2.0 METHODS

2.1 DATA AND INFORMATION SOURCES

The information contained in this report was derived from readily available published and unpublished studies and literature as well as GIS maps and data. A full bibliography is contained at the end of the report. Metadata are available through the Jefferson County Department of Community Development.

This report presents an inventory and analysis of Jefferson County's shorelines at distinct spatial scales: the ecosystem (or watershed) scale, the basin scale, and the shoreline reach scale. The relationship between the various scales of analysis is represented in Figure 2-1. As noted in Section 1.2.1, much of the key inventory information is displayed on maps provided in the map folio (Appendix C). Table 2-1 describes the key GIS data sources used for various inventory elements (themes) described in the text and identifies the map or maps where the information is displayed[1]. Table 3 is not an exhaustive list. Some GIS data used in preparation of this report are not displayed on a map and thus do not appear in Table 2-1. In some cases, mapping data not available in GIS format are integrated in the report text as graphic figures.

2.2 ANALYSIS OF ECOSYSTEM-WIDE PROCESSES

For purposes of this report, ecosystem-wide processes (or landscape processes) are assessed at the watershed scale according to Water Resource Inventory Area (WRIA) boundaries. In this document, *ecosystem-wide processes* refers to the dynamic physical and chemical interactions that form and maintain the landscape at the geographic scales of watersheds to basins (hundreds to thousands of square miles). These processes include the movement of water, sediment, nutrients, pathogens, toxins, and wood as they enter into, pass through, and eventually leave the watershed. The assessment approach for nearshore and freshwater processes varies slightly as outlined below.

[1] Data described in the text are from the applicable data source shown in this table unless otherwise noted.

FIGURE 2-1. Schematic diagram showing the scales of analysis (watershed, basin, and reach/drift cell) and report structure.

