Publication No. 12-03-080

DEPARTMENT OF ECOLOGY State of Washington

Eyes Over Puget Sound

Surface Conditions Report

November 8, 2012

We have a new website (http://www.ecy.wa.gov/programs/eap/mar_wat/)

Start here

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

Marine conditions from 11-08-2012 at a glance

LONG-TERM MARINE MONITORING UNIT

Mya Keyzers
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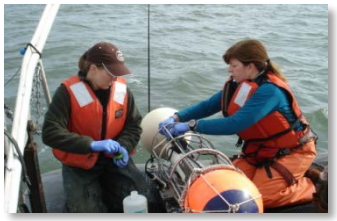
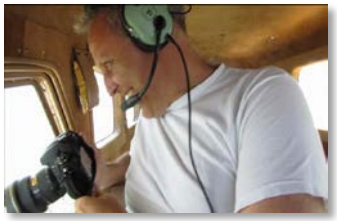


Dr. Christopher Krembs



Dr. Brandon Sackmann

Previous Eyes Over Puget Sound reports: www.ecy.wa.gov/programs/eap/mar_wat/eops/

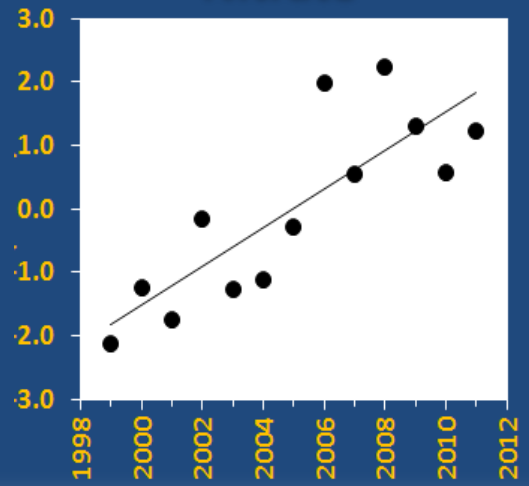
Why Eyes Over Puget Sound?

We observe increasing nutrients and algal blooms in Puget Sound:

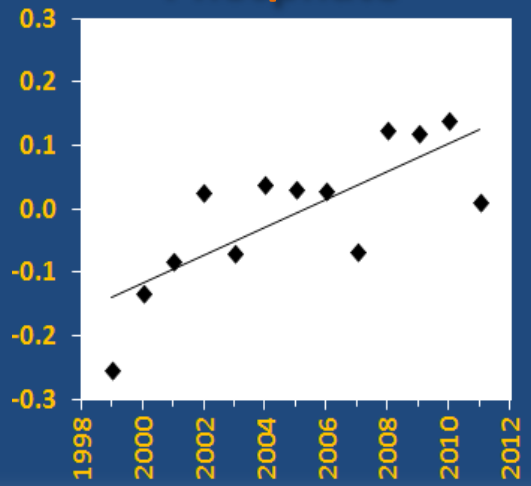
Algae bloom Budd Inlet 2010

Nutrients in Puget Sound are increasing, read more http://www.ecy.wa.gov/programs/eap/mar_wat

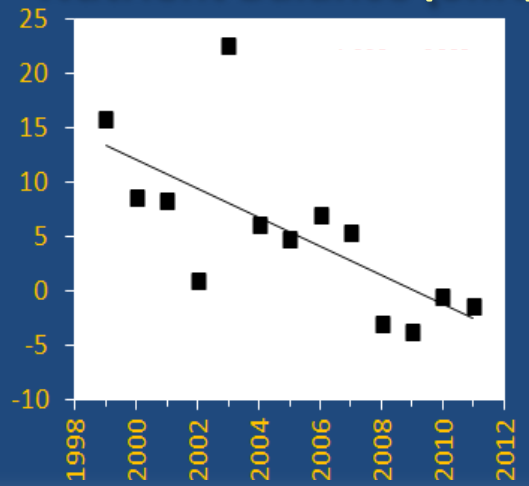
Nitrate



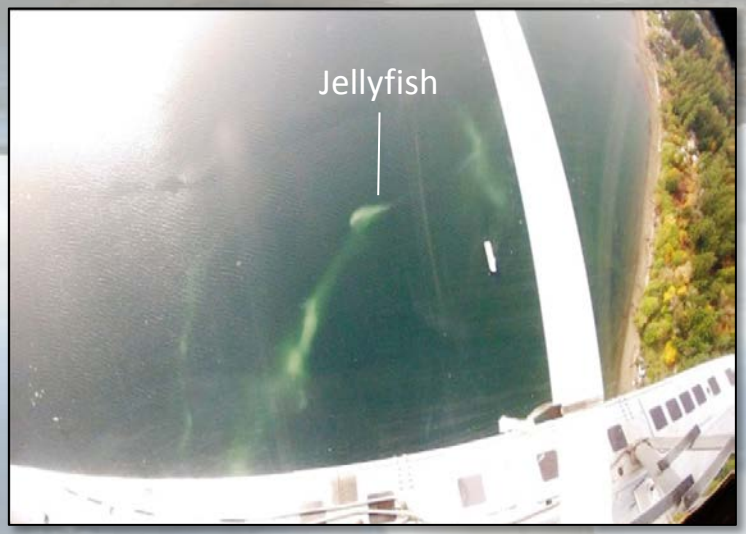
Phosphate



Nutrient Balance (Si:N)



Personal flight impression, 11-08-2012



Jellyfish in Totten Inlet

Red brown bloom in Budd Inlet

Marine Flight 4 (South)

After days of rain and wind, we had a break in the weather and were able to complete our South Sound flight.
This month we were surprised by how clear the water was compared to the previous month. For example, at our Carr Inlet station the water appeared twice as clear.

While flying over Totten Inlet we noticed several large aggregations of jellyfish.

Despite heading into the fall and decreasing solar radiation, we are seeing blooms in Budd Inlet and several other finger Inlets of South Sound

NEW: We took these pictures with our new GoPro field camera. The camera has a fisheye lens which is an ultra wide-angle lens that produces panoramic images. We also attached a polarizing filter that cuts down reflection and increases contrast. ***In the future we will regularly eport from our additional eye in the water column***

Weather patterns from 8-28-2012 to 11-08-2012

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. Source: http://www-k12.atmos.washington.edu/k12/grayskies/nw_weather.html

