



Study of Shoreline Modification in Puget Sound based on EMAP Data

Shoreline modification such as bulkheading, filling and dredging can lead to direct habitat loss by destroying high intertidal habitat used for spawning and other activities. Indirectly, it can lead to changes in the sediments and wave energy on a beach and adjacent subtidal areas. The degree of shoreline modification can also reflect development intensity. For these reasons, shoreline modification is recognized as an important indicator of change in intertidal and nearshore habitats.

In 1995, PSAMP scientists estimated the extent of shoreline modification by surveying 325 stratified random sites throughout the Puget Sound. This research filled an information gap: previous shoreline modification estimates did not consider the entire Sound.

One-third of Puget Sound's shorelines, approximately 800 miles, have been modified (Figure 1). Twenty-five percent of the intertidal zone -- areas that are regularly covered by tides -- has been modified. Eight percent of the shoreline is modified only in the supratidal zone -- areas directly above the extent of tides. Modifications in supratidal zones characteristically have less severe impacts on shoreline processes; however, they continue to affect sediment supply and natural shoreline configuration.

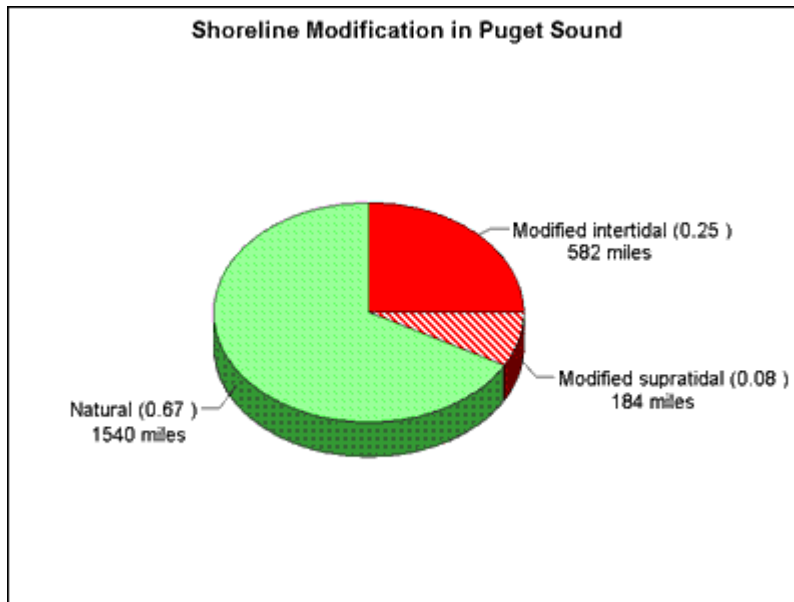
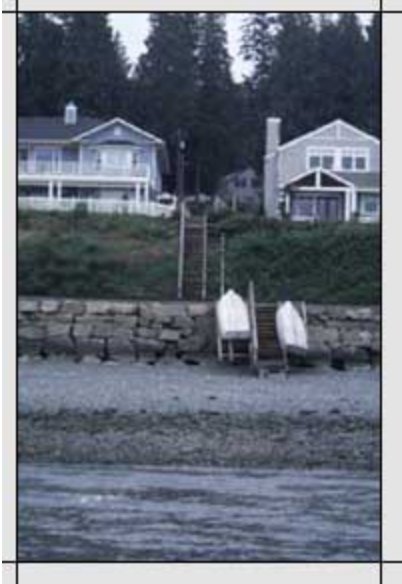


Figure 1. Shoreline Modification in Puget Sound

Shoreline modification trends within the Puget Sound basin reflect historical development patterns and environmental factors (Figures 1 and 2). The Central Puget Sound region, with historical and current high population levels, shows the highest level of modification overall (52%) and the highest percentage of intertidal modification (45%). The Whidbey region, Hood Canal region, and South Puget Sound region have approximately 35% of their shorelines modified. The most striking difference between these regions is that the South Puget Sound region has much more intertidal alteration, reflecting low bank environments in the South Puget Sound and the long history of aquaculture and water-based settlement.

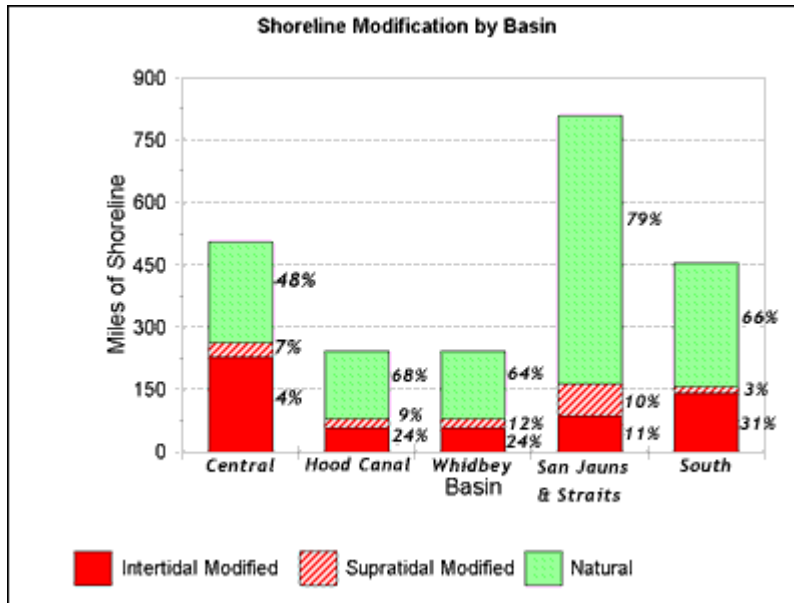


Figure 2. Shoreline Modification by Basin

The San Juan Archipelago, the Strait of Juan de Fuca, and regions north of Guemes Channel have the highest proportion of unaltered shoreline, almost 80%. Within this area, most modifications are likely to be along the strait and the northern mainland, with the islands comprising the smallest percentage. The northern part of the sound has relatively more bedrock shorelines, which are less likely to erode and hence be armored.

The direct, indirect, and cumulative impacts of shoreline modification are complex. They are influenced by interactions with the type of modification, biota, and environmental factors such as sediment supply and wave energy. Modifications to 33 percent of all shorelines is profound, for these modifications have significant long term effects on Puget Sound habitat (Thom and Shreffler, 1994). Limiting shoreline modification is one way to preserve the health of nearshore habitat. Where modification is necessary, methods that reduce impacts should be adopted.

REFERENCE

Thom, R. M., and D. K. Shreffler. 1994. Shoreline Armoring Effects on Coastal Ecology and Biological Resources in Puget Sound. Preliminary Report Prepared for Washington State Department of Ecology Shorelands and Coastal Zone Management Program.