood, fire or other catastrophe.

If a non-conforming development is damaged to an extent up to but not exceeding 75 percent of the replacement cost of the original development, it may be reconstructed to those configurations existing immediately prior to the time the development was damaged. If a non-conforming development is damaged by fire, explosion, flood, or other casualty to a greater extent it must be reconstructed in a location and manner that complies with the PD SMP. However, a single family residential development is allowed to redevelop in kind (i.e. same footprint, same location) if there is no ability to redevelop in a manner that conforms to the SMP. A one-time minor expansion of an existing development (up to 10 percent of the building footprint) is allowed as long as it does not increase the degree of non-conformity. To limit impacts caused by larger expansions, the PD SMP requires that property owners enhance the shoreline buffer through planting to offset the increased structure size such that the area of enhancement is proportionate to the size of the expansion.

The PD SMP also contains special provisions to allow single family residential development on lots that are too small to allow development landward of the shoreline buffer. On these so-called non-conforming lots, the depth of the lot (distance from the ordinary high water mark to the inside edge of the frontage setback) is equal to or less than the width of the standard shoreline buffer (100 or 150 feet). Normally, development on these lots would require a shoreline variance. In order accommodate preferred shoreline uses on these lots, the PD SMP allows for a small building footprint of up to 2,500 square feet plus up to 1,100 square feet for a driveway and an unspecified area for an on-site septic system without a variance when:

- The nonconforming lot was created prior to the date of the original SMP (August 27, 1976).
- Appropriate measures are taken to mitigate all adverse impacts, including using low impact development measures such as pervious pavement for driveways and other hard surfaces; and
- Opportunities to vary the sideyard and/or frontage setbacks are implemented to reduce the nonconformity when doing so will not create a hazardous condition or a condition that is inconsistent with this Program and JCC 18.30; and.
- The residence is located in the least environmentally damaging location relative to the shoreline and any critical areas; and
- There is no opportunity to consolidate lots under common ownership that will alleviate the nonconformity; and
- The lot is not subject to geologic hazards; and

- All structures are as far landward as possible and not closer than thirty (30) feet from the ordinary high water mark; and
- At least eighty (80) percent of the buffer area between the structures and the shoreline and/or critical area is maintained in a naturally vegetated condition.

These provisions would effectively establish a minimum buffer of 30 feet on those lots that are lot large enough to meet the standard buffer requirements, even after lot consolidation options are implemented. They create an incentive for property owners to build small-scale developments with less impact (than larger sized developments) because they are afforded an expedited pathway for approval. Owners wishing to build larger developments with greater impacts would be required to apply for a shoreline variance.

The number of parcels that would be subject to these provisions is estimated to be roughly 917 (out of a total of roughly 6,200 parcels in shoreline jurisdiction) (Table 8). The actual percent of parcels that would receive the expedited approval for a single family residence described above is even less than 917 because approximately 18 percent of these are not under County SMP jurisdiction (due to being federally owned) and approximately 12 percent of these are in areas that are designated Natural. Residential development on non-conforming lots that are designated Natural requires a conditional use permit, so these parcels would have a high level of scrutiny and require approval by Ecology (all CUPs require Ecology approval). Overall, the effects of this 'non-variance' option for development on non-conforming lots is not expected to cause any greater impact that would occur if these developments were permitted via the variance process, especially considering the PD SMP regulations for docks, shoreline armoring, beach access structures, LID and the like.

Table 8. Number of Non-Conforming Marine Shoreline Parcels that Would Be Created As a Result of PD SMP Buffers

Environment Designation	# Parcels	Percentage[26]
Conservancy	118	12.9%
High Intensity	66	7.2%
Natural	116	12.7%
NA	167	18.2%
Shoreline Residential	447	48.8%
Total	917	

5.14 What Other Impacts Could Occur Due to Future Development?

Besides forest practices, agriculture, aquaculture, and residential development the following uses have the potential to impact shorelines in Jefferson County: commercial and industrial development, mining, utility development, transportation, and signage. These development

[26] The percentages do not add up to 100% because some of the lots are coded as Aquatic or Priority Aquatic. Lots that exist below the ordinary high water line are not buildable.

actions are expected to affect a relatively small percentage of the County's shorelines because they are not common (e.g., commercial uses) and/ or they are prohibited from occurring in most shoreline environment designations (e.g., mining). Impacts of these uses, which will be evaluated on a case-by-case basis at the time permits are sought, will be mitigated largely through the PD SMP's general regulations for vegetation conservation, buffers, LID, and shoreline modifications such as bulkheads and docks as described in the previous subsections and summarized in Table 9. The table includes foreseeable uses and developments, their effects, and the proposed regulatory offsets. This includes effects of uses/developments that require a shoreline permit and those that are exempt from a shoreline permit.

Table 9. Summary of foreseeable uses and developments, potential effects, and regulatory offsets

