

4. MARINE REACH INVENTORY

This chapter describes the marine shoreline reaches that are within the jurisdiction of the County's SMP (in WRIAs 18, 19, and a portion of 17, excluding incorporated areas and the Makah Reservation) (see Figure 3-7 for the reach locations). Reaches are described in terms of their physical attributes, ecological condition, and human environment / land use characteristics. Maps are provided in Appendix A.

Based upon available County-wide data sources, key physical, ecological, and land use characteristics for each reach are detailed on "reach sheets," located at the end of this section. A description of the available data sources, including data limitations, is presented in the "reach sheet explainer" following this chapter.

The reach descriptions below contain a summary of the data presented within the reach sheets and additional pertinent information, including potential future land use impacts to shoreline processes and management issues and opportunities.

4.1 *Reach 1: Diamond Point (Maps 1a to 6a in Appendix A)*

The "Diamond Point" reach contains 12.5 miles of marine shoreline, which extends along Miller Peninsula from the Clallam/Jefferson county line to the northwest corner of Sequim Bay (approximately one mile south of Travis Spit). The reach contains shoreline along Discovery Bay, the Strait of Juan de Fuca, and Sequim Bay. The reach also contains the mouth of Eagle Creek (Eagle Creek is not a shoreline of the state, except where it enters the Strait of Juan de Fuca). Jefferson County has designated the majority of the adjacent Discovery Bay shorelands as either Natural or Conservancy. The aquatic area is designated Priority Aquatic. These designations provide the highest levels of ecological protection available under the Jefferson County shoreline master program.

4.1.1 Summary of Baseline Conditions

The predominant shoreform of Miller Peninsula is bluff backed beach. Over half of the shoreline consists of feeder bluffs, except for the Thompson Spit, Diamond Point, and Travis Spit vicinities. The feeder bluffs, combined with net shore-drift, supply the sands, gravels and cobbles that maintain barrier beaches at the spits and Diamond Point. A majority of the bluffs are considered to be unstable and some areas show evidence of recent slides—particularly on the shoreline west of Diamond Point. The shorelines along Diamond Point, Thompson Spit, Paradise Cove Spit, and Travis Spit are within a tsunami hazard zone and the FEMA coastal 100-year floodplain.

Forage fish species such as surf smelt and sand lance spawn in the upper intertidal gravel and gravel-sand beaches of Discovery Bay and Sequim Bay (Figure 4-1). Eelgrass is mapped throughout a majority of the reach, and patches of kelp are mapped along the Strait. The marine shores in this area, and in particular the Discovery Bay and Sequim Bay shorelines, are prime habitat for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. The Jamestown S'Klallam Tribe and Clallam County (2004) identified the nearshore areas between Sequim Bay on the east and Morse Creek on the west as being of particular importance

to Dungeness River salmon stocks. Lagoon/coastal embayment wetland habitat is present at Diamond Point, Thompson Spit, and Paradise Cove. Travis Spit and adjacent shorelines provides habitat for shorebirds and waterfowl, and contains a haulout area for marine mammals. Eagle Creek provides habitat for coho salmon and cutthroat trout.

Most of the tidelands within the reach are publicly owned. Some public tidelands areas near Paradise Cove are leased for aquaculture, and some commercial geoduck beds are present throughout the reach, including the northeastern portion of Sequim Bay. Recreational shellfish harvesting is available on almost the entire north shore of Miller Peninsula, and south of Diamond Point on Discovery Bay. Discovery Bay was closed to shellfish harvesting in 2007 because of elevated fecal coliform levels, but has since reopened. The source of the bacteria is not known, but according to the WRIA 17 Watershed Management Plan several drains near Diamond Point carry pollution into Discovery Bay (Cascadia Consulting Group 2003). The reach has no other documented water quality impairments.

Sections of the shoreline (6% of reach total) have been armored, presumably to protect adjacent residences. The armoring occurs along Diamond Point and Paradise Cove, which are accretion shoreforms. Approximately 3 docks are located in the Diamond



Figure 4-1. Forage fish eggs on gravelly beach substrate

Point vicinity, but no other overwater structures are present within the reach. Neither the docks nor the armoring occur along feeder bluffs or in transport zones. A few small segments of bulkhead occur in areas that support sand lance spawning and eelgrass.

Half of the shoreland area within the reach is heavily forested, which provides habitat for a diversity of wildlife species and helps stabilize erosive bluffs. Outside of the shoreland zone, the majority of Miller Peninsula upland area is forested.

Land use along the shoreline is primarily undeveloped open space, with pockets of residential development. This is consistent with the zoning which is either R5 or open space. The densest concentration of residential development is located in the Diamond Point vicinity, with more sparse development in the Travis Spit vicinity and northeast Sequim Bay. The north, central portion of the reach is the undeveloped Miller Peninsula State Park, managed by Washington State Parks.

More than half of the land in shoreline jurisdiction in this reach is publicly owned. A majority of the adjacent tidelands are also mapped as publicly owned. The uplands are accessible to the public; however, there are limited opportunities to access water from the uplands because of the presence of steep, unstable bluffs. Public shorelines in the northern portion of the reach can be accessed via a trail from Panorama Vista County Park. The shoreline along Discovery Bay can be accessed at one location, via an informal trail at within the site of the future Miller Peninsula State Park.

4.1.2 Future Land Use and Potential Effects on Shoreline Ecology

There are a substantial number of undeveloped and underdeveloped parcels on this reach. Under current zoning regulations, approximately one-third of the shoreland area has potential for new residential development. The developable land is generally located along bluffs in the eastern and western portions of the reach, in areas that are mainly forested. Vacant parcels along Discovery Bay feeder bluffs are mostly 1- to 5-acre lots that cannot be subdivided under current zoning regulations. The lots are rectangular in size with narrow water frontages (approximately 150 feet). Development in these lots could result in relatively dense shoreline development as well as removal of forest cover near the erosive feeder bluffs in this area. Vegetation removal along bluffs tends to accelerate erosion, which can put adjacent homes and other structures at risk.

The Washington State Parks Commission has put plans for development of Miller Peninsula State Park on hold due to budgetary constraints (WSP, 2011). The development would likely increase managed public access to the area, which would be a benefit to the community, but could lead to adverse effects on the quality of the nearshore environment if not properly designed and managed. Clearing, grading, impervious surface and shoreline modification could reduce the amount or quality of the forested habitat or create other adverse impacts on shoreline ecology. State park planners have mapped sensitive ecological features, opportunities and constraints for consideration in the initial planning stages.

The residential land on Diamond Point has already been platted into small (approximately quarter-acre) parcels, and most of the homes are built within 50 feet of the ordinary high water line. Infill development on scattered vacant parcels could occur in the future. Few of the homes in this reach have a dock or other overwater structure since most of this reach is subjected to the strong wind and wave conditions that are prevalent along the Strait. There is some potential for new dock construction on the Discovery Bay shoreline since it is somewhat more protected

(from wind and waves), but the absence of docks along the Bay suggests that conditions are generally unsuitable for docks.

Diamond Point landowners whose homes are close to the shore may seek to construct bulkheads or other shoreline armoring structures to protect their property from storm activity or changes in sea level, particularly on parcels bordering the Strait. An increase in armoring and/or overwater structures in the area may adversely impact sediment delivery and transport processes which could impact submerged aquatic vegetation communities and/or forage fish spawning habitat, which would in turn reduce the quality/suitability of this reach for salmonid rearing and migration. The nature and degree of the impact would depend on the type of armoring and its location relative to the ordinary high water line among other factors.

There is a significant amount of undeveloped land in the Travis Spit vicinity, some of which are large parcels that may be subdivided into 5-acre lots under current zoning regulations. Similar to the southwestern portion of the reach, many parcels are rectangular in shape with water frontage widths averaging 150 feet. Potential shoreline impacts resulting from development on these parcels are similar to those described on the Discovery Bay shoreline. An area near Travis Spit is mapped as a waterfowl concentration area, and changes in the development density in this vicinity could reduce the quality or suitability of the habitat for waterfowl species.

4.1.3 Management Issues and Opportunities

This reach has significant feeder bluffs and transport zones that are mostly intact/uninterrupted, so sediment processes are in relatively good condition. There are few shoreline modifications (such as armoring and overwater structures) and significant amounts of high quality terrestrial (forest) and submerged aquatic vegetation. Protecting these natural shoreline attributes and habitat-forming processes is key to maintaining the overall ecological health of the reach, and minimizing loss of barrier beach habitat. Compared to some shoreforms, lagoons and coastal embayments have been disproportionately affected by shoreline development throughout the Puget Sound / Strait of Juan de Fuca system so protection of the remaining areas is a high priority for regional resource managers.

In addition to their extremely high value as fish and wildlife habitat, Travis Spit and Paradise Cove Spit help protect Sequim Bay's shorelines from wave energy and erosion. Limiting or preventing the construction of bulkheads within their drift cells will help protect these valuable features by preserving their sediment supplies.

Over half of the shoreline in this reach is publicly owned; however, direct water access is generally not feasible because of the steep, erodible bluffs. Opportunities for increased public access, trails, and shoreline viewing areas are available at the undeveloped Miller Peninsula State Park. The northern shoreline of Travis Spit is publicly owned, but there are no adjacent public parcels.

Key management considerations for this reach include:

- Bluffs / highly erosion-prone areas: Protection of feeder bluffs and sediment processes are critical concerns. Bluffs will continue to naturally erode / retreat, so homes and other structures must be set back a sufficient distance (from the edge of the bluff) to minimize

risk and avoid the need for harmful stabilization measures. Vegetation should be maintained to stabilize slopes and runoff needs to be managed so that it does not destabilize slopes. Shoreline property owners should be aware of the substantial risks to property and human safety resulting from developing land near unstable feeder bluffs.

- Low bank areas: Potential risks of coastal flooding and tsunami damage, sediment transport, and fisheries habitat should be considered when siting new or modifying existing structures. Construction of bullheads where they do not now exist should be discouraged in favor of more environmentally protective strategies. Protection of embayment and lagoon habitats at Diamond Point and Paradise Cove is critical.
- Future development of Miller Peninsula State Park should be managed and located to minimize habitat fragmentation and avoid intensive public use/access in ecologically and geologically sensitive areas.
- Existing public access sites should be managed to avoid impacts to shorelines, adjacent residences, and habitats.

4.2 Reach 2: Sequim Bay (Maps 1a to 6a in Appendix A)

The “Sequim Bay” reach contains 8.2 miles of marine shoreline which extends from the northeast corner of the bay (approximately one mile south of Travis Spit) to just south of the John Wayne Marina. The reach also contains the mouths of Jimmycomelately and Dean creeks (these streams are not shorelines of the state, except where they enter Sequim Bay). Areas within the S’Klallam Reservation are part of this reach, but the reach excludes shoreline within City of Sequim jurisdiction.

4.2.1 Summary of Baseline Conditions

The predominant shoreform of Sequim Bay is bluff backed beach, and approximately one-third of the total reach shoreline is classified as feeder bluffs. The feeder bluffs, combined with net shore-drift within the reach, supply the sand, gravel, and cobble that maintain the barrier beaches present at several locations within the reach. Bluffs within the reach are generally stable, and the relatively sheltered position of Sequim Bay means there is less exposure to winds and waves compared with other areas along the Strait. However, some unstable bluffs areas are located in the western portion of Sequim Bay.

Approximately one-third of the shoreland area within the reach is heavily forested, which provides habitat for a diversity of wildlife species. The dense forest cover also helps stabilize the bluffs within the reach. Outside of the shoreland zone, the majority of the surrounding land is forested. However, portions have been cleared for residential development, agriculture, and other uses.

Wetlands occur near the mouth of Jimmycomelately Creek, and there have been ongoing restoration efforts to improve salmonid habitat within the creek and its estuary. The wetlands provide important habitat for shorebirds, waterfowl and other species. Eelgrass is mapped throughout almost all of the reach. Forage fish species, such as herring and sand lance, spawn on eelgrass and in the upper intertidal gravel and gravel-sand beaches of the bay. The presence of

aquatic vegetation and forage fish makes the Sequim Bay shoreline prime feeding grounds for juvenile salmonids and other species, which use the shallow nearshore waters for migration and rearing. In addition, coho salmon, chum salmon, winter steelhead, and resident cutthroat trout are mapped in several of the streams draining to the bay. As noted above, the nearshore habitats in this area are noted as being of particular important to Dungeness River salmon stocks.

