PUGET SOUND
VITAL SIGNS

VITAL Sign
MARINE WATER

Marine water quality refers to aspects of water such as temperature, salinity, oxygen, nutrient levels, organic matter, and pH. A functioning, resilient Puget Sound ecosystem also includes marine sediment quality that supports healthy communities of sediment-dwelling invertebrates. The Marine Water Vital Sign tells us about the condition of marine waters and sediment in Puget Sound.

Marine water and sediment quality is affected by many different factors including weather, climate and circulation patterns, offshore ocean conditions, inflow from rivers and streams, discharges from wastewater treatment plants and industries, erosion and stormwater runoff, and other sources of pollution.

Deception Pass in northwest Puget Sound.

Related Strategies

- Awareness of Effects of Climate Change
- Climate Adaptation & Resilience
- Education Partnerships
- Funding
- Greenhouse Gas Emissions & Carbon Sequestration
- Oil Spills
- Research & Monitoring
- Stewardship & Motivating Action
- Stormwater Runoff & Legacy Contamination
- Strategic Leadership & Collaboration
- Submerged Aquatic Vegetation
- Toxic Chemical Pollution
- Wastewater Systems
- Water Pollution Source Identification & Correction
- Working Lands Runoff

Vital Sign Reporter

PSEMP Marine Waters Work Group

Last Updated

05/22/2025

VITAL SIGN > INDICATOR	PROGRESS	STATUS
Marine Water		
Sediment Chemistry Index	NO TREND	NO TARGET
Dissolved oxygen in marine water	INDICATOR TO BE DEVELOPED	NO TARGET
Ocean acidification	INDICATOR TO BE DEVELOPED	NO TARGET
Nutrient balance in marine water	INDICATOR TO BE DEVELOPED	NO TARGET
Marine water temperature	INDICATOR TO BE DEVELOPED	NO TARGET
Marine Benthic Index	GETTING WORSE	NO TARGET
Noise in marine water	INDICATOR TO BE DEVELOPED	NO TARGET
Primary production in marine water	INDICATOR TO BE DEVELOPED	NO TARGET

KEY VITAL SIGN MESSAGES

Climate change is impacting the water cycle throughout Puget Sound, altering the timing of key chemical, physical, and biological processes including river flow, snow melt and coastal upwelling. Puget Sound waters are experiencing stronger seasonal extremes, with each basin responding differently depending on local conditions, impacting plants, animals, and humans.

- **Dissolved oxygen in marine water**: Low oxygen waters may stress or kill fish and shellfish, or reduce food availability for birds and marine mammals. Waters with low dissolved oxygen are naturally present in Puget Sound and can result from low oxygen waters entering the Salish Sea from the ocean, changes in river flow, or lack of vertical mixing.
- **Marine benthic communities**: The areas where bottom-dwelling benthic communities are impacted by natural and human-caused pressures are expanding. Excessive amounts of organic material reaching the sediments account for much of the human disturbance to benthic communities, especially in inlets with low tidal exchange.
- **Marine water temperature**: Warmer waters can change species found in Puget Sound and impact the food web by changing shellfish spawn time, reducing nutritional value of zooplankton, and slowing kelp growth. Puget Sound waters have been seasonally warmer than average, which can be driven by regional climate events such as El Niño, Pacific marine heatwaves, and shifting weather patterns.
- **Nutrient balance in marine water**: Puget Sound nutrients vary on multidecadal and shorter time scales. Over the last decade nutrients have been higher than average and increasing in some areas, and lower than average and decreasing in others. The mechanism of the cyclical behavior of nutrients in Puget Sound is currently not fully understood.
- **Ocean acidification**: Ocean acidification is an increasing threat to Puget Sound as estuarine processes, both natural and human-caused, can also lower the pH of marine waters. Coastal upwelling brings deeper, lower pH ocean waters into Puget Sound. Puget Sound waters are particularly sensitive to these conditions.

- **Primary production in marine water**: Marine phytoplankton abundance and timing of blooms has been variable from year to year. This is especially true in recent years where climate anomalies have affected water properties that influence phytoplankton. Similarly, species composition has also been variable from year to year and can have ripple effects throughout the food web.
- **Sediment chemistry**: Chemical contamination in sediment has generally been stable throughout the past 20 years. The highest concentrations of contaminants remain near population and industrial centers, however improvements in five of six urban bays show sediments in good condition or improving. Notably, pervasive and increasing microplastics were present in Puget Sound sediments.

BACKGROUND DOCUMENTS

Implementation Strategy

The Partnership and its affiliated network of researchers works with the three Strategic Initiative Lead Teams on Implementation Strategy development and operationalization. Please read more about these teams and our shared work at https://pugetsoundestuary.wa.gov/recovering-puget-sound/

- Stormwater Strategic Initiative
  - Marine Water Quality Implementation Strategy

Indicator Targets

- 2020 Ecosystem Recovery Targets
  - Leadership Council Resolution 2011-10: Adopting a 2020 ecosystem recovery target for dissolved oxygen in marine waters
  - Leadership Council Resolution 2011-19: Adopting a 2020 ecosystem recovery target for marine sediment quality
  - Marine Water Quality 2020 Target Briefsheet
  - Toxics in Sediments 2020 Target Briefsheet

OTHER RESOURCES

- Puget Sound Metrics Dashboard reporting on estuarine flow, temperature changes from surface heat fluxes, salinity changes from rivers and rain, water column dissolved oxygen, and ocean boundary conditions
- Marine Waters Overview by the Puget Sound Ecosystem Monitoring Program Marine Waters Work Group
- Puget Sound Marine Water Monitoring, Washington Department of Ecology
- Puget Sound Sediment Monitoring, Washington Department of Ecology

CONTRIBUTING PARTNERS

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