Development or Activity	Current Circumstances	Relevant Shoreline Processes Affected	Foreseeable Use and Development	Foreseeable Impacts / Effects	SMP Provisions	Other Regulatory Programs
Unregulated Activities (per SMA/SMP)						
Forest Practices	Much of County's land base in upper watershed is in commercial forestry. Activities generally have effects at watershed scale.	Hydrology and sediment processes most directly affected at watershed scale.	Under the SMP, "Forest lands should be reserved for long term forest management and such other uses as are compatible with the dominant use." Forest lands currently in production are likely to remain in production within the foreseeable future.	Poorly functioning forestry roads will likely continue to contribute fine sediments to riverine aquatic environments. Landslides associated with these roads and road failure due to channel migration is also possible.	Permits required for non-harvest related development. Limits on roads on steep slopes. Conversions to non-forest uses must meet all standards of the proposed use including buffers.	Forest Practices Act (RCW 76.09); WAC 222, as amended; 1999 *Forest and Fish Report* implementing rules.
On-site Septic Systems	Most on-site septic systems in County are associated with rural residential and agricultural land uses, along marine shorelines and within the lower reaches of river valleys.	Failing on-site septic systems may affect water quality by introducing pathogens in the hyporheic, riverine, and marine aquatic environments. Functioning on-site systems may also affect water quality with the introduction of excess nutrients in the hyporheic, riverine, and marine aquatic environments.	Under Washington State's Growth Management Act (GMA), sewer systems are generally not allowed outside of urban growth areas. On-site septic systems are likely to accompany residential and commercial development in rural areas of Jefferson County.	On-site septic systems within the shoreline jurisdiction or in proximity to waters of the state may contribute to increased nutrient loading in the foreseeable future, and failing on-site systems may contribute pathogens to aquatic environments of the County.	SMP regulations for water quality require siting and maintenance of on-site sewage systems to avoid septic failures and to minimize effects when failures occur. Buffer requirements are intended to control fecal coliform inputs from septic systems.	Septic permit through Jefferson County DCD and Jefferson County Public Health.
Roads (located outside shoreline jurisdiction)	Upper watersheds in County are primarily served mostly by unpaved roads, which are typically maintained by the Forest Service. Impervious surface roads maintained by the County are concentrated in more densely developed rural residential areas; shoreline processes are in some cases interrupted by roads paralleling shorelines, such as Highway 101 along the western shore of Hood Canal.	Roads can constrict river and/or stream channels, limit channel migration, contribute pollutants to riverine and marine aquatic environments, increase sediment deposition in waters of the County, and disrupt feeder bluff/sediment supply for nearshore processes.	Some new roads to serve anticipated development can be expected, but the County's Transportation Element shows that no capacity-related transportation improvements are necessary to meet estimated future traffic growth.	Road maintenance projects have the potential to increase erosion and associated sediment input to aquatic environments, but impacts are not likely due to the implementation of BMPs. Other impacts are unlikely, as transportation infrastructure is to be located outside of the shoreline jurisdiction.	New roads, highways, freeways, and railways shall be located outside shoreline jurisdiction, except for unavoidable water crossings and transportation facilities serving water-dependent or public uses. Other specific provisions limit road construction within floodplains and near sensitive marine areas, such as accretion shoreforms.	County requirements for stormwater detention and water quality treatment; Hydraulic Project Approval (HPA) permitting process (WDFW) and Section 404 permitting process for work within the Ordinary High Water Mark; Department of Ecology water quality certification; SEPA; mitigation potential for projects with adverse impacts.
Agriculture (located outside shoreline jurisdiction)	Local and Commercial Agriculture zoning and activities exist primarily in the lower reaches of watersheds, such as Salmon, Snow, and Chimacum creeks and the Little Quilcene River.	Nutrients in runoff and/or groundwater may affect water quality in hyporheic and riverine aquatic environments.	Jefferson County's Comprehensive Plan establishes a policy basis for maintaining an undeveloped land base for future agricultural use. Some expansion of agriculture can be anticipated in the foreseeable future, though this expansion could be offset by current agricultural lands taken out of production or converted to other uses.	New agricultural development shall conform to the provisions of the Master Program. The SMP establishes standards for shoreline and water quality protection that will likely limit impacts of new agricultural development.	New agricultural activities must be managed to minimize impacts to shoreline environments, specifically to reduce livestock intrusion into the water, water quality contamination from the use of fertilizers and pesticides, and bank erosion.	Department of Ecology Concentrated Animal Feeding Operation General Permit (NPDES); Department of Ecology and Department of Agriculture pesticide application permits; County critical areas requirements.
Development Exempt from Shoreline Substantial Development Permits Development or activities exempt from obtaining a shoreline substantial development permit are required to demonstrate compliance with SMP policies through the Statement of Exemption process.						
Single-family development (and appurtenances)	The majority of the shoreline is currently developed as single-family residential.	Clearing and grading for single-family development within shoreline jurisdiction removes riparian vegetation, affecting water	Most vacant parcels will be developed for residential uses.	Population growth throughout the County may create pressure to convert lands currently used for agriculture or forestry to residential uses. Residential	Prohibits construction of residences within Aquatic environment; CUP required in Natural environment; limits construction of residences in other designations; requires	Jefferson County Building Permit can be issued with "shoreline conditions" per the SMP Statement

Development or Activity	Current Circumstances	Relevant Shoreline Processes Affected	Foreseeable Use and Development	Foreseeable Impacts / Effects	SMP Provisions	Other Regulatory Programs
		quality functions. Fertilizer application related to landscaping can also affect water quality by increasing nutrient loading.		land uses may typically result in associated shoreline modifications (i.e., vegetation clearing, grading, and shoreline structures such as piers, docks, bulkheads, etc.) that can affect shoreline functions.	future development to avoid the need for bulkheads (i.e., buffers from OHWM) or shore stabilization measures and ensure minimal impact on shoreline processes.	of Exemption process. County critical areas requirements.
"Normal protective bulkhead" associated with single-family development	Approximately 10% of marine shorelines have bulkheads or other armoring; Bulkheads are much less of an issue on freshwater shorelines in Jefferson County.	Interrupts feeder bluff/ nearshore connection (e.g., sediment supply and transport processes); increases wave energy and refraction, scouring and coarsening substrate, which affects eelgrass and shellfish habitat.	Demand is associated with anticipated residential development or redevelopment activities	Building setback requirements and prioritization of alternative bank stabilization methods decrease likelihood of future bulkheads.	Establishes policy basis and buffers to avoid need for new bulkheads; Residential bulkheads are prohibited on all lakes and in the Aquatic, Priority Aquatic and Natural designations and require a CUP in the other shoreline environments. Where new or replacement bulkhead is needed, applicant must consider alternative bank stabilization ('soft-shore') designs. Bulkheads are only allowed when a primary structure is in imminent danger.	SEPA and potential for mitigation; County clearing and grading permit. County critical areas requirements.
Agricultural practices and construction (including structures and irrigation facilities)	See discussion above for agriculture.	Within shoreline jurisdiction, grading for cultivation removes riparian vegetation, affecting water quality (e.g., temperature) functions and nutrient inputs to aquatic environment (e.g., excessive nutrients from fertilizers; lack of nutrients from lost large woody debirs (LWD) recruitment); Irrigation facilities (e.g., diversions, channels, pumps) alter hydrologic processes (timing and volume of flows) and drainage patterns.	See discussion above for agriculture.	See discussion above for agriculture.	See discussion above for agriculture.	See discussion above for agriculture.
Docks (below threshold criteria for fair market value - $5,000, salt water; $10,000, fresh water)	Most concentrations of docks are located in bays and harbors of the County, including Mats Mats Bay, Mystery Bay, and Ludlow Bay. Concentrations are also found near population centers such as Nordland and Port Townsend.	Docks can affect sediment transport processes and negatively impact eelgrass beds, which provide habitat functions for a number of nearshore-dependent species, including salmonids.	Some of the population growth projected in the County's Comprehensive Plan can be expected to occur in or near the shoreline jurisdiction, and some demand for new docks can be expected to accompany this growth. Due to SMP policies, substantial demand for individual, private docks is unlikely.	Policy preference for buoys and community docks over individual docks in all cases, decreasing the odds of substantial cumulative impacts related to new dock construction.	SMP allows docks, piers, floats and lifts accessory to residential development/use shall only when: Ecological impacts are mitigated in accordance with the Program; and The moorage platform is designed for access to private watercraft; and The cumulative effects of dock, pier, float and lift proliferation have been identified and shown to be negligible. Dock dimensions are limited to minimize	Hydraulic Project Approval (HPA) permitting process (WDFW); Corps of Engineers Section 10 permit; SEPA and potential for mitigation. County critical areas requirements.

