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# **Puget Sound Nearshore Regional Perspective**

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A variety of activities affect the diverse habitats of Puget Sound's nearshore areas. Information from interviews with shoreline planners, scientists and regulators demonstrates that even permitted activities are causing a loss of nearshore habitat. Other reports suggest that some of these losses are permanent and that the regulatory system does not adequately protect nearshore habitats in Puget Sound. Interviews and limited data gathered from tracking permits show that development activities and threats vary regionally. State and local governments need to manage the environment in a way that recognizes these differences, but allows the ecosystem to be viewed holistically.

Shoreline planners, habitat biologists and scientists from around Puget Sound identified various impacts and threats to the nearshore. Concern was expressed about activities that directly alter the environment and about development activities occurring further inland, which indirectly but significantly affect the nearshore area.

The level of concern for certain activities varied considerably among jurisdictions depending on:

1. The present condition of the shoreline (how much is already altered, how valuable is the existing habitat).
2. The degree to which the shoreline manager understands the connections between development activities along the shoreline and impacts to nearshore habitat.
3. The level of current development activities (number and type of permit proposals).
4. The degree of protection offered by the local shoreline master program.
5. Personal concerns for economic growth and private property rights.
6. Natural geological conditions.

## **DEFINING THE NEARSHORE**

"Nearshore habitats are critical to the health of Puget Sound and its marine life. They provide shelter, and are used as spawning, rearing and feeding grounds for species that live in and around the Sound – including fish, shellfish, birds and marine mammals. In addition, nearshore habitats protect the shoreline from erosion, filter pollutants from the water, and, in the case of salt marshes, they reduce flooding by retaining stormwater during high-flow periods."

~ 1994 Puget Sound Water Quality Management Plan

The term habitat refers to any physical, chemical or biological systems that support animal life. Marine nearshore habitats lie along the shoreline and include the strip of shallow water and the land immediately adjacent to the shoreline. This report focuses on the marine nearshore area 200 feet landward of the ordinary high-water line to the shallow subtidal zone. The 200-foot distance correlates with the area of land that falls within the jurisdiction of the state's Shoreline Management Act. It includes uplands where activities occur that significantly affect nearshore habitats. Tidally influenced areas of river mouths are also included.

## **THE VALUES OF NEARSHORE HABITATS**

Amid continuing threats to nearshore habitat, people in the Puget Sound region are becoming more aware of the importance of these habitats. Nearshore areas play a critical role in supporting healthy populations of fish and wildlife. Concern is growing that damage to these habitats is contributing to declines in species such as salmon, surf smelt, sand lance and rock sole.

A study of marine life for the Protect Marine Life Workgroup of the Puget Sound/Georgia Basin International Task Force identified 13 species or

groups of organisms whose regional populations have declined substantially in recent years. These include six species of fish, three seabirds (marbled murrelet, common murre and tufted puffin), unclassified marine invertebrates, Olympia oysters, and harbor porpoises (West, 1997). Habitat is identified as a limiting factor for the survival of unclassified marine invertebrates and the Olympia oyster.

### **THREATS TO NEARSHORE HABITAT**

The Puget Sound region is experiencing a tremendous amount of activity associated with development and urbanization. The rapid growth occurring in the Puget Sound area is expected to continue into the foreseeable future. Urbanization, and activities associated with it, pose a major threat to fish and wildlife in Puget Sound. Some of the threats to nearshore habitat include:

- Conversion of land to commercial or residential uses.
- Problems associated with development.
- Dredging or filling of important habitat.
- Disruptions of hydrological systems.
- Increased erosion along the shoreline.
- Degradation from urban contaminants.

Although few data exist regarding the types and amounts of nearshore habitats, or the rate at which they are being destroyed, studies have documented a 73 percent decline in the area of Puget Sound covered by salt marshes. Nearly all salt marsh habitats have been destroyed in river deltas within major urban areas (Bortelson et al., 1980).

A review of previous studies on habitat changes in the Strait of Georgia and Puget Sound revealed that filling and diking, changes in water quality, and modifications to watersheds were the major causes of intertidal and subtidal habitat loss and change (Levings and Thom, 1994). Dredging, filling and industrial contamination associated with urbanization and harbor development caused substantial losses of shoreline and nearshore habitats within Puget Sound, particularly within urban waterbodies (Bortelson et al., 1980). The Puyallup River delta, for example, lost 100 percent of its nearshore habitat. These urban waterways

account for less than 10 percent of Puget Sound shoreline, however (Shipman, 1997). The majority of Puget Sound's shoreline is rural and most of the development along these shorelines is residential.