Several patches of armoring are present along the reach shoreline; approximately 20% of the shoreline within the reach has been armored, or otherwise modified. Approximately 15 overwater structures (docks and piers) are mapped in the southern and western portions of the reach. Many mooring buoys are also present within the reach. The location of the armoring, overwater structures and fill coincides with the mapped forage fish habitat. Most of Sequim Bay is in a tsunami hazard zone and FEMA coastal and stream (Jimmycomelately Creek) 100-year floodplains.

Some of the tidelands within the reach are public (managed by DNR), but most of the tideland areas are privately owned. Of the public tidelands, some portions are leased for aquaculture. Sequim Bay State Park is a popular recreational shellfish harvesting area, and a commercial oyster farm (operated by the Jamestown S'Klallam Tribe) is located at the bay head. Hardshell clam, geoduck, and pandalid shrimp are also mapped within the bay. Dungeness crab are assumed to be present, as well.

There are no impaired water quality listings for the marine waters of Sequim Bay; however, the State lists Sequim Bay as a "water of concern" for low dissolved oxygen levels. The portion of Jimmycomelately Creek within the reach has State impaired water quality listings for fecal coliform and low dissolved oxygen levels. The Streamkeepers have listed Jimmycomelately water quality as "impaired" for both B-IBI and WQI. Increasing fecal coliform levels in the creek has a variety of negative human health and ecological impacts, including affecting the safety of shellfish harvesting on the bay shorelines.

The dominant land use along the Sequim Bay shoreline is moderate- to low-density residential development (occurring throughout the reach), with other significant land uses being open space and timber harvest. The Jamestown S'Klallam Tribe offices and tribal commercial facilities are located at the bay head. Over 90% of the shoreland area is privately owned. Several roads are located within the shoreland area including portions of Highway 101, Old Blyn Highway, and West Sequim Bay Road. The Olympic Discovery Trail runs along the southern end of Sequim Bay with public access and parking near the mouths of Jimmycomelately and Dean Creeks.

Portions of the lower Sequim Bay estuary and the mouths of Jimmycomelately and Dean Creeks have been restored in the last 10 years by the County, Jamestown S'Klallam Tribe, and Clallam Conservation District, with state, federal and private partners. Restoration activities included the removal of a log dump and access road in the estuary, removal of a trailer park and other structures in the shorelands, re-routing of the mouth of Jimmycomelately Creek, re-vegetation of shorelands, and other activities to improve ecosystem function.

Approximately 15% of the shoreline in the reach is publicly owned, the majority of which is accessible from land. Publically owned shoreline is located on the west shore of Sequim Bay, and can be directly accessed from Sequim Bay State Park.

4.2.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, approximately half of the shoreland area within the reach has potential for new development. The undeveloped land within SMP jurisdiction is distributed fairly evenly throughout the reach, along both bluff and barrier beach shoreforms. Most of the vacant parcels are between one to two acres in size, and cannot be subdivided under current zoning regulations. There are a few larger parcels (10 to 20 acres) that can be subdivided into five-acre lots.

Most of the undeveloped lots are rectangular in size, with narrow water frontages (approximately 75 feet). Development in these lots could result in relatively dense shoreline development, which would likely require reductions in the amount of forest cover. Vegetation removal along the erosive feeder bluffs in the reach could accelerate erosion, which puts adjacent homes and other structures at risk. Removal of forest cover also reduces cover, nesting/breeding, and foraging habitat for a large number of birds and other wildlife.

Sequim Bay landowners whose homes are close to the shore along barrier beaches may seek to construct bulkheads or other shoreline armoring structures to protect their property from wind and wave action. In addition, given the prevalence of docks in the bay, landowners without docks may wish to build them. An increase in shoreline armoring and/or overwater structures in the area may adversely impact aquatic vegetation communities and forage fish spawning habitat, which would in turn reduce the suitability of this reach to continue to provide high-quality salmonid rearing habitat.

4.2.3 Management Issues and Opportunities

As stated above, the nearshore environment of Sequim Bay provides vital salmon rearing and migration habitat, as well as shellfish habitat. While a significant amount of shoreline armoring is present in the bay, the majority of the shoreline is unaltered which allows natural sediment movement and beach forming processes. Protecting these natural qualities of the nearshore environment is crucial to maintaining the overall ecological health of the reach, and protecting beachfront properties from erosion. In addition, protecting the remaining forest cover in the reach is important for maintaining wildlife habitat in the area, as well as protecting properties from accelerated bluff erosion. Other special management considerations in this reach include:

- Protection of water quality from non-point sources in the watershed, shoreline septic systems, and boater operations.
- Effects of shoreline armoring and overwater structures on forage fish spawning areas, salmon rearing, and aquatic vegetation. Limits on the length, location and design of new overwater structures (such as docks) would help to prevent impacts on eelgrass, kelp and other forms of aquatic life. Docks “shade out” submerged aquatic vegetation, which decreases herring spawning and salmon rearing habitat.
- Continued work on protection and restoration of estuarine wetland habitats since these areas provide habitat for a diversity of species and perform flood storage and water quality functions.

- Given the relatively sheltered position of Sequim Bay, “soft armoring” techniques (such as log placement) should be strongly preferred over traditional “hard armoring” methods (such as rock/concrete bulkheads).

4.3 Reach 3: Gibson Spit (Maps 1a to 6a in Appendix A)

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

4.3.1 Summary of Baseline Conditions

Shoreforms in the reach consist of bluff backed beach, barrier beach, and barrier estuary, with a lesser amount of Dungeness River delta shore at the northern end of the reach. From the north, net shore-drift is generally southward along feeder bluffs, which supplies the sand, gravel, and cobble that maintains barrier beach at Gibson Spit, at the north end of Washington Harbor. A second, northward drift cell originates at the John Wayne Marina, which supports a second barrier beach (South Spit) that encloses the harbor from the south.

Several relatively short feeder bluff segments, located in the central portion of the reach north of Washington Harbor, are identified as landslide hazard areas. Graysmarsh (Gierin Creek estuary), Gibson Spit, Washington Harbor, and the southern portion of the reach (Sequim Bay) are in a tsunami hazard zone and the FEMA coastal and/or stream 100-year floodplain.

Within 300 feet of the shore, approximately 12% of the shoreland area is heavily forested, and another 71% consists of natural shrub and herbaceous habitat. These diverse vegetation communities provide habitat for a variety of wildlife species. The majority of the landslide hazard areas within the reach are forested, which helps stabilize the slopes. Outside of the shoreland zone, the majority of the surrounding land is agricultural, but some forest land is present in the Gierin and Bell creek vicinities.

Washington Harbor, also known as the Bell Creek estuary, is the largest tidal wetland complex in the vicinity of Sequim Bay. Most of the historic mudflat, tidal marsh, and barrier beach (Gibson Spit) remain. However, a road, which provides maintenance access and protection for the City of Sequim’s sewer outfall, and dikes have degraded ecosystem processes including tidal hydrology, sediment supply, and tidal channel formation. This areas is identified as a high priority site for restoration and plans are underway to remove the stressors that are degrading the habitat.

Approximately three-quarters of the shoreland zone with the reach is wetland habitat. These wetlands provide important habitat for salmon, shorebirds and waterfowl. Peregrine falcon and bald eagle habitat is also mapped throughout the reach. The northern portion of the reach, near Graysmarsh, provides habitat for harbor seal (including a haulout area) and Taylor’s checkerspot butterfly. Graysmarsh, a paleo-mouth of the Dungeness River, was historically a saltwater marsh complex and a tidal barrier was installed in the early 20th century near the mouth of Gierin Creek. The marsh is currently managed as freshwater habitat by the Graysmarsh landowner. (Personal communication, R. Johnson).

Patches of eelgrass and kelp are present along a majority of the reach, and the shoreline in the Washington Harbor vicinity provides forage fish (sand lance) spawning habitat. The marine shores in the area, and in particular the southern portion of the reach (Sequim Bay and Gibson Spit), provide important feeding grounds for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. Gierin and Bell creeks within the reach provide habitat for coho salmon, bull trout, steelhead, and resident cutthroat trout.

Four segments (15% total) of this reach are armored including a small portion of the feeder bluff exceptional southeast of Graysmarsh. There are partial tidal barriers at Graysmarsh, at the mouth of Bell Creek and within the embayment at Washington Harbor (Figure 4-2). Other shoreline modifications include fill and/or overwater structures, most of which appear to be in the divergence zone of the drift cell. Approximately one-acre of nearshore fill occurs within the sediment transport zone near the county park end of Port Williams Road and may be disrupting transport toward the Spit. There are also numerous overwater structures identified within Graysmarsh. These appear to be part of a trail or boardwalk system crossing channels and other open water areas within the marsh itself.



Figure 4-2. View of the partial tidal barrier within Washington Harbor; the road/ dike contains a sewer outfall pipe

There are no impaired water quality listings for the marine waters within the reach; however, the portion of Bell Creek within the reach has State impaired water quality listings for dissolved

oxygen, fecal coliform, and biological impairment. The Streamkeepers have listed the water quality of the creek as "impaired" for B-IBI and "highly impaired" for WQI.

Land use in the northern portion of the reach (Gibson Spit and northward) is primarily forestry and agriculture, with minimal shoreline development. Most of the reach is zoned for agricultural residential, except for the spit which is rural low zoning. South of Gibson Spit, moderate- to high-density residential development is present along Sequim Bay. The shorelands on this reach are almost all in private ownership with the exception of Marlyn Nelson County Park at the end of Port Williams Road. The park provides public access to the shoreline for recreational activities, including shellfish harvesting

4.3.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, over three-quarters of the shoreland area has potential for new residential development. The undeveloped and underdeveloped parcels within SMP jurisdiction are distributed fairly evenly through the reach. In the southern portion of the reach, bordering Sequim Bay, are several one to two acres parcels that are occupied, but could be further subdivided. The majority of the subdivided lots would likely be well landward of the shore, outside of SMP jurisdiction. The majority of the shoreline in this developed area is already armored. Two docks are present in this developed area, and given the prevalence of docks in Sequim Bay, landowners without docks may seek to build them. An increase in overwater structures in the area may adversely impact aquatic vegetation communities, forage fish spawning habitat, and salmonid rearing and migration, which could in turn reduce the suitability of the habitat for other species.

North of Gibson Spit, undeveloped parcels are larger (20 acres average) and are currently working timber and agricultural lands with little to no existing residential development along the shoreline. Under current zoning regulations, parcels in this area cannot be subdivided into lots less than 5 acres, so the potential for dense shoreline development in this area is unlikely. Additionally, the significant extent of wetland habitat at Graysmarsh likely precludes intensive development in the area. However, even low-density development near the marsh or along the feeder bluffs in the area could degrade the habitat quality or disrupt the delivery of sediment to the nearshore environment.

4.3.3 Management Issues and Opportunities

With the exception of the armored areas in Sequim Bay, the shoreline of the Gibson Spit reach is generally unaltered, so nearshore processes are in relatively good condition. The mostly unarmored feeder bluffs in the central portion of the reach, combined with net shore-drift, allow the natural beach formation processes that maintain Gibson Spit/Washington Harbor. Protecting the natural condition of these bluffs, along with the remaining riparian forest cover in the reach, is key to maintaining the overall ecological health of the reach and minimizing loss of barrier beach habitat. Protection and restoration of the Bell Creek estuary has been identified as a high priority nearshore restoration project.

Because most of the shoreline is privately owned, there are relatively few opportunities for increasing public access in this reach. Acquisition of land near Gibson Spit could be beneficial but would require willing sellers.

As compared to the reaches to the east, there is relatively low development potential within this reach. However, additional development along the shoreline will likely occur in the future.

Key management considerations for this reach include:

- Maintaining the sediment delivery and transport process in the adjoining up-drift reaches to ensure the sustainability of Gibson Spit.
- Restoring sediment and tidal processes by removing or modifying the dike within Washington Harbor would improve this significant tidal wetland complex.