Development or Activity	Current Circumstances	Relevant Shoreline Processes Affected	Foreseeable Use and Development	Foreseeable Impacts / Effects	SMP Provisions	Other Regulatory Programs
					overwater shading. Also, difficult to build dock under current cost thresholds.	
Irrigation Systems (including canals, waterways, reservoirs)	Identified infrastructure includes an unscreened irrigation canal on the Little Quilcene River. Other facilities (e.g. pumps) are likely associated with agricultural uses in lower watersheds of the County.	Irrigation diversions can reduce downstream water quantity within the shoreline jurisdiction.	The construction of new, large-scale irrigation systems – including canals and reservoirs that could damage salmonid habitat – is unlikely within the current regulatory framework of the county and state. Less invasive infrastructure (e.g. pumps) can be expected to accompany new agricultural development and expanded current operations.	New infrastructure enabling water withdrawals may reduce downstream water quantity in streams of Jefferson County, though the regulatory framework makes withdrawals affecting aquatic ecosystems unlikely.	The SMP does not specifically address irrigation infrastructure, although in-stream structures such as pumps are regulated and utilities are regulated to ensure no net loss.	Department of Ecology Reservoir Permit, Water Right Change, or New Water Right Permit; HPA permitting process. County critical areas requirements.
Restoration Plans and Projects	A variety of restoration efforts are underway or planned in Jefferson County, including stream restoration, beach nourishment, bulkhead removal, eelgrass restoration, and others.	Shoreline processes such as sediment supply and transport, channel migration, and LWD recruitment can benefit from restoration. Habitat functions provided by eelgrass and upper intertidal areas can also be restored through restoration efforts.	Funding opportunities for restoration benefiting salmonids and nearshore areas are increasing, and the restoration of Puget Sound is a high priority at the state level, particularly in Hood Canal. Restoration opportunities will likely increase in the foreseeable future.	Beneficial effects by restoring shoreline ecological functions and processes where they have been degraded through programmatic or site specific restoration actions.	SMP Restoration Plan establishes policy basis and priorities for shoreline restoration actions.	Specific projects would be developed in concert with a variety of stakeholders, permitting agencies, and/or funding agencies.
Shoreline Modifications						
Beach Access Structures (i.e., stairs)	Numerous staircases are identified along the western shore of Hood Canal, particularly near Triton Cove State Park, Fulton Creek, and Pleasant Harbor. Stairways are also identified on Marrowstone Island, in Oak Bay, and in the vicinity of Port Ludlow.	Staircases and other structure can disturb bluff vegetation, lead to slope stability problems, and affect sediment transport processes and contribute to increased scouring of upper intertidal areas, decreasing habitat functions.	Provisions for stairs and other access structures are included in the SMP, though shared access structures are preferred. Demand for new beach access structures can be expected to accompany new development in and near the shoreline jurisdiction.	Beach access structures can affect shoreline functions by removal of vegetation, disruption of sediment transport processes, and natural bank stability.	Private beach access structures are regulated as a conditional use. They are prohibited in the Natural environment They are prohibited on feeder bluffs, in landslide/erosion hazard areas and other critical areas. There are dimension limits to minimize the amount of vegetation removal required.	County clearing and grading permit; potential for SEPA and/or mitigation. County critical areas requirements.
Shoreline Stabilization (excluding residential bulkheads)	Shoreline stabilization is present throughout most shoreline reaches of the County, functioning as a breakwater for marinas, shoreline stabilizer, and occasionally existing as jetties. Seawalls – made of concrete or wood – are also present near population centers.	Marina breakwaters and jetties made of riprap block longshore transport of sediment, while riprap bulkheads can contribute to increased scouring of upper intertidal areas. Riprap is also known to block tidal flow between marine waters and salt marshes. Riprap along stream banks can restrict channel migration.	Additional shoreline stabilization measures are most likely to accompany necessary public infrastructure, such as roads. Policies and regulations of the SMP strongly discourage new development where shoreline stabilization would be necessary. It should be noted that rising sea levels could substantially alter shoreline jurisdiction in the foreseeable future, necessitating significant shoreline stabilization measures in areas where infrastructure is at risk.	Shoreline stabilization is typically highly detrimental to sediment transport processes and habitat in the upper intertidal zone. Additional stabilization measures are, however, unlikely in the near future under the policies and regulations of the SMP. Long-term stabilization measures as a result of rising sea levels could significantly alter shoreline processes and functions.	SMP policies and regulations require that construction within the shoreline jurisdiction be carried out in a manner that avoids or minimizes the need for shoreline stabilization. Applicants must show that alternative 'soft shore' approaches are infeasible, but allowances are made to accommodate infrastructure, essential facilities and water dependent uses that provide pubic access.	HPA permitting process; Department of Ecology Water Quality Certification; Army Corps of Engineers 404 and/or Section 10 permits; SEPA and potential for mitigation. County critical areas requirements.

