



Eyes Over Puget Sound

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Surface Conditions Report, *July 24, 2017*



Critter of the month: The Ice Cream Cone Worms

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Up-to-date observations of water quality conditions in Puget Sound and coastal bays



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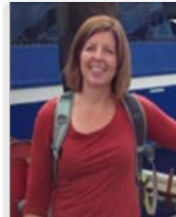
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Skip Albertson



Julia Bos



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Krembs (Editor)*



*Tyler Burks
Jim Shedd*



Personal impressions [p. 3](#)

Why is Hood Canal water so turquoise? Because of a harmless coccolithophore bloom.

Climate influences [p. 5](#)

Warm air temperatures and abundant sunshine have kept most river flows higher with snowmelt. Upwelling has been weak.

Water column [p. 8](#)

Temperatures are get warmer again, especially in Central Sound. Record spring rains and snow melt resulted in new salinity minima. In June, DO was as expected.

Aerial photography [p. 10](#)

Intense and unusual blooms in Hood Canal and Case Inlet. Strong blooms in orange-red-brown in Budd, Eld and Henderson Inlets. Large mats of organic material and macro algae in South, Central Sound and Hood Canal. Many schools of fish. Water is generally greener than in other years.

Streams [p. 34](#)

Slightly warmer temperatures and dry conditions has led to a variable supply of freshwater to Puget Sound.

Editorial assistance provided by:

J. Ruffner, A. Brownlee, V. Partridge, C. Maloy

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Why is Hood Canal water so turquoise?

Because of phytoplankton! Tiny little plant-like organisms called coccolithophores are currently blooming in Hood Canal. These single-celled organisms build calcium carbonate scales around themselves. When present in very large numbers, the water around them appears cloudy and turquoise. This harmless bloom is non-toxic to humans and other organisms.

Interesting fact: The White Cliffs of Dover in England are composed of coccolithophore scales from the Cretaceous period!



<http://www.bbc.co.uk/nature/life/Coccolithophore>

Critter of the Month – The Ice Cream Cone Worms



Dany Burgess & Angela Eagleston
Marine Sediment Monitoring Team

Family Pectinariidae

Beat the summer heat with the coolest critters around, the Ice Cream Cone Worms! Find out about the two species of pectinariids that inhabit Puget Sound, and what makes them a special treat for taxonomists to identify.



Fun Facts!

- They build their cone-shaped tubes from grains of sand.
- They use golden eyelash-like hairs on their heads to burrow into the sediment.
- You can see their digestive processes through their translucent bodies.





Climate and natural influences, including weather, rivers, and the adjacent ocean, can affect our marine waters. Graphics are based on provisional data and are subject to change. http://www.ecy.wa.gov/programs/eap/mar_wat/weather.html, page 26.

Summary:

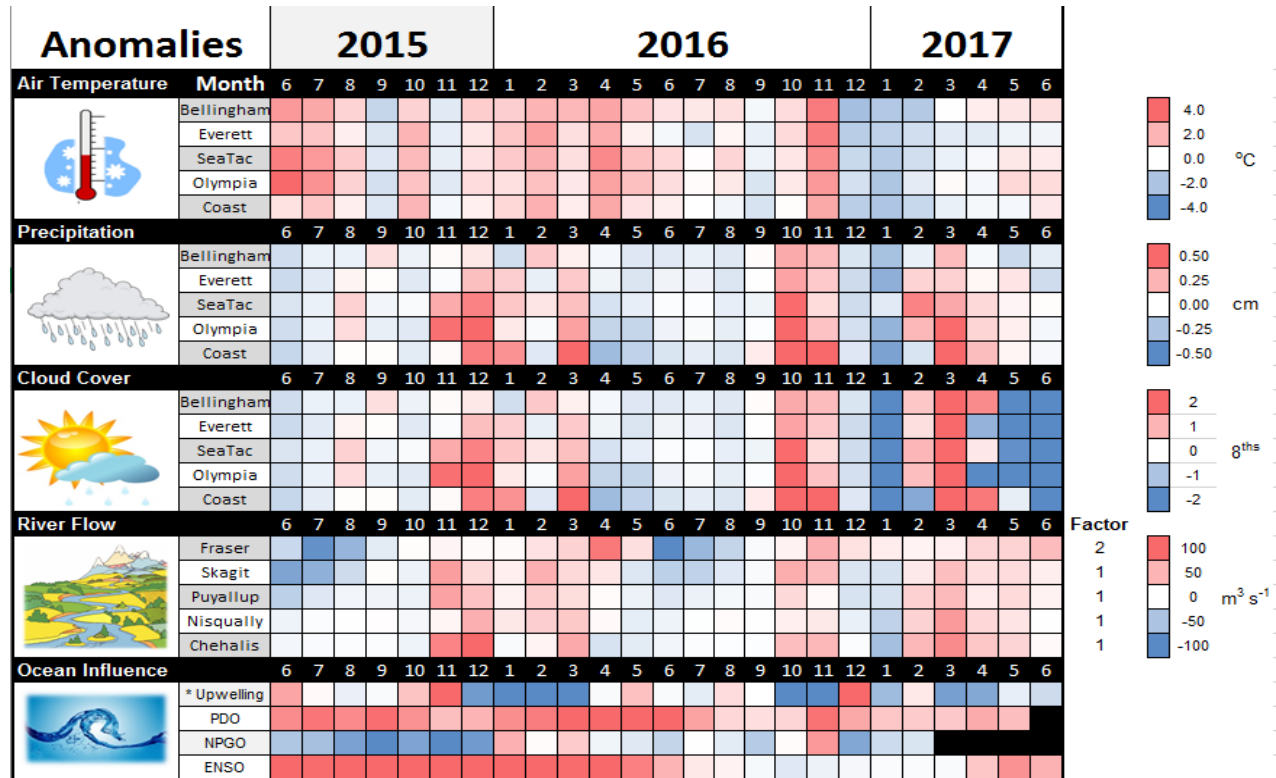
Air temperatures have been mostly above normal since May.

Precipitation levels have been below normal, after a wet spring.

Sunshine levels have been above normal.

River flows are still mostly above normal due to snow melt from the warmer temperatures.