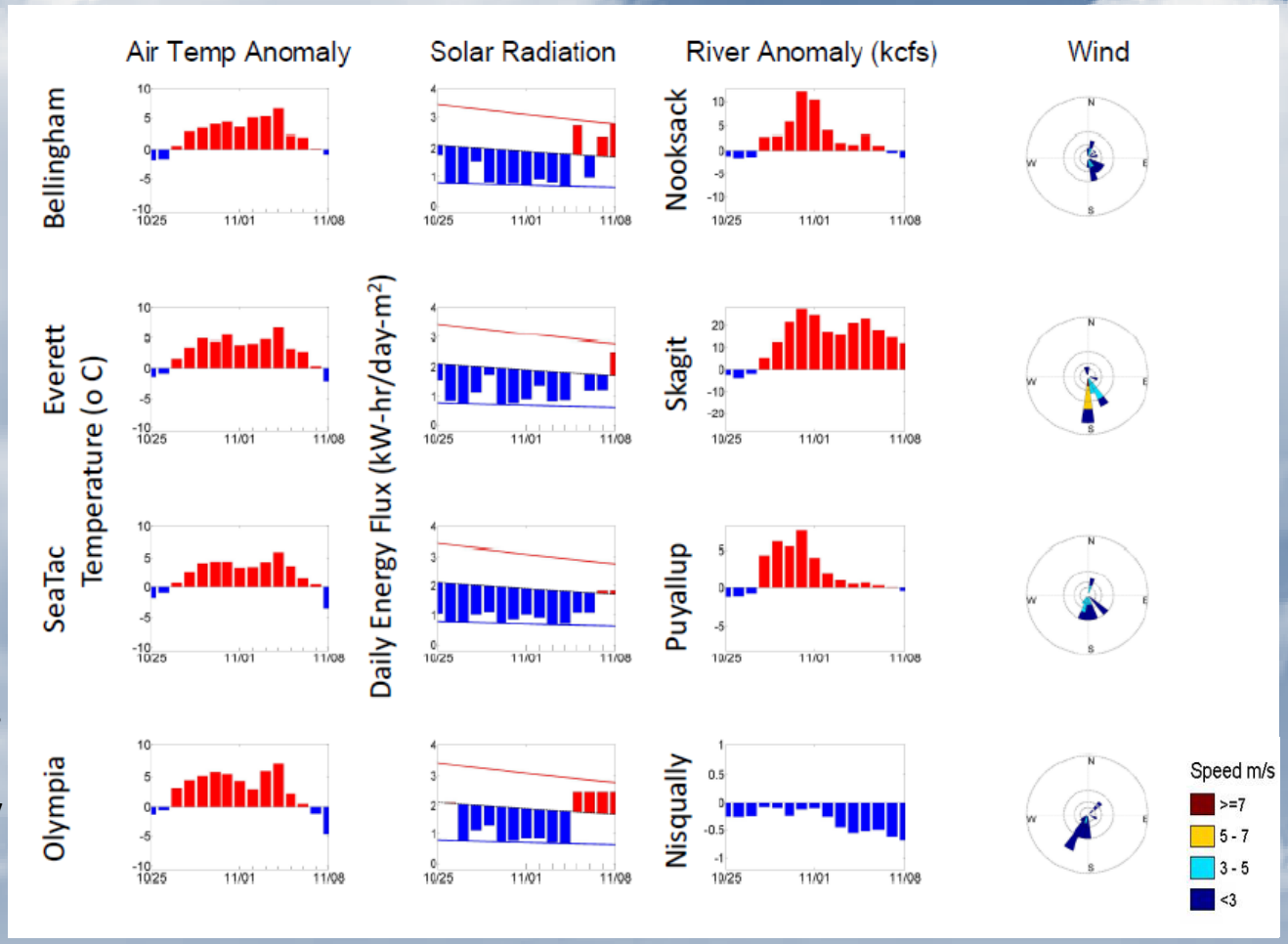
Summary:

Air temperatures have been above normal until the day of the flight.

Sunshine has been below normal, but above normal on the day of the flight.

Rivers to the north have been above normal trending downward, but South Sound rivers are running below normal.

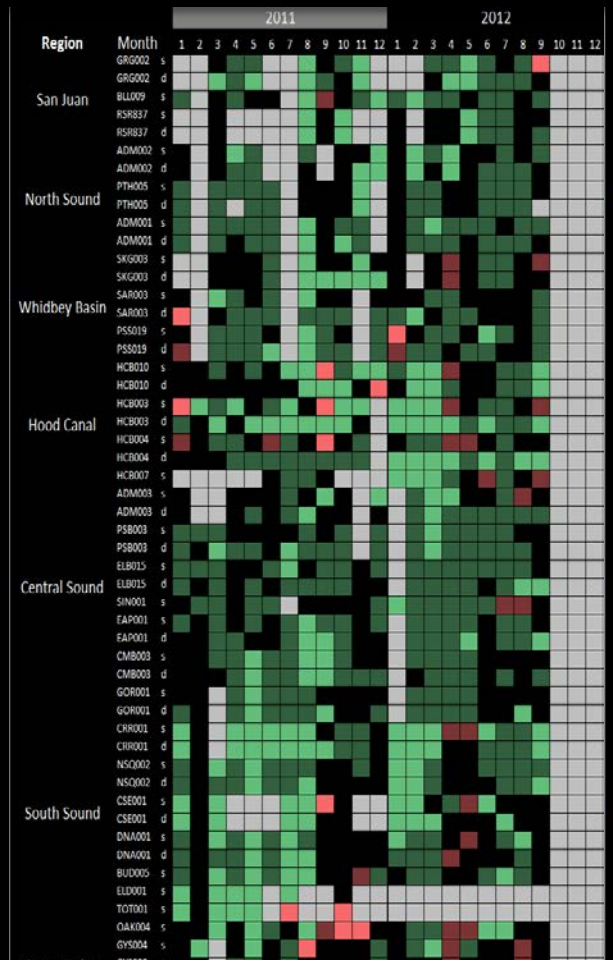
Winds have been predominantly from the south until the day of flight.



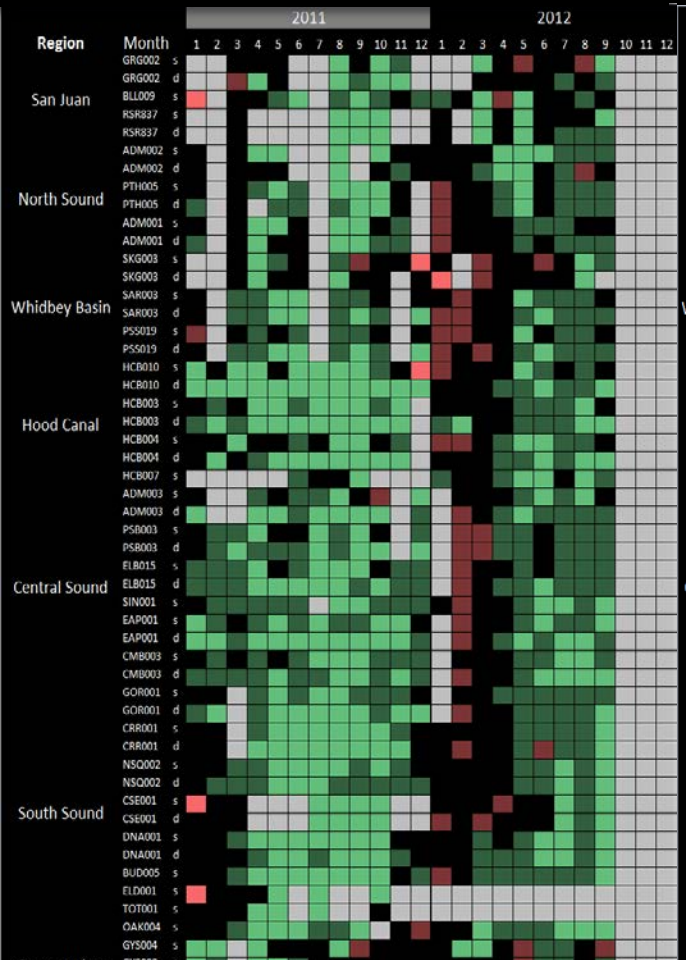
Moore et al. 2008. Local and large-scale climate forcing of Puget Sound oceanographic properties on seasonal to interdecadal timescales. Limnol. Oceanogr., 53(5), 1746–1758

2011-12 Temperature, salinity is down and oxygen is up

Colder



Fresher



More Oxygen

= 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

Read about the details: http://www.ecy.wa.gov/programs/eap/mar_wat/pdf/Poster_Long_Live_The_Kings.pdf

Summary: Aerial photography 11-08-2012

Red-brown blooms and jellyfish aggregations continue in terminal inlets. Suspended sediment and leaf litter in nearshore locations as a result of stronger winds and waves. Many fishing vessels on water.