Development or Activity	Current Circumstances	Relevant Shoreline Processes Affected	Foreseeable Use and Development	Foreseeable Impacts / Effects	SMP Provisions	Other Regulatory Programs
Flood Control Structures	Dikes and levees are noted in the delta and estuary of the Big and Little Quilcene River, and in the Hoh River valley. Diking is also noted in the lower Dosewallips River watershed and around Ludlow Lagoon.	Levees and dikes isolate rivers from their floodplains, restricting channel migration. Dams can interrupt the passage of sediment from freshwater to marine systems, affecting sediment supply and thereby altering habitat functions.	The construction of additional dikes and levees is highly unlikely in the near future due to the current regulatory framework. As with shoreline stabilization measures, the construction of flood control infrastructure may be necessary in the long term as a result of increased flooding associated with climate change.	Flood control structures such as dikes and levees can cause significant damage to aquatic habitats. The construction of new flood control structures is, however, unlikely in the near future. Long-term flood control improvements as a result of climate change could significantly alter processes and functions of freshwater aquatic systems.	Residential development shall not be approved where flood control will be required to create residential lots or site area. Other provisions are made for transportation infrastructure, which should not create the need for new flood control devices. Structural flood control is only allowed as part of an agency-sponsored flood control project.	HPA permitting process; Army Corps of Engineers 404 and/or Section 10 permits; Department of Ecology Dam Construction and/or Reservoir permit; NEPA; SEPA and potential for mitigation. County critical areas requirements.
Moorage (docks, piers, buoys, marinas and boat launches)	See discussion above for docks. Marinas and boat launches are present throughout most of Hood Canal and eastern Jefferson County.	See discussion above for docks. Marinas and boat launches both affect longshore transport of sediment and can contribute to degradation of upper intertidal habitat. Marinas can be focal points for the introduction of pollutants into marine waters, negatively impacting water quality.	See discussion above for docks. Demand for expansion of existing marinas or construction of new marinas and boat launches can be expected to accompany population growth at the county and regional level.	See discussion above for docks. SMP regulations require new marinas and boat launches to be sited away from ecologically sensitive areas, and for mitigation to accompany any disruption of shoreline processes. Cumulative impacts are unlikely if activities are in accordance with the SMP.	See discussion above for docks. Expansion of existing marinas preferred over addition of new marinas; provisions for launch ramps that do not affect sediment transport or tidal processes; restricts construction of marinas and launches to less ecologically sensitive areas.	See discussion above for docks.
Shoreline Uses						
Aquaculture	Commercial aquaculture operations are identified in Scow Bay, Discovery Bay, and Quilcene Bay. There is high potential for aquaculture throughout much of the marine shorelines.	Aquaculture activities can have positive effects on marine water quality. Infrastructure associated with aquaculture operations can affect longshore transport of sediment. If not properly located, aquaculture operations can also impact submerged aquatic vegetation such as eelgrass.	Aquaculture is a water-dependent use, and when consistent with control of pollution and avoidance of adverse impacts to the environment and preservation of habitat for resident native species, is a preferred use of the shoreline under the SMP. Current operations are dependent on water quality, and a future expansion of aquaculture would only occur if water quality was maintained and improved, where necessary.	If undertaken in accordance with the SMP and other regulatory provisions, expansion of aquaculture operations is unlikely to result in negative impacts to shoreline processes or functions.	Most aquaculture use/development requires a CUP. SMP limits the proximity of aquaculture operations, impacts of overwater structures, potential to interrupt sediment transport, and other potentially detrimental cumulative effects of operation.	Recommended Interim Guidelines for the Management of Salmon Net Pen Culture in Puget Sound; WDFW Aquaculture Registration and Transfer Permit; Department of Health Aquatic Farm Registration and Shellfish Operation License; Department of Natural Resources Aquatic Use Authorization; NPDES permits for waste discharge.
Commercial Use	Commercial use and development is noted at the Snow/Salmon Creek estuary, within the middle Chimacum Creek watershed, in Port Townsend, Port Hadlock, and Port Ludlow, and within the lower reaches of the Duckabush and Dosewallips rivers.	Impervious surfaces associated with commercial development can increase the rate of runoff to freshwater and marine aquatic environments, affecting water quality and quantity downstream. Waterfront commercial development can include docks and other structures that impact sediment transport and tidal processes.	Jefferson County's Comprehensive Plan identifies commercially zoned lands available for future development; most commercial centers contain undeveloped land that could be built out in the future. Due to mandates of the GMA, extensive conversion of lands zoned for other uses to commercial purposes is unlikely.	The Comprehensive Plan identifies the need to protect ecological functions in sensitive areas with some level of commercial development, such as the estuary of Snow/Salmon Creek. Impacts to shoreline functions and processes are unlikely within the current regulatory structure and if development is carried out according to the SMP.	Establishes policy basis for prioritizing water-dependent commercial uses of the shoreline when securing locations for commercial use; requires restoration of impaired shoreline ecological functions and processes as part of commercial development.	Department of Community Development building permits; NPDES Construction Stormwater General Permit and Coverage; NPDES Individual Permit for wastewater discharge to surface waters. County critical areas requirements.
Industrial/Port Development	Industrial zoning and development is mostly concentrated around population centers, including Port Townsend, Port Hadlock, Port Ludlow, and Quilcene.	Port development can include structures that impact sediment and tidal processes, and eliminate habitat functions associated with eelgrass.	The GMA contains provisions for siting industrial lands outside of urban growth areas under specific circumstances, and for qualified counties to designate two Industrial Land Banks (outside of UGAs) before December 31, 2007 for specific purposes of siting Major	Possible impacts from new industrial development are difficult to foresee without the knowledge of where this development might be located. If activities within or near the shoreline jurisdiction are undertaken according	Shoreline industrial development shall result in no net loss of shoreline ecological functions and processes; water-dependent shoreline industrial use is prioritized over water-related and water-enjoyment	Department of Community Development building permits; NPDES Individual Permit for wastewater discharge to surface waters; HPA permitting process and Army Corps Section 10 permit for

Development or Activity	Current Circumstances	Relevant Shoreline Processes Affected	Foreseeable Use and Development	Foreseeable Impacts / Effects	SMP Provisions	Other Regulatory Programs
			Industrial Developments (MIDs). No such land banks are currently designated in Jefferson County although Comprehensive Plan provisions exist to allow MIDs.	to the SMP, impacts to processes and functions are unlikely	commercial uses.	port developments impacting aquatic areas. County critical areas requirements.
Mining	Gravel mines operated by private landowners are located in the upper and middle Hoh River watershed, and Mineral Resource Lands near Shine are the site of a 137-acre gravel mine operated by Fred Hill Materials.	Sediment input to marine and fresh water bodies can increase as a result of mining, decreasing water quality. Mining within floodplains can alter channel morphology and decrease habitat functions.	The 137-acre gravel mine near Shine is scheduled to be mined sequentially in approximately 12 to 15-acre increments. Other mineral resource lands may be developed over time.	Review of potential environmental impacts during gravel mine permitting is extensive. Combined with SMP policies and regulations, this framework makes impacts to shoreline processes and functions unlikely.	Restricts new mining practices to fewer environment designations than the current SMP and is only allowed with approval of a shoreline conditional use permit.	State Surface Mining Act (RCW 78.44); County critical areas requirements.
Recreational Development	Parks and other recreational facilities are located on fresh and marine water bodies, with a majority located in eastern parts of the County.	Infrastructure associated with parks – such as boat ramps and docks – can interrupt sediment transport processes, contribute to scouring of the upper intertidal zone, and alter habitat functions associated with eelgrass. Water quality can be impacted in areas where wastewater/stormwater is not properly treated. Development often requires parking and other infrastructure.	As part of its planning process, Jefferson County regularly analyzes its Level of Service (LOS) for park and recreational facilities, based on population density. As population grows, the County will likely identify a need for new facilities to meet increasing demand of County residents. Several new parks and trail systems are already under development as of 2007.	Park and recreation facilities that do not require structures are unlikely to impact shorelines processes and functions. Facilities involving new structures are subject to permitting requirements and regulations of the SMP, which require the maintenance or improvement of shoreline functions. Foreseeable impacts are unlikely.	No proposal for recreational development shall be approved unless it is demonstrated to the satisfaction of the Shoreline Administrator that the development will maintain, enhance or restore desirable shoreline features including unique and fragile areas, scenic views and aesthetic values.	Appropriate permits from Department of Community Development
Transportation and Utility Facilities	Transportation infrastructure and utility corridors are generally more common in lower watersheds, while unpaved Forest Service roads exist within some upper river basins.	Roads can constrict river and/or stream channels, limit channel migration, contribute pollutants to riverine and marine aquatic environments, and increase sediment deposition in waters of the County.	Based on policies and regulations set forth in the SMP, the addition of new roads within the shoreline jurisdiction is unlikely. In addition, the County's Transportation Element shows that no capacity-related transportation improvements are necessary to meet estimated future traffic growth.	Road maintenance projects have the potential to increase erosion and associated sediment input to aquatic environments, but impacts are not likely due to the implementation of BMPs. Other impacts are unlikely, as transportation infrastructure is to be located outside of the shoreline jurisdiction.	Requirements that new roads, parking, and primary utility facilities (e.g., stormwater treatment ponds, wastewater pump stations, electrical substations, etc.) be located outside shoreline jurisdiction or as far away from the shoreline as possible.	Allowed facilities such as stormwater or wastewater outfalls would require WDFW and/or Corps permits for in-water work.

