



## Kelp canopy monitoring in Washington State

Kelp is a type of seaweed that provides critical habitat along Washington's saltwater shorelines. With more than 20 species of kelp, Washington State has one of the most diverse kelp communities in the world. Valued species like salmon, Orca killer whales and forage fish rely on kelp for habitat. Kelp also fuels the food web through high primary production. Globally, kelp is stable in some regions, and experiencing dramatic losses in many other locations.

The goal of kelp monitoring in Washington State is to understand trends in this critical resource and to guide management actions to conserve kelp. DNR's long-term monitoring data on canopy-forming kelp found that populations on the outer coast and western Strait of Juan de Fuca have been stable. In contrast, there is concern for major losses in portions of Puget Sound. DNR is now conducting historical research to define a baseline for bull kelp (*Nereocystis luetkeana*) from the late 1800's, early in the history of European settlement, and to identify departures from the historical baseline.

A wide range of human activities impact kelp through changing water quality, physical habitat characteristics and the community of animals that interact with kelp. Because kelp is a cold water species, climate warming is expected to have major future impacts.

DNR's kelp monitoring data is being used to inform management actions. DNR partnered with a diverse group of state, federal, tribal and non-governmental groups and developed the *Puget Sound Kelp Conservation and Recovery Plan*. The plan synthesizes knowledge about kelp in Washington State and coordinates management actions to optimally protect this important and iconic resource.



Kayakers explore bull kelp beds along Tacoma's shoreline. Photo credit: Aaron Barna.

### Why does this matter to DNR?

Like coral reefs and rain forests, kelp is a foundation species that supports a unique and diverse community of animals. Many of these animals are both iconic and critical to the ecosystem. Some, like Chinook salmon and Orca killer whales, are also identified as state and federal priorities for protection and recovery. Stewardship of kelp is part of DNR's responsibilities as the state steward of aquatic lands. Through monitoring, DNR can understand the state and the kelp resource and

### For more information

<https://www.dnr.wa.gov/programs-and-services/aquatics/aquatic-science/kelp-monitoring>

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## Project Outcomes

In South Puget Sound, recent DNR research has shown dramatic losses in bull kelp since 2013, with all 4 beds that were monitored either declining or disappearing by 2018. In contrast, bull kelp beds appear to be stable in the Tacoma Narrows, where intense tidal mixing may provide a refuge from environmental stressors. DNR is completing historical studies of bull kelp extent in South and Central Puget Sound, areas where losses are apparent.

DNR's long-term data set of canopy-forming kelp from the outer coast and Strait of Juan de Fuca allowed us to detect climate signals in the dynamics of kelp forests. Kelp cover was strongly related to large scale climate indices. Increased kelp cover occurred when seawater was colder and more nitrogen rich, when the Pacific Decadal Oscillation and the Oceanic Niño Index were negative and the North Pacific Gyre Oscillation was positive.

Kelp forests along the western Strait of Juan de Fuca generally remained stable when compared to historical kelp surveys from 1911. Meanwhile, kelp forests declined in the eastern boundary of the strait, an area which is close to human population centers and distant from cooler oceanic waters.

DNR conducted high resolution monitoring along the Elwha River mouth during dam removal with USGS and other collaborators. Researchers documented dramatic declines. Following the return to normal sediment loads, the kelp resource has re-bounded, which provides evidence of the ability of kelp to recover when stressors are reduced.



DNR scientists and Marine Resource Committee volunteers monitor a kelp bed at North Beach, in Port Townsend. Photo credit: Russ McMillan.

## Future Opportunities

DNR will continue to monitor this important canopy-forming kelp resource. Climate warming is a major concern because kelp is a cold water species, and warming could exceed thresholds for damage. There is also a pressing need to extend long-term monitoring of kelp canopies throughout Puget Sound. Kelp beds along the coast and strait is likely to be less vulnerable than in Puget Sound, which is subject to greater human impacts and higher water temperatures.

In addition to the two species of canopy-forming kelp, Washington State is home to 20 species of understory kelp. Understory species are much more abundant, yet difficult to monitor. DNR is developing new methods to track this important resource.

## Project Outputs

Recent publications and data:

- [Bull kelp monitoring in South Puget Sound](#)
- [Kelp response to sediment releases associated with Elwha Dam Removal](#)
- [Scientific study of kelp dynamics \(Journal of Ecology\)](#)
- [Storymap with maps showing historical and current canopy-forming kelp distribution](#)
- [Kelp forest dynamics following decades of sea otter expansion](#)
- [Download GIS Data](#)