



Eyes Over Puget Sound

[Field log](#)[Weather](#)[Water column](#)[Aerial photos](#)[Ferry and Satellite](#)[Moorings](#)An aerial view of Puget Sound taken from an aircraft window. The image shows the dark blue water of the sound, a rainbow in the lower left, and the white structure of the aircraft wing and fuselage in the foreground. The sky is filled with white clouds.

Surface Conditions Report November 15, 2011

[Start here](#)[Start here](#)

Up-to-date observations of visible water quality conditions in Puget Sound and the Strait of Juan de Fuca

Field log

Weather

Water column

Aerial photos

Ferry and Satellite

Moorings

*Mya Keyzers
Laura Friedenber*



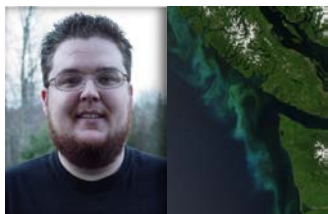
Skip Albertson



*Dr. Christopher
Krembs*



*Dr. Brandon
Sackmann*



David Mora



Personal flight impression

[p. 3-4](#)

Good conditions to be in the field

Weather conditions

[p. 5](#)

Less rain, average temperatures and not much sun

Aerial photography

[p. 7-26](#)

Jelly fish in Budd Inlet. Algae bloom in northern Quartermaster Harbor

Ferry and satellite

[p. 27-29](#)

Temperatures continue to cool and blooms fade, well almost...

In-situ mooring data

[p. 30-31](#)

Dissolved oxygen trends still vary geographically.



Laura uploading data

Partly Cloudy Skies



Hood Canal Bridge

Marine Flight 2 (North Sound)

The weather during November 2010 was not so kind. This November, however, we have had great flights back-to-back early this month. The North Sound flight was no exception. There was a chill in the air but the plane is well heated and we enjoyed direct sun with patchy clouds from the comfort of the cabin.

One of the unique things about flying in fall is the color we see from the air. The changing colors of the leaves, the golden rays of a low lying sun and morning frost on the trees are very beautiful, particularly from the air. We were able to see vibrant yellows and reds and enjoyed the beauty of Puget Sound and its mountains.

We were lucky to see many Harbor Porpoises near our Strait of Georgia station. Several seals came to check us out at all our stations north of Port Townsend. The main obstacle on this flight was the short daylight hours, and we were forced to skip our last two stations because it was getting too dark to be out on the floatplane.

Field log

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Water column

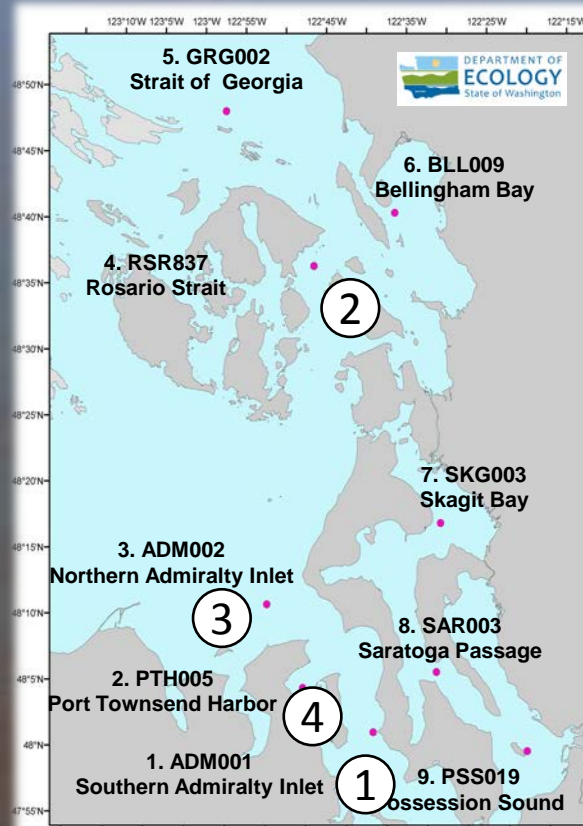
Aerial photos

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Bush Point on Whidbey Island



Clear Skies in the San Juans



Beautiful fall colors near Sakgit Bay



Tide Line in southern Admiralty Inlet



An Early Sunset



Weather of the last two weeks Nov. 1 -15, 2011



- Field log
- Weather**
- Water column
- Aerial photos
- Ferry and Satellite
- Moorings

Meteorological conditions typically explain up to half of the variance in observed marine variables (Moore et al. 2008), particularly in shallower waters like those of South Puget Sound. I summarized the specific conditions prevalent during the past two weeks, from north to south, below.

Summary:

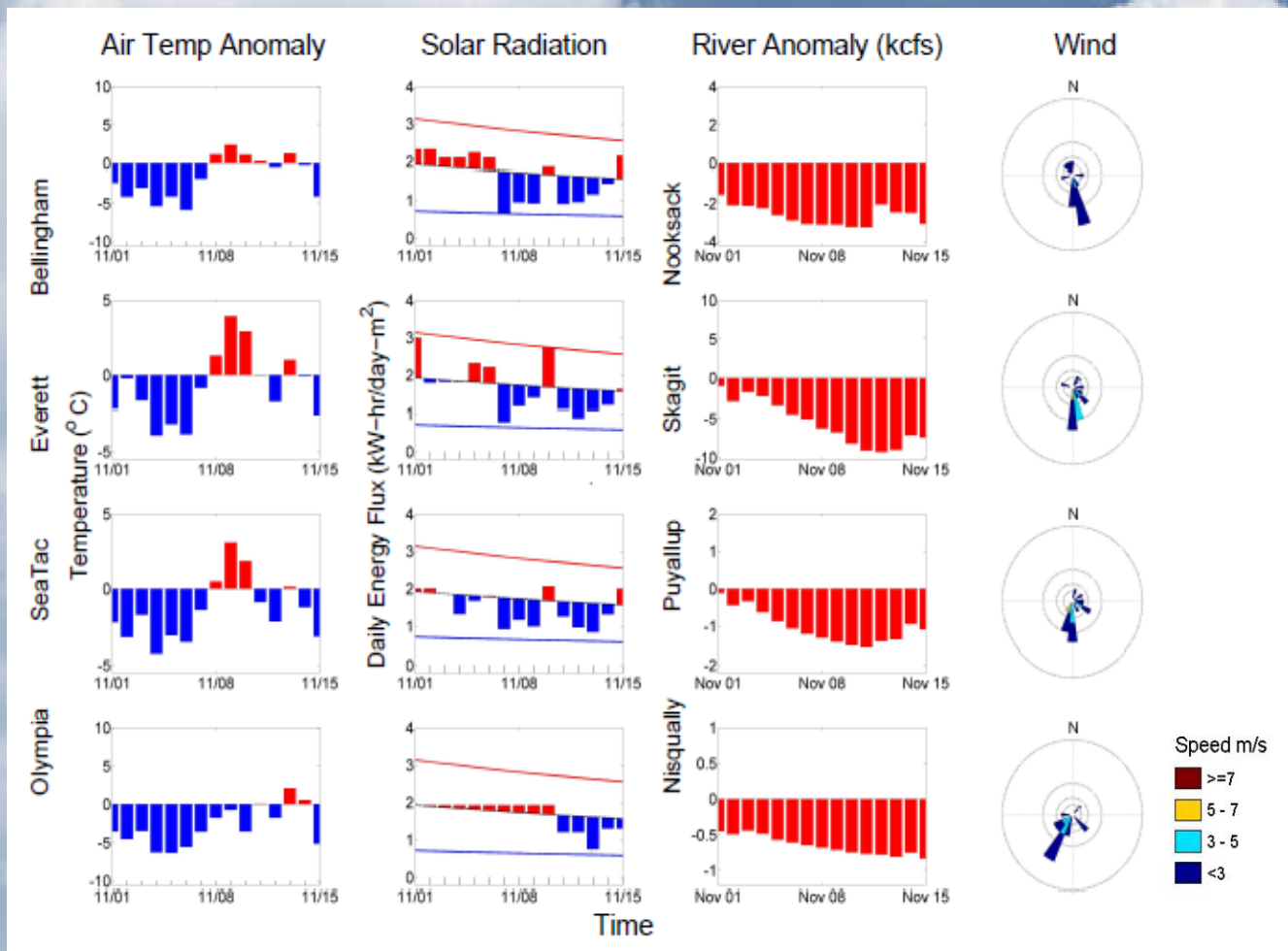


Air temperatures during the past few days have been average, or cooler than expected.