6.0 OTHER PROGRAMS

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.

6.1 What Other County Programs Protect Shorelines?

Jefferson County Code (JCC)

Various sections of the JCC 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.

Building Code, Chapter 15.15: The County's Flood Damage Prevention regulations provide specifications for development, redevelopment, and modifications to existing uses and structures within "all areas of special flood hazard", which are specified as areas mapped by the Federal Emergency Management Administration on flood rate insurance maps (FIRMs). Regulations require standards for development of residential structures within some flood hazard areas, and also prohibit construction in certain areas of highest flood risk.

Unified Development Code, Chapter 18.22: The Critical Area regulations protect streams, wetlands, geologic and soil hazards areas, frequently flooded areas, critical aquifer recharge areas, as well as certain fish and wildlife habitats (including most streams, lakes, and marine shorelines). The regulations of JCC 18.22 require buffers around wetlands and fish and wildlife habitats. The buffers for lakes, rivers and marine shorelines of the state are consistent with the SMP buffers stated above. Regulations also limit the types of alterations that are allowed within critical areas to: ecological restoration, public and private trails (buffers only), certain utilities (heavily restricted within critical areas), essential public facilities, and certain water-dependent and water-enjoyment related uses. Activities that are allowed may require the applicant to prepare a critical areas special report (i.e. geotechnical, wetlands, arborist etc), including an analysis of the impact of the activity on the aquatic area and its buffer and a mitigation plan to compensate for identified impacts.

During project specific site planning, JCC 18.22 requires that development applicants must consider and implement the following mitigation measures, which appear in order of preference: avoidance, minimization, and mitigation. When mitigation is necessary to compensate for permitted critical areas impacts, it must be planned for, implemented, monitored, and maintained. Mitigation is required to be in-kind and sufficient to maintain critical area and buffer functions, and to prevent risk from a hazard posed by a critical area. Mitigation must be developed with goals, objectives, and performance standards, and must use best available science.

The critical areas regulations of JCC 18.22 for frequently flooded areas incorporate by reference the previously detailed regulations of JCC 15.15.

Unified Development Code, Chapter 18.30: The Development Standards of JCC 18.30 include stormwater management standards (SWMS), as detailed by JCC 18.30.070. SWMS adopts by reference the regulations of Washington Department of Ecology Stormwater Management Manual for Western Washington. In addition, the regulations require development meeting specific threshold criteria (based on area of land clearing and/or grading activities) to meet additional standards and to obtain a stormwater permit from the County.

In addition to SWMS, JCC 18.30.060 details grading and excavation standards for the entire County. These regulations set standards for clearing and removal of vegetation, excavation, grading, and earthwork including cuts and fills to protect public health, safety, and welfare. Specifically relating to the shoreline environment and other sensitive aquatic and wetland areas, grading and excavation standards protect resources through minimization of adverse stormwater, water quality, and habitat loss impacts caused by the removal of vegetation and alteration of landforms. All proposed clearing and grading activities must include plans specifying compliance with standards and obtain a Stormwater Management/Grading Permit.

In addition to the JCC Chapter 18.30 requirements detailed above, certain construction projects may require additional permitting to meet federal Clean Water Act requirements (see section 6.2 below), as administered by the Department of Ecology under the Construction Stormwater General Permit program. Typically, only sites or phased construction projects that will ultimately disturb more than one acre of land and that discharge stormwater from the site into state surface waters or drainage systems are required to meet these requirements. The Department of Ecology, however, may require a permit for any construction activity that is determined to be a significant contributor of pollutants to waters of the state. In order to acquire this permit and remain compliant with permit requirements, a project-specific Stormwater Pollution Prevention Plan (SWPPP) must be prepared (Department of Ecology, 2008).

6.2 What State and Federal Regulations Protect Shorelines?

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 significantly 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.

6.3 What Role Do Non-regulatory Programs Have in Protecting Shorelines?

During the SMP Update Process, the County developed a Shoreline Restoration Plan that provides recommendations for restoring the County's shorelines as well as a framework under which shoreline restoration can be successfully achieved (ESA Adolfson, 2008). The Restoration Plan builds on and incorporates information from the Final Shoreline Inventory and Characterization Report (ESA Adolfson, 2008) and other ongoing local and regional efforts to understand and manage the County's diverse shorelines. As required by the state guidelines established in WAC 173-26-201, 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.

The Puget Sound Partnership is also charged with restoring shorelines and related habitats in Puget Sound. The Partnership's Action Agenda lays out a program for restoring ecological functions, processes, and habitats through capital improvements, education and outreach, land acquisition and other means. This program is very high on the state's list of priorities and when implemented is likely to have a very positive effect on the Puget Sound ecosystem over time.

Table 10 describes other non-regulatory programs/organizations that are active in restoring, protecting, and educating the public about Jefferson County shorelines. The organizations and agencies carrying out these programs have all previously implemented projects that have enhanced the shoreline environment or that have taken initial steps towards enhancement and protection of resources.