Upwelling has been weaker than normal. ENSO and PDO are trending warmer.



*Upwelling Anomalies (PFEL)
 PDO = Pacific Decadal Oscillation
 NPGO = North Pacific Gyre Oscillation
 ENSO = El Niño Southern Oscillation

higher expected lower No data

Our long-term marine monitoring stations in Washington



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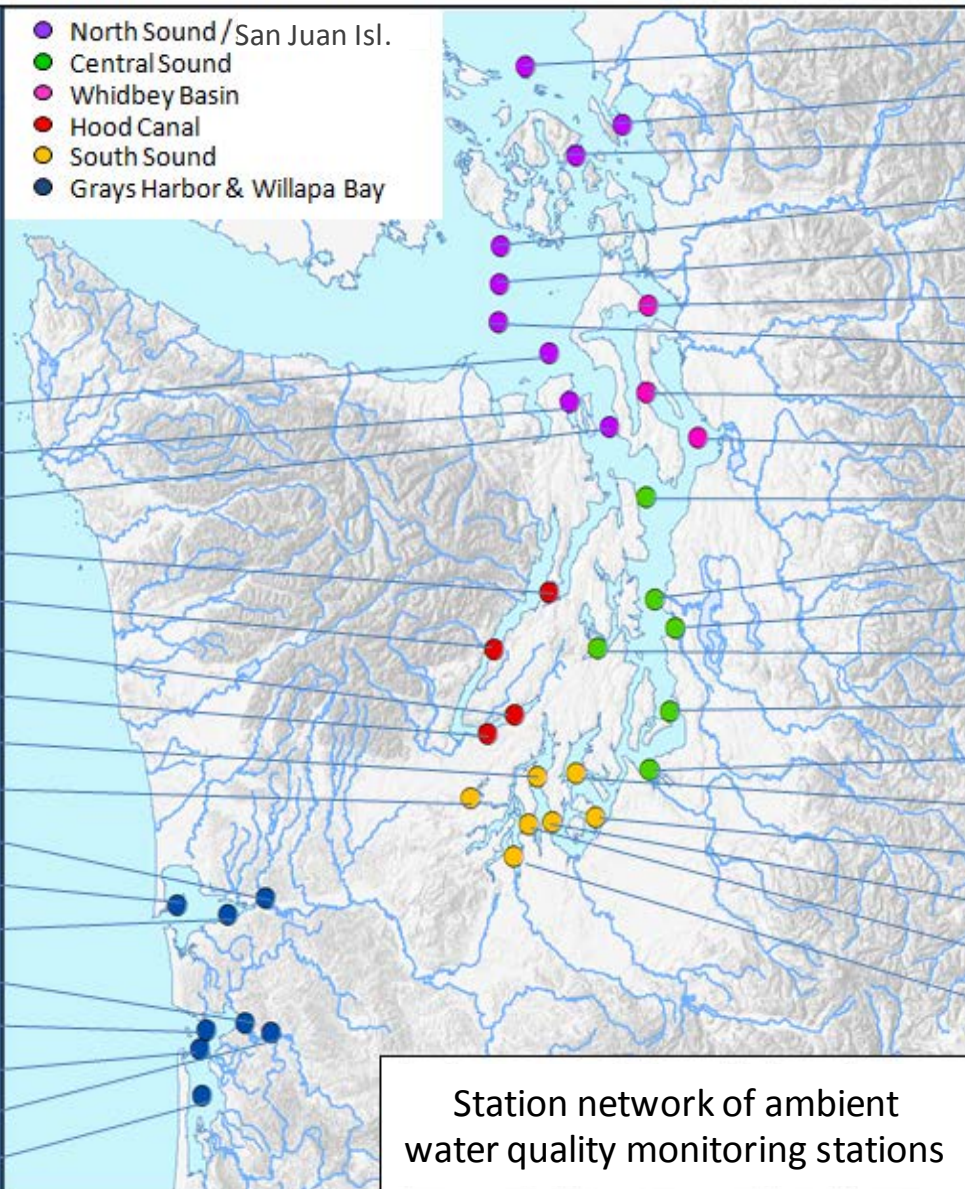
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- North Sound / San Juan Isl.
- Central Sound
- Whidbey Basin
- Hood Canal
- South Sound
- Grays Harbor & Willapa Bay



Stations:

- ADM002
- PTH005
- ADM001
- HCB010
- HCB003
- HCB007
- HCB004
- CSE001
- OAK004
- GYS004
- GYS016
- GYS008
- WPA003
- WPA004
- WPA113
- WPA001
- WPA006

- GRG002
- BLL009
- RSR837
- SJF000
- SJF001
- SKG003
- SJF002
- SAR003
- PSS019
- ADM003
- PSB003
- ELB015
- SIN001
- EAP001
- CMB003
- CRR001
- GOR001
- NSQ002
- DNA001
- BUD005

Station network of ambient water quality monitoring stations

We use a boat and a chartered float plane equipped with a CTD package to access our monthly monitoring stations.

