

Monitoring Marine Water Quality and Conditions 24/7: *The story of a Puget Sound buoy*

by Stephanie Jaeger

Have you ever looked out on Puget Sound from Lincoln Park or the Fauntleroy ferry and wondered why the big yellow buoy is out there? At more than 7 feet in diameter and standing 7 feet tall, this buoy is anchored in more than 500 feet of water about a half mile off Point Williams, with water quality sensors suspended below the surface. It is operated and maintained by the King County Environmental Lab to continuously track Puget Sound water quality and conditions, and is one of several located throughout the Salish Sea.

The buoy is one of King County's four automated marine monitoring sites and is the only floating platform. The other systems are attached to piers at the Seattle Aquarium and docks in Quartermaster Harbor. King County began using continuous data systems in 2008 to supplement water quality data that's collected once or twice monthly across central Puget Sound. The Point Williams buoy was installed in 2013, and recently redeployed in March after it briefly got loose from its mooring.

The water quality data collected with the buoy are available for the public to see and download. These data can be used to help understand how Puget Sound changes between tidal cycles, between day and night, between seasons, and between years. These data can also feed into computer models that predict future conditions, akin to meteorological monitoring stations that are used to ground-truth weather forecasts. These data are also used to understand how water quality is changing over time, to compare with other locations in Puget Sound, and provide data for resource management and policy decisions.

What type of data does the buoy collect? It measures physical, chemical, and biological properties near the water's surface, including temperature, salinity, dissolved oxygen, pH, chlorophyll-a (a proxy for the amount of phytoplankton in the water), and dissolved nitrate.

Phytoplankton are tiny floating plant-like organisms that form the base of Puget Sound's food web, with creatures

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Measured together, these buoy data can inform our understanding of dynamics in Puget Sound and changes over time.

Photo: S. Jaeger

like seabirds, salmon, and orcas at the top. While nitrate nitrogen is an important nutrient that plants and phytoplankton need to grow, too much can be problematic. Measured together, these data can inform our understanding of the dynamics in Puget Sound and help monitor for changes over time.

During spring, as the days get longer and the water column stabilizes, the phytoplankton “bloom” and suck up nitrate and other nutrients. Warmer spring temperatures combined with lower salinities from rain and rivers, along with light and variable winds, all contribute to set up water column stability (stronger layering between surface and deep waters).

Timing and magnitude of the bloom are important for marine life and can be captured by the sensors on the buoy. For example, water temperature, nitrate, and chlorophyll-a are shown for a week and a half in April 2017 along with wind speed and direction from the West Point lighthouse in Figure 1.

The phytoplankton bloom can be observed starting on April 3 by increasing chlorophyll-a levels and decreasing nitrate, then the bloom ramps up over the next couple days along with an increase in water temperature. Afterwards, a strong and sustained southerly windstorm beginning on April 7 serves to stir up the water and break up the bloom. The