4.4 Reach 4: Kulakala Point (Maps 1a to 6a in Appendix A)

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

4.4.1 Summary of Baseline Conditions

The reach predominantly consists of delta shoreform associated with the Dungeness River, with barrier beach at Cline Spit and bluff backed beach along Dungeness Harbor. Cline Spit is maintained by the sand, gravel, and cobble that drifts eastward from the feeder bluffs at Dungeness Harbor, and westward along the Dungeness River delta. The western side of Cline Spit is armored, and several residential properties along Three Crabs Road are protected by bulkheads and other types of armoring. Complete and partial tidal barriers (levees) are located at the Dungeness River mouth. Pockets of nearshore fill and/or structures (e.g., docks and bridges) at the end of Crays Road, at Cline Spit, and near Three Crabs Road, and a concrete flume at the mouth of Cooper Creek, cover portions of the beach and may impede sediment transport processes.

Portions of the feeder bluff area along Dungeness Harbor are landslide hazard areas. Development along the bluffs has removed much of the natural vegetation, which makes the bluffs more susceptible to slides. East of Cline Spit, the extensively developed shoreline along Three Crabs Road is composed of low-bank delta and barrier beach shoreforms, which are in tsunami hazard zones and FEMA coastal and/or stream 100-year floodplains.

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

The naturally vegetated areas that remain in the reach, located primarily in the Dungeness River delta and its associated wetlands and Dungeness Bay, provide important habitat for a large diversity of fish and wildlife species. Wildlife species and assemblages that utilize this habitat

include waterfowl, peregrine falcon, bald eagle, and harlequin duck. In addition, Taylor's checkerspot butterfly habitat is present at the south end of the reach, near Graysmarsh.

Eelgrass is mapped throughout a majority of the reach, and a few patches of kelp are mapped southeast of the Dungeness River. Forage fish (sand lance, herring, and smelt) spawn in the upper intertidal gravel and gravel-sand beaches along the Dungeness Harbor shoreline. The marine shoreline within the reach, and in particular the Harbor shoreline, is prime feeding grounds for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. The Dungeness River and the other streams (including Cooper and Cassalery creeks) within the reach provide habitat for a variety of fish species, including bull trout; resident cutthroat trout; and coho, pink, chum, and chinook salmon.

The portion of Cassalery Creek within the reach has State impaired water quality listings for dissolved oxygen, fecal coliform, and biological impairment. In addition, Cline Ditch is listed for fecal coliform; Cooper Creek for dissolved oxygen and fecal coliform; Meadowbrook Creek for dissolved oxygen, fecal coliform, and pH; and Meadowbrook Slough for pH. Dungeness River water quality within the reach is listed by the Streamkeepers as "impaired" for B-IBI and "compromised" for WQI.

Portions of Dungeness Bay were closed to shellfish harvest following the failure of water quality monitoring stations in 1997-1998. Several studies were conducted in the ensuing decade to track the sources of fecal coliform contamination, including intensive sampling of freshwater sources, preparation of freshwater and marine Total Maximum Daily Loading reports, a circulation study of the bay, and a microbial source tracking analysis by the Battelle Marine Lab. The source tracking study documented the presence of typical sources of fecal coliform in the bay, such as livestock and human waste from failing septic systems, but substantial input came from avian species, wildlife (particularly raccoons), pet waste, and a few exotic mammal species, e.g. yaks and bison. Following several watershed projects to remove animal access, septic remediation, and other actions, portions of the bay were conditionally re-approved for shellfish harvest in April, 2011.

Some of the tidelands within the reach are public, but most of the tideland areas are privately owned. Of the public tidelands, some portions are leased for aquaculture. Some commercial geoduck beds are located on bedlands within the reach. Dungeness Bay is an important location for recreational crab and clams harvest, and is a commercial crab harvesting area. The bay also contains two commercial shellfish farms, and several tribes have treaty rights to harvest shellfish in the bay. Recreational shellfish harvesting occurs in the Cline Spit vicinity.

Land use in the shoreland zone consists primarily of open space, residential development, and agricultural lands. This is fairly consistent with current zoning which includes rural low and rural moderate, rural neighborhood conservation and agricultural residential. The open space land is concentrated around the Dungeness River, and the residential development is located near the shoreline on the south shore of Dungeness Harbor, Three Crabs Road, Seashore Lane, and Jamestown Road

Nearly all the shorelands in the reach are privately owned. Of the shoreline itself, approximately one-third is in public ownership, of which the majority of accessible from land. Public shoreline

can be accessed at the end of Wilcox Road, the east end of Jamestown Road, and from Pioneer Memorial Park and Cline Spit County Park, where there is a public boat launch. Recent acquisitions by WDFW have increased public access near the mouth of the Dungeness River at River's End Road.

The shoreline along Jamestown Road contains several parcels owned by the Jamestown S'Klallam Tribe or tribal citizens, as this was the historic site of the Jamestown Tribal community in 1874. Tribal access to the shoreline is utilized for ceremonial, recreational, and resource harvest purposes at this location, including the annual welcome ceremony for tribal canoe journeys.

4.4.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, over half of the shoreland area in the reach has potential for new development, although the presence of wetland habitat in the Dungeness delta likely precludes development in some areas. In the eastern portion of the reach, along Three Crabs Road, Seashore Lane, and Jamestown Road, most of the land area has already been platted into small (approximately quarter-acre) lots, or very narrow 5-acre lots with moderate-to-densely developed water frontages. The majority of these lots have homes, most of which are within 20 to 60 feet of the ordinary high water line and within the FEMA-mapped coastal floodplain. Infill development on the remaining vacant parcels will likely occur in the future.

Few of the residences in the Three Crabs Road/ Seashore Lane low bank area are protected by armoring. Property owners in the area may seek to construct bulkheads or other shoreline armoring structures to protect their property in response to changes in sea level or storm activity. An increase in armoring could adversely impact aquatic vegetation communities and forage fish spawning habitat, which would in turn reduce the quality/suitability of this reach for salmonid rearing. An increase in armoring could also impede net shore-drift, which would likely result in beach loss along the east side of Cline Spit. The area is generally unsuitable for docks, as most of the area is subjected to the strong wind and wave conditions that are prevalent along the Strait of Juan de Fuca.

There are several large undeveloped parcels adjacent to the Dungeness River mouth that are owned or managed by WDFW, the North Olympic Land Trust, and Dungeness Farms (private) for fish and wildlife conservation purposes. There are also several small (approximately 0.5 acre) undeveloped parcels in the area, particularly along Rivers End Road. Several of the parcels along Rivers End Road have been acquired by Clallam County, WDFW, and the Jamestown S'Klallam Tribe for salmon restoration purposes as part of a larger project to remove houses within the flood plain, remove or set back levees, and restore the lower Dungeness River delta/estuary.

Along the Dungeness Harbor bluffs west of Cline Spit, most of the shorelands have already been subdivided (0.5 to 2 acre parcels) and developed with homes. Under current zoning regulations, some of the parcels could be further subdivided. The areas close to the water are generally already developed; therefore, the majority of future development in the area would take place away from the shore, outside of SMP jurisdiction. However, increased development in the area would likely impact the remaining forest cover, which could destabilize the erosive feeder bluffs and fragment wildlife habitat.

An increase in overwater structures in the area would likely impact aquatic vegetation communities and forage fish spawning habitat, which would in turn reduce the suitability of this reach to continue to provide high-quality salmonid rearing habitat.

4.4.3 Management Issues and Opportunities

As stated above, the nearshore environment and shorelands within the reach provide important fish and wildlife habitat for a variety of species. In particular, the Dungeness River delta, Dungeness Bay, and Dungeness Harbor provide vital rearing habitat for juvenile salmonids. Major restoration activities including dike removal and setback are planned in the lower Dungeness River delta area. Several private parcels remain in the lower river delta area that are at risk of flood hazard from river or coastal flood events. Development or structural modification of these parcels will need to incorporate safety considerations as well as impacts to ecological functions. While some shoreline armoring is present in the reach, the majority of the shoreline is unaltered which allows natural sediment movement and other beach forming processes. The potential increase in shoreline armoring along the low bank shores in the Three Crabs Road vicinity and/or along the Dungeness Harbor shoreline have the potential to disrupt the natural beach maintenance processes and ecological health of the reach.

Most of the activities to maintain or upgrade water quality are outside of SMP shorelands, but septic design and operation along marine shorelines is an ongoing issue, as is pet waste management on publicly-accessible beaches.

Key management considerations for this reach are:

- In the low bank areas in the Three Crabs Road vicinity, set new structures back from the shoreline (if possible) to decrease the potential risks of coastal flooding and tsunami damage, and minimize the need for shoreline armoring. For protection of existing structures, the use of “soft armoring” techniques (such as log placement) should be preferred over traditional “hard armoring” methods (such as rock/concrete bulkheads). Removing or setting back levees on the Dungeness River has the potential to improve natural river and nearshore process and enhance fish and wildlife habitat.
- In order to protect natural sediment movement processes, as well as human health and safety, new structures should be set back an adequate distance from erosion-prone areas, such as the feeder bluffs along the south shore of Dungeness Harbor.

4.5 Reach 5: Dungeness Spit (Maps 1a to 6a in Appendix A)

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

4.5.1 Summary of Baseline Conditions

Dungeness Spit is the longest natural sand spit in the United States. Eastward net shore-drift along the feeder bluffs to the west (Reach 6) supplies the sand, gravel, and cobble that maintains the spit. The eastern, leeward portion of the spit exhibits westward drift, which maintains Graveyard Spit. There are no identified shoreline modifications within the reach

Almost the entirety of Dungeness Spit, and all of Graveyard Spit, are contained within the Dungeness National Wildlife Refuge. The refuge protects a wide array of wildlife species and habitat assemblages and provides recreational opportunities for thousands of visitors each year. The spit and adjacent waters support an abundance of shorebirds, marine birds (such as Caspian terns and black brant), raptors (peregrine falcon and bald eagle), fish and marine mammals (including harbor seal several haulout areas).

The majority of the shoreland area in the reach contains natural shrub and herbaceous vegetation. WDNR ShoreZone data shows patches of eelgrass within Dungeness Harbor but no eelgrass on the outer shore of the spit. However, surveys by Norris and Fraser (2007) found eelgrass patches (approximately 29 acres total) along the northern, outer shoreline of the spit. Norris and Fraser (2009) also found eelgrass patches within Dungeness Harbor (178 acres total), and Dungeness Bay (185 acres total).

Patches of kelp are mapped on the outside of the spit. Forage fish (sand lance, herring, and smelt) spawn in the upper intertidal gravel and gravel-sand beaches along the Dungeness Harbor shoreline. The marine shoreline within the reach, and in particular the harbor shoreline, is prime feeding grounds for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. Nearshore habitats along this reach and reaches to the east are considered critical to the health of Dungeness River salmon stocks (Jamestown S'Klallam Tribe and Clallam County 2004).

The majority of the shorelands within the reach are in public ownership (Dungeness National Wildlife Refuge), and the tidelands around the spit are also publically owned. Dungeness crab, hardshell clam, oyster beds, and red sea urchin are mapped throughout the reach. Some commercial geoduck beds are located offshore.

Dungeness Spit beaches and trail systems can be accessed from the Dungeness Recreation Area, located at the north end of Kitchen-Dick Road. For the purposes of wildlife protection, portions of Graveyard Spit and Dungeness Spit are closed to public entry. There is some private land located along Dungeness Harbor, east of where Dungeness Spit connects to land. Most of these private parcels are already developed with single-family homes, set back approximately 300 feet from the shoreline. Natural vegetation has been cleared around the homes, but forest cover remains along the shoreline.

4.5.2 Future Land Use, Potential Effects on Shoreline Ecology, and Management Issues

Given that the majority of the reach is a publicly owned national wildlife refuge the threat of future development is very low. The few privately owned parcels in this reach land cannot be subdivided under current zoning regulations. The existing homes are located more than 300 feet back from the shoreline; therefore, there is a low chance of future armoring.

There are no overwater structures mapped within the reach and new structures are not likely to proliferate given the existing land use/land ownership patterns. The key management considerations for this reach include preserving the existing forest cover within the reach and maintaining the sediment delivery and transport process in the adjoining up-drift reaches to ensure the sustainability of the Spit.