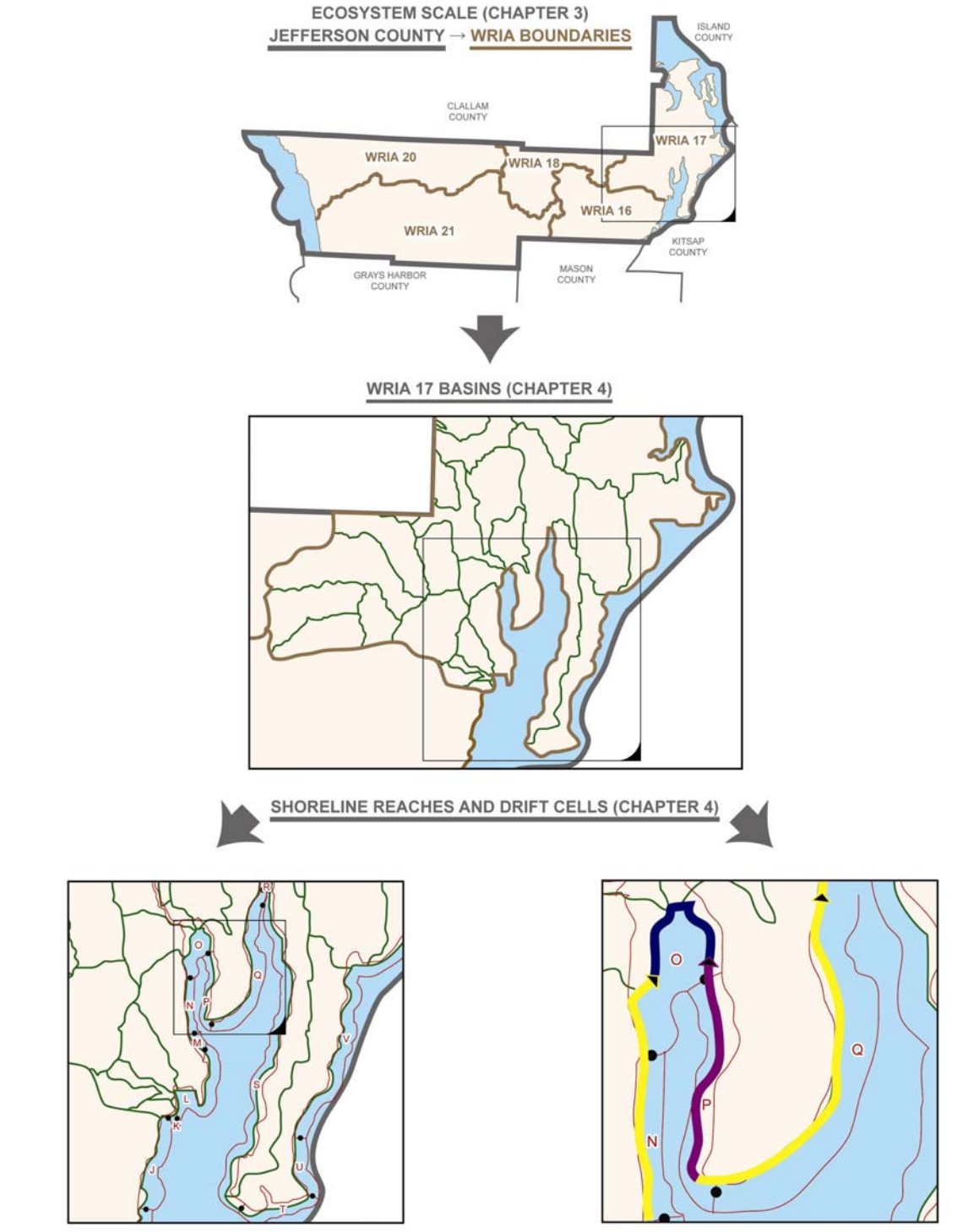

Table 2-1. Jefferson County Shoreline Inventory and Characterization
Primary GIS / Mapping Data Sources

Theme	Map Name/ No.	Source	Issues / Notes
Shorelines of the State	Maps 1A,1B and IC. Jefferson County Shorelines of the State	County mapping for regulated shorelines (existing Shoreline Environment Designations); lakes; wetlands; floodplains. USGS/Ecology (1998) for potential upstream limits of 20 cfs and 1,000 cfs rivers and streams. NW Watershed Institute/ Washington Trout (Bahls et al. 2006) for potential lakes of 20 acres.	
WRIA Boundaries		Ecology.	
Federal / Tribal Land		Protected Lands database (CommenSpace for Jefferson County, 2004).	
Ecosystem-scale Analysis			
Hydrology / Streams and Lakes	Maps 2 and 3. Hydrology	County / WDNR (2004).	Multiple sources with variety of spatial accuracy and detail; County pursuing conversion to National Hydrology Framework.
WRIA Boundaries		Ecology.	
Watershed Boundary		County / WDNR (wshed_oly).	
Permeability		Low, Medium, High permeability ratings for geologic units, based on WDNR 100K scale geologic mapping with input from Ecology.	Geology mapping not available countywide; includes east and west portions of County.
Wetlands / Potential Wetlands		NWI; 1999-2000 landsat (30 m resolution) for wetland classes; hydric soils based on SSURGO (digital NRCS/SCS soil survey).	Soil data of limited extent; NWI spatial accuracy is limited and dated.
Topography		USGS 10 m DEM; LIDAR for eastern Jefferson County.	
Floodplains (100-year floodplain)		County; derived from digital FEMA mapping (1998).	Mapping not available countywide; includes east and west portions of County.
Rain-on-Snow (ROS) and snow-dominated (SD) Zones		WDNR Forest Practices, 1991; 1:250K scale mapping; selected for areas classified as “peak rain on snow” and snow dominated zones.	

