Apr 6th, 9:00 AM - 9:15 AM

Nutrient dynamics and ties to environmental conditions and drivers in central Puget Sound

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Nutrient Dynamics & Ties to Environmental Conditions in Central Puget Sound

*Highlights from 2016-2017*

Stephanie Jaeger, Ben Larson, Kimberle Stark, & Bob Kruger

King County Dept. of Natural Resources & Parks
Water and Land Resources Division
How Do We Monitor Water Quality?

- Offshore waters: 1994
  - CTD Sensors & Discrete Data
- Beach waters: 1999
  - Discrete Data
- Moorings: 2008
  - Automated sensors sample every 15-min
  - Point Williams buoy since 2013
- Phytoplankton: 2008
  - Semi-Quantitative and FlowCam since 2014
- Zooplankton: 2014
- Sediments (offshore and beach)
Offshore Water Column Sites and Moorings
• Optical continuous nitrate sensor added in April 2017 (with sensor loan and help from WA Dept. of Ecology)
Figure 2. Rough time scales of physical, bio-optical, and biogeochemical processes along with time scales that are accessible with different sampling platforms. Figure is a schematic and is not to scale. Note: The mooring designation refers to both fixed location and AUVs and gliders used as virtual moorings (Griffiths et al., 1999b).
Variability in short and long time scales

Point Williams sites: 1-m

Nitrate (+Nitrite) N (mg/L)

Month

1 2 3 4 5 6 7 8 9 10 11 12

1997 – 2016 Bi/Monthly discrete
2017 15-min mooring

30 uM
20 uM
10 uM
0
Tidal and daily signals are significant

April - August 2017 Nitrate - Spectral analysis

24 hr

12.5 hr
Surface Nitrate between years: 2016 vs. 2017

2017 Point Williams: 1-m

- **2016 Nitrate**
- **2017 Nitrate**

SUNA Nitrate Nitrogen (mg/L)

Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---

The graph shows the concentration of surface nitrate nitrogen (SUNA Nitrate) from January to December for both 2016 and 2017.
July – early August 2017

Water level (NOAA)

Winds at WP light (NOAA)

Surf. Salinity

Surf. Temp.

Surf. Nitrate
Surface Nitrate between years: 2016 vs. 2017

2017 Point Williams: 1-m

- Red: 2016 Nitrate
- Blue: 2017 Nitrate

Graph showing the concentration of Nitrate in mg/L over time from January to December for both 2016 and 2017.
Stratification greater in 2017 than 2016

* = Depth of Max buoyancy frequency calculated as in S. Moore et. al 2008
Nutricline follows chlorophyll

* = Depth of Max buoyancy frequency calculated as in S. Moore et. al 2008
Consider drivers when evaluating change over time.
Summary Points

• Scales are important when looking at drivers of change, and can impact inter-annual variability, along with large scale climate drivers.
  – These can impact sensitivity to eutrophication
  – Different processes can arise between basins
• Large short-term variability in surface nitrate conditions at times during growing season, higher at night.
• Nutricline depth provides information on where waters could be most sensitive to local inputs
• Range of nitrate variability and understanding of drivers can be applied to models to better characterize the natural system
Thank you!

Contributors:

– King County Environmental Lab staff for year-round field sampling and lab analysis
– WA Dept. of Ecology Marine Monitoring Unit for use of SUNA nitrate sensor