Solar radiation has been weak and declining.

Rivers have been running below normal in all locations.

Winds have been from predominantly from the south – more SE at Northern Puget Sound stations, and more SW at Southern Puget Sound sites.



Water conditions of the previous month



Field log

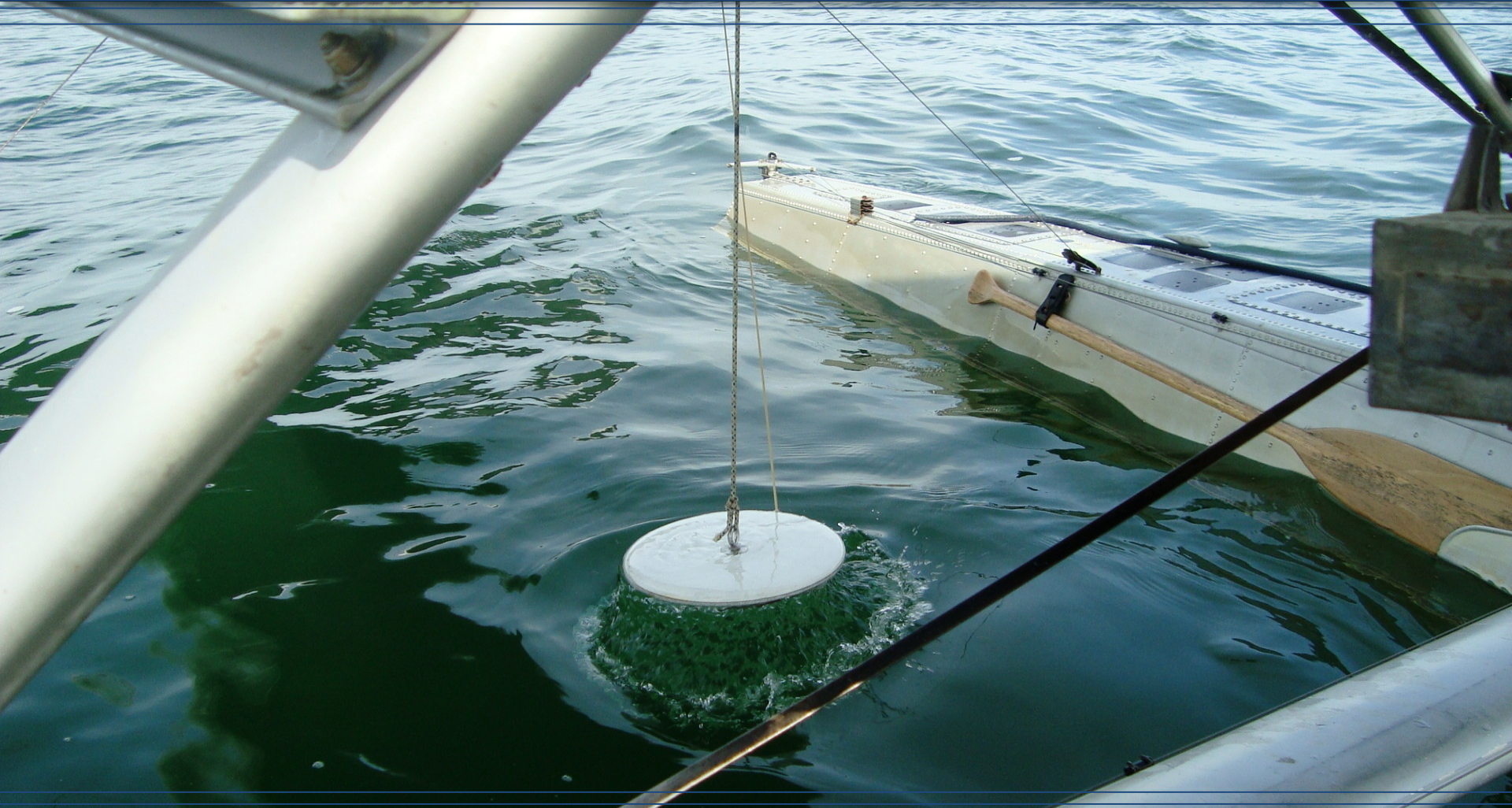
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Section is currently in development:

We will present CTD measurements from our Marine Flight Program and discuss observations in the temporal context of Ecology's Long-Term Marine Monitoring data. The focus will rest on anomalies of physical and optical variables throughout the water column.

Summary: Aerial Photography 11-15-2011



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Jelly fish aggregations persist in Budd Inlet. Green algae biomass visible in northern parts of Quartermaster Harbor (Vashon Island)

Start here

Jelly fish still abundant in Budd Inlet



Guest: Jeff Rice, writing a feature in the forthcoming Encyclopedia of Puget Sound at the Puget Sound Institute