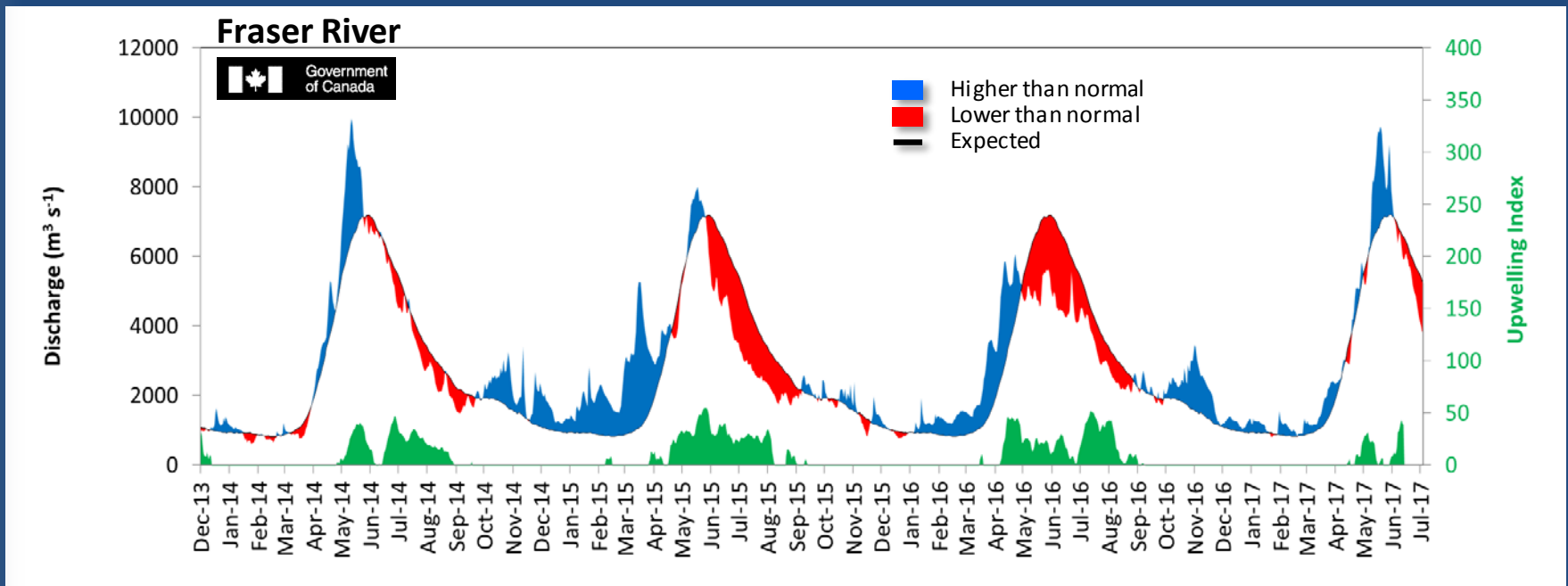
[Start here](#)

We communicate data and environmental marine conditions using:

1. Marine Water Condition Index (MWCI)
2. Eyes Over Puget Sound (EOPS)
3. Anomalies and source data

Year 2016 had record-breaking global temperatures. The year 2017 is looking much better. Fraser River flows were normal or higher than normal in early June and similar to the year 2014. However, due to weaker than normal **upwelling** along the coast, the inflow of low oxygenated, nutrient-rich water into Puget Sound has been lower.

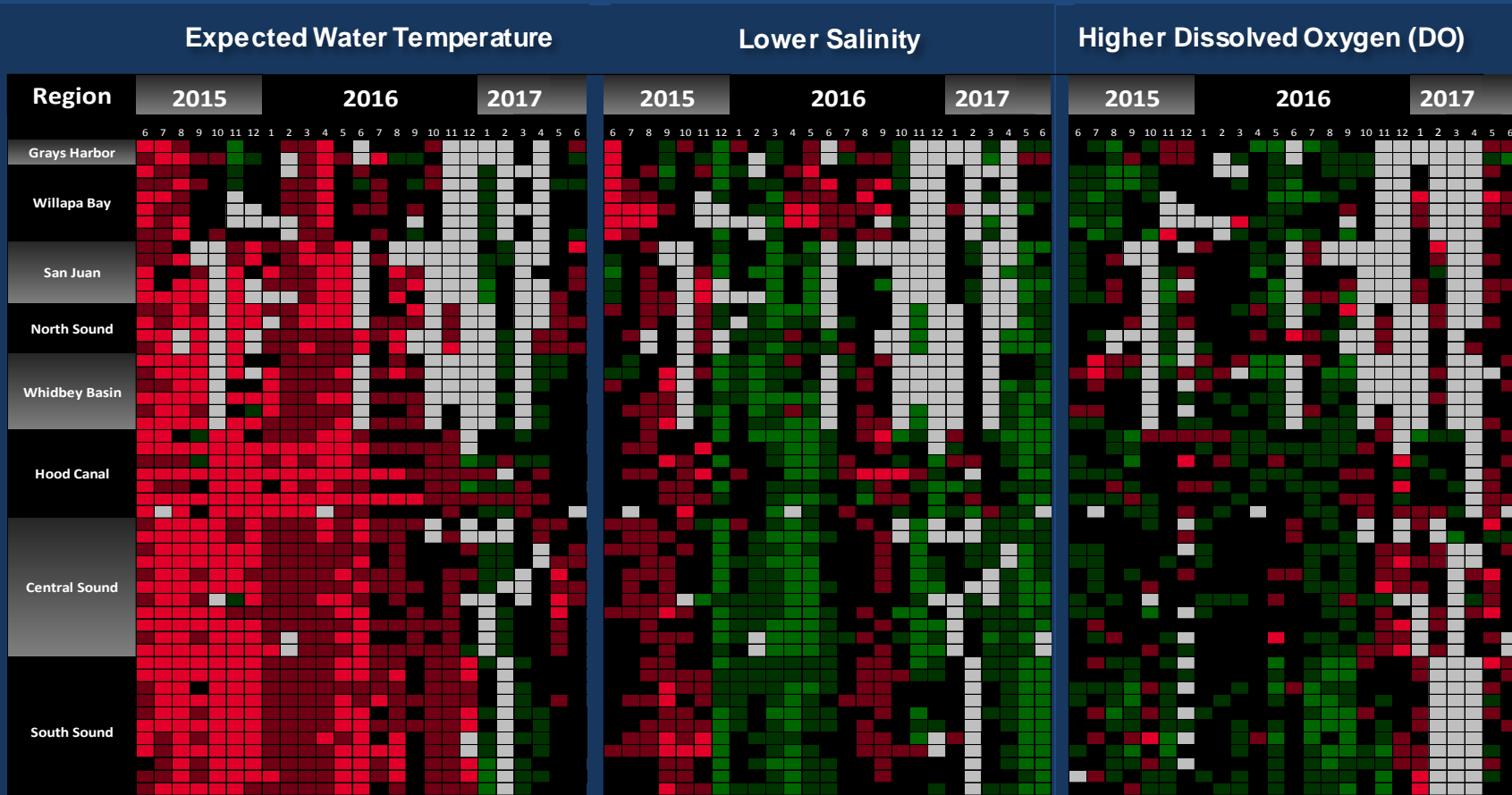
Historically peaks of coastal upwelling and the freshet are in sync



[Wikipedia:](#) The term **freshet** is most commonly used to describe a spring thaw resulting from snow and ice melt in rivers located in the northern latitudes of North America.