Theme	Map Name/ No.	Source	Issues / Notes
Channel Migration Zones (CMZ)		Designated Channel Migration Study for Eastern Jefferson County (Klawon, 2004). Undesignated CMZs: Additional information on specific reaches of the Hoh River (US BOR, 2004; Herrera Consultants and Northwest Hydraulics 2002; Perkins Geosciences and Terra Logic, 2004) is noted.	Eastern County limited to Duckabush, Dosewallips, Big Quilcene and Little Quilcene Rivers. Additional information on Hoh River was reviewed but not available in GIS format for inclusion in map folio. Scanned graphics are included in report text.
Land Cover (early and late seral stage vegetation; human imprint)		1999-2000 landsat data; 30 m resolution. Late Seral Stage: all forest classes. Early Seral Stage: all non-forest vegetative classes. Human Imprint: all developed or altered classes (agricultural; residential; commercial; transportation; etc.).	Countywide coverage; resolution appropriate for landscape analysis only; slightly dated; good classification for alterations and mature forest cover.
Hydrology / Streams and Lakes; WRIA Boundaries; Watershed Boundary; Permeability; Wetlands	Maps 4 and 5. Water Quality	As described above (Hydrology Map set).	
Dairy farms		Ecology point data.	Limited spatial extent – eastern County only.
Water Quality (not shown on map)		2004 Ecology Water Quality Assessment / 303(d) data.	Data limited to tested waterbodies.
Septic Permits		County; parcel query from County Dept. of Health records for properties with septic tanks (2006).	Limited spatial extent – eastern County only.
Tilled Fields		1999-2000 landsat data; 30 m resolution. Classification = “Row Crops”.	
Lost Wetlands		Lost depressional wetlands depicted by hydric soil units on 2% slopes or less that intersect “Human Imprint” areas (as described below).	
Human Imprint		1999-2000 landsat data; 30 m resolution: Areas classified as developed or altered (agricultural; residential; commercial; transportation; etc.).	

Theme	Map Name/ No.	Source	Issues / Notes
Hydrology / Streams and Lakes; WRIA Boundaries; Watershed Boundary	Maps 6 and 7. Sediment	As described above (Hydrology Map set).	
Road Density		County data; WDNR.	County data limited to major roads; WDNR Trans layer much more thorough – includes network of logging roads throughout County.
LSI Landslides		Landslide Inventory, WDNR Forest Practices (Vaugeois and Boyd, 2004) (aka Mass Wasting Events).	Compiled from a variety of 1:24000 scale products dating 1999-2003.
Landslide Hazard Zonation		WDNR Forest Practices (hazone-landform areas of landslide hazard, 2007).	Statewide mapping effort, compiled from previously existing public and private assessments and the landslide hazard zonation project (LHZ).
Erodible Soils		SSURGO (digital NRCS/SCS soil survey) where slope >= 30% and erodibility factor = 0.24 – 0.32.	Limited spatial extent – eastern County only.
Human Imprint		As described above.	
Reach-Scale Inventory Maps			
Shoreline Planning Area (i.e., Shoreline Inventory Reaches)	Maps 8, 9, and 10. Aquatic Resources	County mapping for regulated shorelines (existing SEDs); wetlands; Public Lands database for boundaries of federal and tribal land.	
Reach Breaks		SSHIAP for breaks in stream gradient and natural barriers to fish migration; drift cells for marine reach breaks.	Differ in places from reach breaks defined in previous County inventory (Harrington, 2005).
Potential Wetlands		As described above.	
Federal Land		As described above.	
100-year Floodplain		As described above.	
Channel Migration Zone		As described above.	
Riparian Corridor Conditions	Not mapped.	East Jefferson County Salmonid Refugia Report (May and Peterson, 2003).	Data on riparian conditions in eastern County was reviewed but not included in map folio. Ranked nodal corridors from study are shown as graphics in report text.