1 **Table 10. Role of Non-regulatory Programs/Organizations in Protecting Shorelines**

Program/ Organization	Mission and Scope	Role in Restoration and Protection of County Shorelines
Jefferson County Marine Resources Committee (MRC)	The MRC was established: "*To achieve the protection and restoration of the marine resources of Jefferson County and to do so in furtherance of the benchmarks for performance as identified in the August 20, 1998, report to the conveners by the Murray-Metcalf Northwest Straits Citizens Advisory Commission."* Their mission is as follows: • Protection and restoration of important marine resources and habitats. • Address local marine environmental issues through our programs and actions, and to • Build local awareness of the issues through education, outreach and citizen involvement • Recommend actions to the Board of County Commissioners to remedy issues consistent with our advisory role. The MRC's Strategic Plan calls for adoption of the SMP Update Restoration Plan, which will become the Action Plan for future MRC restoration efforts.	The MRC is one of the most important partners and can play a major role in the following types of restoration efforts: • Implementing variety of the programmatic actions related to nearshore areas (see Chapter 5). • Providing technical support and coordinating volunteer resources for specific nearshore restoration and enhancement projects that improve intertidal habitat. • Derelict fishing gear removal. • Forage fish spawning habitat surveys. • Olympia oyster seeding. • Eelgrass habitat protection • Drift cell restoration • Invasive species • Marine birds
Jefferson County Conservation District (CD)	A non-regulatory government agency that performs and supports a wide range of conservation-related activities involving farming, grazing, timber supply, parks, outdoor recreation, potable water supplies, watershed stabilization, erosion control, flood prevention, scenic preservation, protection of fish and wildlife, salmon recovery and preservation of wilderness areas and wild rivers. The CD manages the Conservation Reserve Enhancement Program (CREP) and along with local, state, federal and tribal partners are actively involved in habitat restoration throughout the County.	• Using the CREP to implement riparian planting/enhancement on Chimacum, Snow and Salmon Creeks and other areas. • Livestock fencing to protect riparian areas. • Acquiring high quality habitats for conservation purposes. • Working with farmers and residential property owners to implement BMPs for water quality and habitat protection.
WSU Jefferson County Cooperative Extension	Enlists local volunteers in education, research, and stewardship activities such as the Water/Beach Watchers program.	• Removing derelict pilings. • Replanting and enhancing riparian/ nearshore areas. • Educating landowners and residents about shoreline conservation. • Removing fill and obstructions to increase salmon habitat availability. • Providing volunteer resources/support for restoration and monitoring efforts.
Jefferson Land Trust	A private, nonprofit organization focused on the preservation of open space, working lands and habitat in east Jefferson County. The Land Trust also works with *Chumsortium* on habitat restoration efforts.	• Acquiring properties as a precursor to restoration. • Providing technical resources for projects involving public access, interpretation and trails.

Program/ Organization	Mission and Scope	Role in Restoration and Protection of County Shorelines
Hood Canal Coordinating Council	The HCCC is a council of governments consisting of Jefferson, Kitsap and Mason counties, Port Gamble S'Klallam and Skokomish tribes, and with the support of federal and state agencies. Its mission is to coordinate actions that protect and restore the environment and natural resources of the Hood Canal basin. It also provides educational services to local communities.	• Coordinating restoration efforts among diverse entities related to recovery of Hood Canal salmonid stocks.
Hood Canal Salmon Enhancement Group	One of 14 Regional Fisheries Enhancement Groups (RFEGs) (similar to NOSC, above) implementing salmon restoration projects throughout Hood Canal.	• Removing culverts. • Replanting and enhancing riparian/ nearshore areas. • Removing fill and obstructions to increase salmon habitat availability.
Jamestown S'Klallam Tribe*	The Tribe's Habitat Program protects healthy and functional nearshore, estuarine, and river habitat, restores degraded areas, and does research to understand the organisms and the land/water they occupy.	• Stream and estuarine restoration involving LWD, fill removal, invasive species control, and other actions related to tribal fish and shellfish resources.
Port Gamble S'Klallam Tribe*	The Tribe is an active participant in the Hood Canal Coordinating Council, and serves as a restoration partner working on a variety of projects around Hood Canal. These include the multi-stakeholder Hood Canal Salmon Sanctuary and the WRIA 17 watershed planning unit.	• Stream and estuarine restoration involving LWD, fill removal, invasive species control, and other actions related to tribal fish and shellfish resources. • Securing conservation easements for sensitive riparian, riverine and estuarine restoration efforts in the Dosewallips and Big/Little Quilcene watersheds.
Point No Point Treaty Council	The Council is a natural resource management organization to fulfill the requirements placed upon the Jamestown S'Klallam and Port Gamble S'Klallam Tribes by the Boldt Decision. The Council confirms the reserved rights established in the 1855 Treaty of Point No Point. It implements goals set by member tribes for resource conservation, fisheries management and the protection of treaty fishing rights.	• Gathering habitat information in selected watersheds, with research and monitoring projects targeted at specific watersheds.
North Olympic Salmon Coalition	One of 14 Regional Fisheries Enhancement Groups under the auspices of the Regional Fisheries Enhancement Group Program that involve local communities, citizen volunteers, and landowners in salmon recovery efforts.	• Remeandering channelized streams. • Instream placement of large woody debris. • Riparian planting and enhancement. • Culvert removal to improve fish passage. • Beach nourishment. • Livestock fencing to protect riparian areas. • Acquisition of acquire estuarine habitat. • Forage fish spawning surveys.
Wild Fish Conservancy (formerly Washington Trout)	Wild Fish Conservancy seeks to improve conditions for all of the Northwest's wild fish by conducting important research on wild-fish populations and habitats, advocating for better land-use, harvest, and hatchery management, and developing model restoration projects.	• Projects that restore ecological processes and benefit wild fish stocks.

7.0 CONCLUSION

Developing a shoreline master program that allows "the utilization of shorelines for economically productive uses that are particularly dependent on shoreline location and provides preferential accommodation of single family uses" while achieving 'no net loss' of ecological functions is a difficult—some might contend impossible—task. As this analysis shows, Jefferson County's Preliminary Draft SMP provides the highest possible standard of care to shorelines while allowing for and accommodating appropriate shorelines uses and developments. This section explains that the SMP fully addresses the cumulative impacts of reasonably foreseeable future developments in a manner that achieves no net loss.

Proposed updates to the County's SMP will have a positive influence on the size, location, design, and operation of future shoreline uses and developments, but will not substantially alter the existing shoreline land use patterns. In other words, rural residential use will continue to be the dominant land use on the marine and river shores in east Jefferson County and forestry will continue to be the predominant use on the river shores in west Jefferson County.

In planning for these and other future uses, the County has developed specific regulations aimed at preventing impacts from known threats to marine, river and lake shorelines: bulkheads, overwater structures, stormwater runoff, forest practices, aquaculture, vegetation clearing, etc. These regulations have been developed based on a detailed inventory of shoreline conditions and assessment of the shoreline ecological functions and processes.

