PUGET SOUND INSTITUTE

ISSUES in BRIEF

mapping the bluffs that feed beaches

Eroding feeder bluffs supply the sand and gravel that form healthy beaches and intertidal forage fish habitat. Historically, shoreline residents have built anti-erosion structures in these sensitive areas, but in many cases this may be harmful to the environment. To better protect feeder bluffs from human development, it is important to inventory their locations and analyze erosion patterns.

Feeder bluff and beach at Fort Flagler Historical State Park. Marrowstone Island, WA. Photo: Kris Symer (CC BY-NC-ND 4.0)

BACKGROUND

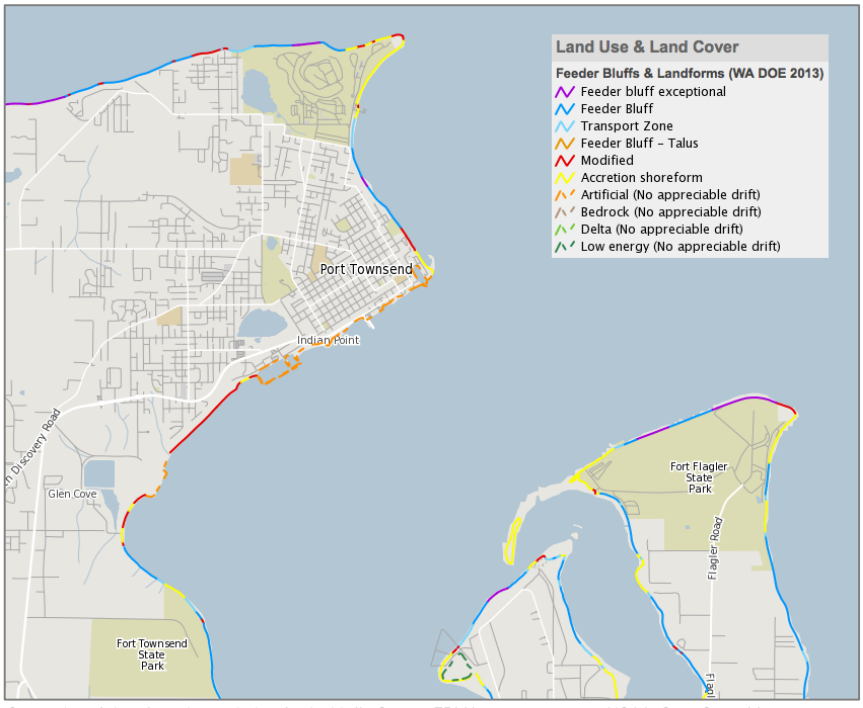
Feeder bluffs erode naturally unless impeded by man-made structures, such as bulkheads. Sand and gravel coming from these natural sediment sources spread out along the shoreline, creating habitat for many species — including forage fish — that form the base of the food web.

SHOREFORM STUDY

In 2013, coastal geologists compiled existing studies of feeder bluffs across 700 miles of Puget Sound shoreline, then conducted new research on another 572 miles. The result was a complete geospatial database of landforms bordering Puget Sound waters. In all, some 17 percent of the shoreline was listed as feeder bluffs.

BENEFITS OF MAPPING

The maps, which identify the location and document the quality of feeder bluffs throughout Puget Sound, can help set priorities for bulkhead removal and other kinds of restoration. Funding to assist property owners with bulkhead removal, for example, can be directed to projects that will result in the greatest ecological benefit.



Screenshot of shoreform data including feeder bluffs. Source: ERMA mapping system, NOAA; Open Street Map

EFFECTS OF BULKHEADS

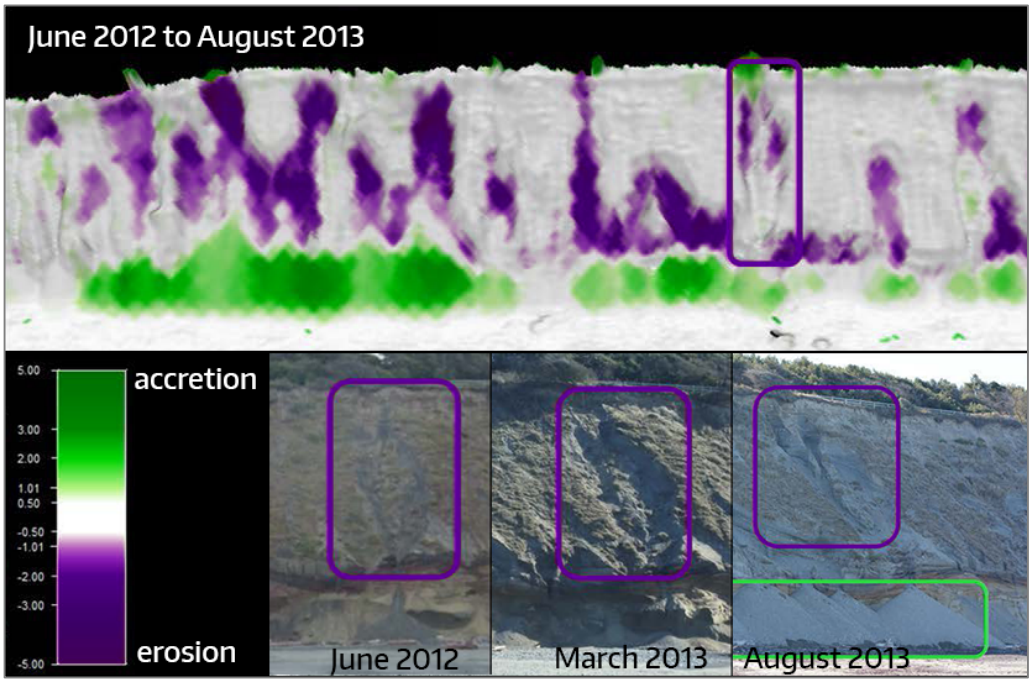
Bulkheads built by property owners impede natural processes that nourish habitat along the shoreline, but their effects on feeder bluffs may be the most worrisome. About one-third of all the shorelines that were modified with bulkheads had been serving as important feeder bluffs before development took place. The total amount of feeder bluffs affected by bulkheads was 147 miles.

VALUE OF NATURAL SHORELINES

Another study compared the value of unarmored beaches to armored beaches in the Strait of Juan de Fuca north of the Olympic Peninsula. In the Elwha River area, the cost of maintaining a sea wall along with maintenance of the Ediz Hook sand spit was calculated. Researchers found that the costs were roughly three times higher — and the ecological values were lower — than what was found in the nearby Dungeness River area, which has no sea wall.

MEASURING EROSION AND DEPOSITION

In the enhanced images, below, areas of erosion (purple) occur on the steep bluff near the Dungeness River, leading to deposition, or accretion (green), along the edge of the beach. Shoreline armoring at the base of the bluff may reduce undercutting, but it has no effect farther up the slope. More importantly, the armoring traps the sands and gravels, which can no longer spread out and supplement the natural habitat along the beach. These images were made possible with a relatively new technology, boat-based LIDAR, which uses reflected laser beams to measure even slight changes in the near-vertical



Boat-based LiDAR and photography study of Dungeness Bluffs. Adapted from: Kaminsky, et.al. (2014).

SOURCES

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