Theme	Map Name/ No.	Source	Issues / Notes
Shoreline Modifications (nearshore)	Maps 11, 12, and 13. Coastal Processes and Modifications	PNPTC survey/mapping data from 1999-2000 depicting bulkheads, marinas (line files) and docks, piers, jetties, groins, launch ramps, and stairs (point files).	Limited spatial extent – eastern County only. As documented by Hirschi et al., 2003.
Freshwater Shoreline Modifications	Not mapped.	Limited data sources; 2000 aerial photos for piers and docks on lakes.	No comprehensive mapping of levees, revetments, or other bank alterations to rivers and streams.
Shore Form Type	Maps 11, 12, and 13	WDNR (2001) ShoreZone Inventory depiction of marine shorelines, classified as: Accretional, Erosional, Stable.	General accuracy limitations with statewide dataset (filmed shoreline by helicopter). Additional nearshore geomorphic landform data included in Maps 26 and 27 (described below).
Feeder Bluffs	Not mapped.	No comprehensive mapping layer.	Data derived from variety of sources (drift cell descriptions; geo-hazards; coastal atlas slope stability mapping; and WDNR ShoreZone for "erosional" shorelines). Report incorporates Coastal Geologic Study for Kala Pt. To Tala Pt. (Johanessen 1999) – not in GIS format.
Drift Cells	Maps 11, 12, and 13	Ecology compiled statewide GIS file.	Compilation of drift cell studies of varying detail and dates of study; accuracy is limited.
Critical Aquifer Recharge Areas	Maps 14, 15, and 16. Critical Areas	County GIS, 2003. Produced from Geology source coverage based on susceptible aquifer areas specified in the Unified Development Code and from CAD drawings of Special Aquifer Recharge Protection Areas from the Jefferson County Natural Resources Department and the Jefferson County Public Utility District.	Limited spatial extent – eastern County only.
Landslide Hazard (County) / Landslide Hazard Zonation (WDNR)	Maps 26 and 27	County GIS. Metadata lacking. WDNR data (as described above).	Limited spatial extent – eastern County only.
Erosion Hazard	Maps 26 and 27	County GIS. Metadata lacking.	Limited spatial extent – eastern County only.

Theme	Map Name/ No.	Source	Issues / Notes
Potential Wetlands		As described above.	
Frequently Flooded Areas (100-year Floodplain)	Maps 8, 9 and 10	As described above.	
Priority Fish Presence	Maps 17, 18, and 19. Critical Shoreline Habitat	WDFW (2006) data for priority fish distribution (fishdist).	Maps currently show WDFW PHS fish presence/use as rearing vs. spawning vs. migration.
Priority Habitat Areas	Maps 11, 12, and 13	WDFW (2006) (phspoly) shown for areas associated with species use.	
Marine Resource Species (geoduck, urchin, oyster, crab, clam, razor clam, surfsmelt, sandlance, herring)	Maps 17, 18, and 19	WDFW (2006) shows documented presence of shellfish and forage fish species.	WDFW PHS/MRS data incorporates 2005 NOSC forage fish survey data.
Eelgrass	Map 20. Aquatic Vegetation	WDNR (2001) ShoreZone Inventory depiction of eelgrass, classified as: Continuous or Patchy. WDNR Aquatic Lands Eelgrass Sampling Sites, 2000-2005 for areas in eastern Jefferson County.	
Kelp	Map 20	WDNR (2001) ShoreZone Inventory depiction of kelp, classified as: Continuous or Patchy.	
Land Use / Land Ownership (not shown on map)	Maps 21, 22, and 23. Land and Shoreline Use Patterns	Parcel data with Assessor current use codes; Washington Public Lands Database (CommenSpace)	Assessor data has limited accuracy and currency difficult to verify.
Shoreline Features	Maps 11, 12 and 13	PNPTC survey/mapping data from 1999-2000 depicting marinas (line files) and boat launch ramps to illustrate water dependent shoreline access/use.	As documented by Hirschi et al., 2003.
Current and propsosed Shoreline Environment Designations	Maps 29, 30 and 31	County GIS (based on 1989 SMP designations currently in effect).	
Zoning		Jefferson County.	