7.1 Does the SMP Fully Address Potential Cumulative Impacts?

The PD SMP protects shorelines to the highest degree practicable while still accommodating preferred shoreline uses and recognizing private property rights. The proposed regulations are based on a detailed inventory of ecosystem-wide and shoreline reach conditions as well as detailed knowledge about threats facing shoreline resources. They include a requirement to maintain existing conditions of well vegetated buffers for 100 (lakes) or 150 (rivers and marine shores) feet on all shorelines to protect ecological functions and processes. Nearly half (41 percent) of all the shoreline in the County are designated Natural, which provides the highest level of protection possible. Of these 60 percent have a corresponding in-water designation of Priority Aquatic. An additional 26 percent of the uplands (or shorelands) are designated Conservancy, which ensures that they will be used for low intensity uses. Approximately 51 percent of all in-water areas are designated Priority Aquatic, which is the most protective designation for areas waterward of ordinary high water. With these designations and the regulations that they trigger, shoreline modifications such as bulkheads, residential docks, and beach stairs will be highly restricted. With regard to forest practices, the PD SMP includes regulations that are fully consistent with the shoreline guidelines and with Ecology directives related to regulating timber harvest.

One measure of the adequacy of the PD SMP in protecting shoreline functions is to compare the proposed regulations to the recommended shoreline protection strategies offered by the Aquatic Habitat Guidelines Working Group, which is a multi-agency committee that receives support and participation from the WDFW, Ecology, WDNR, the Washington departments of Transportation, and Community Trade and Economic Development; the Recreation and Conservation Office,

and the Puget Sound Partnership. The Jefferson County PD SMP includes nearly all of the strategies cited in Protecting Nearshore Habitat and Functions in Puget Sound An Interim Guide (EnviroVison et al., 2007) as shown in Table 11.

Table 11. SMP Standards and the Checklist of Recommended Protection Strategies

Shoreline Resource	Recommended Protection Strategies[27]	Does the PD SMP Include the Recommended Strategy?
Beaches and Bluffs	• Identify feeder bluffs and protect them (and their functions) through appropriate shoreline designation and SMP regulations	Yes. Feeder bluffs are identified in the Final Shoreline Inventory Report and are mostly designated Natural.
	• Identify existing canopy cover and forested buffer by reach and protect through appropriate shoreline designation and SMP regulations	Yes. The SMP requires 150 ft buffers on all marine and river shorelines. Buffers must remain well vegetated.
	• Identify intact beaches and protect them through appropriate shoreline designation and SMP regulations	Yes. Intact beaches, salt marshes and similar areas are identified in the Final Shoreline Inventory Report and are designated Natural or Conservancy.
	• If tree removal is unavoidable, leave felled trees or create snags for wildlife habitat	This is not specifically required by the SMP.
	• Minimize displacement of beach area by pilings or other structures. Where such structures are unavoidably necessary, prohibit the use of treated wood in favor of concrete, steel, or recycled plastic	Yes. Treated pilings are prohibited. Pier/dock length and size are limited to minimize pilings.
	• Prohibit grounding of floats, rafts, docks and vessels	Yes. The SMP prohibits grounding.
Forage Fish Habitat	• Avoid placing docks or piers in tidal flats because these locations require very long structures	Yes. The SMP restricts pier/dock length and size. Many tidal flats are designated Priority Aquatic and most piers/docks are prohibited.
	• Minimize displacement of beach area by pilings	Yes. The SMP restricts pier/dock length and size and prohibits piers/docks in many areas.
	• Prohibit grounding of floats and rafts on the beach	Yes. The SMP prohibits grounding.
	• Minimize the footprint and number of pilings associated with overwater structures and do not allow use of treated wood.	Yes. The SMP restricts pier/dock length and size. Treated wood is prohibited.
	• Place structures to perpendicularly span the shoreline spawning habitat zone	Yes. The SMP requires perpendicular structures unless there is a better orientation

[27] The list of recommended protection strategies is adapted from Protecting Nearshore Habitat and Functions in Puget Sound An Interim Guide (EnviroVision et al., 2007). Recommended strategies for Freshwater Lakes are from the authors' best professional judgment.

Shoreline Resource	Recommended Protection Strategies[27]	Does the PD SMP Include the Recommended Strategy?
		with less impact.
	• Promote overwater structure designs that result in improved light levels (e.g., minimize width, use grating, orient north-south to minimize shading resulting from new and rebuilt structures	Yes, as noted above.
	• Designate inventoried spawning areas as natural or conservancy shorelines	Yes. Forage fish spawning areas are identified in the Final Shoreline Inventory Report and are generally designated Natural or Conservancy.
	• Do not allow construction activity during egg deposition and incubation periods	This is achieved via compliance with state and federally mandated in-water work windows.
Kelp and Eelgrass Habitat	• Identify all marine vegetation within intertidal and subtidal zones and protect them through appropriate shoreline designation and SMP regulations	Eelgrass and brown algae are identified in the Final Shoreline Inventory Report map portfolio and results were factored into SEDs.
	• Require survey of intertidal and shallow subtidal areas prior to permitting any structures or activities that could impact existing beds	Yes. SMP requires site specific studies and mitigation for most all development actions.
	• Prohibit placement of overwater structures over marine vegetation	Yes. The SMP restricts pier/dock length and size and prohibits piers/docks in many areas.
	• Require structure designs that minimize shading and disturbance of the substrate including from propeller wash	Yes, as noted above.
	• Prohibit grounding of floats and rafts	Yes. The SMP prohibits grounding.
Riparian Vegetation	• Promote off-site mitigation to address cumulative impacts using the restoration component of the shoreline master program	Yes. The SMP promotes off-site mitigation and the restoration plan indentifies numerous mitigation/restoration opportunities.
	• Identify marine riparian protection areas that support existing functions through no-touch buffers in undeveloped areas and enhancement and mitigation requirements related to expansions or redevelopment of developed areas	Yes. The SMP requires buffers 150 ft on all marine and river shorelines. Buffers must remain well-vegetated.
	• Require site surveys of existing conditions including vegetation function analysis	Yes. SMP requires site specific studies and mitigation for most all development actions.
	• Provide protected shallow water migration corridors, especially between estuaries and marine waters through shoreline designations	Yes. SEDs (Priority Aquatic) and shoreline buffers protect migration corridors.
	• Minimize and limit over-water structures and improve light conditions under these structures through design specifications (width, grating, etc.)	Yes, as noted above.

