PUGET SOUND
National Estuary Program

SUBTIDAL MONITORING OF SHORELINE RESTORATION EFFECTIVENESS

Do the benefits of removing shoreline armor extend beyond the beach? Does shoreline restoration support fish using adjacent subtidal habitats, in addition to improving habitat for beach-spawning forage fish?

Shallow subtidal habitats are important nursery areas for juvenile fishes, including Pacific salmonids and important forage fish such as herring and smelt, but very little is known about the impacts of armor, or effectiveness of restoration, in those zones.

What we're doing

We are surveying sites where armor has been removed, evaluating these shoreline restoration projects for their effects beyond the beach, including providing habitat for salmonid species and Pacific herring. At six restoration projects around Puget Sound, we are conducting lampara net surveys to enumerate the abundance of fish in subtidal zones along shorelines. We are comparing observations from restored sites to sites with armor and never-armored sites to determine whether restoration leads to improved habitat for salmon and forage fish beyond the beach.

Surveying fish with a lampara net. Photo: G. Sullaway

WHAT YOU CAN DO

Much of the armor around the Puget Sound shoreline may not be needed to protect property and harms Puget Sound beaches. Property owners can contact county or conservation district offices to ask about technical resources, including erosion risk evaluation, and financial assistance available for armor removal.

ABOUT THE PUGET SOUND INSTITUTE

The Puget Sound Institute (PSI) at the University of Washington to identify and catalyze the science driving Puget Sound and Salish Sea ecosystem recovery. PSI receives major funding from the Environmental Protection Agency. This project is a collaboration with the Northwest Fisheries Science Center at NOAA.

FOR MORE INFORMATION

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Armored shoreline at Edgewater survey site. Photo: T. Francis

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Overall, shoreline restoration, in the form of armor removal, had limited effects on the use of subtidal habitat by nearshore salmonids and forage fish.

Project outcomes

Using data from lampara net surveys at 6 restored sites around Puget Sound, paired with natural and armored sites, we fit Bayesian linear models to assess which factors influenced the abundance of nearshore fishes. We found:

- Shoreline condition was only weakly linked to forage fish abundance: herring were more abundant at natural (unarmored) sites. Shoreline effects on smelt varied by site: either natural or armored shorelines had higher abundances of smelt, depending on the survey site.
- For salmon, geographic location and the presence of eelgrass were the best predictors of abundance. Chinook salmon were at least 7x more abundant at the most abundant site, and chum salmon were 12x more abundant where there was eelgrass.
- There was no clear evidence that small-scale shoreline restoration promotes fish use of subtidal habitats.

Counting and measuring fish caught in a lampara net at Orcas Island site. Photo: G. Sullaway

Success Story

This study shows that herring prefer natural shorelines, and that chum salmon are strongly associated with eelgrass habitats. Our findings suggest that protecting intact shorelines and promoting eelgrass restoration are priorities for providing quality habitat for herring and chum salmon.

FUTURE OPPORTUNITIES

There is still much to learn about the impacts of armor on Puget Sound fish at local as well as larger scales. Taking a broader landscape view of the Puget Sound shoreline and the environmental factors that influence habitat use by nearshore fish is our best strategy for supporting growth and survival of these important species.

A Pacific herring caught at Dockton marina, Vashon Island. Photo: G. Sullaway