Theme	Map Name/ No.	Source	Issues / Notes
Publicly Owned Tidelands	Maps 21, 22 and 23	WDNR Aquatic Lands (Feb 2007). Tidelands recorded in public ownership by federal, state, or county government or other public agency/entity.	Aquatic land ownership parcels.
Commercial Shellfish Growing Areas; Biotoxin Closure Zones; Recreational Harvest Beaches	Map 24. Shellfish Harvesting	WDOH (2006). Draft data by Jamestown Tribe showing tribal shellfish harvest beaches in east Jefferson County.	Data shows management zones by WDOH; does not necessarily show where actual commercial shellfish operations are currently active. Data developed by Jamestown Tribe were not available in GIS format but shown as graphic in report text (Figure 3-3).
Forest Cover	Map 25. Forest Cover and Impervious Surface	1999-2000 landsat data; 30 m resolution. Early and Late Seral Stage classes as described above.	Countywide coverage; resolution appropriate for landscape analysis only; slightly dated; good classification for alterations and mature forest cover.
Impervious Surface	Map 25. Forest Cover and Impervious Surface	Impervious Cover Mapping – Hood Canal Chum Salmon ESU (Hood Canal Coordinating Council, 2004).	Spatial extent limited to eastern Jefferson County (Chum Salmon Study Area).
Marine Shoreline Geomorphic Landforms	Maps 26 and 27. Geomorphic Classes	Battelle's Nearshore Restoration Prioritization for Jefferson County (Diefenderfer et al., 2006).	Limited spatial extent – eastern County only. Marine shoreline classified at ShoreZone unit scale into 7 landform types.
Lagoons, Salt Marshes, and Intertidal Wetlands	Maps 26 and 27	PNPTC (Todd et al., 2006) survey/mapping data of nearshore features.	Limited spatial extent – eastern County only.
Shoreline Slope Stability	Maps 26 and 27	Ecology (mid-1970s; digitized 2001). Areas shown include those mapped as unstable slopes.	Data originally published as hard copy maps in the Coastal Zone Atlas of Washington between 1978 and 1980; limited to 2,000 feet from marine shoreline.
Landslide Hazard	Maps 26 and 27	As noted above.	
Erosion Hazard	Maps 26 and 27	As noted above.	
Zoning; Wetlands; Priority Habitats	Map 28. Quinault River	Mapping themes as noted above.	~4.8 miles of Quinault River in unincorporated Jefferson County; limited GIS data available for this area of the County.

2.2.1 Marine (Nearshore) Shorelines

The marine nearshore environment encompasses the interface between subtidal marine habitats and the adjacent uplands, or more specifically the area that extends waterward from the upland edge of the marine riparian zone (200 feet landward of OHWM) to depths of about 65 feet mean low water (Hood Canal Coordinating Council, 2005). These environments are formed and maintained by landscape-scale processes such as net shore-drift and fish and wildlife movement patterns (Williams et al., 2004). Nearshore habitats and the species that occupy and depend on them (including juvenile salmonid species and many species of commercially/recreationally harvestable shellfish) require that these landscape processes function properly across various spatial scales (Williams and Thom 2001; Ruckleshaus and McClure, 2007).

Several investigators have shown that the health and sustainability of nearshore environments are linked to physical processes at the watershed scale (Williams et al. 2004, Difenderfer et al., 2006). Physical processes create habitat structure, which affects habitat-related processes, which in turn influence ecological functions and values (Table 2-2). Chemical and biological processes also influence nearshore environments. As an example, decomposition of beach wrack is important for food chain support functions.