Start here

Vashon Island into Quartermaster Harbor

Blake Island

Front

Plume

Bloom

Debris

Mixing and Fronts:
Jet leaving Budd Inlet, Tacoma Narrow

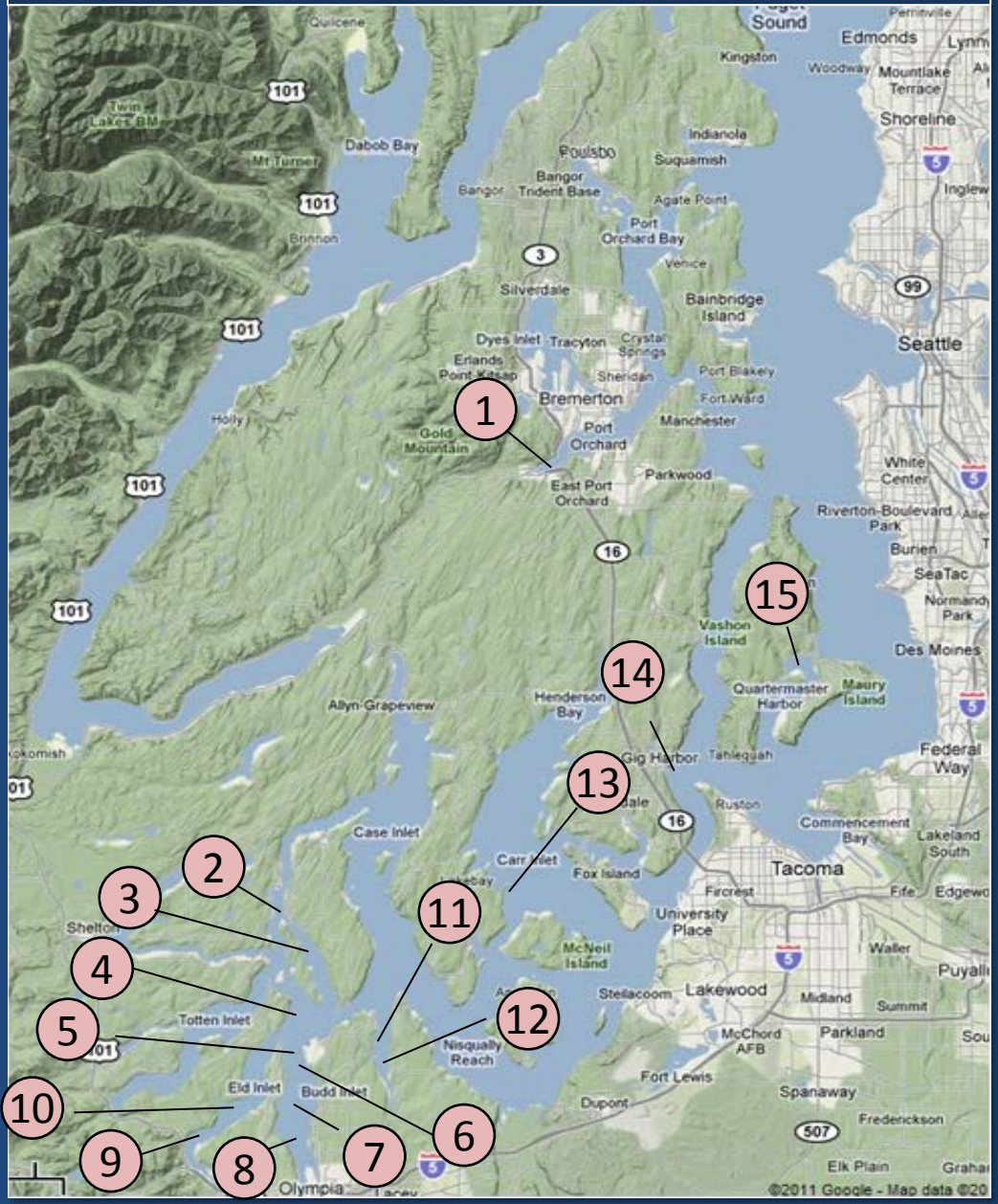
Jellyfish:
Case-, Budd- , Eld,- Totten-, Henderson and Sinclair Inlets

Suspended sediment:
At many wave exposed shores (see maps)

Visible blooms:
- **Red-brown:** Still strong in most inlets of South Sound, Sinclair Inlet, and Eagle Harbor.
- **Turquoise (?):** Budd, Eld and Henderson Inlets and Quartermaster Harbor.

Debris:
In some locations in South Sound, abundant leaves in the water forming long nearshore lines

High tides: 12:03 PM,; Low tides: 5:02 AM, 6:53 PM



Aerial photography navigation guide, **11-08-2012**

Click on numbers

Flight Information:

Noon flight:
High visibility, waves, high tide

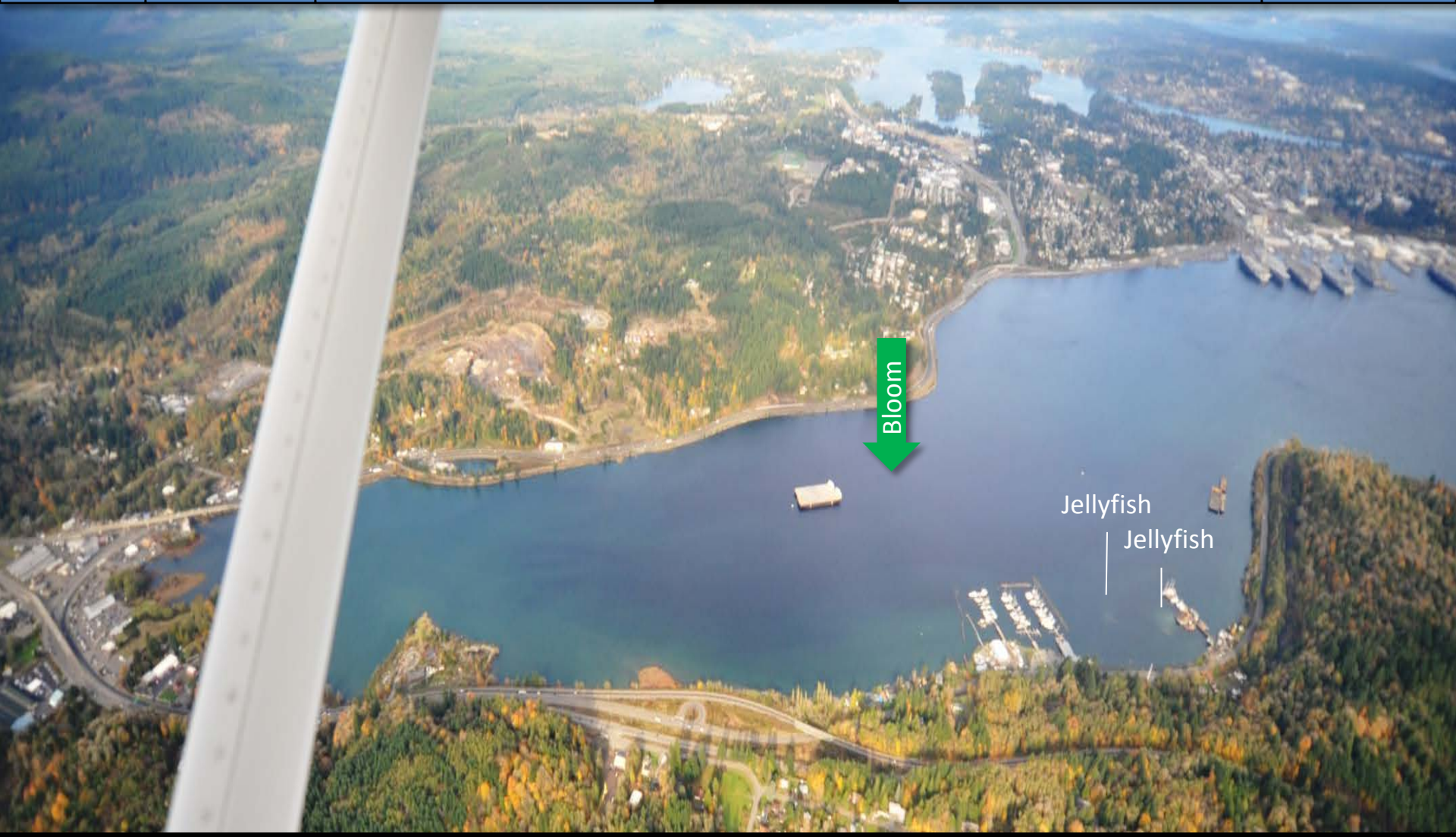
Observation Maps:

