

ISSUES in BRIEF

forage fish, shoreline armoring and sea level rise

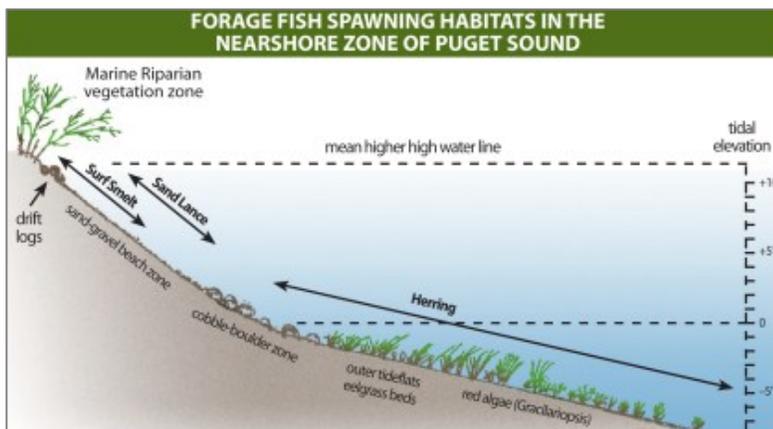
Bulkheads and other shoreline structures can block the movement of sand and gravel to higher elevations on a beach as the sea rises. As a result, forage fish that spawn in intertidal areas, such as surf smelt and sand lance, could lose 80 percent of their Puget Sound spawning habitat before the end of the century.

BACKGROUND

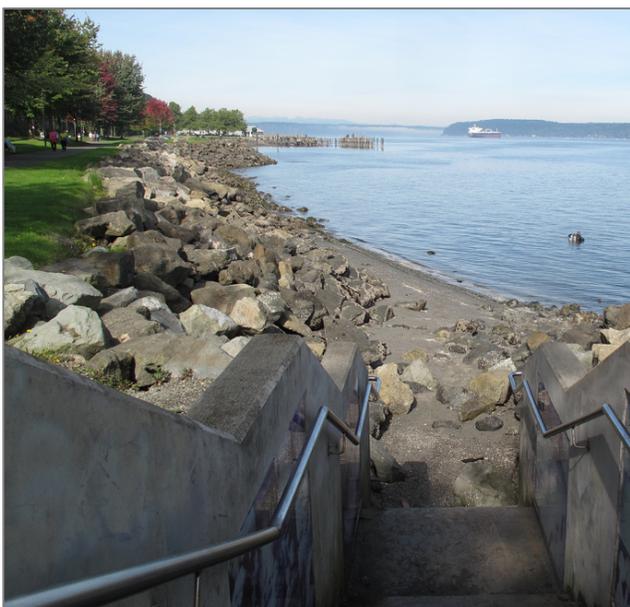
Surf smelt and sand lance are important food sources for a variety of birds, marine mammals and fish, including salmon. Surf smelt eggs have been documented on 11 percent of Puget Sound beaches, sand lance eggs on 5 percent — but their occurrence is likely much more widespread. Surf smelt spawn higher on a beach than sand lance.



Spawning Surf Smelt, Fidalgo Bay. Photo: Copyright Jon Michael



Habitat Zone Diagram. Graphic: Dan Penttila, WDFW



Shoreline armoring on the Tacoma waterfront. Photo: Gexyda (CC BY-NC-ND 2.0)

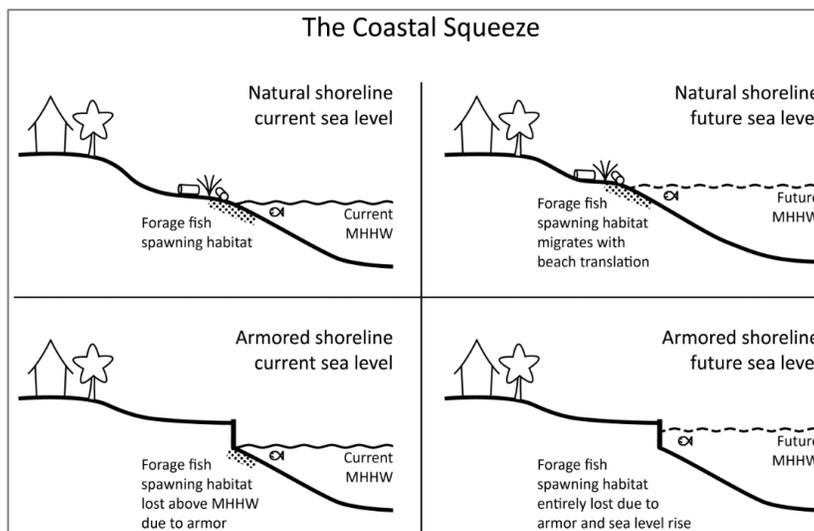
SEA LEVEL RISE

Sea levels in Central Puget Sound have risen about 9 inches since 1900 and are expected to rise even faster over time, as global warming causes ice to melt in the polar regions. Geologic forces are affecting land elevations, so the change in sea level is not the same everywhere in Puget Sound. But as the sea levels rise, both the high-tide and the low-tide lines move up the beach to higher elevations. How fast that occurs cannot be predicted with current information, but the average climate model predicts the rise will be about 2 feet by 2100.

forage fish, shoreline armoring and sea level rise (continued)

SHORELINE ARMORING

Bulkheads are usually installed to reduce erosion caused by wave action, but they are a fixed barrier. As sea levels rise, the high-tide mark gets closer and closer to the bulkhead and may eventually reach it. Since surf smelt spawn in sands and gravels in the intertidal area, their habitat will be reduced and could be squeezed out entirely by the rising waters. This process is known as “coastal squeeze” or “beach squeeze.” Where bulkheads are not present, the sand and gravel tend to move up to higher elevations on the beach, maintaining some habitat for forage fish.



Coastal Squeeze: how armoring and sea level rise reduce spawning habitat. Graphic: Coastal Geologic Services



Bulkhead removal and beach nourishment. Samish Is. Photo: Jim Johannessen, Coastal Geologic Services

BULKHEAD ALTERNATIVES

When homes need protection from rising sea levels, one answer could be to embed logs and large rocks into the upper beach. This so-called soft-shore protection has been found to reduce erosion by deflecting wave energy while causing less harm to the natural spawning habitat for forage fish.

SHORELINE REGULATIONS

So far, land-use rules for building new houses do not account for sea level rise, although some jurisdictions have a policy of discussing rising waters with prospective waterfront homeowners. Increasing the distance from the house to the shoreline may be prudent. Public-outreach efforts encourage property owners to remove bulkheads where they are not needed, but rising sea levels could complicate the discussion. Rising waters may cause some people to seek permits for new bulkheads or for raising their existing bulkheads — actions that run counter to high-priority efforts to protect and restore natural shorelines. Studies are underway to predict the effects of sea level rise, including flooding, for local areas throughout Puget Sound.

SOURCE

Kinney, A., Francis, T., & Rice, J. (2015). Analysis of Effective Regulation and Stewardship Findings: A review of Puget Sound Marine and Nearshore Grant Program results, part 1. University of Washington Puget Sound Institute.