This characterization examines physical, chemical, and biological factors influencing marine environments at the landscape scale including local/regional geology, fluvial systems, waves, wind and energy/exposure, and land use/human development. These factors operate via different mechanisms and exert varying degrees of influence depending upon landscape position. In Jefferson County, the western shores of the Pacific Ocean are subject to different influences than the marine shores of Puget Sound (eastern Jefferson County) due to differences in oceanographic processes/circulation, geomorphology, bathymetry, net shore-drift patterns, fluvial influences, nutrient dynamics, effects of coastal bluff landslides, and land use.

Table 2-2. Relationship of Nearshore Physical Processes to Habitats and Ecological Functions (adapted from Williams et al., 2004)

Processes	Habitat Structure	Habitat Processes	Ecological Function
Wave Energy Light (Increase) Light (Shading) Sediment Supply Substrate Pollution/Nutrients Hydrology Physical Disturbance	Density Biomass Length/Size Diversity Landscape Position Patch Shape/Size	Production Sediment Flux Nutrient Flux Carbon Flux Connectivity/Fragmentation	Prey Production Reproduction Refuge Biodiversity Maintenance Disturbance Migration Corridors

This analysis includes a qualitative assessment of processes affecting nearshore environments, based in part on the analysis of nearshore conditions in eastern Jefferson County presented in *Multi-Scale Restoration Prioritization for Local and Regional Shoreline Master Programs: A Case Study from Jefferson County, Washington* (Diefenderfer et al., 2006), which is hereby incorporated by reference.

2.2.2 Freshwater Shorelines

The ecosystem characterization approach used for non-marine shorelines (including estuaries and freshwater rivers, streams, and lakes) is based in part on the approach reported in *Protecting Aquatic Ecosystems: A Guide for Puget Sound Planners to Understand Watershed Processes* (Stanley et al., 2005) and on the *Draft Watershed Characterization for Jefferson County, Version 2* (Ecology, 2007), which covers eastern Jefferson County and is hereby incorporated by reference. This approach examines specific watershed processes, including the movement of water, sediment, nutrients, pathogens, toxicants, organic matter, and energy or heat, that form and maintain aquatic resources, including shorelines, over a large geographic scale. These processes interact with landscape features to create the structure and function of aquatic resources.

The analysis uses a coarse-grained approach for integrating watershed processes into shoreline management, restoration planning, and related land use planning efforts. Results of the characterization will help to identify areas that are important for maintaining watershed processes and whether or how much these "process-intensive" areas have been altered. This approach considers the relative degree of importance and extent of alteration for each basin, so that priorities for protection and restoration can be identified. A central assumption of this approach is that the health of aquatic resources is dependent upon intact upgradient watershed processes (Ecology, 2007).

The purposes of the freshwater watershed-scale analysis are to highlight the relationship between key processes and aquatic resource functions, and to describe the effects of land use on those key processes. This approach is not intended to quantify landscape processes and functions. Rather, the goals are to:

- Identify and map areas on the landscape important to processes that sustain shoreline resources;
- Determine their degree of alteration; and
- Identify the potential for protecting or restoring these areas.

The approach to characterizing watershed-scale processes acting on freshwater systems consisted of several steps, which are described below (see also Stanley et al., 2005 for a complete description of the background and methods for this approach).

2.2.2.1 Step 1 – Identify Aquatic Resources and their Contributing Areas

Project analysts identified and mapped aquatic resources including rivers, lakes, estuaries, and wetlands (existing and historic wetlands) using available GIS hydrography data from various

sources. Mapped areas include aquatic resources that are subject to shoreline jurisdiction (e.g., large rivers and lakes) and resources outside of shoreline jurisdiction (e.g., small streams, depressional wetlands outside floodplains, etc.). Contributing areas are defined as the surface water drainage boundaries in each WRIA. Each WRIA is also divided into smaller units or basins that are referenced when discussing conditions at a more refined scale.

