Forage fish, an assemblage of small schooling fish species also known as bait fish, play a unique role in the food web of the Salish Sea. They are an essential source of food for larger fish, seabirds, and marine mammals. Forage fish, such as Pacific herring, depend on clean water and natural shorelines, and are susceptible to the cumulative impacts associated with shoreline development; including vessel noise, ambient light, poor water quality, and shoreline hardening. This Vital Sign tells us about the status of forage fish populations in Puget Sound, with a specific focus on Pacific herring as one of the most abundant and well-studied species.

Key Messages

- Pacific herring is an important prey species for Chinook salmon and countless other fish, birds, and mammals.
- Despite seeing an increase in total Pacific herring spawn biomass between 2013 and 2018, the current spawning biomass of all stocks is below both their respective 25-year mean reference and their 2020 target values.
- The size and timing of spawning herring populations changes from beach to beach. Hood Canal’s Quilcene Bay stock (part of the ‘Other Stocks Complex’) has seen important increases over the past five years and now contributes over half of all Puget Sound herring spawning biomass. However, the biomass of herring in Central and Southern Puget Sound, while variable, has shown a slight negative trend over the past 40+ years. This decline has become more pronounced recently and is being closely monitored.
- Unusual seasonal timing of herring spawning events occurred in 2019, with stocks at many locations spawning later than generally observed.
- Several other forage fish species live in Puget Sound, and have different life history and life cycle drivers than herring. To find out more about where these species live and their role in the food web, scientists from various organizations are conducting beach spawning surveys for surf smelt and habitat studies of Pacific sand lance.
- Northern Anchovy, another forage fish species, are widely reported throughout Puget Sound. While no official count is available, continued reports of schooling fish between 2016 and 2019, combined with observations in their predators’ diets, may signal an increase in their abundance.
- Zooplankton are important prey for forage fish and emerging studies on these small organisms in Puget Sound by King County and the Marine Survival Project improves our understanding of the Puget Sound food web.
Strategies, Actions, And Effectiveness

- Actions proposed in the Action Agenda that advance this Vital Sign (let us know if we missed any!):
  - Mitigating Contamination to Nearshore Habitat from Creosote Pylings
  - Implement salmon habitat recovery in Quartermaster Harbor
  - East Kitsap Forage Fish Monitoring
  - Forage Fish Habitat Tidal Range
- Restoration and protection projects funded by the National Estuary Program posted in National Estuary Program Atlas
- What’s working to improve this Vital Sign? Answers from effectiveness evaluations

Background Documents

- Leadership Council Resolution 2011-18, Adopting a 2020 ecosystem recovery target for Pacific herring
- Pacific Herring Target Briefsheet

Other Resources

- 2016 Washington State Herring Stock Status Report
- Assessment and Management of Pacific Herring in the Salish Sea: Conserving and Recovering a Culturally Significant and Ecologically Critical Component of the Food Web
- Articles related to herring in the Encyclopedia Of Puget Sound
- WDFW Forage Fish Spawning Ecology and Map
- King County phytoplankton and zooplankton monitoring programs
- Salish Sea Marine Survival Project Zooplankton Sampling program

Contributing Partners

The Washington Department of Fish and Wildlife Marine Fish Unit (forage fish) monitors forage fish in Puget Sound