After the cooler winter & spring of 2016-2017, water temperatures are mostly normal, with some warmer water in Central and North Sound. Higher spring rains contributed to the significantly fresher (lower salinity) conditions with several basins reaching new salinity minima. Dissolved oxygen has returned to expected levels in June after reaching new maxima in some places during May.



■ = higher than expected (>IQR, n=13)
 ■ = expected (=IQR, n=13)
 ■ = lower than expected (<IQR, n=13)
■ = higher than previous measurements
 ■ = no data
■ = lower than previous measurements

The ocean affects water quality: Ocean Climate Indices



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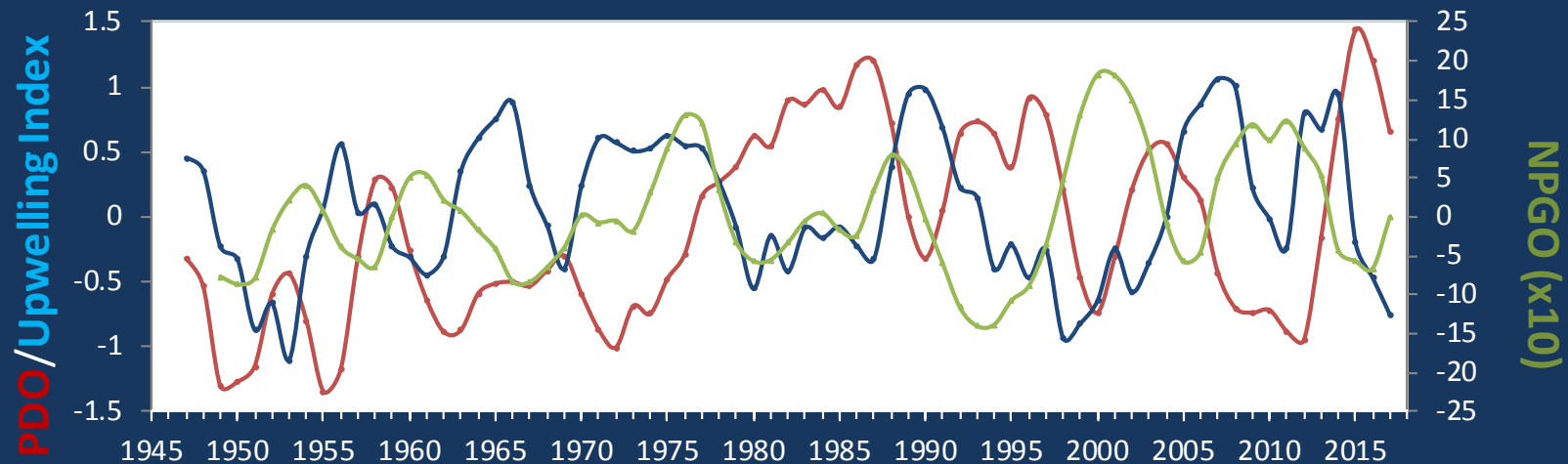
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- a) Pacific Decadal Oscillation Index (**PDO, temperature**) [\(explanation\)](#)
- b) Upwelling Index (anomalies) (**Upwelling, low oxygen**) [\(explanation\)](#)
- c) North Pacific Gyre Oscillation Index (**NPGO, productivity**) [\(explanation\)](#)

Three-year running average of PDO, Upwelling, and NPGO index scores



Ocean boundary conditions long-term variability: (a) water is still warm (PDO), (b) upwelling of low oxygen and high nutrient ocean water are low (Upwelling Index anomaly), and (c) surface productivity along the coast is near normal (NPGO).



Intense and unusual blooms in Hood Canal (coccolithophores) and Case Inlet (brown-purple). Strong blooms of orange-red-brown in Budd, Eld, and Henderson Inlets. Large mats of organic material and macro algae in South, Central Sound and Hood Canal. Many schools of fish. Water is generally greener than in other years.

Start here

Puyallup River discharging into Commencement Bay



The Puyallup flowing towards Commenc. Bay



Mixing and Fronts:

Tidal fronts near Port Madison, Blake Island, Commencement Bay, Pickering Passage and Nisqually Reach. Internal waves in Commencement Bay and Hood Canal/Bangor.



Jellyfish:

No jellyfish but abundant schools of fish in South Sound.



Suspended sediment:

Glacial flour from Puyallup river.



Visible blooms:

Turquoise bloom in Hood Canal (coccolithophores). Orange-red-brown blooms in Budd, Eld, Henderson Inlets, and northern Hood Canal. Brown-purple bloom in Case Inlet and northern Hood Canal.



Debris:

Macro algae near beaches in large numbers in Mayo Cove and Yukon Harbor. Drifting in large numbers in South, Central Sound, Sinclair Inlets, and Hood Canal.



Click on numbers



Aerial photography and navigation guide

Date: 7-24-2017

Tide data (Seattle):

Time	Height (ft)	High/Low
12:12 AM	5.85	L
05:17 AM	11.19	H
12:09 PM	-2.80	L
7:24 PM	12.22	H

Flight Information:

Sunny, good visibility

--- Flight route

Observation Maps:

Central Sound & Hood Canal

South Sound



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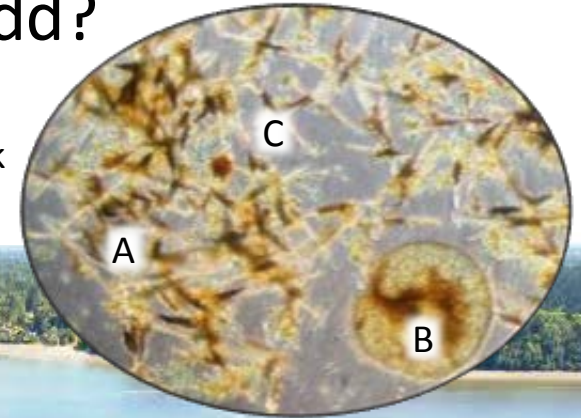
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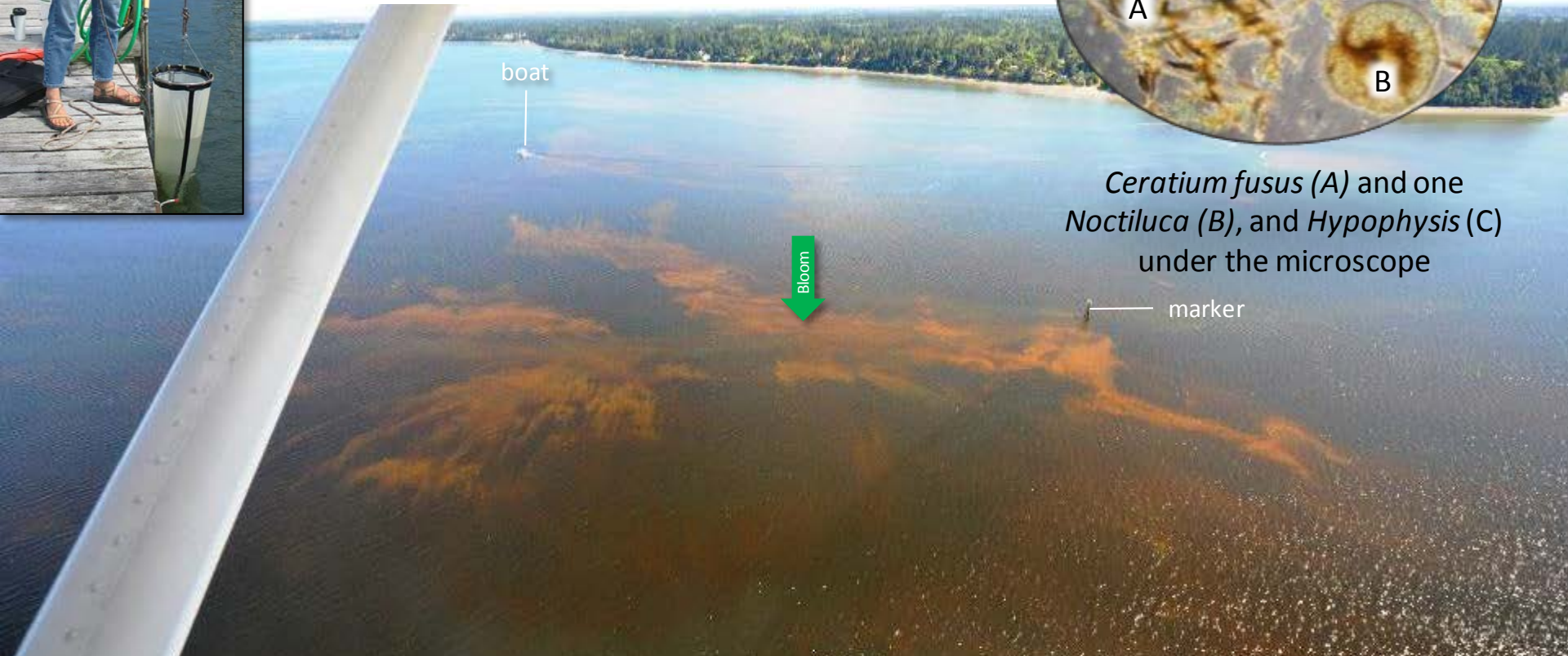

 Pacific
 Shellfish
 Institute

What's Blooming in Budd?

Aimee Christy collected a 3m net tow sample from 2 lower Budd Inlet locations during the bloom and observed a thick tangle of *Ceratium fusus* (100X magnification).



Ceratium fusus (A) and one *Noctiluca* (B), and *Hypophysis* (C) under the microscope



Large, very patchy orange-brown bloom.

Location: Budd Inlet (South Sound), 11:56 AM.

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boat

Bloom

Large, very patchy orange-brown bloom.
Location: Budd Inlet (South Sound), 11:56 PM.



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*Large, very patchy orange-brown bloom concentrated in two Budd Inlet marinas.
Location: Budd Inlet (South Sound), 12:00 PM.*



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A.



B.



*Large mats of organic material accumulating along tidal fronts.
Location: Near Dana Passage (South Sound), 12:08 PM.*



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Red-brown bloom and schools of fish off Young Cove.

Location: Eld Inlet (South Sound), 12:04 PM.

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Extensive coccolithophore bloom.

Location: Potlatch (Hood Canal), 12:18 PM.



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Coccolithophore bloom, extending to Bangor. Other red-brown and brown purple bloom near surface.
Location: Near Dabob Bay (Hood Canal), 12:38 PM.



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Large mats of organic material.

Location: Eagle Harbor, Bainbridge Island (Central Sound), 12:50 PM.



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*Tidal outflow from Dyes Inlet bringing organic material and algal bloom reaching into Sinclair Inlet.
Location: Sinclair Inlet (Central Sound), 12:55 PM.*



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*Tidal outflow from Sinclair Inlet meeting outgoing water from Colvos Passage. Both are rich in algal.
Location: Colchester (Central Sound), 12:57 PM.*



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*Large mats of organic material accumulating at the fringes of the Puyallup River plume.
Location: Near Poverty Bay (Central Sound), 1:05 PM.*



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*Internal waves and glacial flour mixed in with an algae bloom inside Puyallup River plume.
Location: Commencement Bay (Central Sound), 1:06 PM.*



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Large mats of macro algae near Puyallup River plume.
Location: Commencement Bay (Central Sound), 1:07 PM.



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*Internal waves and glacial flour mixed in with an algae bloom.
Location: Commencement Bay (Central Sound), 1:10 PM.*

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Schools of fish and macro algae in shallow water.
Location: Mayo Cove, Carr Inlet (South Sound), 1:17 PM.



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B.



Macro algae in shallow water.

Location: A. Off South Head, B. Mayo Cove, Carr Inlet (South Sound), 1:17 PM.



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B.



Intense bloom in brownish-purple and large mats of organic material along tidal fronts.