2.2.2.2 Step 2 – Identify Key Processes

Processes occurring at the watershed scale maintain aquatic resources to varying degrees. This analysis focuses on key processes that are fundamental to the integrity of the ecosystem and can be managed within the context of the available land use plans and regulations. In accordance with Stanley et al. (2005), analysts identified the following key processes as critical to sustaining the aquatic resources and likely to be altered by human activity:

- Hydrology
- Sediment
- Water Quality
- Organic Inputs

2.2.2.3 Step 3 – Identify and Map Process-intensive Areas

For this step, analysts used available GIS data to identify and map areas within the County that support ecosystem processes (Table 2-3). These so-called "process-intensive areas" are those areas which, when maintained in an unaltered condition, have the greatest *relative* influence on the dynamics of a specific process and consequently on aquatic resources[2]. In some cases, the process-intensive areas are areas where inputs to the processes occur (e.g., the feeder bluffs that generate sediment supply as a result of erosion). For other processes, inputs occur so broadly across the landscape that specific important input areas are difficult to identify. In those cases, the process-intensive areas are areas that facilitate movement or storage of materials such as water, sediment, or pathogens. Identifying an area such as a feeder bluff as a "process-intensive" area is not meant to suggest that the associated transport zones or depositional areas are not important; it simply focuses this coarse-scale analysis on the main trigger or generator of the net shore-drift processes (i.e., without the feeder bluff generating the sediment there is no sediment transport or deposition).

Commonly, multiple processes are present in a single area, sometimes due to feedback relationships among processes. Storage areas such as depressional wetlands are a good example because they store surface water, which traps sediment and facilitates phosphorus removal and contaminant adsorption, uptake and storage. Mapping of these areas allows us to identify where each process occurs as well as areas that support multiple processes and therefore may provide valuable protection and/or restoration opportunities.

[2] The use of the term "process-intensive areas" is used as a means of distinguishing, on a relative scale, areas that play a key role in how ecosystem processes operate within a watershed. This does not imply that other areas are not important for ecological functioning, land use management or other purposes.

2.2.2.4 Step 4 – Identify and Map Process Alterations

This step determines where land uses and/or actions associated with land use have altered naturally occurring processes. Knowing where and how processes have been altered provides information necessary to develop appropriate environment designations and standards for the type and intensity of development that shoreline segments can support while accommodating appropriate uses and achieving no net loss of shoreline functions and values. Altered areas may provide opportunities for restoration, while unaltered areas may have potential for conservation or similar protection (Ecology, 2007).

Table 2-3. Examples of Process-intensive Areas, Mechanisms by which they Operate, and Alterations for Key Ecosystem Processes

Key Process	Mechanism	Process-intensive areas	Alterations
Hydrology	Infiltration/recharge	Permeable deposits	Impervious area, loss of hydrologically mature forest cover, roads, ditches, storm sewers
	Surface water storage	Depressional wetlands Lakes Floodplains	Lost wetlands, streams disconnected from floodplains
	Surface runoff and peak flows	Rain-on-snow zones and snow-dominated zones	Loss of hydrologically mature forest cover, road density
	Groundwater flow (baseflow)	Surficial aquifers Surface expression areas (lakes, wetlands, streams)	Ditched/drained areas with shallow groundwater, groundwater consumption
Sediment	Surface erosion	Erodible soils on steep slopes	Native vegetation loss, roads near streams, till agriculture, developing lands
	Mass wasting	Landslide hazard areas	Roads in landslide hazard areas, vegetation removal
	Sediment storage	Depressional wetlands Floodplains	Loss of wetlands, floodplain disconnection, stream channelization
Water Quality (including heat/light inputs)	Contaminant storage Nutrient storage/ denitrification Riparian canopy cover	Wetlands that denitrify groundwater Wetlands that filter surface water Riparian/Hyporheic zones particularly in headwater streams Low-order streams	Onsite septic systems, agricultural and residential fertilizer, riparian disturbance, loss of wetlands, loss of vegetation
Organic Inputs	LWD recruitment	Riparian zones Historic channel migration zones Landslide hazard areas	Loss of mature forest, bank armoring, stream channelization, loss of mature forest