Extensive public use of the shoreline at the top and bottom of the feeder bluffs immediately west of Dungeness Spit occurs because of public access and trails at the Dungeness Recreation Area. These areas have been subject to erosion and trail areas have recently been moved. Future public access and parking at this location will need to consider human safety as well as the impact to the bluffs.

4.6 Reach 6: Green Point (Maps 1a to 6a in Appendix A)

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

4.6.1 Summary of Baseline Conditions

The predominant shoretype in the reach is bluff backed beach, with smaller portions of barrier beach and barrier estuary. Over 70% of this reach is mapped as feeder bluff or feeder bluff exceptional (Figure 4-3). Starting from a small region of no appreciable drift near the mouth of Lees Creek, net shore-drift is eastward along the feeder bluffs, transporting sand, gravel, and cobble that maintains Dungeness Spit. These feeder bluffs are subject to the high wind and wave energy. There is very minimal armoring within this drift cell, which allows unimpeded drift and natural beach building processes to occur to occur along Dungeness Spit. The area just west of Green Point is a landslide hazard area. Recent landslides have been mapped along the feeder bluffs within the reach, and many homes along the edge of the bluffs could be at risk. A second drift cell flows west from Lees Creek towards Port Angeles. The shoreline within this drift cell is heavily modified with armoring that protects the Olympic Discovery Trail, and contains an area of nearshore fill. There are no overwater structures identified within the reach.



Figure 4-3. Segment of exceptional feeder bluff west of Dungeness Spit lacking native riparian forest cover. Note proximity of existing homes to edge of retreating bluffs (Photo: Ecology Coastal Atlas)

The mouths of Morse and McDonald Creek are in tsunami hazard areas and mapped FEMA 100-year floodplains (coastal and stream). There is limited development adjacent to the McDonald Creek mouth; however, dense residential development is located near the Morse Creek mouth, and many of these homes are within the floodplain and/or channel migration zone of the creek (Figure 4-4). The mouth of Siebert Creek has been the focus of a coordinated program by the North Olympic Land Trust and other organizations to acquire conservation easements.

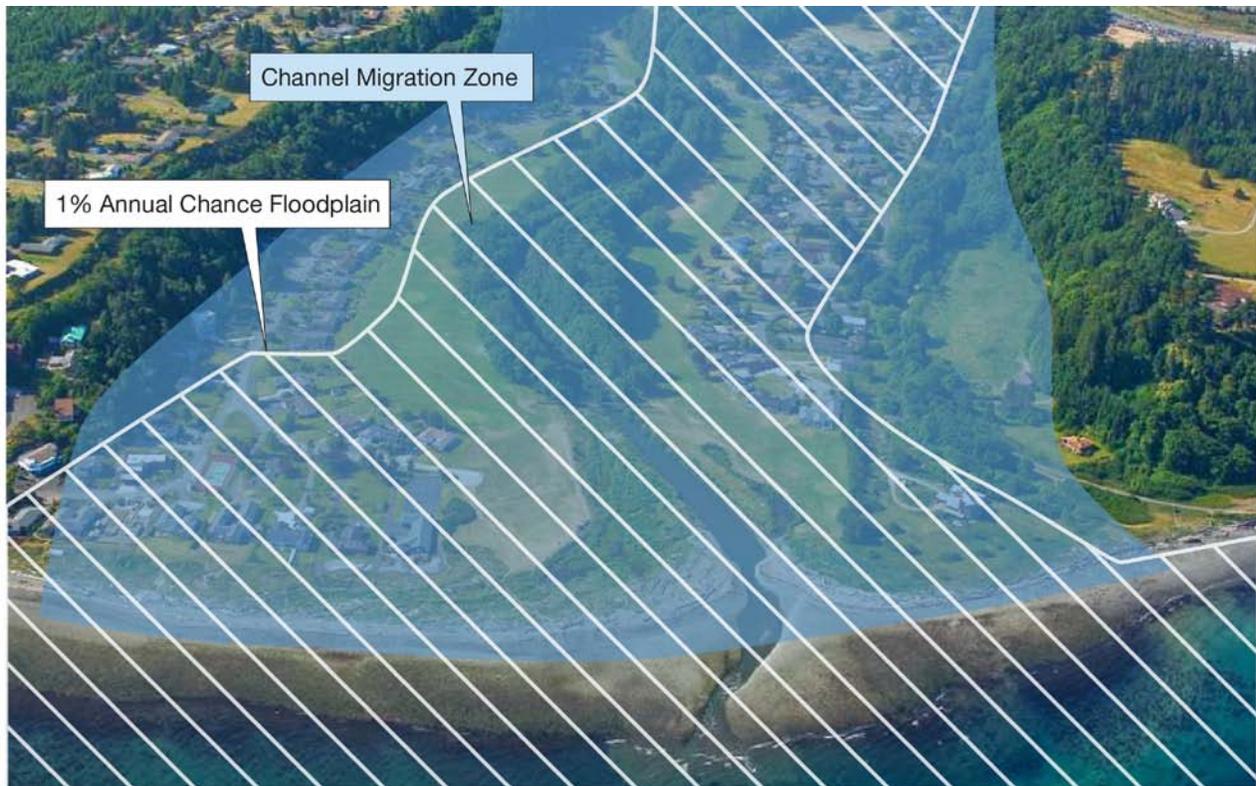


Figure 4-4. Development at the mouth of Morse Creek with the mapped floodplain and channel migration zone. (Photo: Ecology Coastal Atlas)

Approximately one-third of the shoreland area in the Green Point reach is forested, and another third contains natural shrub and herbaceous vegetation. Forest cover is generally absent in the heavily developed areas. The forest cover that remains in the reach helps stabilize the erosive bluffs, and provides habitat for a diversity of wildlife species. Wetland areas associated with the mouth of Morse Creek provide important habitat for waterfowl and other wildlife, and a gray whale feeding area is identified near the mouth of Siebert Creek. The reach also provides habitat for bald eagle and peregrine falcon.

WDNR ShoreZone data shows patches of eelgrass directly east of Green Point. This is generally consistent with a survey by Norris and Fraser (2007), which found eelgrass patches (approximately 74 acres) located primarily east of the point.

Patches of kelp are mapped throughout the reach, and patches of smelt spawning habitat are mapped east of Morse Creek. No smelt habitat areas are located in the armored shoreline areas west of the creek. The marine shores in the area, and in particular the unarmored areas east of Morse Creek, provide feeding grounds for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. The streams within the reach provide habitat for resident cutthroat, rainbow, and bull trout; steelhead; and coho, chinook, chum, and pink salmon.

Tideland ownership throughout the reach is mixed, private and public. Abalone and red sea urchin are mapped throughout a majority of the reach. Some commercial geoduck beds are located on bedlands within the reach.

The portion of Lees Creek within the reach has a State impaired water quality listing for dissolved oxygen. The water quality of Morse and McDonald Creeks is listed by the Streamkeepers as "compromised" for B-IBI and "healthy" for WQI.

Land ownership within the reach is 93% private and 7% public. The primary land use within the reach is residential development, with lesser amounts of open space, commercial timber land, agriculture, and vacant land. The existing land uses do not align fully with the existing zoning as none of the reach is zoned for Commercial Forestry or agriculture. Most of the land is zoned for residential development (mostly R5 or rural character conservation with a few pockets of R1 near Kitchen-Dick Road and near Morse Creek).

Over 10% of the shoreline in the reach is publicly owned and accessible by land. Public shoreline in the eastern portion of the reach can be accessed from the Dungeness Recreation Area (via trails), and shoreline in the western portion can be accessed via the Olympic Discovery Trail.

4.6.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, approximately 40% of the shoreland area has potential for new residential development. The undeveloped and underdeveloped land within SMP jurisdiction is distributed fairly evenly throughout the reach. Much of the vacant land within the reach has already been subdivided into 1 to 3 acre lots. These lots are rectangular in size with narrow water frontages; varying from approximately 75 to 150 feet. In addition, there are several larger parcels (approximately 20 acres in area) that could be subdivided into 3 or 5 acre lots. Development in these lots could result considerable clearing/loss of forest cover, increased stormwater runoff, and other changes that could exacerbate landslide and erosion hazards and diminish ecological functions.

4.6.3 Management Issues and Opportunities

The Green Point reach has potential for substantial new residential development in the future, which is a potential management concern considering the highly erosive feeder bluffs and the importance of these bluffs to down-drift shores. Development that involves vegetation removal or increased rates of stormwater runoff could accelerate erosion and potentially put homes and other structures at risk. Given the height, steepness, and sediment composition of these bluffs, as well as their exposure to wind and wave energy on the Strait of Juan de Fuca, it is unlikely that shoreline armoring along the toe of the bluffs would effectively protect homes or other structures. The majority of the shoreline in this reach is unaltered; attempts to armor these shorelines could impede natural sediment recruitment and net shore-drift, thus putting Dungeness Spit at significant risk.

There is limited opportunity for increased public shoreline access within this reach given the topography and sensitivity of the bluffs. All of the publicly owned shoreline is already accessible.

Key management considerations for this reach are:

- Protection of feeder bluffs and sediment processes are critical concerns. Bluffs will continue to naturally erode / retreat, so homes and other structures must be set back a sufficient distance (from the edge of the bluff) to account for the potentially rapid rate of erosion, minimize risk and avoid the need for harmful stabilization measures. Vegetation should be maintained to stabilize slopes and runoff needs to be managed so that it does not destabilize slopes. Shoreline property owners should be aware of the substantial risks to property and human safety resulting from developing land near unstable feeder bluffs.
- Regulations should be streamlined to allow landowners whose homes are close to the edge of the bluff to move structures back from the shoreline, if feasible.
- Removal of forest cover, which generally results in accelerated erosion, should be limited in and near erosion-prone areas. Preserving forest cover also helps maintain wildlife species and diversity in developing areas.

4.7 Reach 7: Angeles Point (Maps 1b to 6b in Appendix A)

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

4.7.1 Summary of Baseline Conditions

Shoretypes within the reach are primarily bluff backed beach and Elwha River delta shores. Net shore-drift within the reach is entirely eastward, originating along the west shore of Freshwater Bay. Approximately one-third of the shoreline consists of feeder bluffs, while the rest is accretion shoreforms and transport zones. Levee sections are mapped near the Elwha River mouth and sections of shoreline armoring (less than 10% of reach total) are mapped at the western end of the reach.. Baseline conditions in this reach include the presence of two dams in the Elwha River (described further in freshwater sections) that block sediment transport from the Elwha River and migration of several species of fish. As the dams are dismantled from 2011 to 2014, baseline conditions will change.

The feeder bluffs within the reach, located east of Angeles Point and within Freshwater Bay, are mapped as unstable, but no recent slides are identified. The Freshwater Bay and Angeles Point shorelines are mostly within the tsunami hazard zone and FEMA coastal and/or river 100-year floodplains. With the exception of Angeles Point and an area just to the west of the Elwha River mouth, there is limited existing development within these identified hazard areas.

Within 300 feet of the shore, more than half of the shoreland area contains forest cover, and another quarter is natural shrub and herbaceous vegetation. These vegetation communities, along with the wetland habitat at the Elwha River estuary, provide habitat for a diversity of species. Designated priority habitats within the reach include bald eagle, harlequin duck (at the Elwha River estuary), and common loon (at west end of reach) (Figure 4-5). Outside of the shoreland

zone, the majority of the surrounding land is forested, although some low-density residential development is present.

WDNR ShoreZone data shows patches of eelgrass present throughout a majority of the reach, from Angeles Point to Observatory Point. However, a survey by Norris and Fraser (2007) found three eelgrass patches within Freshwater Bay (approximately 60 acres total), and none east of the Elwha River mouth.

Continuous kelp stands are present from Port Angeles City limits to Observatory Point. A patch of forage fish (smelt) spawning habitat is located east of the Elwha River. Freshwater Bay provides habitat for crab and shellfish, and recreational shellfish harvesting and crabbing is available at the County Park. The entire reach provides habitat for abalone.



Figure 4-5. Common loon, one of several priority species to occur in Freshwater Bay

Tideland ownership throughout the reach is mixed: public and private. Commercial geoduck beds are located offshore in Freshwater Bay.