Central Sound

South Sound

DEPARTMENT OF ECOLOGY State of Washington

Aerial photography 11-08-2012



Red-brown algal bloom and jellyfish. Location: Bremerton, Sinclair Inlet, 12:36 PM

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Aerial photography 11-08-2012

Algae bloom entering Pickering Passage. Location: Squaxin Island (South Sound), 12:46 PM

Green algal bloom. Location: Peale Passage (South Sound), 12:48 PM

Jet of water from Budd with algae. Location: North of Boston Harbor (South Sound), 1:01 PM

Jet of water from Budd with algae. Location: West of Boston Harbor (South Sound), 12:50 PM

Jet of water with red-brown algae. Location: Budd Inlet (South Sound), 12:51 PM

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Aerial photography 11-08-2012

Red-brown algal bloom and jellyfish and turquoise water. Location: Budd Inlet (South Sound), 12:52 PM

Red-brown algal bloom and jellyfish and turquoise water. Location: Budd Inlet (South Sound), 12:52 PM

Red-brown algal bloom and jellyfish and turquoise water. Location: Eld Inlet (South Sound), 12:56 PM

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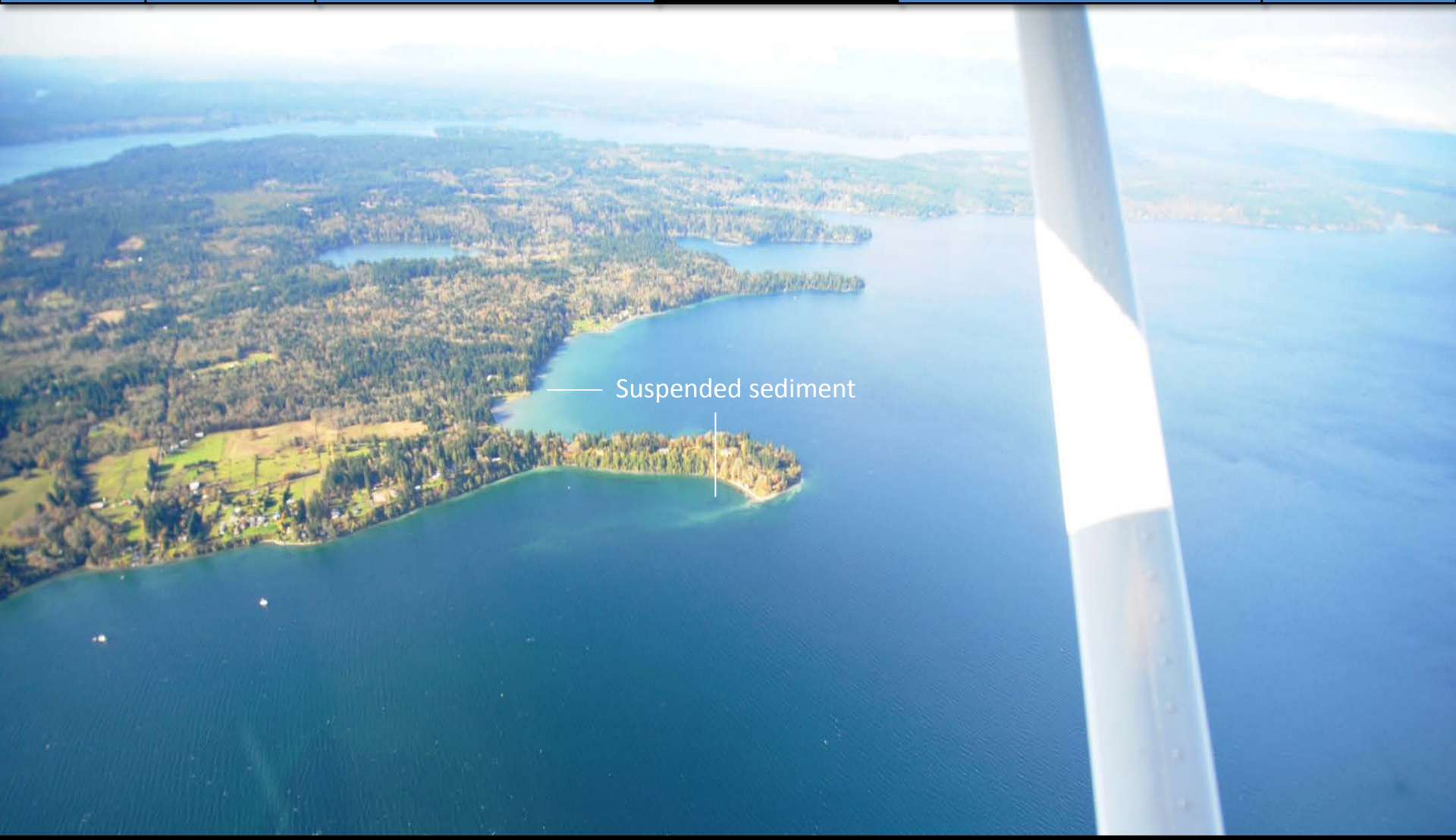
Aerial photography 11-08-2012

Red-brown algal bloom and jellyfish and turquoise water. Location: Eld Inlet (South Sound), 12:56 PM

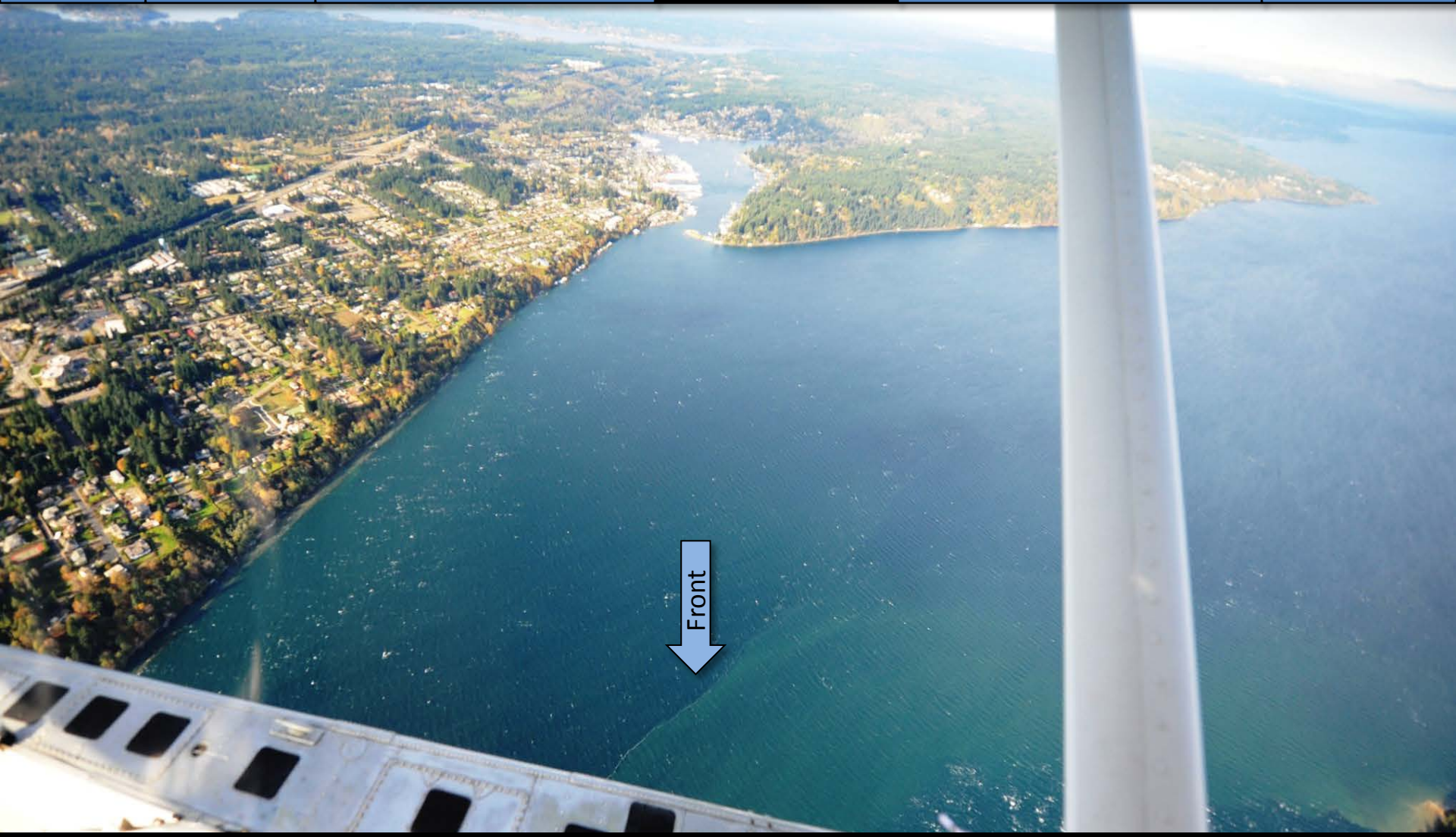
Red-brown algal bloom and turquoise water. Location: Henderson Inlet (South Sound), 1:03 PM