Shoreline Resource	Recommended Protection Strategies[27]	Does the PD SMP Include the Recommended Strategy?
	• Minimize pilings, avoid use of treated wood, and eliminate grounding of boats and structures	Yes, as noted above.
	• Protect marine riparian areas and require mitigation for lost habitat elements such as trees, logs, and boulders	Yes, as noted above.
Shellfish Habitat	• Preserve forest cover near marine shorelines. Native vegetation and soils provide irreplaceable functions. Replant trees and amend soils in areas that have been cleared or damaged.	Yes, as noted above.
	• Preserve continuous riparian corridors with mature, native vegetation to protect and buffer streams, shorelines and other water bodies	Yes, shoreline buffers are must be well-vegetated.
	• Prevent pollution. Take care of onsite sewage systems and wastes from domestic animals, boats and other fecal sources	Yes, SMP requires compliance with Dept of Health standards for on-site septic
	• Limit impervious surfaces—such as rooftops, concrete and asphalt—that generate stormwater runoff. Wherever possible, disconnect these surfaces from pipes and other drainage systems and use alternative materials and approaches to reduce runoff and promote onsite infiltration	Yes, SMP requires clustering, pervious pavements and other LID measures and compliance with stormwater standards
	• Plan for protection. Determine land uses based on long-term protection and use of water resources. Use local planning tools to tailor development policies and standards to needs and conditions in different areas	Yes, SMP identifies high value shellfish habitats and designates them designates Priority Aquatic. Minimal alterations are allowed in these areas.
	• Use appropriate infrastructure. Try to avoid development densities that require use of large-scale sewer systems. Instead, aim to use low impact development principles and practices and decentralized wastewater approaches that support rural density land uses in shellfish watersheds	Yes. SMP uses development rural development densities consistent with Comprehensive Plan. LID is required.
Freshwater Lakes	• Minimize use of chemical and fertilizer inputs	Partially. The SMP encourages alternatives to chemicals and fertilizers but does not prohibit them.
	• Maintain well-vegetated buffers to trap and filter sediments and pollutants	Yes. The SMP requires 100 ft wide buffers on lakes. Buffers must be well vegetated.

8.0 REFERENCES

Bishop D.M. and M.E. Stevens. 1964. Landslides on logged areas in southeast Alaska. U.S. Dept. Agr. For. Serv. Res. Pap. NOR-1.

Casola, J., J. Kay, A. Snover, R. Norheim, and L. Whitely Binder. 2005. Climate Impacts on Washington's Hydropower, Water Supply, Forests, Fish, and Agriculture. Prepared for King County Conference on Climate Change, by University of Washington Climate Impacts Group. October 27, 2005. Available at: http://www.cses.washington.edu/cig/outreach/workshops/kc2005.shtml

Diefenderfer, H L., K L. Sobocinski, R. M. Thom, C. W. May, S. L. Southard, A. B. Borde, C. Judd, J. Vavrinec, and N. K. Sather. 2006a. Jefferson County Marine Shoreline Restoration Prioritization: Summary of Methods. Battelle Marine Sciences Laboratory, Sequim, Washington. Report No. PNWD-3762. November 22, 2006.

Diefenderfer, H L., K L. Sobocinski, R. M. Thom, C. W. May, S. L. Southard, A. B. Borde, C. Judd, J. Vavrinec, and N. K. Sather. 2006b. Multi-Scale Restoration Prioritization for Local and Regional Shoreline Master Programs: A Case Study from Jefferson County, Washington. Battelle Marine Sciences Laboratory, Sequim, Washington Report - Not for Distribution.

ESA Adolfson, Coastal Geologic Services, and Shannon and Wilson. 2008. Jefferson County Shoreline Master Program Update Project Ecology Grant # G0600343, Final Shoreline Inventory and Characterization Report – Revised June 2008.

Fagergren, D., A. Criss, and D. Christensen. 2004. Hood Canal Low Dissolved Oxygen Preliminary Assessment and Corrective Action Plan. Puget Sound Action Team and Hood Canal Coordinating Council. Publication #PSAT04-06. May 6, 2004.

Harrison, P.J., D.L. Mackas, B.W. Frost, R.W. Macdonald, and E.A. Crecelius. 1994. An assessment of nutrients, plankton and some pollutants in the water column of Juan de Fuca Strait, Strait of Georgia and Puget Sound, and their transboundary transport. Can. Tech. Rep. Fish. Aquat. Sci. 1948:138-172

Hood Canal Coordinating Council. 2004. Impervious Cover Mapping - Hood Canal Chum Salmon ESU for Hood Canal Coordinating Council. Final Report. June 2004.

Long, K., N.E. Harrington and P.J. Mackrow. 2005. Intertidal forage fish spawning site investigation for Eastern Jefferson County, Northeastern Kitsap County and North Mason County 2001-2004. Prepared by North Olympic Salmon Coalition. Final Report to: Salmon Recovery Funding Board, Washington Department of Fish and Wildlife, Jefferson County Marine Resources Committee, Jefferson County, and City of Port Townsend.

MacDonald, K., D. Simpson, B. Paulsen, J. Cox, and J. Gendron. 1994. Shoreline Armoring Effects on Physical Coastal Processes in Puget Sound, Washington. Coastal Erosion Management

Studies Volume 5. Shorelands and Water Resources Program, Washington Department of Ecology, Olympia. Report # 94-78.

May, C. and G. Peterson. 2003. East Jefferson County Salmonid Refugia Report.

Puget Sound Action team (PSAT). 2001. Sound Facts: Eelgrass. Available at: http://www.psat.wa.gov/Publications/Fact_sheets/eelgrass.pdf

Rice, C.A. 2006. Effects of Shoreline Modification on a Northern Puget Sound Beach: Microclimate and Embryo Mortality in Surf Smelt (*Hypomesus pretiosus*). Estuaries and Coasts 29(1): 63–71.

Todd, S., N. Fitzpatrick, A. Carter-Mortimer, and C. Weller. 2006. Historical Changes to Estuaries, Spits, and Associated Tidal Wetland Habitats in the Hood Canal and Strait of Juan de Fuca Regions of Washington State. Final Report. Point No Point Treaty Council Technical Report 06-1. December 2006.

Todd, Steve. 2006. Point No Point Treaty Council Habitat Biologist, personal communication to Michelle McConnell, Jefferson County Department of Community Development, October 2006.

Winter, T.C. 1988. A conceptual framework for assessing cumulative impacts on the hydrology of nontidal wetlands. Environmental Management 12(5):605-620.

Ziemer, R.R. and D.N. Swanston. 1977. Root strength changes after logging in southeast Alaska. U.S. Dep. Agric. For. Serv. Res. Note PNW-306. Portland, OR, USA.