The marine shores in the area provide feedings grounds for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. In particular, the Elwha nearshore is very important habitat for fish including federally listed salmonids, including Columbia River and Klamath River Chinook stocks (Shaffer et al., 2008; Shaffer, Crain, and Kassler, 2008). The Elwha River and Colville Creek within the reach provide habitat for steelhead; resident cutthroat and bull trout; and coho, chinook, chum, pink, and sockeye salmon.

The portion of the Elwha River within the reach has a State impaired water quality listing for temperature. Elwha water quality is listed by the Streamkeepers as "compromised" for WQI. Coville Creek is listed as "healthy" for WQI.

Land ownership within the reach is 58% private, 18% public, and 24% tribal. The majority of the private and tribal-owned land is used for residential development, with some agriculture land present. The publicly owned land includes DNR forest land and park land. Public shoreline near the Elwha River mouth can be accessed directly from the north end of Elwha Dike Road, where limited public parking is available. Shoreline at the western end of the reach (Freshwater Bay) can be accessed directly from Freshwater Bay County Park.

4.7.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, approximately two-thirds of the shoreland area has potential for new residential development. The undeveloped land within SMP jurisdiction is distributed fairly evenly throughout the reach. Privately owned parcels in the eastern portion of the reach, east of the Lower Elwha Klallam Tribe Reservation, have already been subdivided into approximately 2 acre lots. These lots are rectangular in size with narrow water frontages; varying from approximately 100 feet in width. Development of these lots could reduce forest cover and result in relatively dense shoreline development along the bluff shoreline in the area. Vegetation removal along the bluffs could degrade wildlife habitat and further destabilize the bluffs.

To the west of the reservation, along the eastern shore of Freshwater Bay, is a densely developed residential area with approximately 1-acre parcel sizes. Most of the parcels along this barrier beach shoreline have been developed, although some infill development will likely occur in the future. No armoring is located along the shoreline in this location; landowners whose homes are close to the shore may seek to construct bulkheads or other shoreline structures to protect their homes from wind and wave action. If that occurs it could adversely impact sediment delivery and transport processes, reduce productivity of the submerged aquatic vegetation communities, and reduce the quality of the nearshore aquatic habitat for fish and wildlife.

Parcel sizes in the western portion of the reach are generally between 5 to 10 acres in area, but under current zoning regulations, could be subdivided into 2 acre lots and become more intensively developed. The privately owned land near the center of the Freshwater Bay shoreline is currently used for timber production. However, current zoning regulations allow these parcels to be subdivided. The effects of timber harvest and / or residential development would be similar for this reach as for other reaches.

4.7.3 Management Issues and Opportunities

The Angeles Point reach contains the mouth of the Elwha River and is likely to experience dramatic changes in sediment transport following dam removal from 2011 to 2014. Restoration planners do not plan to use artificial means to move the large volume of sediment coming from behind the dams, and expect natural sediment transport processes to move it through the river mouth and nearshore over time. Management strategies in this reach will need to consider the potential for change for several years and minimize disruption of net shore-drift and habitat formation processes as the river delta and estuary system resets.

Most of the shoreline in this reach is publicly owned; however, there is limited direct public water access in the reach because most of the adjacent shoreland parcels are privately owned. In many areas, water access is generally not feasible because of the steep, erodible bluffs. An opportunity for public access is the DNR-managed parcel near the center of the Freshwater Bay.

4.8 Reach 8: Observatory Point (Maps 1b to 6b in Appendix A)

The “Observatory Point” reach contains 4.9 miles of marine shoreline, which extends from Observatory Point to Tongue Point, along the Strait of Juan de Fuca.

4.8.1 Summary of Baseline Conditions

Virtually the entire shoreline of this reach consists of rocky platform shore. The rocky shoreline is relatively stable compared to most of the reaches to the east; minimal landslide or erosion hazards are mapped within the reach. There are no identified shoreline modifications (such as armoring or docks) identified within the reach. There is no appreciable net shore-drift along this reach.

The majority of the shoreland area is forest habitat, with a lesser portion of natural shrub and herbaceous vegetation. Less than one-tenth of the riparian vegetation has been altered. The majority of land surrounding the shoreland area is also forested and zoned for commercial forestry. The large expanses of riparian forest within the reach provide important habitat for a variety of wildlife species, including bald eagle and harlequin duck.

The rocky shoreline provides important habitat for harbor seal; several marine mammal haulout areas are mapped within the reach. Abalone, Dungeness crab, and red sea urchin are mapped along almost the entire reach. Both eelgrass patches and continuous kelp stands are mapped along approximately half of the shoreline. The bedrock composition of the nearshore substrate makes the area unsuitable for forage fish spawning habitat, but the large expanses of submerged aquatic vegetation make the nearshore area important habitat for marine species, including juvenile salmonids. The undeveloped condition of the shoreline with forest habitat also provides important sources for cover and food production for migrating juvenile salmon. In particular, the Salt Creek nearshore provides highly functioning habitat for a number of critical species, including federally listed salmon (Shaffer and Ritchie, 2008a).

Private development within the reach is limited to moderate-density residential development in the east third of the reach, where the zoning is rural low mixed. Parcel sizes range from approximately 3 to 5 acres, and most homes are set back over 200 feet from the shoreline. A significant amount of forest coverage remains on the developed parcels.

At the western end of the reach, surrounding Tongue Point, is the Salt Creek Recreation Area, one of the County’s premier marine parks. Bordering the park to the east is the Striped Peak Recreation Area, managed by DNR. The Striped Peak area is accessed via a trail from the Salt Creek Park. Over half of the shoreline in this reach is publicly owned, and can be accessed from these recreation areas (Figure 4-6). Most of the tideland areas within the reach are publically owned.

4.8.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, only 6% of the reach has potential for new residential development. Potential development would consist of residential infill adjacent to existing developed parcels. The undeveloped parcels range from 3 to 5 acres in area, and cannot be further subdivided. As a result, this area is not as likely to experience shoreline development impacts as other reaches to the east.

4.8.3 Management Issues and Opportunities

The developed parcels within the reach have retained a substantial degree of forest cover, and the homes are generally set back a significant distance from the shoreline. In order to minimize impacts to shoreline processes and ecology, future development should encourage similar design and stewardship.



Figure 4-6. Surfer at Salt Creek Recreation Area, Crescent Beach

4.9 Reach 9: Crescent Bay-Low Point (Maps 1b to 6b in Appendix A)

The “Crescent Bay-Low Point” reach contains 10.7 miles of marine shoreline, which extends from the east end of Crescent Bay to approximately 2 miles west of Low Point. The reach contains shoreline along Crescent Bay, the mouths of Salt, Whiskey, and Murdock creeks, and the Lyre River estuary. Salt Creek and the Lyre River are shorelines of the state. The other streams in the reach are not shorelines of the state, except where they enter the Strait of Juan de Fuca.

4.9.1 Summary of Baseline Conditions

Net shore-drift is generally eastward along the reach. The western half of the reach generally consists of feeder bluffs, which supply the sand, gravel, and cobble to sustain the beaches of Crescent Bay. The feeder bluffs near the center of the reach are composed of talus, which erode much slower than the unconsolidated glacial deposits that make up the feeder bluffs in the western portion of the reach. There are no identified shoreline modifications mapped within the reach. Several of the feeder bluffs areas are considered unstable, with recent slides identified adjacent to Agate Bay. Most of Crescent Bay, Agate Bay, and Low Point are in tsunami hazard zones and FEMA 100-year floodplains (coastal and stream).

Just over half of the shoreland area contains forest vegetation, and the majority of the land that borders the shoreland zone is also forested. Less than 10% of the shoreland area consists of wetland habitat that is concentrated along the river mouths, primarily in the Salt Creek estuary. These forest and wetland areas provide habitat for a wide variety of wildlife species, including bald eagle. Priority harbor seal habitat and a marine mammal haulout area are mapped at Low Point. In addition, a gray whale feeding area is located at Crescent Bay.

WDNR ShoreZone data shows patches of eelgrass from the western end of Crescent Bay to Tongue Point. A survey by Norris and Fraser (2009) also found eelgrass patches in Crescent Bay (approximately 31 acres total), which are located primarily in the western portion of the bay.

Kelp is mapped throughout almost half of the reach, but is somewhat sparse in Crescent Bay. Patches of forage fish (smelt) spawning habitat are located east of the Whiskey Creek mouth, and west of the Lyre River estuary. As a result, the nearshore area of the reach is used by many species for feeding, migration and rearing. The nearshore areas and streams within the reach provide habitat for a variety of salmonid and trout species, including steelhead, resident cutthroat trout, and coho and chum salmon.

There are no State impaired water quality listings within the reach. However, Streamkeepers has listed Whiskey Creek water quality as "impaired" for WQI, and the Lyre River is listed as "impaired" for B-IBI but "healthy" for WQI. Salt Creek is listed as "compromised" for both B-IBI and WQI.

A breakwater, associated with a boat ramp, is located at the Whiskey Creek Campground. The breakwater is the only mapped shoreline modification within the reach.

Land uses and ownership within the shoreland area vary throughout the reach. The eastern end of Crescent Bay is within the Salt Creek Recreation Area. The remainder of Crescent Bay is a privately owned campground (the Crescent Beach and RV Park) zoned Tourist Rural and Parks and Recreation. Lands from the west end of Crescent Bay to the mouth of Whiskey Creek are DNR-managed commercial forest lands. The land at the west end of the reach is also publicly owned commercial forest land. The remaining land within this reach is zoned Commercial Forest Residential or Residential (R5). Parcels vary in area, with an average size of approximately 5 acres.

Although slightly more than half of the shoreline in this reach is publicly owned, only a small portion of this can be easily accessed from land (from the Salt Creek Restoration Area).

Approximately one-third of the shoreline is privately owned, but accessible only to customers of the Crescent Beach and RV Park, Whiskey Creek Campground, and Lyre River Campground. Tideland ownership within the reach is mixed: public and private.

4.9.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, almost three-quarters of the shoreland area has potential for new development. There are several undeveloped parcels located near the east shore of Crescent Bay; however, the presence of wetland habitat in the area likely precludes development. Parcel sizes, shapes, and zoning categories vary widely in the remaining privately-owned, developable land within the reach. Many of the parcels are large (> 10 acre), and could be subdivided into lots from 2 to 20 acres in size, depending upon the specific zoning category.

4.9.3 Management Issues and Opportunities

The majority of the privately owned land within the reach is undeveloped and forested. There are no identified shoreline modifications within the reach, so sediment and habitat-forming processes are in good condition. Protecting these natural shoreline attributes is crucial key to maintaining the overall ecological health of the reach.

This reach has a substantial amount of publicly owned shoreline, but a minimal portion of this can be accessed by the public. Opportunities for increased access are available through the DNR-managed land within the reach.

Key management considerations for this reach are:

- New structures should be set back an adequate distance from erosion-prone areas, such as feeder bluffs. Moving development away from bluffs helps protect structures from landslides, and allow natural sediment transport processes to continue and avoid the need for harmful forms of shoreline stabilization in the future.
- In low bank areas, set structures back from the shoreline to decrease the potential risks of coast flooding and tsunami damage, and minimize the need for shoreline armoring. Armoring degrades nearshore habitat (such as forage fish spawning and salmon rearing areas), and can impede natural sediment flow/beach maintenance processes.
- Removal of forest cover, which generally results in accelerated erosion, should be limited in and near erosion-prone areas. Preserving forest cover also helps maintain wildlife species and diversity in developing areas
- Increase access to publicly owned shorelines, so the public can use and enjoy the high-quality shoreline areas within this reach.

4.10 *Reach 10: Twin Rivers (Maps 1b to 6b in Appendix A)*

The “Twin Rivers” reach contains 7.4 miles of marine shoreline, which extends along the Strait of Juan de Fuca from approximately 2 miles west of Low Point to approximately 1 mile east of the mouth of Deep Creek. The reach includes the mouths of the East and West Twin Rivers, which are shorelines of the state.

4.10.1 Summary of Baseline Conditions

The predominant shoretype within the reach is rocky platform shores, with small portions of barrier beach and bluff-backed beach located at the Twin River mouths. Over three-quarters of the shoreline consists of feeder bluffs, but the majority of these bluffs are composed of talus, which erode more slowly than the unconsolidated glacial deposits that make up the most feeder bluffs along the eastern shore of the Strait of Juan de Fuca. Net shore-drift is entirely eastward through the reach. However, a large, manmade obstruction to littoral drift (referred to as a mole) occurs in the western portion of the reach, which bisects drift into two separately functioning cells (Figure 4-7). The mole is associated with a mine (now closed) at the adjacent bluff. There are no other shoreline modifications mapped within the reach.