Aerial photography 11-08-2012

Red-brown algal bloom and turquoise water. Location: Henderson Inlet (South Sound), 1:03 PM



Suspended sediment from shore due to high waves. Location: Carr Inlet (South Sound), 1:10 PM



Puyallup river plume entering the Narrows. Location: Point Defiance (Tacoma), 1:15 PM

Red-brown algae bloom and turquoise water.

Location: Quartermaster Harbor (Vashon Island), 1:20 PM

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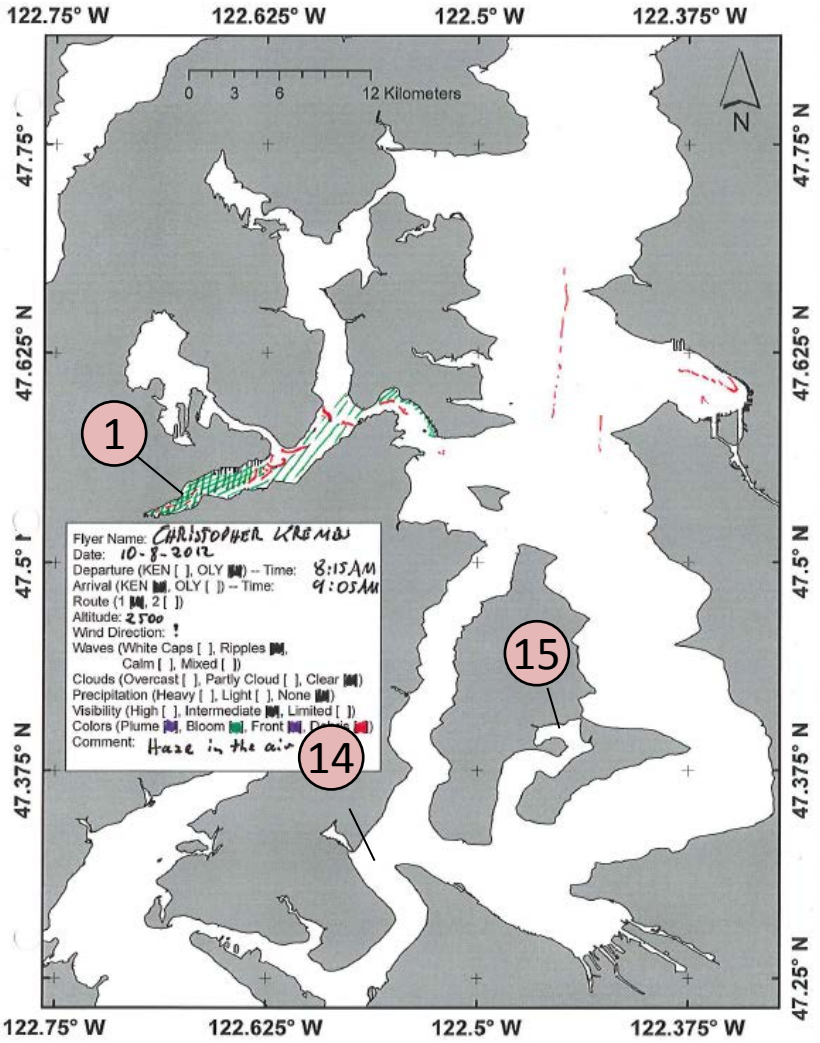
Aerial photography observations in Central Sound