Front

Mixing and Fronts: 6 7 11

Budd Inlet, Dana Passage, Commencement Bay

Plume

Suspended sediment: 15

South of Discovery Park, Seattle

Bloom

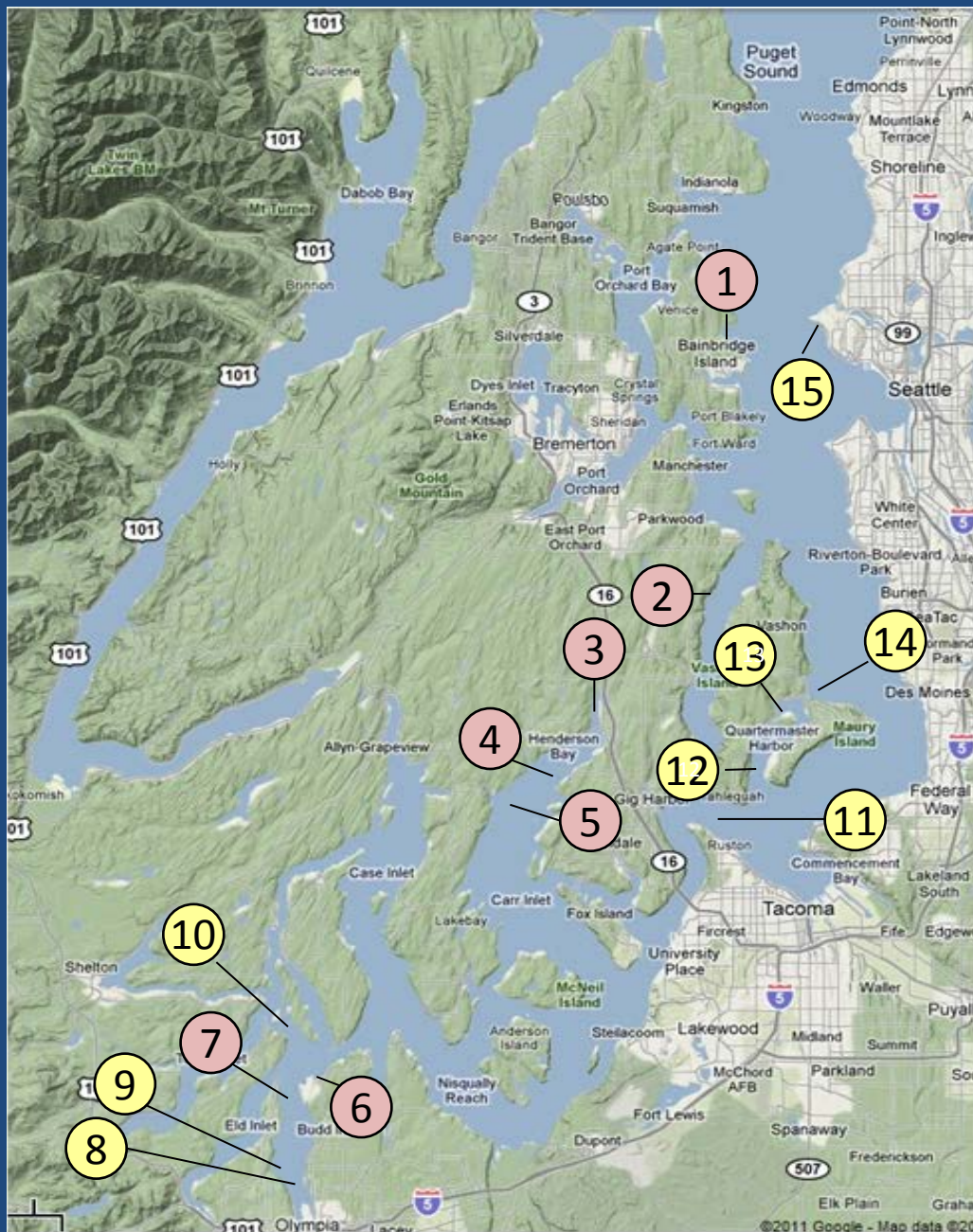
Visible blooms: 13

Green: Northern end of Quartermaster Harbor

Debris

Debris 2 4 7 14

South Sound: Some filaments in Carr Inlet, Budd Inlet. Central basin: Colvos Passage, East of Vashon Island



Aerial Photography Image guide 11-15-2011



Click on numbers

- Morning Flight
- Evening Flight

Flight Information:

Morning flight:

Low clouds, altitude 1000ft, no wind
(visibility limited, dark)

Evening flight:

Cloud banks affected flight route
Visibility limited, altitude 2500ft

Observational maps Central Sound

Observational maps South Sound

[Field log](#)[Weather](#)[Water column](#)[Aerial photos](#)[Ferry and Satellite](#)[Moorings](#)

Low clouds moving in.

Location: Central Basin, Bainbridge Island, 8:40 AM



Field log

Weather

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Ferry and Satellite

Moorings



Surface debris. Location: Colvos Passage, 8:46 AM



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Weather

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Ferry and Satellite

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Steaming water (= latent heat flux). Location: Head of Carr Inlet (South Sound), 8:50 AM



Field log

Weather

Water column

Aerial photos

Ferry and Satellite

Moorings



Debris

Debris line. Location: Northern Carr Inlet (South Sound), 8:52 AM

[Field log](#)[Weather](#)[Water column](#)[Aerial photos](#)[Ferry and Satellite](#)[Moorings](#)

More latent heat flux. Location: Carr Inlet (South Sound), 8:52 AM



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Small front. Location: Boston Harbor (South Sound), 9:03 AM



Field log

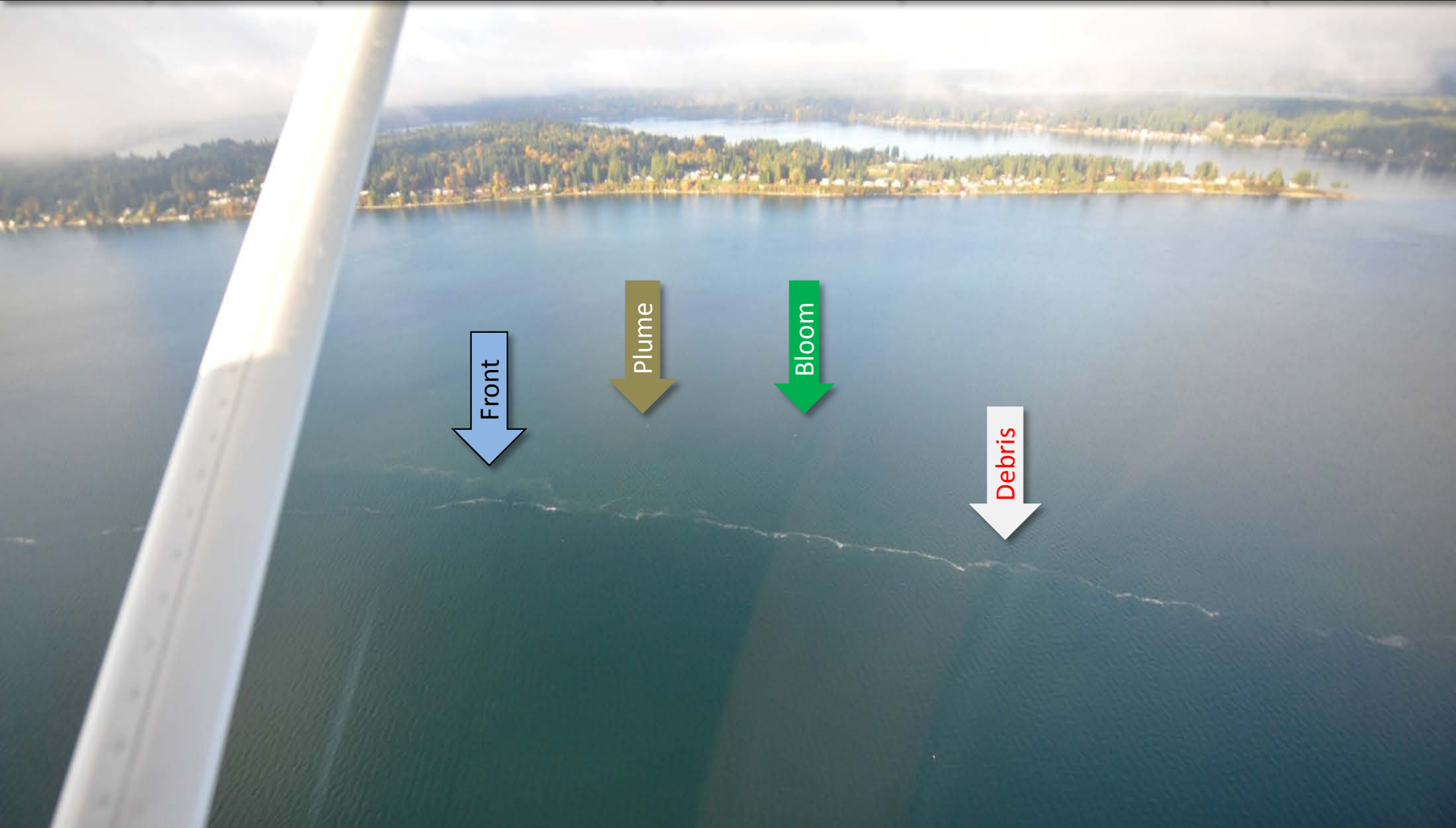
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Different surface water and debris line. Location: Budd Inlet (South Sound), 9:03 AM



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Jelly fish-looks like Aurelia. Location: Budd Inlet (South Sound), 4:23 PM