Location: A. Northern Harstine Island, B. Near Buffingtons Lagoon, Case Inlet (South Sound), 1:20 PM.



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Brownish-purple bloom from Case Inlet extending into Nisqually Reach. Large mats of macro algae.
Location: Nisqually Reach (South Sound), 1:25 PM.



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Schools of fish in red-brown bloom.

Location: Henderson Inlet (South Sound), 1:27 PM.

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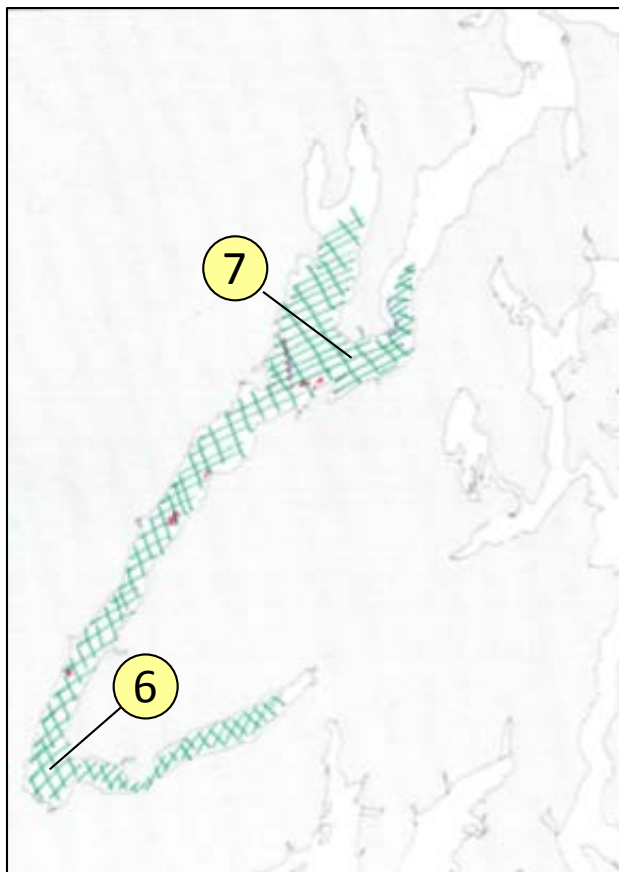
Large mats of organic material.

Location: Off Gull Harbor, Budd Inlet (South Sound), 1:31 PM.