More stringent regulations have reduced many destructive activities, such as extensive filling of shoreline areas. Developments may impact the nearshore, but compensatory mitigation to offset environmental impacts is usually required. Though often mitigation is ineffective.

Large-scale development projects in urban areas receive greater scrutiny through the existing permit process. However, concerns still exist regarding the level of mitigation required and the follow-up to ensure that mitigation efforts are working. A compensatory mitigation project may be monitored or tracked for an extremely short time relative to the life of a fill project.

### **REGIONAL DIFFERENCES**

#### *Northern Puget Sound*

In northern Puget Sound (San Juan, Whatcom, Skagit, and Island counties) activities related to tourism and large developments in non-urban, sensitive nearshore areas are of greatest concern to local resource managers. Shoreline armoring – installing a hard structure such as a bulkhead to protect shoreline property from erosion or other damage – is less of a concern in the San Juan islands because of the area's rocky shoreline. The issues of concern in the northern region include marinas and docks, anchoring boats, degraded water quality, and the direct physical alteration of important habitats, such as herring spawning grounds, caused by large developments in non-urban areas.

#### *Central Puget Sound*

Central Puget Sound (King, Pierce, Kitsap and Snohomish counties) faces many issues along its shorelines. The shoreline area of King County and much of Snohomish County is already heavily urbanized. Most of the shoreline in these two counties has been altered by the railroad construction along the shore. Kitsap County is growing rapidly along its shoreline. A tremendous number of property owners apply for permits to

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armor their shoreline each year in Kitsap County. Pierce County's main concern is the number of docks being built along its shores.

### *Southern Puget Sound*

In southern Puget Sound (Thurston and Mason counties) concerns are focused on the impact of shoreline armoring and the cumulative impacts of residential development. This region has a great deal of low- and no-bank shoreline, allowing greater access to the beach and a prevalence of shoreline armoring projects. Thurston and Mason counties also have an abundance of aqua-culture.

### *Western Puget Sound*

Virtually no shoreline armoring or dock construction occurs in Clallam County. Jefferson County receives a small number of requests for shoreline armoring, but of greater concern is the number of mooring buoys being installed around the county.

## **ACTIVITIES AND THEIR IMPACTS ON NEARSHORE AREAS**

This section summarizes the major activities that threaten nearshore habitat and explains potential effects that are known or suspected. Table I lists threats identified in the interviews and the potential impact of each activity on nearshore habitat.

### *Residential Development*

Major urban waterbodies – focal points for commercial and industrial development – account for less than 10 percent of the Puget Sound shoreline (Shipman, 1997), leaving approximately 90 percent of the shoreline available for residential development. The extent to which residential development affects nearshore habitat depends on many factors, including geology of the shoreline, the size of each development, materials used, construction practices, timing and setbacks. The most significant impacts result from the dwelling itself, the landscaping and added amenities. Activities that can affect nearshore habitat include clearing native vegetation along the shoreline, adding impervious surfaces (such as a roof, driveway or lawn) that increase stormwater runoff, introducing contaminants (chemicals and fertilizers used for lawn maintenance and fecal bacteria from on-site sewage systems), and directly disturbing or altering the shoreline by constructing stairways, bulkheads, docks and piers. The impacts of these activities to the nearshore include loss of shoreline habitat, destabilization of bluffs, interference with natural erosion processes, increased erosion and contamination of the nearshore.

Table I. Summary of issues of concern and known or possible impacts

Issue of Concern	Known or Possible Impacts
aquaculture	possible effects of tube worms, effects of fecal matter generated, elimination of biodiversity, accidental release of non-native species, destruction of eelgrass
beach clean up after slides	beaches need the influx of new materials <sup>1</sup>
bulkheads/armoring	interference with natural erosion and groundwater; scouring of beach <sup>1</sup> , change in biological populations <sup>3</sup> , removal of overhanging and shoreline vegetation
docks and piers	shading of eelgrass <sup>2</sup> , interference with fish migration <sup>3</sup>
dredging	loss of shallow water habitat
failing septic system	fecal coliform contamination
ferries	the four major categories of impacts listed below <sup>1,2,3,4</sup>