Navigate

Date: 10-08-2012

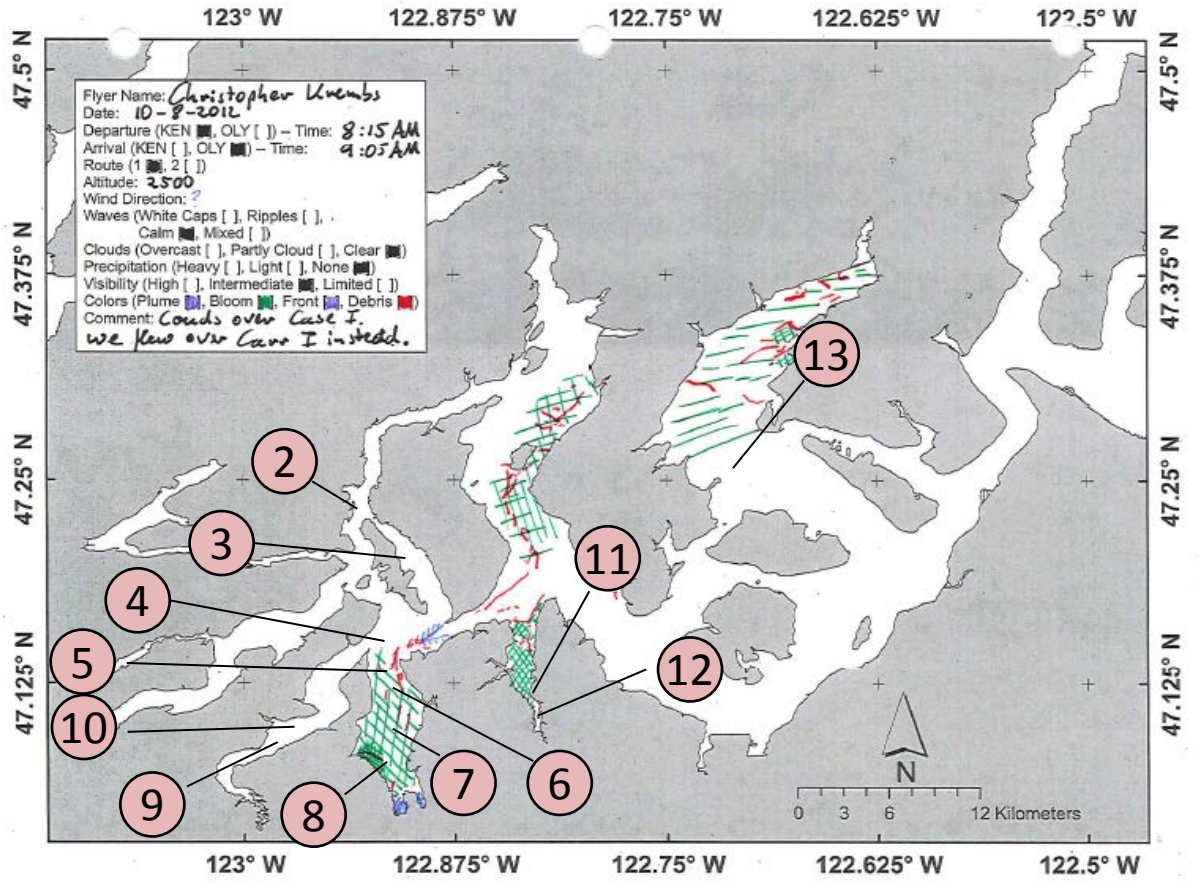


Numbers on map refer to picture numbers for spatial reference

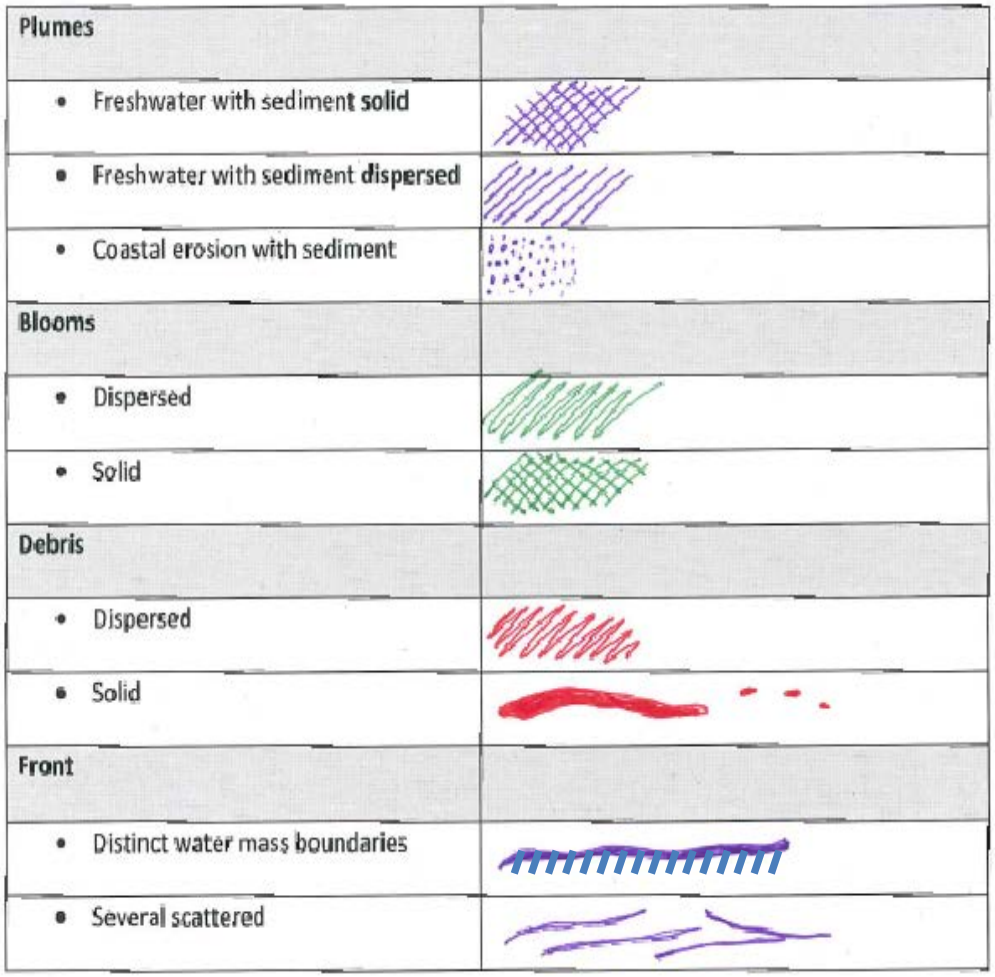
Navigate

Aerial photography

Observations in South Sound: 10-08-2012



Numbers on map refer to picture numbers for spatial reference



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

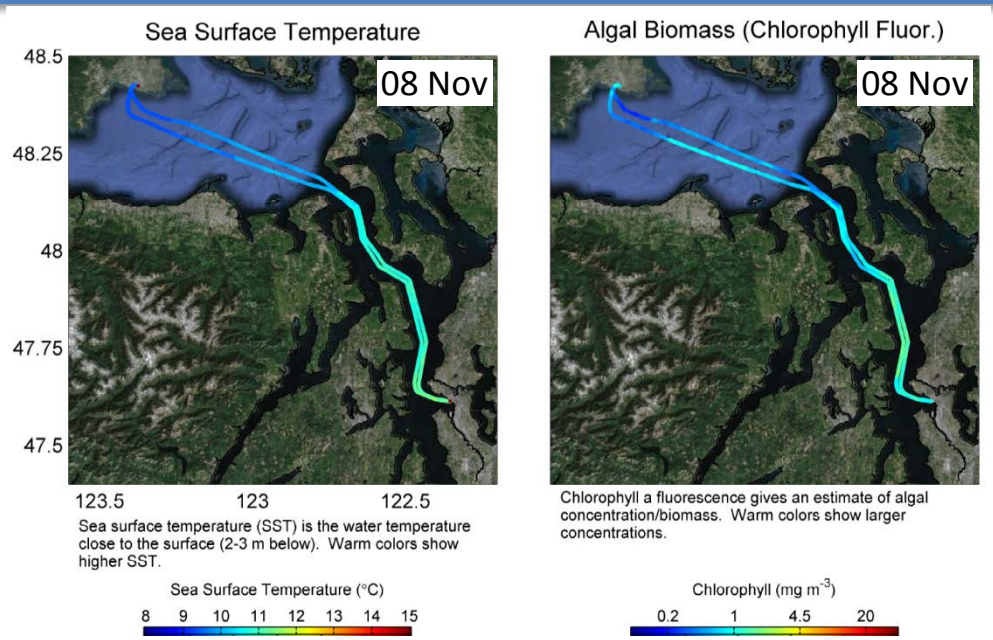
Debris: Debris can be distinguished into natural and anthropogenic debris *sensu* Moore and Allen 2000. The majority of debris in Puget Sound is natural mixed with discarded man made pieces of plastic, wood etc. From the plane we can't differentiate the quality of debris at the surface and therefore call it for reasons of practicality just "debris".

S.L. Moore, M. J. Allen. 2000. Distribution of Anthropogenic and Natural Debris on the Mainland Shelf of the Southern California Bight. Marine Pollution Bulletin, 40(1), 83–88.

Daily ferry and satellite observations in Central Sound, 11-08-2012

Contact: brandon.sackmann@ecy.wa.gov

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



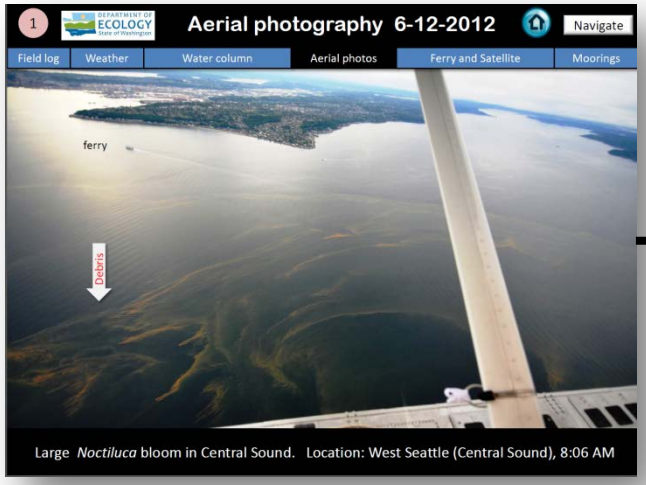
Current Conditions: Low fluorescence throughout Central Sound and Admiralty Inlet. Temperatures range from 9-11°C. Increased freshwater entering Central Sound near Triple Junction (near-surface salinity <23 PSU).