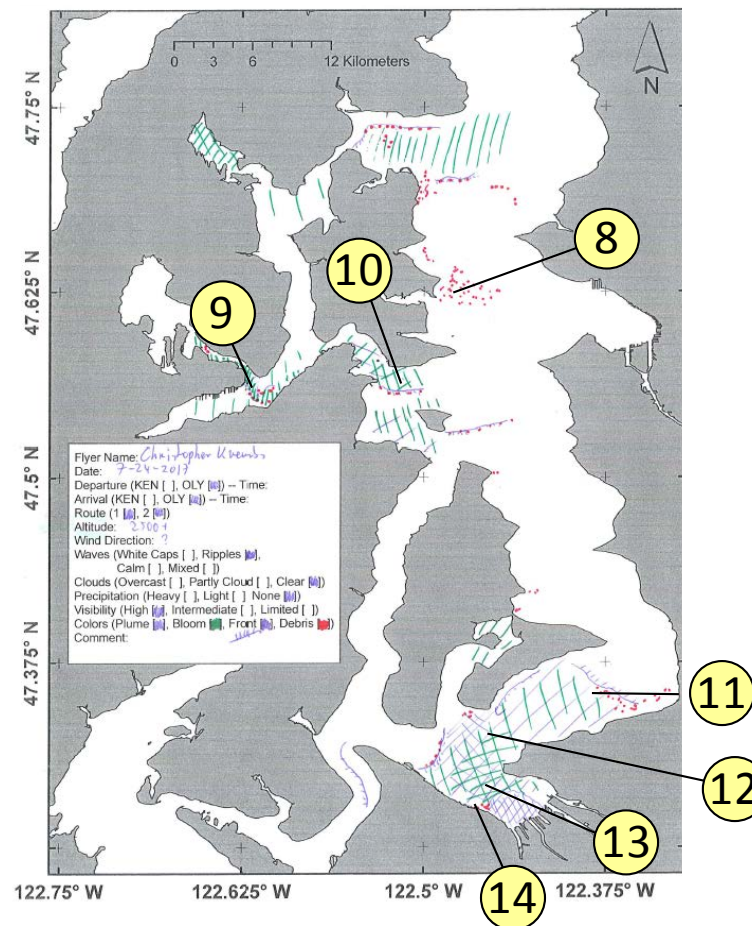


Date: 7-24-2017

Hood Canal



Central Sound

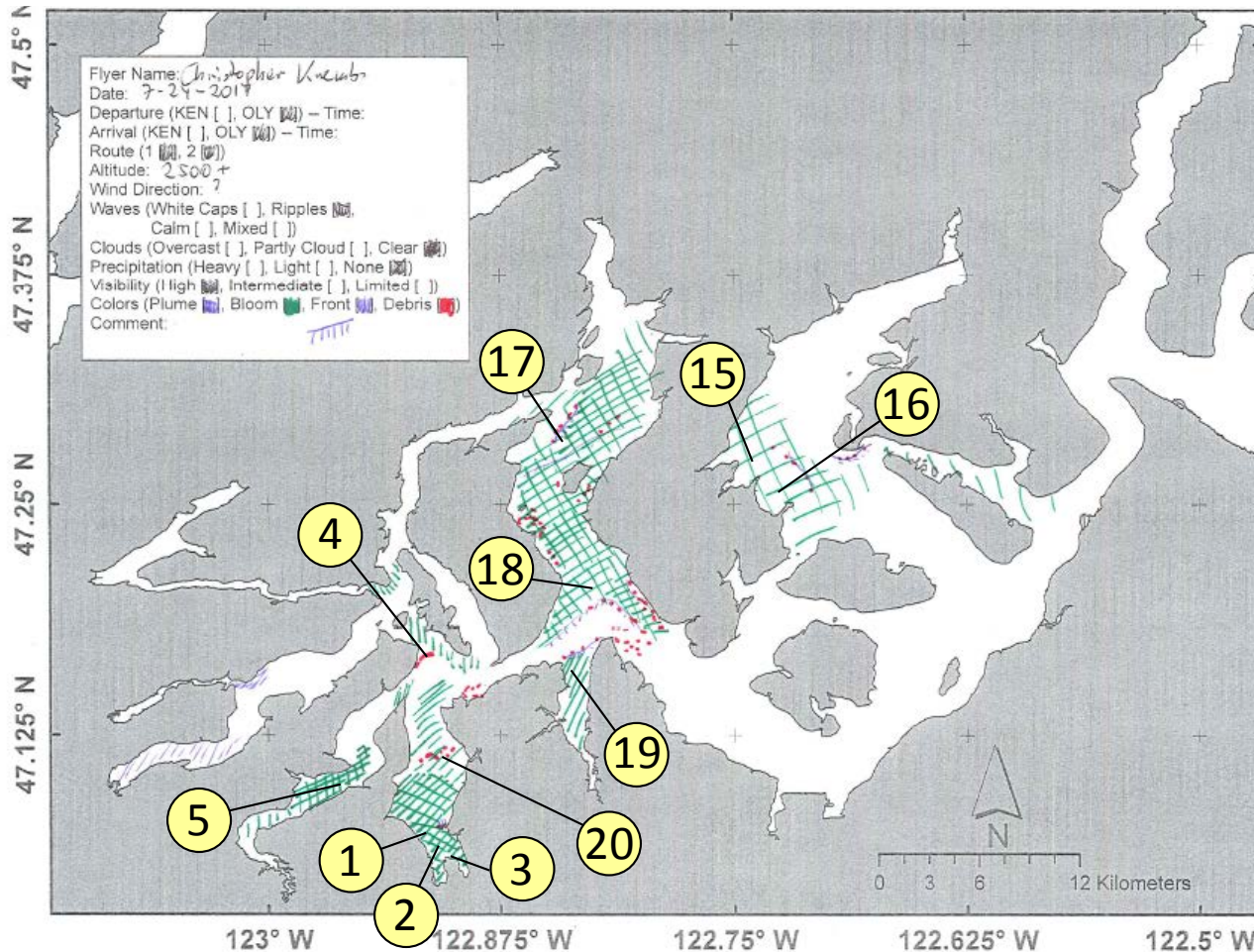


Numbers on map refer to picture numbers for spatial reference



Date: 7-24-2017

South Sound

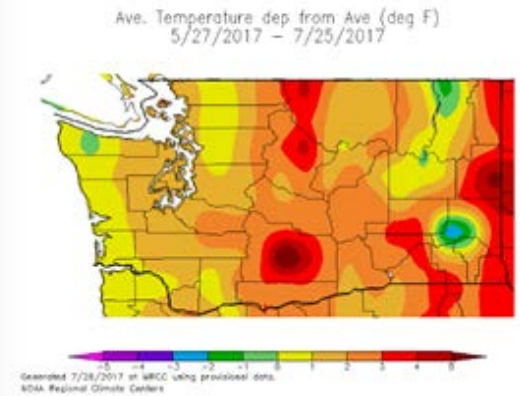
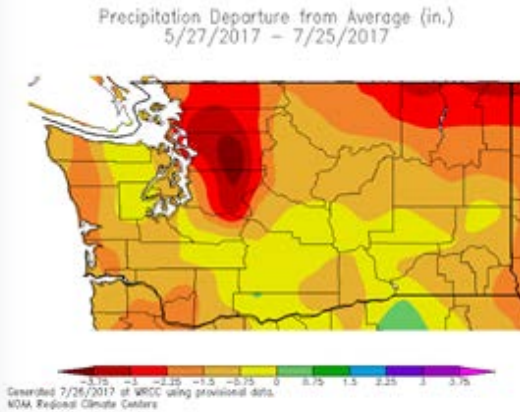