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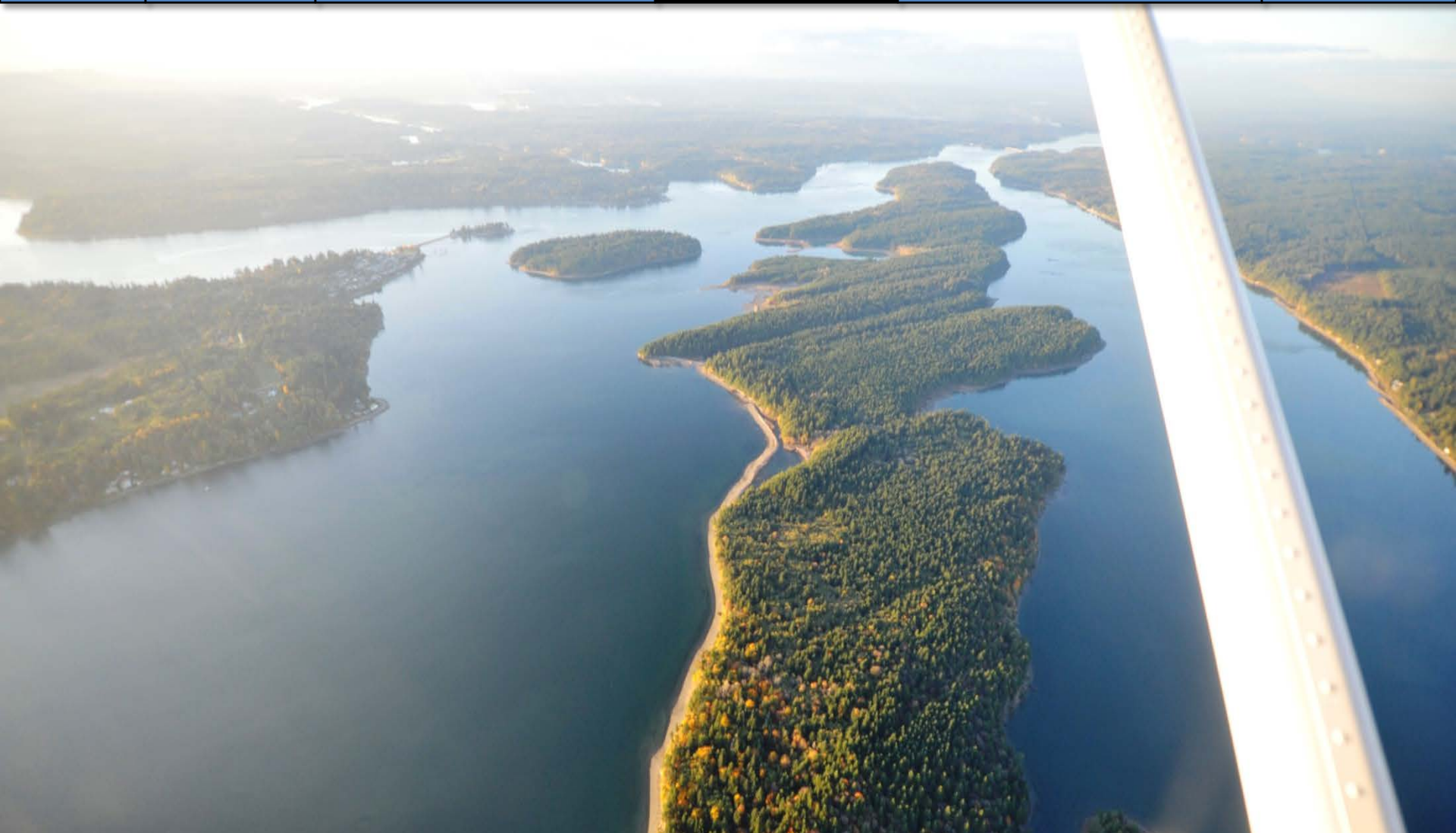
Aerial photos

Ferry and Satellite

Moorings



Jellyfish aggregations. Location: Budd Inlet (South Sound), 3:53 PM

[Field log](#)[Weather](#)[Water column](#)[Aerial photos](#)[Ferry and Satellite](#)[Moorings](#)

No algae bloom or debris, Location: Squaxin Passage (South Sound), 3:58 PM



Field log

Weather

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Water masses meet. Location: Near Point Defiance, Tacoma (Central Sound), 4:09PM

[Field log](#)[Weather](#)[Water column](#)[Aerial photos](#)[Ferry and Satellite](#)[Moorings](#)

Quartermaster Harbor in south clear. Location: Vashon Island (Central Sound), 4:07 PM



Field log

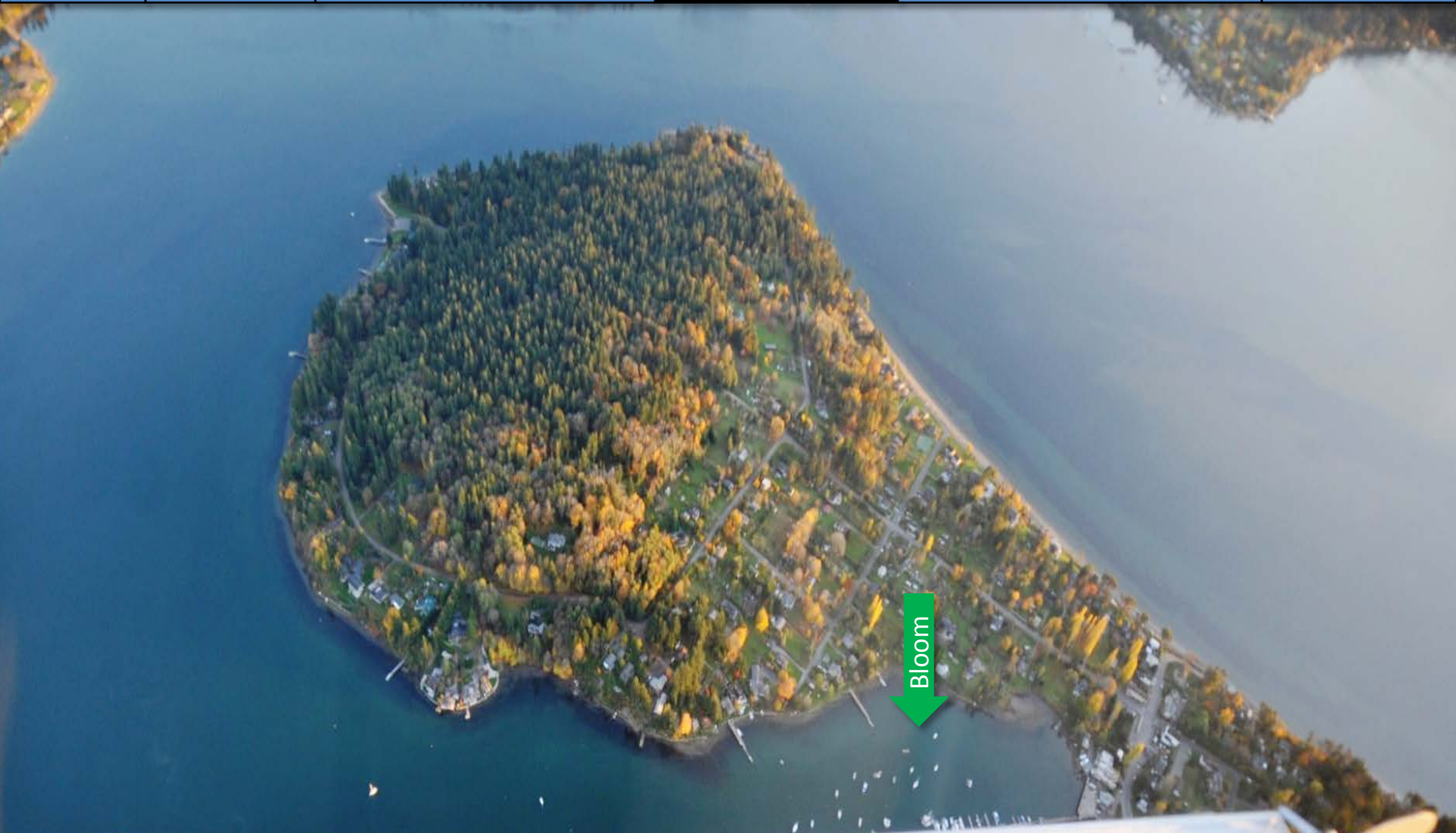
Weather

Water column

Aerial photos

Ferry and Satellite

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Higher algal abundance. Location: Northern Quartermaster Harbor (Central Sound), 4:12 PM