Figure 4-7. Retailed fill (“mole”) extending into the nearshore zone just west of West Twin River.

The area around the mouths of the Twin Rivers is in a Tsunami hazard zone, and the FEMA coastal 100-year floodplain. Some unstable bluff areas are present within the reach, with recent slides mapped near the eastern end of the reach.

Over half of the shoreland area of the reach consists of forest habitat, with most of the remaining area being natural shrub and herbaceous habitat. In addition, most of the land surrounding the shorelands is forested. These large, continuous tracts of forest land provide important habitat for a variety of species, including bald eagle. The forest cover also helps stabilize the erosive bluffs in the area.

The rocky shoreline within the reach provides important habitat for harbor seal, and several marine mammal haulout areas are mapped within the reach. Two patches of smelt spawning habitat are located on the beach habitat near the mouths of the Twin Rivers. Patchy eelgrass meadows are located in the eastern half of the reach, and continuous kelp stands are located throughout the nearly the entire reach. As a result, the nearshore areas of the reach are important feeding grounds for marine wildlife including juvenile salmonids, which use the shallow nearshore waters for migration and rearing. In particular, the nearshore habitat adjacent to the Twin Rivers is very important habitat for steelhead, trout, and forage fish (Shaffer and Ritchie, 2008).

The Twin Rivers provide habitat for steelhead, resident cutthroat trout, and coho and chum salmon. The Twin Rivers have no impaired water quality listings by the state. However, within the reach boundary, Streamkeepers lists the water quality of the East Twin River as "impaired" for WQI, and the West Twin River is listed as "compromised" for B-IBI but "healthy" for WQI.

Most of the land within the shoreland area is privately owned and zoned for Commercial Forestry. Some DNR-managed forest land is located in the eastern portion of the reach. The shorelands within the reach are largely undeveloped.

Almost the entire shoreline length in this reach is publicly owned, but only a small portion of this is accessible from land. Shoreline area near the Twin Rivers is informally accessible from Highway 112; however, there are no dedicated parking areas available. The tideland areas within the reach are mostly publically owned.

4.10.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, approximately one-third of the shoreland area has potential for new development. However, most of this land is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. Therefore, the development potential within the shoreland area is minimal.

4.10.3 Management Issues and Opportunities

Because of the overall lack of development along the shorelands, sediment processes and habitat conditions within the reach are in good condition. An exception is the area of nearshore fill (mole) that bisects a drift cell. State and federal agencies have identified removal of this fill as a nearshore restoration priority.

The majority of the shoreline in this reach is publicly owned, but generally inaccessible from land. Substantial opportunities for increased access are available through the DNR-managed land within the reach. In addition, public access to the Twin Rivers mouths could be improved.

Given that most of the privately owned land is zoned for Commercial Forestry and unlikely to be intensively developed, the risk of degradation of ecological function resulting from development is minimal.

4.11 *Reach 11: Deep Creek (Maps 1c to 6c in Appendix A)*

The “Deep Creek” reach contains 5.3 miles of marine shoreline, which extends along the Strait of Juan de Fuca from approximately 1 mile east of the mouth of Deep Creek to approximately one-third of a mile east of the mouth of Butler Creek. The reach includes the mouths of Deep, Joe, and Jim Creeks. Deep Creek is a shoreline of the state. Joe and Jim Creeks are not shorelines of the state, except where they enter the Strait of Juan de Fuca.

4.11.1 Summary of Baseline Conditions

The eastern half of the reach is composed of bluff backed beach while the western half is rocky platform shores, with a small barrier beach area at the mouth of Deep Creek. Approximately half of the reach is composed of talus feeder bluffs, which erode much slower than the unconsolidated glacial deposits. Net shore-drift along the reach is entirely eastward; however, a large obstruction (the Silver King Resort breakwater) is located at the mouth of Jim Creek. Nearshore fill, armoring, and 3 overwater structures are located in the resort vicinity. The remainder of the reach has no identified shoreline modifications.

Most of the shoreline areas in the Jim and Deep Creeks vicinity are in a tsunami hazard zone and FEMA 100-year floodplains (coastal and stream). Some unstable bluff areas are present within the reach, with recent slides mapped directly west of Deep Creek.

Approximately three-quarters of the shoreland area of the reach consists of forest habitat. In addition, most of the land surrounding the shorelands is forested. These large, continuous tracts of forest land provide important habitat for a variety of species, including bald eagle. The forest cover also helps stabilize the erosive bluffs in the area.

The shoreline within the reach provides important habitat for harbor seal, and several marine mammal haulout areas occur within the reach. Almost the entire shoreline is mapped as Dungeness crab and sea urchin habitat. Two patches of smelt spawning habitat are located at the eastern and western ends of the reach. Patchy kelp stands are located throughout nearly the entire reach, with continuous stands west of the Silver King Resort. The nearshore areas of the reach are important migration and rearing habitats for juvenile salmonids and other species.

Jim and Deep Creeks provide habitat for resident cutthroat; steelhead; and coho, chinook, and chum salmon. The portion of Deep Creek within the reach has State impaired water quality listings for dissolved oxygen and temperature. Deep Creek water quality is listed by Streamkeepers as “healthy” for WQI.

Land ownership within the reach is 100% private. Land usage within the shoreland is Commercial Forestry, with the exception of the Silver King Resort area, which is zoned Rural Neighborhood Commercial. Over two-thirds of the shoreline in this reach is publicly owned; however, none of this area is accessible from land. The remainder of the reach shoreline is privately owned, but can be accessed by Silver King owners and guests. The tideland areas within the reach are mostly publically owned.

4.11.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, almost the entire shoreland area has potential for new development. However, most of this land is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. Therefore, the development potential within the shoreland area is minimal.

Because 100% of the shorelands are privately owned, without the acquisition of public access easements there is limited potential for increasing shoreline public access within the reach.

4.11.3 Management Issues and Opportunities

Because of the overall lack of development along the shorelands, sediment processes and habitat conditions within the reach are generally in good condition. However, the breakwater at the Silver King Resort impedes natural sediment flow processes in the area.

Given that most of the privately owned land is zoned for Commercial Forestry and unlikely to be intensively developed, the risk of degradation to ecological function resulting from development is minimal.

4.12 *Reach 12: Pysht River (Maps 1c to 6c in Appendix A)*

The “Pysht River” reach contains 2.4 miles of marine shoreline, which extends along the Strait of Juan de Fuca from approximately one-third of a mile east of the Butler Creek mouth, to just south of Pillar Point. The reach includes the mouth of Butler Creek and the Pysht River estuary. The Pysht River is a shoreline of the state. Butler Creek is not a shoreline of the state, except where it enters the Strait of Juan de Fuca.

4.12.1 Summary of Baseline Conditions

The most abundant shoretype in the reach is barrier estuary, associated with the mouth of the Pysht River. A south-trending drift cell, originating at Pillar Point, supplies the sand, gravel, and cobble that forms barrier beach north of the Pysht River mouth. This drift cell converges with a westward drift cell at the Pysht River estuary. Rocky platform shores comprise the eastern portion of the shoreline. Tidal barriers (levees) are located at the mouth of the river.

Some of the bluff areas in the northern and southeastern portion of the reach are unstable, but no recent landslides are identified. Nearly all of the Pysht River estuary area is in a tsunami hazard zone and FEMA coastal and/or river floodplains.

More than half of the shoreland area of the reach is mapped as forest habitat, and most of the remainder of the shorelands (Pysht River estuary) contain natural shrub and herbaceous vegetation. In addition, most of the land surrounding the shorelands is forested. These large, continuous tracts of forest land provide important habitat for a variety of species, and help stabilize the erosive bluffs in the area.

The Pysht estuary is one of the largest estuarine complexes on the Olympic Peninsula and provides important habitat for waterfowl and other wetland-dependent species, as well as steelhead and several salmon species (Todd et al., 2006 in Shaffer et al., 2008). The river itself

provides habitat for steelhead; resident cutthroat trout; and coho, chinook, and chum salmon. Pysht River water quality is listed by Streamkeepers as “compromised” for B-IBI. In addition, the portion of the Strait of Juan de Fuca within the reach has a State impaired water quality listing for fecal coliform.

The rocky shores at the eastern end of the reach are designated priority habitat for harbor seal. A patch of forage fish (sand lance) spawning habitat is located in the northern portion of the reach. The nearshore and estuarine areas of the reach are important feeding grounds for juvenile salmonids, which use the shallow nearshore waters for migration and rearing.

The lower Pysht river area was historically used extensively for commercial logging operations that resulted in significant diking, channelizing, and filling of the estuary and lower river (Todd et al., 2006 in Shaffer et al., 2008). Logging operations in the estuary ended in 1974, but many of the remnant structures remain.

Land ownership within the reach is 100% private. Land use in the reach is primarily timber land, with a small amount of low-density residential and open space. The entire reach is zoned Commercial Forest. Approximately 5% of the shoreline is publicly owned, and can be directly accessed at Pillar Point County Park (located at Butler Cove). Recreational crabbing is available at the park. The tideland areas within the reach are mostly privately owned.

4.12.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, almost the entire shoreland area has potential for new development. However, most of this land is zoned for Commercial Forestry, and is unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. Therefore, the development potential within the shoreland area is minimal.

Because over 95% of the shorelands are privately owned, without the acquisition of public access easements there is limited potential for increasing shoreline public access within the reach.

4.12.3 Management Issues and Opportunities

Because of the overall lack of development along the shoreline, sediment processes and habitat conditions within the reach are in very good condition. However, because of the ecological value of the estuary and the presence of historic modifications in the lower river, the Pysht estuary is a high-priority restoration area (Shaffer et al., 2008).

Given that most of the privately owned land is zoned for Commercial Forestry and is unlikely to be intensively developed, the risk of degradation to ecological function resulting from development is minimal.

4.13 *Reach 13: Pillar Point (Maps 1c to 6c in Appendix A)*

The “Pillar Point” reach contains 2.1 miles of marine shoreline, which extends along the Strait of Juan de Fuca from just south of Pillar Point to approximately a mile and a half west of the point.

4.13.1 Summary of Baseline Conditions

Almost the entire shoreline of the reach consists of bedrock shores, with rocky platforms comprising the eastern half and a broad pocket beach in the western half. Feeder bluff talus shoreforms back the pocket beach. The reach consists of two short drift cells, which converge at the pocket beach area. However, bedrock shores and deep water preclude sandy beach development in the area. There is no appreciable drift along the rocky platform area. There are no identified shoreline modifications within the reach.

Many of the bluff areas within the reach are unstable, with recent slides mapped in the northwestern portion of the reach. A portion of Pillar Point and the pocket beach area in the western portion of the reach is in a tsunami hazard zone and the FEMA coastal 100-year floodplain.

Almost the entire shoreland area contains forest habitat, and the surrounding land is also forested. The large expanses of forest within the reach provide important habitat for a variety of wildlife species, including bald eagle. In addition, the rocky shoreline provides important habitat for harbor seal; two marine mammal haulout areas are mapped within the reach.

Kelp (both continuous and patchy stands) are mapped throughout the reach. The bedrock composition of the nearshore substrate makes the area unsuitable for forage fish spawning habitat, but the undeveloped condition of the shoreline and large expanses of submerged aquatic vegetation make the nearshore area important habitat for marine species, including juvenile salmonids.

Land ownership within the reach is almost entirely private, and use is primarily timber, with a smaller amount of low-density residential located in the eastern portion of the reach, adjacent to Pillar Point. Approximately three-quarters of the shoreline is publicly owned; however, none of the area can be accessed from land. Tideland ownership in the reach is mixed: public and private.

4.13.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, more than half of the shoreland area has potential for new development. However, almost all of this land is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. Therefore, the development potential within the shoreland area is minimal.

Because over 95% of the shorelands are privately owned and there are no public roads in the vicinity, there is limited potential for increasing shoreline public access within the reach.