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Issue of Concern	known or Possible Impacts
filling	loss of shallow water habitat
hydrologic changes/diversions to freshwater	change in sediment deposition, loss of estuarine habitat
large projects in sensitive areas	inability to mitigate for some habitats
lawns	runoff of pollutants <sup>4</sup> . loss of native vegetation, addition of water (sprinkler systems) <sup>1</sup>
log rafting	physical scouring of intertidal and subtidal, accumulation of wood waste
long-term moorage/liveboards (outside of marinas)	discharge of waste (gray water and sewage), water quality impacts <sup>4</sup>
marinas	structural impacts as well as associated impacts (e.g. due to increased boat traffic); water quality impacts <sup>4</sup>
mooring buoys	scouring of eelgrass <sup>2</sup>
recreational boating	pollution from waste <sup>4</sup> , increased need for moorage and anchorage opportunities
residential development	erosion effects, all major categories of concern <sup>1,2,3,4</sup>
reverse osmosis	may cause salinity changes
seaweed harvest	over-harvest, loss of habitat
sediment remediation	disposal occurs in the nearshore
<i>Spartina anglica</i>	elimination of native shoreline habitats
stairways	additional clearing of vegetation <sup>1</sup>
stormwater	increased bluff erosion <sup>1</sup> , pollution <sup>3</sup>
tourism	overuse of public areas, trampling of vegetation
upland runoff	eutrophication, turbidity, choking out eelgrass <sup>2</sup> , limiting eelgrass growth
vegetation removal and over-clearing of land	unstable bluffs <sup>1</sup> , loss of native vegetation, loss of biodiversity

### FOOTNOTES – MAJOR CATEGORIES OF CONCERN FOR IMPACTS:

- <sup>1</sup> interruptions and exacerbation of shoreline erosion processes
- <sup>2</sup> impacts to eelgrass (suppressing growth or physical scouring)
- <sup>3</sup> interruptions to fish migration and fish spawning (particularly baitfish)
- <sup>4</sup> water quality degradation (contamination of resources and changes to resource populations)

### UPLAND RUNOFF

A few scientists and regulators felt that the greatest threat to the nearshore environment comes not from physical alterations to the shoreline but

from upland runoff that degrades water quality. Eutrophication is a documented problem in a few areas where water flushes slowly, including lower Hood Canal and Budd Inlet, and scientists have recently observed eutrophication in other isolated areas around Puget Sound (Thom, 1997; Mumford, 1997). Eutrophic waterbodies have reduced dissolved oxygen due to high levels of organic nutrients. Impacts include increased growth of sea lettuce (*Ulva*), decreased growth of eelgrass (*Zostera* spp), increased turbidity and other suspected, but undocumented, impacts. In a few locations around Puget Sound, mats of sea lettuce were found growing on and around eelgrass beds, inhibiting the growth of eelgrass (Thom, 1997). Resource managers suspect that nutrients are coming from

adjacent shoreline developments and residential farming and forestry practices further upland.

## **LARGE COMMERCIAL AND INDUSTRIAL DEVELOPMENT**

Regulators expressed concern about the siting of large structures and developments in the nearshore environment. Effects associated with large development projects vary greatly depending on individual project proposals. The dominant concerns include the inability to adequately protect extremely sensitive areas of the shoreline, the lack of information available to substantiate potential impacts to aquatic and nearshore marine resources, and the inability to adequately mitigate for impacts on resources.

Cherry Point, in Whatcom County, was cited as an example of an extremely significant nearshore area where a large development could tremendously impact marine resources. Cherry Point provides approximately half of the spawning ground for herring in Puget Sound. Regulators have long known of the area's importance, but the local land-use plan does not prevent development proposals. Several people interviewed cited Cherry Point as a situation where a permanent protective measure should be taken to protect the resources and preempt development proposals, rather than continuing to battle over individual permits.

## **VEGETATION REMOVAL**

Land clearing occurs with most development projects, but nowhere is it of as much concern as at the water's edge. Clearing vegetation removes a source of shading at the shoreline, decreases the contribution of organic debris into the water and depletes the upland-edge habitat for wildlife species. In areas with steep and eroding bluffs, the native vegetation is usually the best tool for keeping the bluff intact and minimizing erosion.

Some local governments provide guidelines for the removal of vegetation in their shoreline master programs, but most regulators admit it is extremely difficult to enforce. Vegetation that is spared during the construction process is often incrementally removed over time to improve views or expand

landscaping structures. Restoring an over-cleared area is difficult unless the landowner is committed to replanting, watering and nurturing new plants.

## **FAILING ON-SITE SEWAGE SYSTEMS**

Failing on-site sewage systems contribute fecal bacteria and nutrients to the nearshore environment in areas of Puget Sound. Some jurisdictions have taken strong measures to locate failing systems while other areas are just beginning to address the issue. Several county officials stated that failing septic systems and their impact on nearshore water quality are a primary concern, more so than physical alterations to the shoreline.