Field log

Weather

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Debris. Location: Tramp Harbor, Vashon Island (Central Sound), 4:13 PM



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Beach erosion or freshwater? Location: Discovery Park, Seattle (Central Sound), 4:22 PM

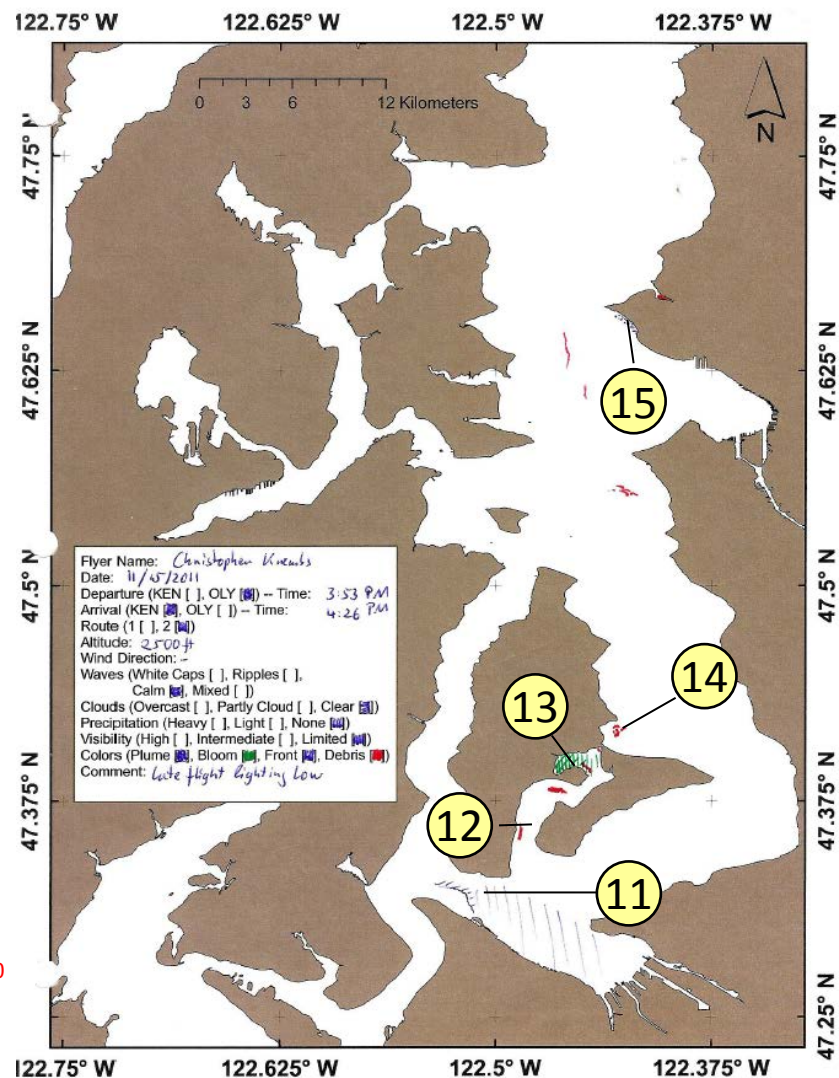
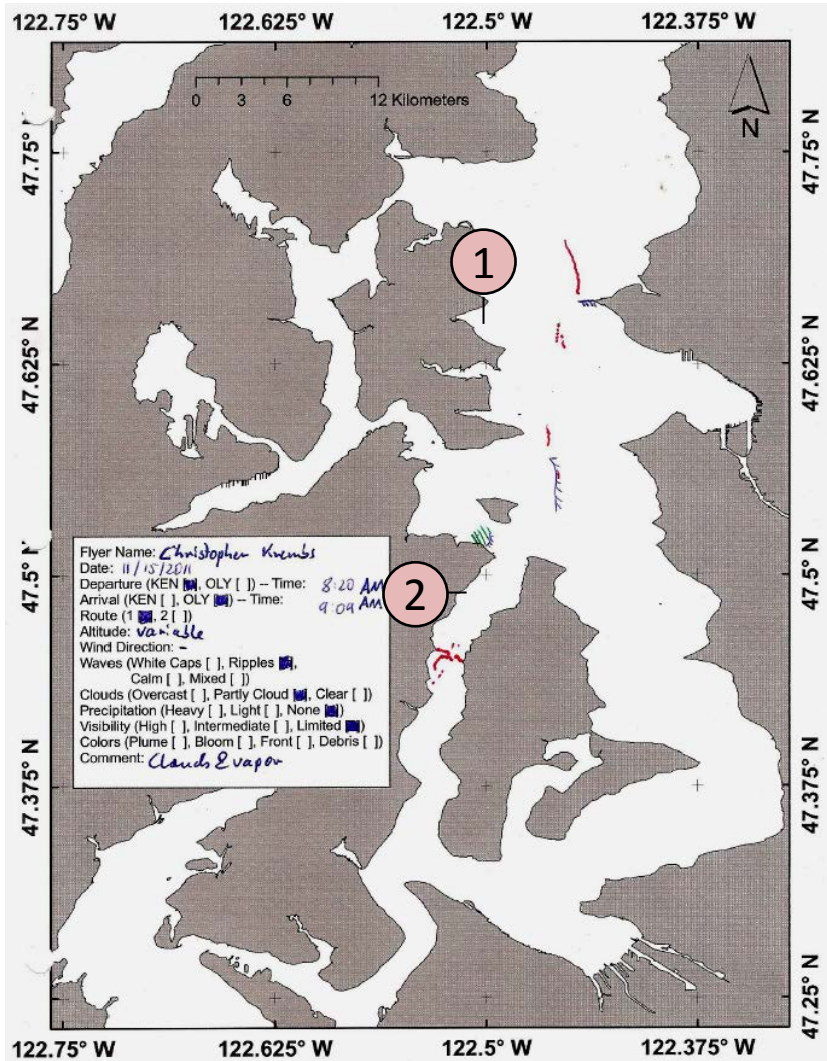
Aerial photography observations in Central Sound