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

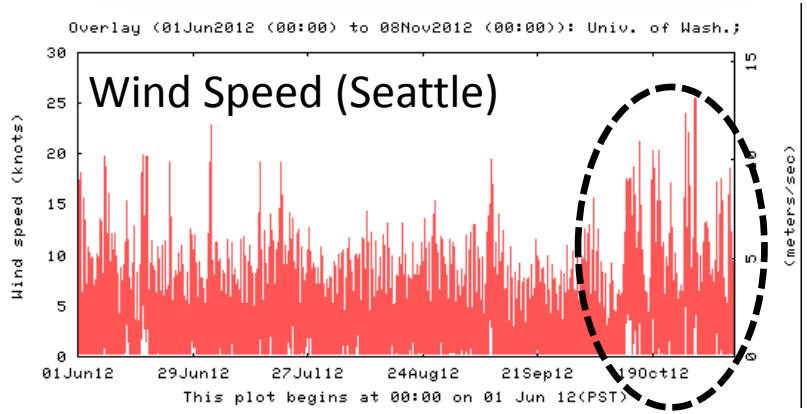
(http://www.ecy.wa.gov/programs/eap/mar_wat/eops/clipper.html)

Ferry & satellite observations 11-08-2012

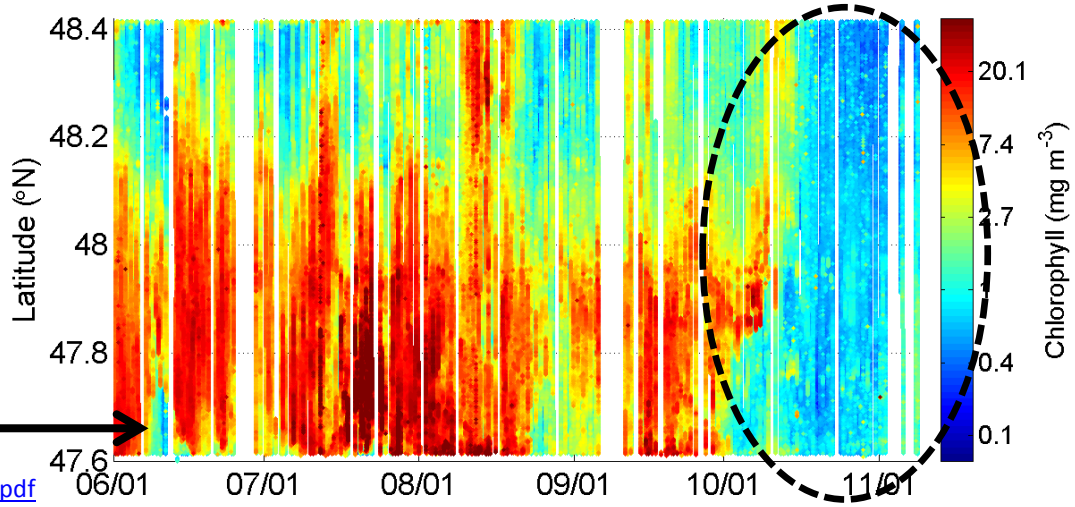
- Widespread *Noctiluca* bloom in Central Sound seen in June 2012 was associated with a significant reduction in near-surface phytoplankton biomass (i.e., fluorescence); similar pattern observed in 2010 and 2011!
- Fall has arrived!!! Increased wind speeds in October help erode near-surface stratification in Puget Sound and re-distribute phytoplankton blooms throughout the mixed layer.

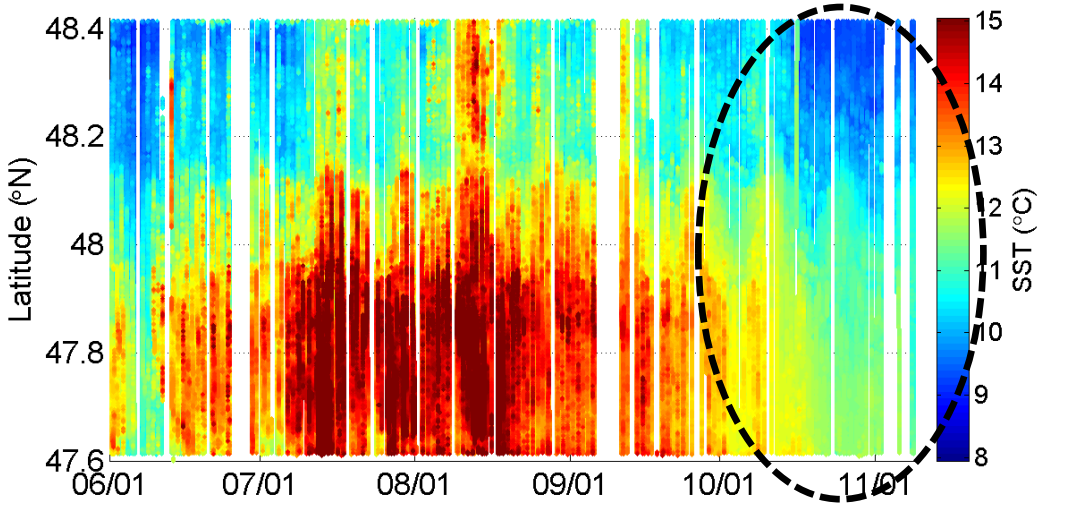


http://www.ecy.wa.gov/programs/eap/mar_wat/eops/EOPS_2012_06_12.pdf



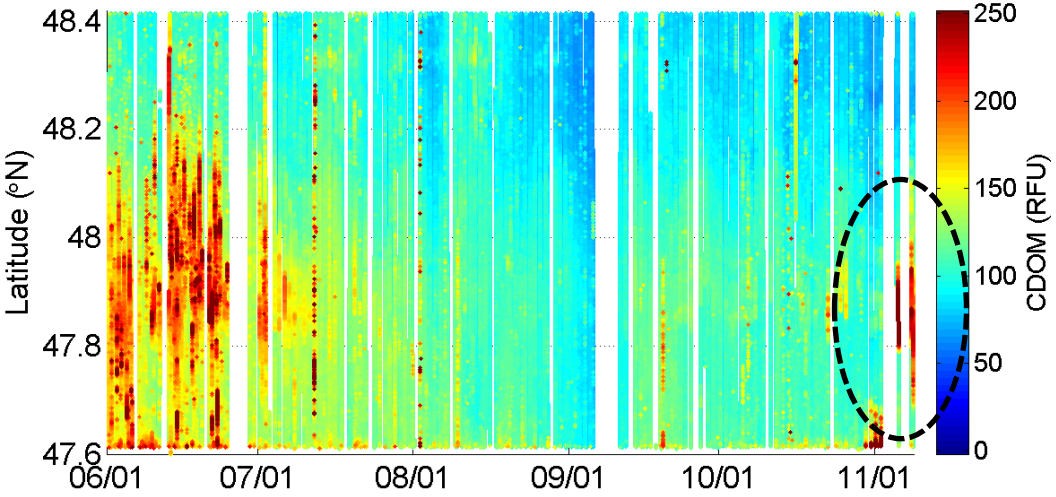
http://www-k12.atmos.washington.edu/k12/grayskies/nw_weather.html