## **SHORELINE ARMORING**

Many people build artificial structures, such as bulkheads and seawalls, on their shoreline property. Referred to as shoreline armoring, this very common practice is a primary concern of state and some local regulators. While most shoreline managers consider shoreline armoring on residential property a serious problem, many property owners view bulkheads as a necessary addition to waterfront homes to control erosion, maintain real estate values and provide a tidy landscaping feature for the front of their home. Shoreline armoring also occurs with commercial and industrial development projects, although it requires a different permitting process.

Shoreline armoring causes problems for nearshore habitats because it interferes with the coastal erosion process and requires clearing of natural vegetation. The natural process of bluff erosion is critical to maintaining a supply of sediment to the beach. Constructing a bulkhead at the bottom of a feeder bluff cuts off the supply of new sediments, and the continuing wave action and littoral drift can result in localized beach loss and eventually accelerated, localized retreat of the bluff (Macdonald, 1995). Concerns also focus on the permanence of the damage, i.e., the cumulative effects of armoring within a given geographic area, and long-term effects on species that depend on the intertidal zone for portions of their life-cycle. Further information on the relationship of armoring

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to coastal erosion can be found in the Coastal Erosion Management Studies (Ecology, 1993-1997).

Those interviewed have witnessed changes to the intertidal shoreline caused by armoring and studies have documented changes to the beach substrate (Macdonald, 1995; Schreffler et al., 1995). In some places, the hard surface of the armoring structures increased wave energy, allowing both fine and coarse sediments to move out of the area due to littoral drift. This change in the natural shoreline process can cause problems, such as scouring of the beach. Such changes in beach sub-strate significantly impact some species of baitfish that use the intertidal area for spawning. These species include surf smelt, sand lance and rock sole. These baitfish form the base of the food chain for larger fish, marine birds and marine mammals. As activities cause losses of nearshore habitat, changes in other species of marine animals in Puget Sound can be expected.

The connection between habitat alteration and the spawning of surf smelt, sand lance and rock sole concerns habitat biologists. Beach surveys conducted in 1995 showed that baitfish depend on this type of habitat more than previously known (Pentilla, 1995). Thirty-four percent of all beaches surveyed yielded eggs of at least one of the three baitfish species found in the intertidal beach. The reproduction of surf smelt, sand lance and rock sole is an integral and important part of Puget Sound beaches which resource managers should give the same consideration as more visible intertidal marine life (Pentilla, 1995).

Using a 1995 survey of 325 randomly selected shoreline sites in Puget Sound, scientists at the Department of Natural Resources estimated that one-third of Puget Sound's shoreline – approximately 800 miles – has been modified by human development. Twenty-five percent of the modifications have occurred in the intertidal

zone – areas that are regularly covered by tides. Another eight percent of the modifications have occurred above the normal extent of tides. Impacts from modifications above the normal tidal range on the character and processes of shorelines characteristically are less severe than modifications in the intertidal zone. They can, however, adversely affect sediment supply needed to maintain existing beach habitat.

The distribution of modified shorelines reflects historical development patterns and environmental factors in the Puget Sound basin. Central Puget Sound, with the basin's highest past and present population, has the highest level of shoreline modification overall (52 percent) and the highest percentage of shoreline with intertidal modification (45 percent). The areas of Whidbey Island, Hood Canal and south Puget Sound each have roughly one-third of their shorelines modified. The most striking difference among these regions is that southern Puget Sound has many more alterations in the intertidal zone, reflecting the low-bank environments in the region and the long history of aquaculture and settlement along the water. Morrison et al. (1993) found that the length of Thurston County's shoreline covered by armoring structures increased by more than 100 percent from 1977 to 1993.

The San Juan islands, the Strait of Juan de Fuca to Port Angeles, and the regions north of Guemes Channel (north of Camano Island) have the highest proportion of natural (unmodified) shoreline, almost 80 percent. Within this area, most modifications tend to be along the Strait of Juan de Fuca and the northern Olympic Peninsula. The northern part of the Sound has relatively more bedrock shorelines, which are less likely to erode (a primary reason that land-owners modify their shorelines).

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Excerpted and adapted from: **Puget Sound Nearshore Habitat Regulatory Perspective: A Review of Issues and Obstacles**. 1998. Ginny Broadhurst, Puget Sound/Georgia Basin International Task Force Work Group on Nearshore Habitat Loss for Coastal Training Program by Elliott Menashe, Greenbelt Consulting. 2004. Check with Puget Sound Action Team for updated conditions ([www.psat.wa.gov](http://www.psat.wa.gov)).