 Navigate
 

Date: 11-15-2011

Morning

Evening



Numbers on map refer to picture numbers for spatial reference

Navigate

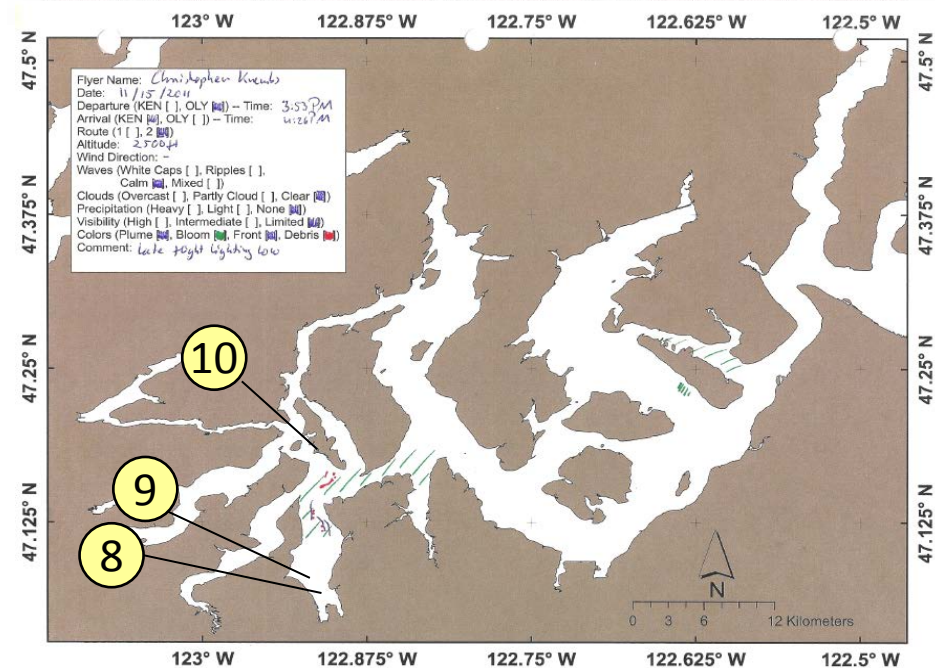
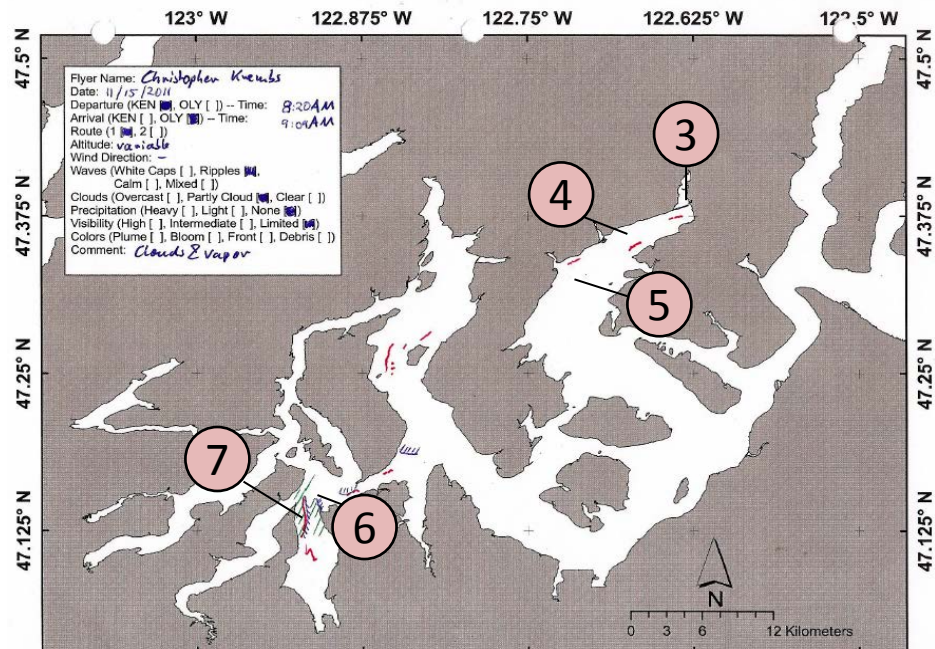


Aerial photography

Observations in
South Sound:
11-15-2011












Numbers on map refer to picture
numbers for spatial reference



Legend to map annotations



Navigate

Plumes	
• Freshwater with sediment solid	
• Freshwater with sediment dispersed	
• Coastal erosion with sediment	
Blooms	
• Dispersed	
• Solid	
Debris	
• Dispersed	
• Solid	
Front	
• Distinct water mass boundaries	
• Several scattered	

Comments:

Maps are produced by observers during and after flight and intended to give an approximate reconstruction of surface conditions on scales that connect to and overlap with satellite images in the following section.

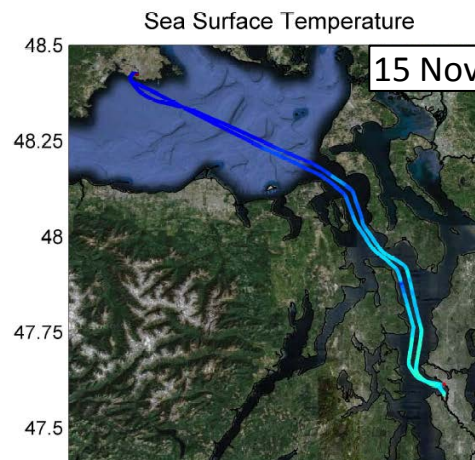


Daily ferry and satellite observations in Central Sound, 11-15-2011

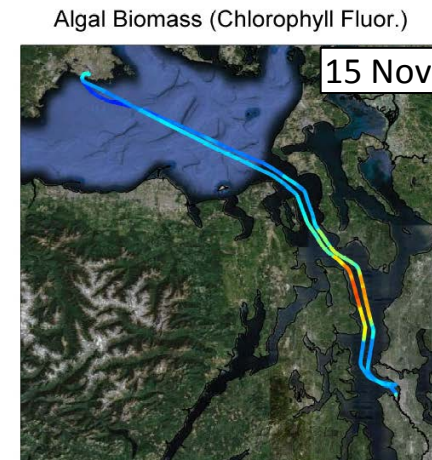
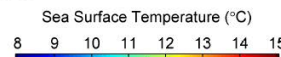


Field log	Weather	Water column	Aerial photos	Ferry and Satellite	Moorings
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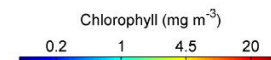
Contact: brandon.sackmann@ecy.wa.gov



Sea surface temperature (SST) is the water temperature close to the surface (2-3 m below). Warm colors show higher SST.



Chlorophyll a fluorescence gives an estimate of algal concentration/biomass. Warm colors show larger concentrations.



Current Conditions: Phytoplankton bloom can be seen in Central Sound (associated with increased river discharge); lowest fluorescence values in Strait of Juan de Fuca; surface temperatures in Central Sound range from 10-11 °C and 9-10 °C in Strait of Juan de Fuca.

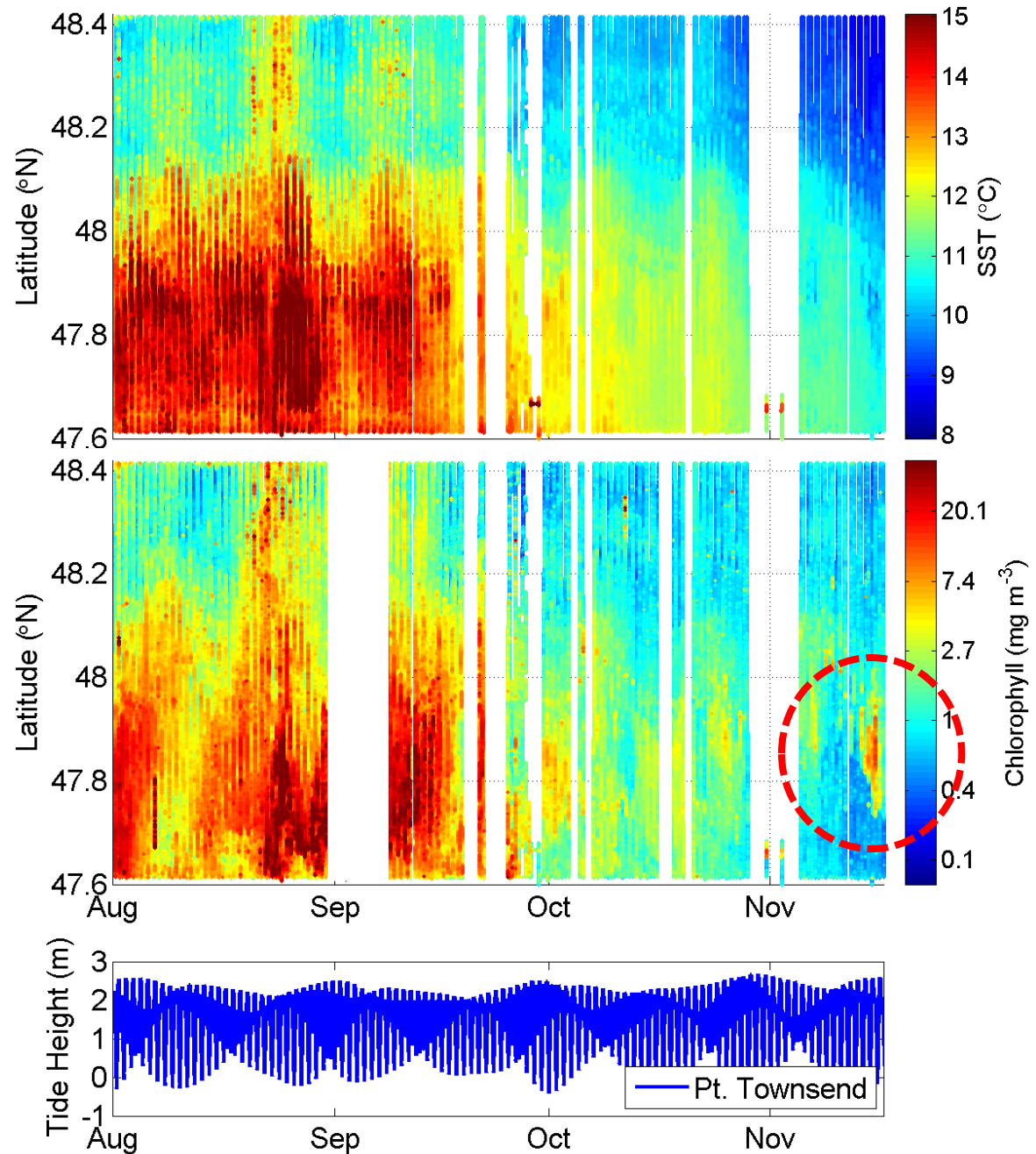
--- Daily 'Quick-Look' Products Available ---