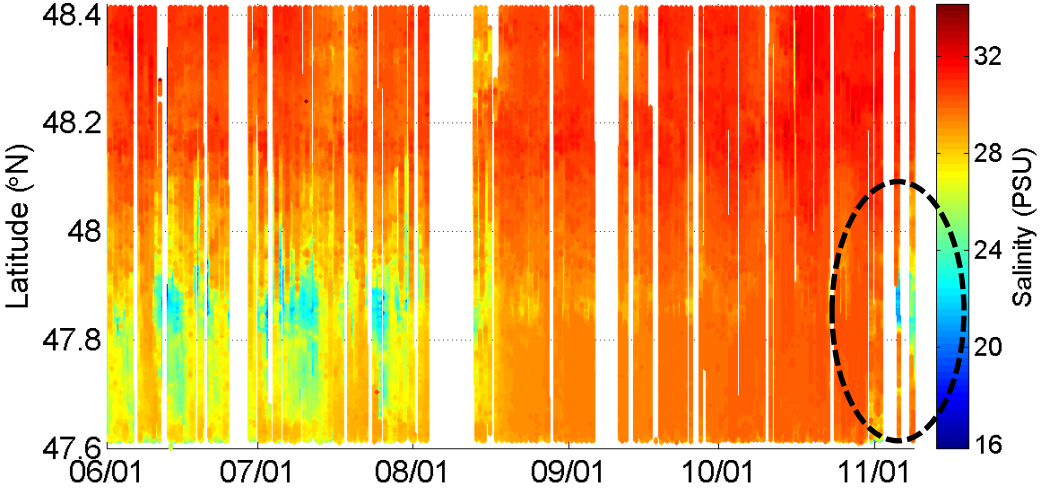


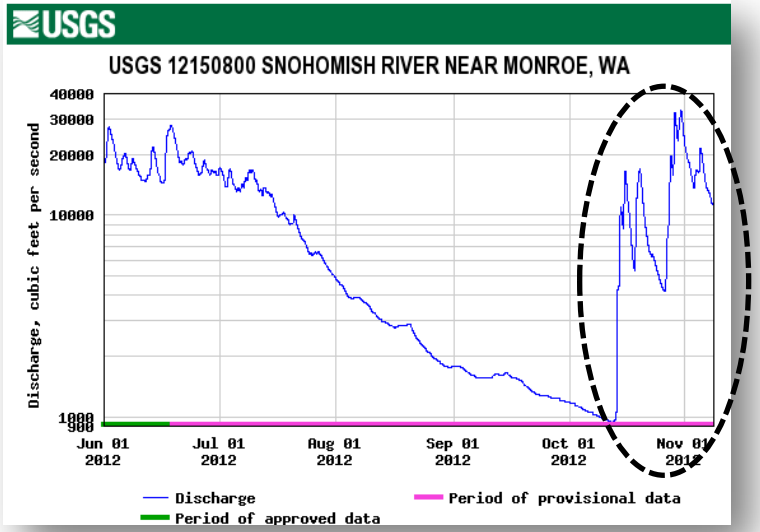


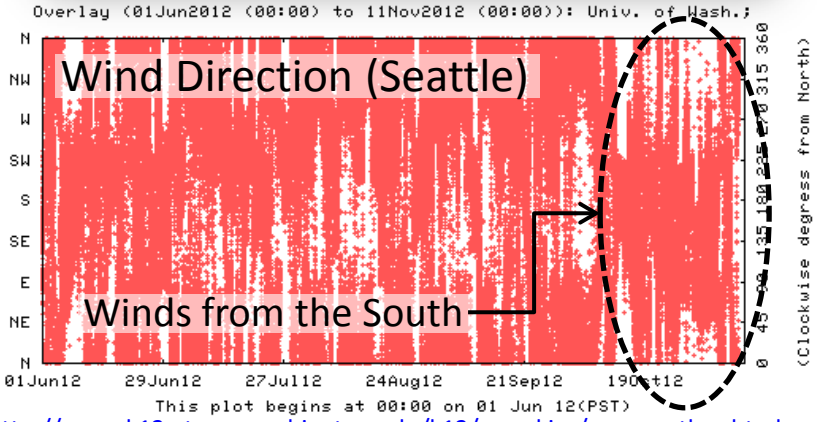
Ferry & satellite observations 11-08-2012

- Increased freshwater finally seen entering Central Sound from Whidbey Basin.
- Strong winds from the south over the past few weeks appeared to keep water trapped in Whidbey Basin long after the initial rise in river discharge from recent precipitation and storm activity.









http://www-k12.atmos.washington.edu/k12/grayskies/nw_weather.html

Get data from Ecology's Monitoring Programs

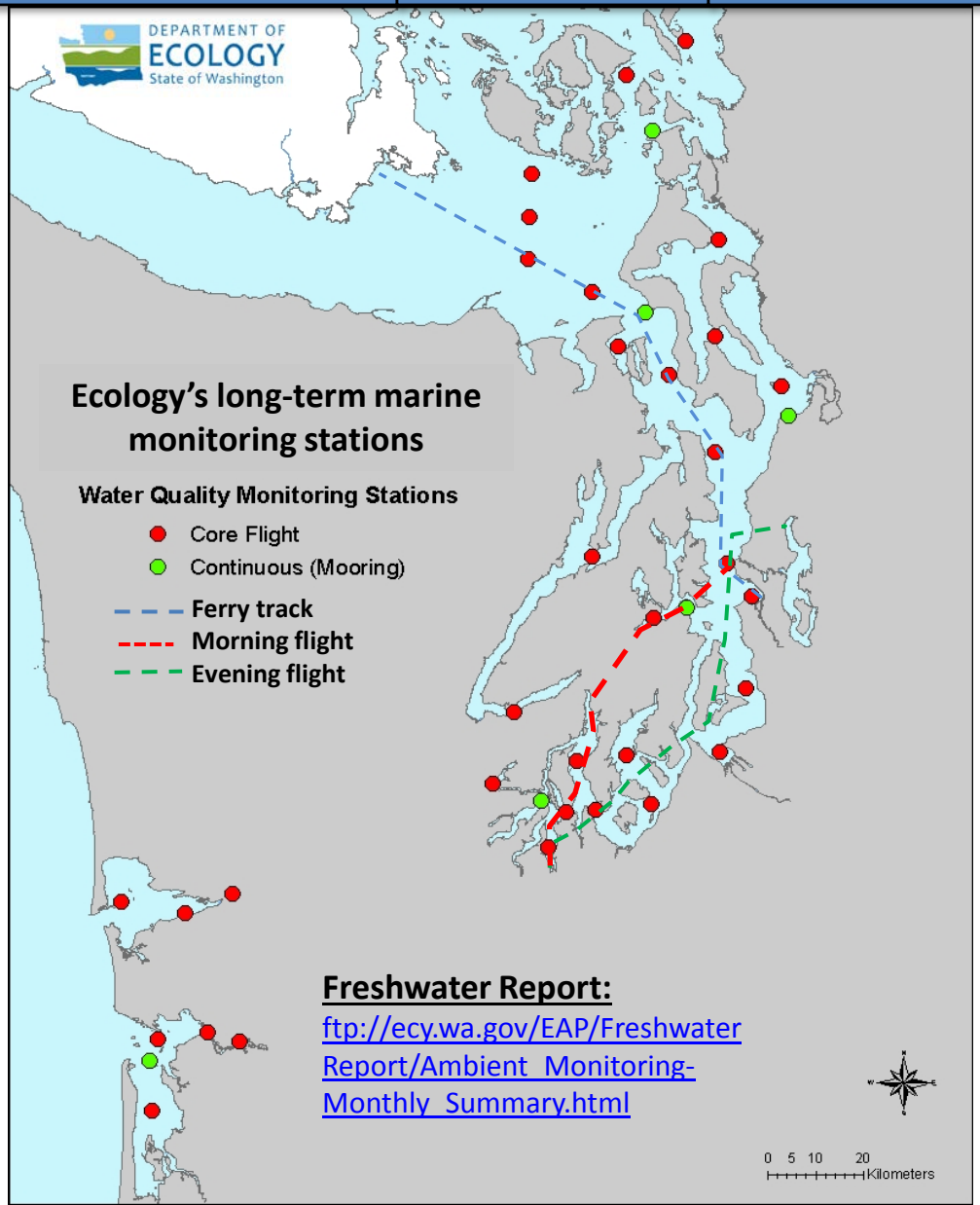
Field log	Weather	Water column	Aerial photos	Ferry and Satellite	-

Long–Term Monitoring Network

christopher.krembs@ecy.wa.gov

Access core monitoring data:

http://www.ecy.wa.gov/apps/eap/marinewq/mwdataset.asp



Real–Time Sensor Network

brandon.sackmann@ecy.wa.gov

Access mooring data:

http://www.ecy.wa.gov/programs/eap/mar_wat/-.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

Many thanks to our business partners: Clipper Navigation, Swantown Marina, and Kenmore Air.