4.13.3 Management Issues and Opportunities

Because of the overall lack of development along the shoreline, sediment processes and habitat conditions within the reach are in very good condition. Given that nearly all of the shoreland area is zoned for Commercial Forestry and unlikely to be intensively developed, the risk of degradation to ecological function resulting from development is minimal.

4.14 *Reach 14: Slip Point (Maps 1c to 6c in Appendix A)*

The “Slip Point” reach contains 6.8 miles of marine shoreline, which extends along the Strait of Juan de Fuca from approximately a mile and a half west of Pillar Point to Slip Point.

4.14.1 Summary of Baseline Conditions

Bedrock rocky platform shores comprise the entire shoreline within the reach, and there is no appreciable net shore-drift along the shores. There are no identified shoreline modifications within the reach. Many of the slopes along the shoreline are unstable; however, no recent slides are identified. Most of the shoreline near Slip Point is in a tsunami hazard zone and the FEMA coastal 100-year floodplain.

Almost the entire shoreland area contains forest habitat, and the surrounding land is also forested. The large expanses of forest within the reach provide important habitat for a variety of wildlife species, including bald eagle. The forest cover also helps stabilize the unstable slopes within the reach. The rocky shoreline provides important habitat for harbor seal; several marine mammal haulout areas are mapped within the reach.

Continuous kelp stands are mapped throughout the reach. The bedrock composition of the nearshore substrate makes the area unsuitable for forage fish spawning habitat, but the undeveloped condition of the shoreline and large expanses of submerged aquatic vegetation make the nearshore area important habitat for marine species, including juvenile salmonids.

Almost the entire shoreland area is privately-owned timber land. Nearly the entire shoreline is publicly owned; however, none of the area can be accessed from land. Tideland areas within the reach are publically owned.

4.14.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, more than 90% of the shoreland area has potential for new development. However, all of this land is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. Therefore, the development potential within the shoreland area is minimal.

Because almost all of the shoreland area within the reach is privately owned and there are no public roads in the vicinity, there is limited potential for increasing shoreline public access within the reach.

4.14.3 Management Issues and Opportunities

Because of the overall lack of development along the shoreline, habitat conditions within the reach are in very good condition. Given that nearly all of the shoreland area is zoned for Commercial Forestry and unlikely to be intensively developed, the risk of degradation to ecological function resulting from development is minimal.

4.15 *Reach 15: Clallam Bay (Maps 1c to 6c in Appendix A)*

The “Clallam Bay” reach contains 5.7 miles of marine shorelines which extends along Clallam Bay from Slip Point to Sekiu Point, within the Clallam Bay Sekiu urban growth area. The reach also contains the Clallam River estuary and the mouth of Falls Creek. The Clallam River is a shoreline of the state. Falls Creek is not a shoreline of the state, except where it enters the Strait of Juan de Fuca.

4.15.1 Summary of Baseline Conditions

The eastern half of the shoreline in this reach consists of low beaches (barrier estuary and barrier beach), with bluff backed beach in the western portion. These beaches are maintained by two drifts cells (originating at the Clallam Bay headlands), which converge in the central portion of the bay near the mouth of the Clallam River. Some of the bluff areas within the reach are unstable, and recent slides are identified near the center of the reach. Most of the Clallam Bay shoreland area is within a tsunami hazard zone and FEMA coastal and/or river 100-year floodplain.

Almost one-quarter of the shoreline within the reach has been armored, or otherwise modified. Two marina breakwaters are located within the reach, near the center of the bay and at the west end. In addition, shoreline armoring is present along the shoreline near the west marina. There are several overwater structures (docks) at each of the marinas (Figure 4-8).

This is one of the more heavily developed reaches in western Clallam County so the shoreline vegetation has been significantly altered. Only about one-quarter of the shoreland area contains forest cover, with natural shrub and herbaceous vegetation located along the Clallam River. The remainder of the shorelands contains developed and lawn/landscaped area. The remaining forest cover provides habitat for many wildlife species, including bald eagle. Most of the land outside of the SMP jurisdiction is forested.

Wetland habitat is mapped within the Clallam River estuary, which provides important habitat for wetland-dependent species. Almost the entire shoreline provides habitat for abalone, Dungeness crab, and red sea urchin. Patchy kelp stands are present throughout the reach. Two patches of forage fish spawning are located in the reach; sand lance near the Clallam River mouth and smelt west of the marina in the central portion of the bay. The presence of submerged aquatic vegetation and forage fish habitat makes the Clallam Bay shoreline important feeding grounds for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. However, nearshore habitat quality has been impacted by the shoreline modifications within the bay.

The Clallam River provides habitat for coho salmon, chum salmon, resident cutthroat trout, and steelhead. However, natural net shore-drift processes sometimes blocks fish access to the river mouth, particularly during periods of low river flows. Clallam River water quality has a State impaired water quality listing for temperature. Water quality of the river is listed by Streamkeepers as "impaired" for WQI.

Major land uses within the shoreland area include open space, roads, lodging, high-density residential, and commercial. Over 90% of the shoreland area is privately owned.

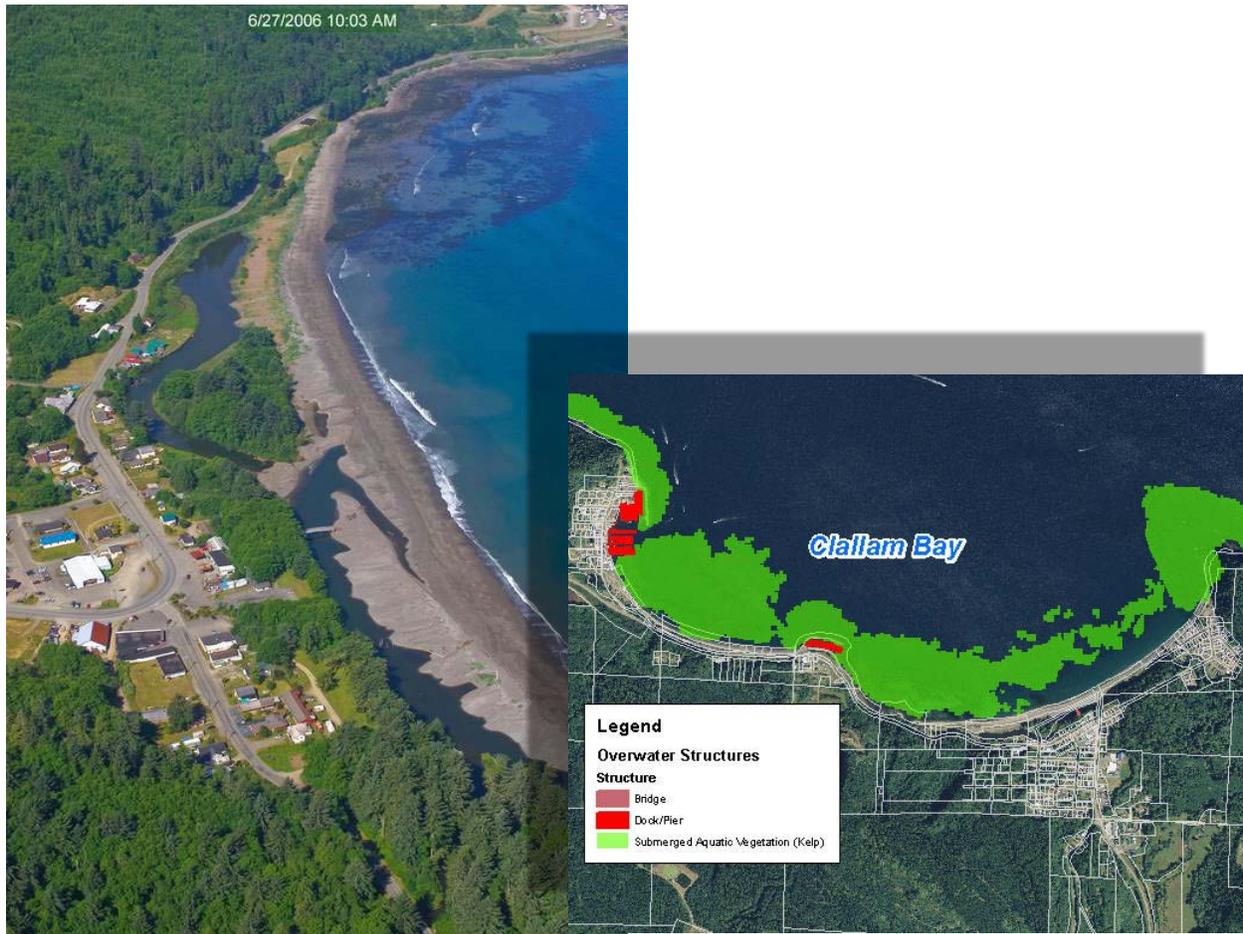


Figure 4-8. Clallam Bay shoreline showing overwater structures (shown in red) and kelp stands (shown in green on right photo) (Photo: Ecology Coastal Atlas)

Half of the shoreline in the bay is publicly owned and accessible from land. Public shoreline in the eastern portion of the reach is accessible from Clallam Bay Spit Community Beach County Park. Public shoreline near the western end of the reach is informally accessible from Highway 112. An additional quarter of the shoreline in the reach is not publicly owned, but can be accessed by patrons of the two marinas in the bay. Tideland areas within the reach are mostly privately owned.

4.15.2 Future Land Use and Potential Effects on Shoreline Ecology

Clallam Bay-Sekiui is an urban growth area and is expected to absorb additional growth. Under current zoning regulations, approximately half of the shoreland area within the reach has potential for new development. The vacant, developable land is primarily concentrated in the western two-thirds of the reach, and is zoned for commercial development or lodging. These undeveloped parcels are generally irregular in size and narrow in width, with wide water frontages. Most of these parcels are narrow in width and backed by Highway 112, so development within the parcels would occur in close proximity to the shoreline. Development in

these parcels may also necessitate installation of shoreline armoring to protect structures. An increase in shoreline armoring in these areas may adversely impact submerged aquatic plant communities and/ or forage fish spawning habitat, which would in turn reduce the suitability of this reach to continue to provide high-quality salmonid rearing habitat. Armoring may also impede natural sediment flow and beach maintenance processes.

Clallam Bay landowners along the low beach areas may seek to construct bulkheads or other shoreline armoring structures to protect their property from wind and wave action.

4.15.3 Management Issues and Opportunities

As stated above, the nearshore environment of Clallam Bay provides important salmon rearing habitat. While a significant amount of shoreline armoring is present in the reach, the majority of the shoreline is unaltered which allows natural sediment movement and beach forming processes. Protecting these natural qualities of the nearshore environment is crucial to maintain the overall ecological health of the reach, and protecting beachfront properties from beach erosion. In addition, protecting the remaining forest cover in the reach is important for maintaining wildlife habitat in the area, as well as protecting properties from accelerated erosion.

Key management recommendations for this reach are typical of other portions of the marine shoreline, including:

- Removal of forest cover, which generally results in accelerated erosion, should be limited in and near erosion-prone areas. Preserving forest cover also helps maintain wildlife species and diversity in developing areas.
- In low bank areas, set structures back from the shoreline (if possible) to decrease the potential risks of coast flooding and tsunami damage, and minimize the need for shoreline armoring. Armoring degrades nearshore habitat (such as forage fish spawning and salmon rearing areas), and can impede natural sediment flow/beach maintenance processes.
- For protection of existing structures, the use of “soft armoring” techniques (such as log placement) should be preferred over traditional “hard armoring” methods (such as rock/concrete bulkheads). As opposed to hard armoring, soft armoring generally has less negative impact on natural sediment movement and beach forming processes, as well as nearshore forage fish spawning and salmon rearing habitat.

4.16 *Reach 16: Sekiu-Kydaka Point (Maps 1c to 6c in Appendix A)*

The “Sekiu-Kydaka Point” reach contains 5.7 miles of marine shoreline, which extends along the Strait of Juan de Fuca from Sekiu Point to Kydaka Point. This reach includes a very small segment of the western Clallam Bay-Sekiu urban growth area.

4.16.1 Summary of Baseline Conditions

Rocky platform shores comprise over half of the shoreline within the reach, with bluff backed beach in the center of the reach. Two small pocket beaches are located in the western portion of the reach. Net shore-drift within the reach is entirely eastward. A small section of shoreline

armoring is located at the eastern end of the reach, near Sekiu. The remainder of the shoreline is unaltered (Figure 4-9).