2.3 SHORELINE REACH-SCALE INVENTORY

Within Jefferson County there are approximately 250 linear miles of marine shoreline (including the inner shores of bays and marinas) and approximately 22 miles of lakeshore on 14 lakes that are designated as shorelines of the state in Jefferson County. In addition, this report provides a general inventory of more than 742 river miles of stream and river shoreline, of which approximately 238 river miles are within and County-regulated (non-federal and non-tribal) lands (per WAC 173-18, with revisions from 20 cubic feet per second [cfs] mapping from USGS, 1998).

Most of the shoreline areas under Jefferson County's jurisdiction are located in the eastern part of the County. All of the marine shorelines that fall within County jurisdiction are in the eastern part of the County on greater Puget Sound. The Pacific Coast shoreline and the lower reaches of freshwater rivers in the western part of the County are located on federal or tribal lands—including Olympic National Park (ONP), Olympic National Forest (ONF), and the Hoh and Quinault Indian Reservations—and are therefore not subject to the state SMA. All of the Queets River, the upper reaches and tributaries of the Hoh and Bogachiel Rivers, and potentially numerous other tributaries are also on federal or tribal lands (see Table 1-1). The marine shores of Indian Island and most of Protection Island – with the exception of the Zella M. Schultz State Seabird Sanctuary, a 48-acre parcel on the Island's southwestern edge managed by Washington Department of Fish and Wildlife – are also under federal jurisdiction. Although these areas are outside County jurisdiction, management and use of these areas influence the functions and values of SMA-regulated shorelines through various mechanisms.

The reach-scale inventory focuses on WAC-designated shorelines considered to be within County jurisdiction. In general, the inventory area includes, at a minimum, lands within 200 feet of the shoreline OHWM, plus floodplain and associated wetland and delta areas. This zone is referred to as the shoreline planning area. Areas outside the planning area were analyzed at the ecosystem scale as described above to develop a better understanding of shoreline processes and functions. Streams and lakes that are not currently designated as shorelines per WAC 173-18 or 173-20 but which may meet the criteria for shoreline designation are described and charecterized within Appendix D, and mapped along with WAC-designated shorelines within Appendix C, but not inventoried at the same level of detail as WAC-designated shorelines.

2.3.1 Marine (Nearshore) Reaches

The marine shoreline is divided into 64 individual reaches for inventory and analysis purposes[3]. Each reach is identified by a unique alpha designation beginning with "A" in the southwest corner of the County. The reach breaks were defined based primarily on net shore-drift patterns (drift cells) and other geomorphic factors. Major characteristics of the built and natural environments are described for each reach, including: zoning; existing land use; historical resources; shoreform; aquatic vegetation; marine resource species (including forage fish and

[3] Diefenderfer et al. (2006) also analyzed nearshore reaches both at finer ShoreZone Unit scale and Drift Cell Reach scale for purposes of identifying and ranking restoration sites in *Multi-Scale Restoration Prioritization for Local and Regional Shoreline Master Programs: A Case Study from Jefferson County, Washington*.

other species); commercial shellfish growing areas; shoreline modifications (bulkheads, marinas, docks, piers, jetties, groins, launch ramps, and stairs); threatened, endangered and priority habitats/species; salt marshes and intertidal wetlands and lagoons; geomorphic class; public access; and other attributes (see Table 2-1 for a list of primary datasets).

2.3.2 Freshwater Reaches

For freshwater shorelines, reaches were delineated based primarily on habitat. There are 59 river/stream reaches and 14 lake reaches. The reach identifier includes the water body name and a numeric qualifier. The attributes of the freshwater reach inventory are similar to the marine reach inventory and include ecological characteristics, human use, and other features as required by the state guidelines (see Table 2-1 for a list of primary datasets).