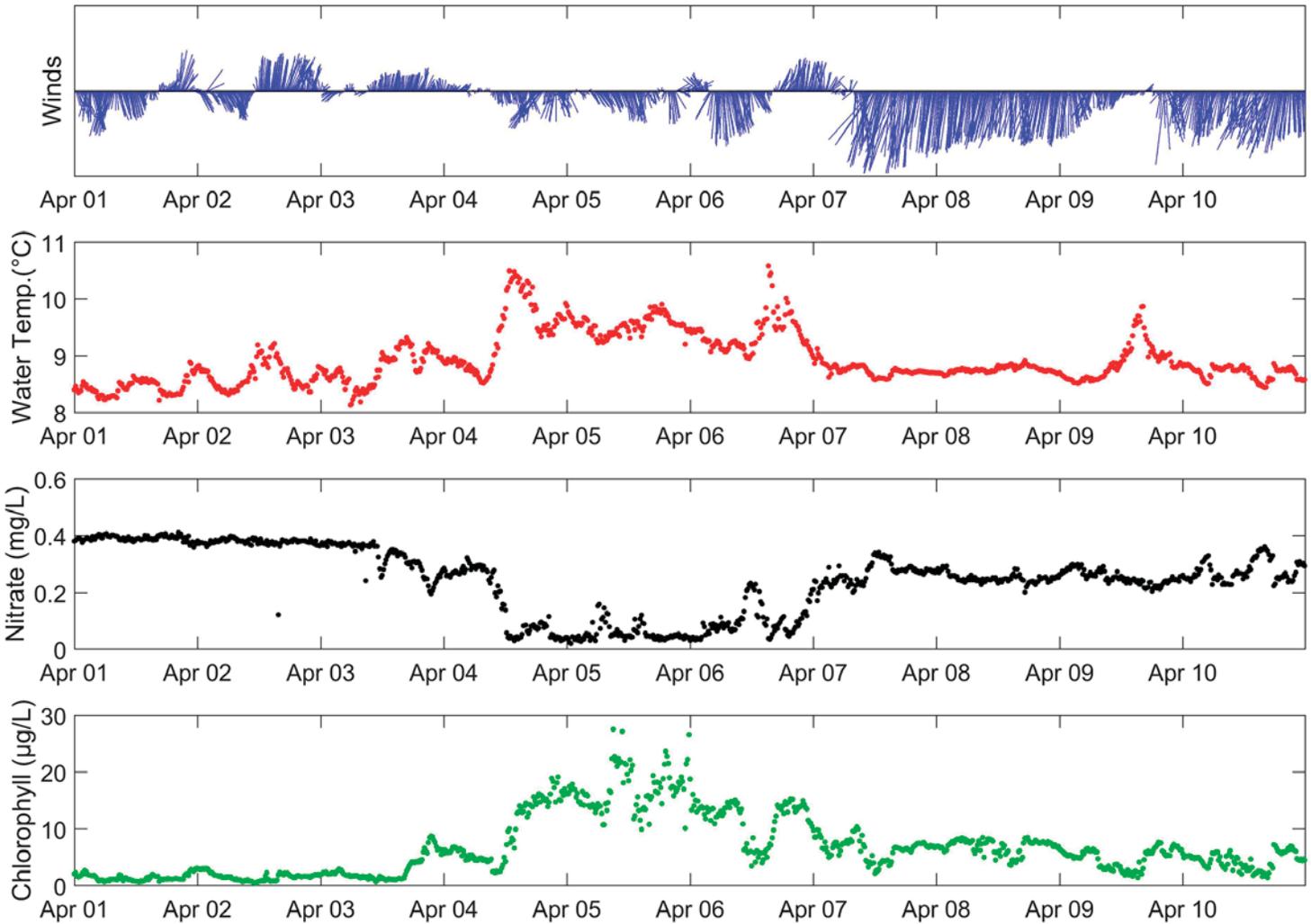


Figure 1. Conditions and water quality data collected every 15 minutes from April 1 – 10, 2017. The top panel shows winds measured at West Point Lighthouse, where the line indicates the direction the wind is coming from and relative wind speed (by the length of the line). The lower three panels show water temperature, dissolved nitrate, and chlorophyll-a fluorescence measured at the Point Williams buoy at 2 feet deep.

The increase in chlorophyll and decrease in nitrate starting on April 3 are indicators of a phytoplankton bloom, followed by a southerly windstorm on April 7 that mixes up the water and breaks up the bloom. Buoy observations make it possible to capture events like these that may otherwise go undetected.

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cycle of bloom and bust continues through the growing season until September.

For more examples of water quality and conditions monitored by King County and other regional entities, see the [Puget Sound marine waters 2016 overview report](#). The King County mooring sites are also part of a much larger data collection network called the [Northwest Association of Networked Ocean Observing Systems](#), which includes partners who also collect marine data, such as the University of Washington, National Oceanic and Atmospheric Administration, and many others.

Recently, the development team released new apps to provide all these data in one place for activities like [walking on the beach](#), [fishing](#), and [boating](#). For example, if you'd like to take a trip to the beach and you want to figure out when to go and what to wear, the [Beach View](#) tool will show you current and forecasted conditions for tide height, air and water temperatures, wind and waves. It also provides a link to check out if marine beaches are open or closed for [swimming](#) due to possible health risks. This is just one example of how the data collected by King County and partner agencies can be used and accessed not just by scientists, but by the greater public.

King County's SciFYI is published by:



King County

Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Section Manager: Dave White

Newsletter Coordinator: Larry Jones

Editor: Doug Williams

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Send questions, comments and future story ideas to:

- Jim Simmonds – jim.simmonds@kingcounty.gov, 206-477-4825
- Kate O'Laughlin – kate.olaughlin@kingcounty.gov, 206-477-4789
- Deb Lester – deborah.lester@kingcounty.gov, 206-477-4752

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File: 1810_9165L_SciFYInews.indd  1/202M