Numbers on map refer to picture numbers for spatial reference

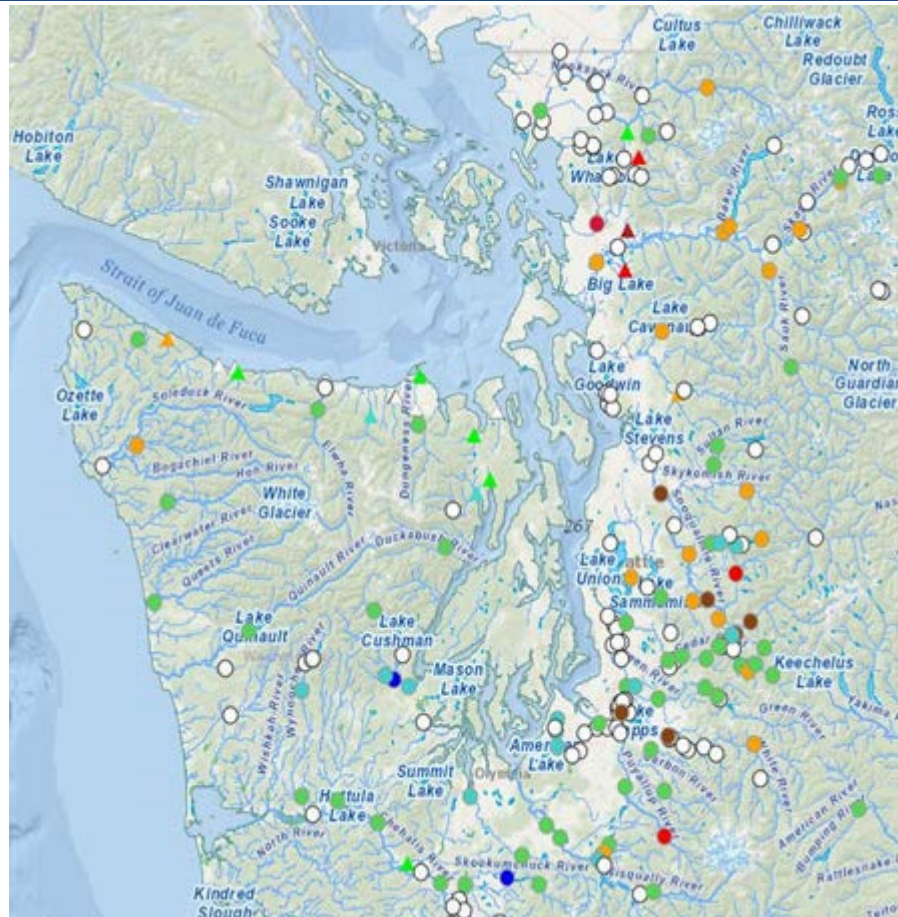


Tyler Burks,
Jim Shedd
Ecology

Slightly warmer temperatures and dry conditions in parts of western WA, despite a robust snowpack, lead to a variable supply of freshwater to Puget Sound. The Skagit, Snohomish, and Stillaguamish Rivers are below normal due to a lack of precipitation. Rivers of south Puget Sound and from the Olympic Mountains are flowing normally.



https://wrcc.dri.edu/anom/was_anom.html



USGS Real Time Streamflow Values

- Much above normal (>90%)
- Above normal (76-90%)
- Normal (25-75%)
- Below normal (10-24%)
- Much below normal (5-10%)
- Far below normal (>5%)
- Lowest recorded
- Not Ranked

Ecology Daily Streamflow

- Daily Streamflow
- ▲ Highest recorded
 - ▲ Much above normal (>90%)
 - ▲ Above normal (76-90%)
 - ▲ Normal (25-75%)
 - ▲ Below normal (10-24%)
 - ▲ Much below normal (<10%)
 - ▲ Lowest recorded
 - △ Not ranked

Get data from Ecology's Marine Monitoring Programs



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Long-Term Monitoring Network

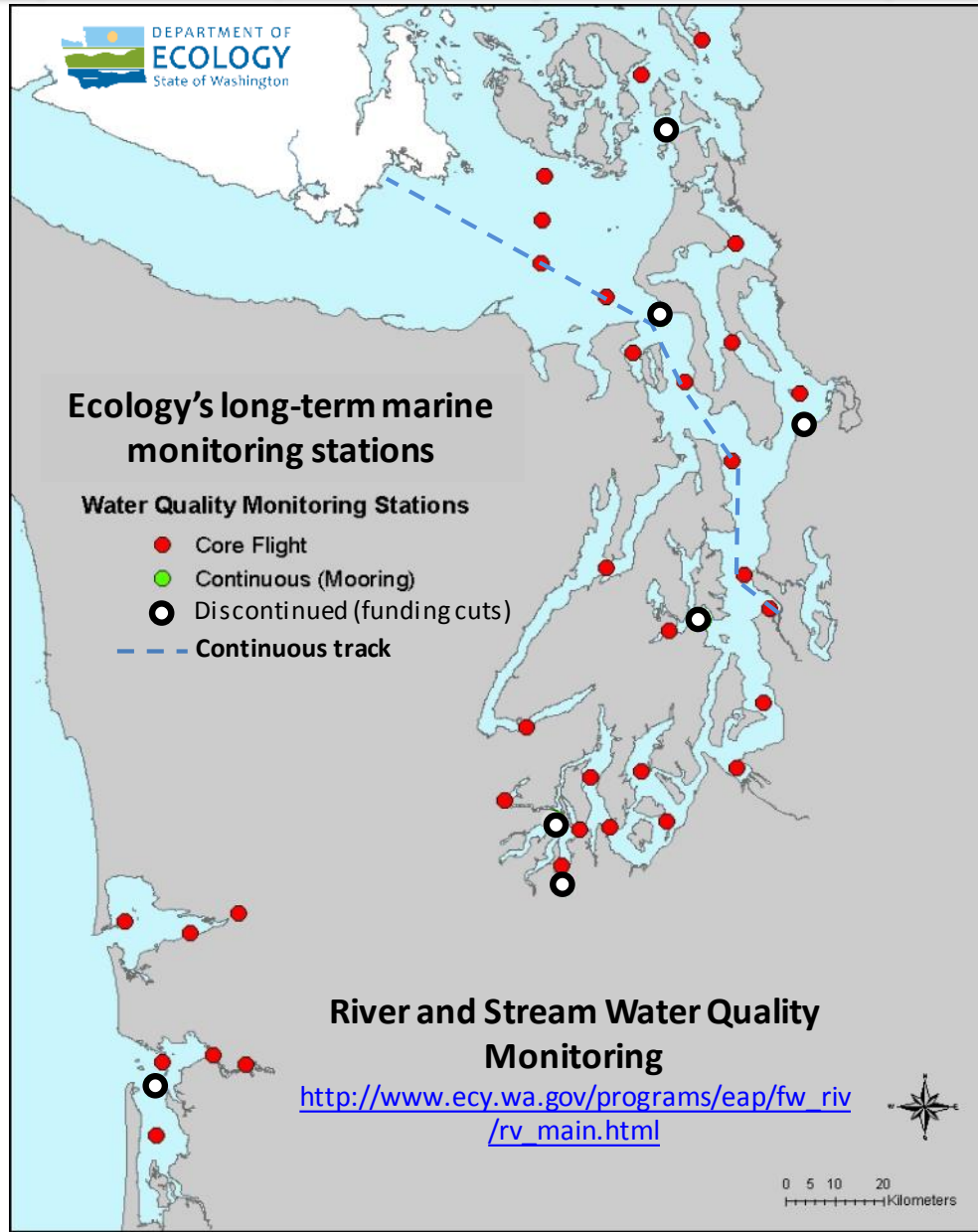


christopher.krems@ecy.wa.gov



Access core monitoring data:

<https://fortress.wa.gov/ecy/eap/marinewq/mwdata/set.asp>



Real-Time Sensor Network



Suzan.Pool@ecy.wa.gov



Access historic mooring data:

http://www.ecy.wa.gov/programs/eap/mar_wat/dat_a.html

You may subscribe or unsubscribe to the Eyes Over Puget Sound email listserv by going to:

<http://listserv.wa.gov/cgi-bin/wa?A0=ECOLOGY-EYES-OVER-PUGET-SOUND>



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