Figure 4-9. Mussels and other fauna on the rocky beach west of Sekiu Point

Over half of the reach contains unstable bluff areas, with recent slides mapped southwest of Kydaka Point. Most of the northwest portion of the reach is in a tsunami hazard zone and the FEMA coastal 100-year floodplain.

Almost the entire shoreland area contains forest habitat, and the surrounding land is also forested. The large expanses of forest within the reach provide important habitat for a variety of wildlife species, including bald eagle. The shoreline in the eastern portion of the reach provides important habitat for harbor seal, and several marine mammal haulout areas are mapped within the reach.

Patches of kelp are mapped throughout the reach, and a patch of forage fish (smelt) spawning habitat is mapped at the east end of the reach. Red sea urchin is mapped throughout most of the reach, and patches of abalone, hardshell clam, and geoduck are also mapped. The prevalence of bedrock substrate in and along the shoreline makes most of the reach unsuitable for forage fish spawning habitat. Nevertheless, the undeveloped condition of the shoreline and large expanses of submerged aquatic vegetation make the nearshore area important habitat for marine species, including juvenile salmonids.

The eastern two-thirds of the reach is primarily privately owned timber land, with one publicly owned parcel (managed by State Parks) located near the center of the reach. Land use in the western third of the reach is moderate-density residential and vacant parcels.

More than three-quarters of the shoreline in the reach is publicly owned, but there are no available public access points from land. Tideland areas within the reach are mostly publically owned.

4.16.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, approximately two-thirds of the shoreland area has potential for new development. However, most of the land within the reach is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres.

The western portion of the reach is zoned for very low density residential development (R20), and contains many vacant 1 to 2 acre lots. Some of these lots are have narrow water frontages (approximately 100 feet). Development in these lots could result in relatively dense shoreline development. In general, the shoreline in the Residential-zoned areas consists of stable, rocky platform shores. The shoreward ends of the lots lie within mapped tsunami and FEMA-mapped coastal floodplain areas. Development in these parcels would also likely remove forest cover with potential impacts to existing, high-quality wildlife habitat in the area.

4.16.3 Management Issues and Opportunities

Because of the overall lack of development along the shoreline, habitat conditions and sediment flow processes within the reach are in very good condition. The eastern two-thirds of the reach is zoned for Commercial Forestry unlikely to be intensively developed; therefore, the risk of degradation to ecological functions resulting from development in this area is minimal.

There is no land access to public shoreline within the reach. Access could be provided at the publicly owned, WSP-managed parcel near the center of the reach. However, direct access to the water in this area may be limited due to the high bluffs along the shoreline.

There is significant development potential on the residential lots in the western third of the reach. Given that the shoreline consists of stable, rocky shores, there is a low potential for shoreline armoring in the area.

Key management recommendations for this reach are:

- Removal of forest cover should be limited where possible. Preserving forest cover helps maintain wildlife species and diversity in development area.
- To protect property and human health and safety, structures should be built outside of tsunami and coastal floodplain hazard areas.

4.17 *Reach 17: Shipwreck Point (Maps 1c to 6c in Appendix A)*

The “Shipwreck Point” reach contains 6.9 miles of marine shoreline, which extends along the Strait of Juan de Fuca from Kydaka Point to the Jansen Creek mouth. The reach also contains portions of the Hoko and Sekiu River estuaries, and the mouths of Jansen and Olson Creeks. The Hoko and Sekiu rivers are shorelines of the state. Jansen and Olson Creeks are not shorelines of the state, except where they enter the Strait of Juan de Fuca.

4.17.1 Summary of Baseline Conditions

The majority of the shoreline consists of rocky platforms shores, with barrier beaches and barrier estuary located near the Hoko and Sekiu estuaries. A bluff backed beach is located between the estuaries, and a pocket beach is located in the western portion of the reach. Net shore-drift in the reach is entirely eastward. Nearly the entire eastern half of the reach is armored (50% of the total reach), which protects Highway 112. Some of the bluff areas within the reach are unstable, but there are no recent slides identified. Most of the shoreland area is within a tsunami hazard zone, and the estuaries and some of the low bank areas lie within FEMA-mapped coastal and stream 100-year floodplains.

Approximately one-third of the reach is heavily forested, with a lesser amount of natural shrub and herbaceous vegetation within the wetlands associated with the river estuaries. Natural vegetation cover within a third of the shoreland area has been altered by residential development and roads. Most of the land bordering the shorelands is forested. This forest land provides habitat for a wide variety of wildlife species, including bald eagle. The remaining forest cover also helps stabilize the erosive slopes in the area.

No forage fish spawning habitat is identified within the reach. Red sea urchin is mapped throughout almost the entire shoreline, with abalone mapped in the east and a patch of hardshell clam in the center. Continuous kelp stands are located along the shoreline in the western two-thirds of the reach, and patchy stands are located along the remainder of the reach. Patches of eelgrass are located along the west end of the reach. The presence of dense submerged aquatic vegetation make the shoreline an important habitat area for juvenile salmonids, which use the shallow nearshore waters for migration and rearing. The rocky shoreline near the center of the reach provides priority habitat for harbor seal, including two marina mammal haulout areas.

The streams within the reach provide habitat for resident cutthroat trout; steelhead; and coho, chinook, and chum salmon. The portion of the Sekiu River within the reach has a State impaired water quality listing for temperature. Hoko River water quality is listed by Streamkeepers as "compromised" for B-IBI but "healthy" for WQI. The Sekiu River is listed as "compromised" for B-IBI.

Almost half of the land use within the reach is timber, with other significant land uses being residential, open space, and roads. Moderate- to high-density residential subdivisions are located along the pocket beach near the center of the reach, on the landward side of Highway 112, and directly west of the Hoko River estuary. Most of the homes are set back more than 75 feet from the shoreline.

Over three-quarters of the shoreline within the reach is publicly owned, and accessible from land. Shoreline access in the western and eastern portion of the reach is informally available off of Highway 112. State Parks has recently acquired 850 acres near the Hoko estuary and extending up the river (Hoko River State Park); however, no formal parking or access areas have been established. Tideland ownership within the reach is mixed: public and private.

4.17.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, approximately one-third of the shoreland area has potential for new development. Most of the developable parcels are located in the narrow strip of land between Highway 112 and the shoreline. Approximately half of this area is zoned Commercial Forest (including all of the land west of the Sekiu River), while the other half is zoned for residential development (1 to 2 acre lots). Most of the undeveloped land is located within both tsunami and coastal floodplain hazard areas. Development on these lots could result in a significant risk to structures, as well as human health and safety.

Shoreland landowners whose homes are close to the shore along low beach areas may seek to construct bulkheads or other shoreline armoring structures to protect their property from wind and wave action (Figure 4-10). In addition, given the location of the underdeveloped properties, shoreline armoring may be necessary if future structures are built. An increase in shoreline armoring could negatively impact natural sediment transport and beach maintenance processes.



Figure 4-10. Riprap or “hard” shoreline armor and homes on the beach near the Hoko River (Photo by A. MacLennan)

4.17.3 Management Issues and Opportunities

All of the publicly owned shoreline within the reach is accessible from land, but there are no formal parking areas available. The recently-acquired WSP land at the Hoko River mouth provides an excellent opportunity for increasing public access at the eastern end of the reach.

A significant portion of the shoreland area has potential for increased moderate-density residential development. Given the dimensions of the undeveloped parcels, and the location of Highway 112, most of the new residential development would occur very close to the shoreline, in tsunami and flood hazard areas.

Key management recommendations for this reach are:

- In low bank areas, set structures back from the shoreline (if possible) to decrease the potential risks of coastal flooding and tsunami damage, and minimize the future need for shoreline armoring.
- If shoreline protection is needed, the use of “soft armoring” techniques (such as log placement) should be preferred over traditional “hard armoring” methods (such as rock/concrete bulkheads).

- Minimize the removal of forest cover within the shorelands. Preserving forest cover helps stabilize erosion-prone areas, maintain wildlife species and diversity in developing areas.
- Increase access to publicly owned shorelines, so the public can use and enjoy the high-quality shoreline areas within this reach.

4.18 *Reach 18: Rasmussen (Bullman Creek) (Maps 1c to 6c in Appendix A)*

The “Rasmussen (Bullman Creek)” reach extends along the Strait of Juan de Fuca from just west of the mouth of Jansen Creek to the Makah Nation boundary. The reach also contains the mouths of Rasmussen/Bullman, and Snow Creeks. Bullman Creek is a shoreline of the state. The other streams within the reach are not shorelines of the state, except where they enter the Strait of Juan de Fuca.

4.18.1 Summary of Baseline Conditions

More than three-quarters of the reach consists of rocky platform shores, with some intermittent pocket beaches. Most of the shoreline within the reach has no appreciable net shore-drift; however, eastward drift occurs along Bullman Beach and at the mouth of Rasmussen Creek. Two small segments of shoreline armoring (8% of reach total length) are mapped in the western portion of the reach, at Bullman Beach and the mouth of Snow Creek. In addition, there is one overwater structure (dock) mapped at Snow Creek.

Approximately one-third of the reach contains mapped unstable slopes, with recent slides in the southeast portion of the reach and west of Bullman Creek. Most of the land adjacent to the Snow and Bullman creek mouths is located within a tsunami hazard zone and FEMA coastal and/or stream 100-year floodplains.

Approximately half of the shoreland area within the reach is heavily forested, which helps stabilize erosive slopes and provides habitat for a diversity of wildlife species, including bald eagle. Natural shrub and herbaceous vegetation is present near the creek mouths. Vegetation in approximately a quarter of the reach has been altered by roads and development. Most of the shoreland area is bordered by forest land.

Continuous kelp stands and patchy eelgrass areas are present throughout a majority of the reach. A small patch of forage fish habitat (smelt) is present at the mouth of Bullman Creek. The presence of dense aquatic vegetation provides important nearshore habitat for marine species, including juvenile salmonids. Priority harbor seal habitat and a marine mammal haulout area is identified at the west end of the reach.

The streams within the reach provide habitat for steelhead, and coho, chinook, and chum salmon. The portions of Rasmussen and Snow creeks within the reach have State impaired water quality listings for temperature. Water quality within the streams is listed by the Streamkeepers as "compromised" for WQI.

The predominant land usage within the reach is timber, with residential, lodging, and open space land at the west end of the reach. A pocket of higher density residential development is located at

Bullman Beach, and most of the homes are fairly close to the shoreline (approximately 50 feet) (Figure 4-11). A few of the homes are protected by shoreline armoring. The entire residential area is within mapped tsunami and coastal floodplain hazard areas.



Figure 4-11. Pocket of residential development at Bullman Beach (Photo: Ecology Coastal Atlas)

Nearly the entire shoreline is publicly owned and accessible from land. Shoreline at the western end of the reach can be accessed from the Snow Creek boat launch. Other portions of the shoreline can be accessed informally from Highway 112. Tideland areas within the reach are mostly publically owned.

4.18.2 Future Land Use and Potential Effects on Shoreline Ecology

Under current zoning regulations, approximately one-third of the shoreland area has potential for new development. However, most of this area is zoned for Commercial Forestry, and unlikely to be intensively developed. Zoning regulations allow single-family dwellings on Commercial Forest-zoned land, but at a maximum density of one dwelling per 80 acres. With the exception of a few undeveloped lots, the residential-zoned land at Bullman Beach is already fully developed. As a result, the development potential within the shoreland area is minimal.

Bullman Beach landowners whose homes are close to the shore may seek to construct bulkheads or other shoreline armoring structures to protect their property from wind and wave action. An increase in shoreline armoring in the area may adversely impact aquatic vegetation communities and smelt spawning habitat, which would in turn reduce the suitability of the area to continue to provide high-quality salmonid rearing habitat.

4.18.3 Management Issues and Opportunities

Development opportunities within the reach are limited. However, an increase in shoreline armoring may occur within the Bullman Beach area. Key management recommendations for this reach for the low bank areas include the use of “soft armoring” techniques where necessary, and setting structures back from the shoreline (if possible) to decrease the potential risks of coastal flooding and tsunami damage, and minimize the need for shoreline armoring.