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

MERIS True Color image used for spatial context (19 February 2011). Image is not coincident with ferry data shown on right

Temperatures continue to cool and increased stratification near entrance to Whidbey Basin promotes brief phytoplankton bloom

A relatively short-lived, but intense, phytoplankton bloom followed the latest pulse of freshwater entering Puget Sound from Whidbey Basin.

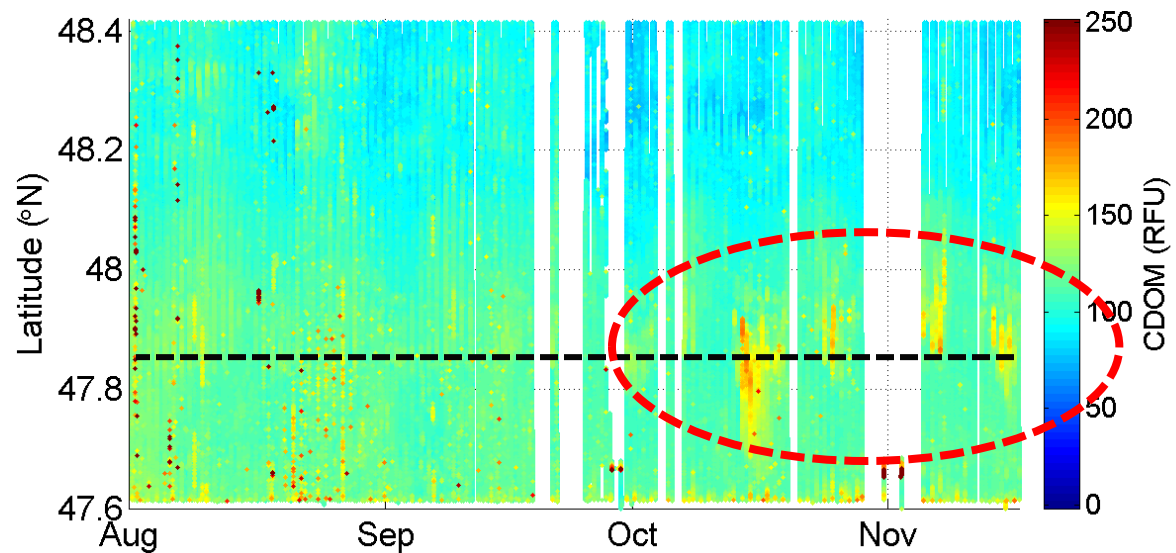


CDOM fluorescence as an indicator of freshwater influence in Central Sound

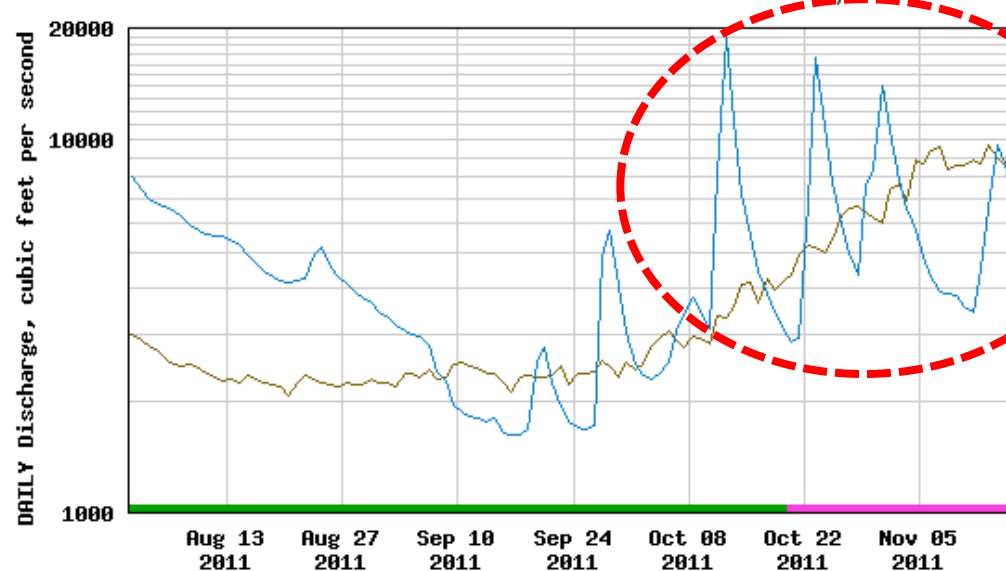
A primary source of [Colored Dissolved Organic Matter](#) (CDOM) to Puget Sound is from rivers.

Recent rainfall events and increasing river discharge lead to highly colored pulses of water moving from Whidbey Basin (dashed black line) into Central Sound.

Latest freshwater pulse likely lead to increased stratification that promoted a brief phytoplankton bloom.



USGS 12150800 SNOHOMISH RIVER NEAR MONROE, WA



— Median daily statistic (48 years)
— Daily mean discharge

— Period of approved data
— Period of provisional data



Mooring observation and trends from Nov. 2 - 16, 2011



Field log Weather Water column Aerial photos Ferry and Satellite **Moorings**

Go to our mooring site at: http://www.ecy.wa.gov/programs/eap/mar_wat/moorings.html

Summary: Over the past 2 weeks, waters have become colder, fresher in Whidbey Basin, colder in the Central Basin, colder and saltier in South Sound, accompanied by a decline in DO.

Mukilteo, Whidbey Basin near Everett: Lower DO coincident with higher salinity. Temperature and salinity decreased at depth (12-16m, NB).

Mean values & trend over past 2 weeks:

NB: DO: 5.9 mg/L
Temp: 11.0°C (↓0.6°C)
Salinity: 29.7 PSU (↓0.7 PSU)

Surface: Not reporting

Manchester, Central Sound: DO at depth (11 m, NB) increased while temperature decreased.

Mean values & trend over past 2 weeks:

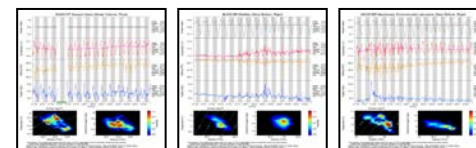
NB: DO: 5.9 mg/L (↑ 0.2 mg/L)
Temp: 11.1°C (↓ 0.7°C)
Salinity: 30.0 PSU

Surface: Not reporting

Squaxin Passage (South Sound) near Olympia: Dissolved oxygen and temperature at depth (5 m) decreased.

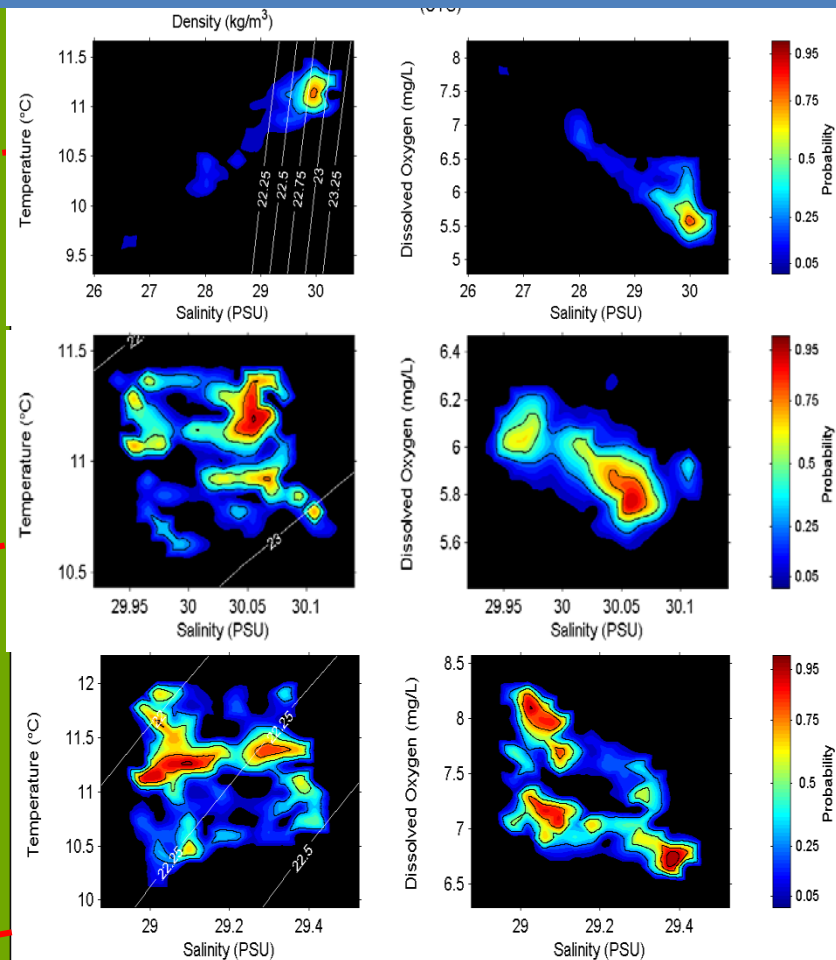
Mean values & trend over past 2 weeks:

NB: DO: 7.4 mg/L (↓ 1.2 mg/L)
Temp: 11.3°C (↓ 1.3°C)
Salinity: 29.2 PSU (↑ 0.1 PSU)



[Real-time data online \(click\)](#)

Water Masses and DO from our Moorings: Nov. 2-16, 2011



Left Panel: Probability of finding a specific density over the past two-week period. High probability shown in warm colors.

Right Panel: Dissolved oxygen concentration in relation to salinity. High probability shown in warm colors.



Get your data from Ecology's Environmental Assessment Program

Long – Term Monitoring Network

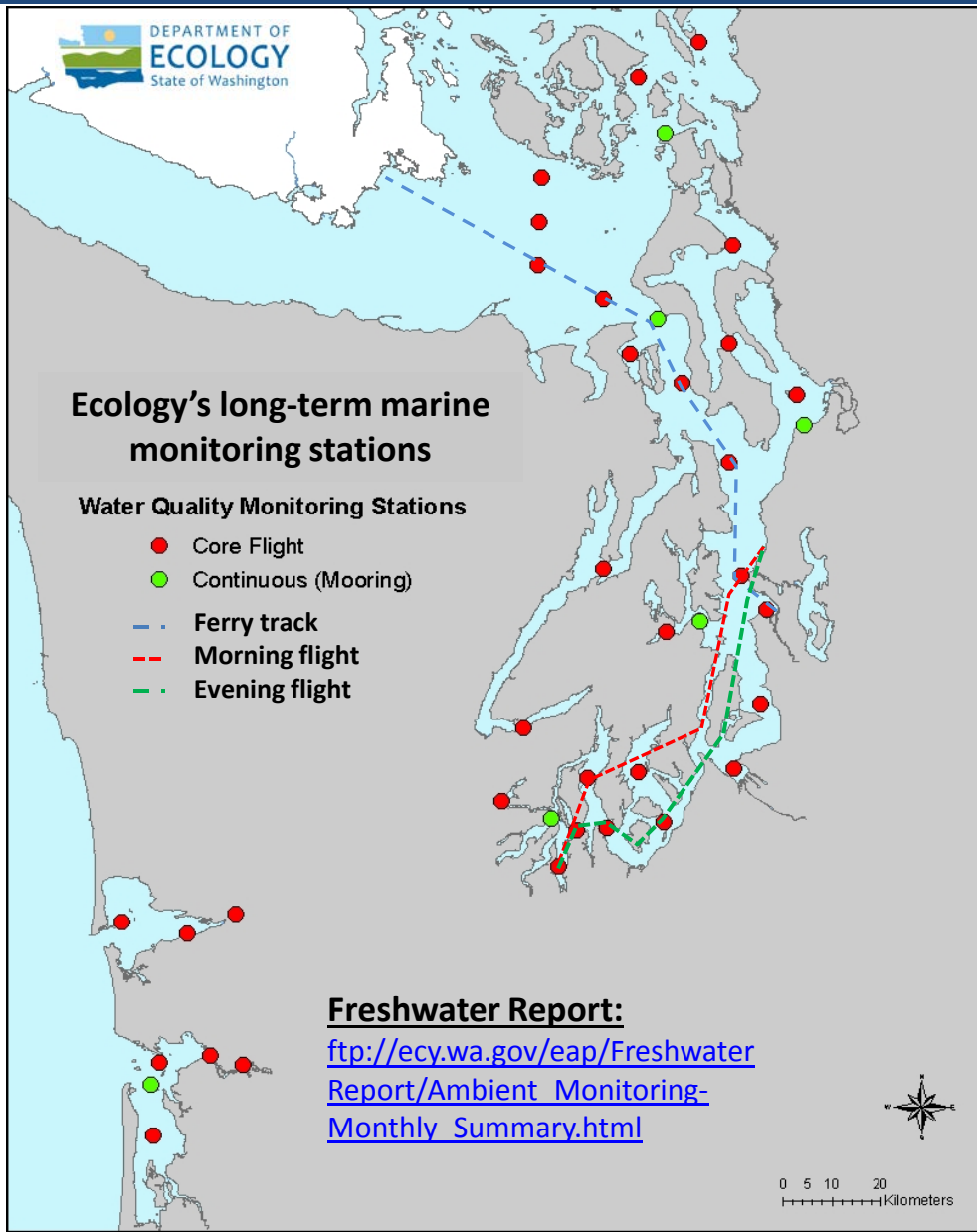


ftp://www.ecy.wa.gov/eap/Flight_Blog/



Access core monitoring data:

http://www.ecy.wa.gov/apps/eap/marine_wq/mwdataaset.asp



Real – Time Sensor Network



brandon.sackmann@ecy.wa.gov



Access mooring data:

http://www.ecy.wa.gov/programs/eap/mar_wat/moorings.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>

We are looking for feedback to improve our products.

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**Marine Monitoring Unit
Environmental Assessment Program
WA Department of Ecology**