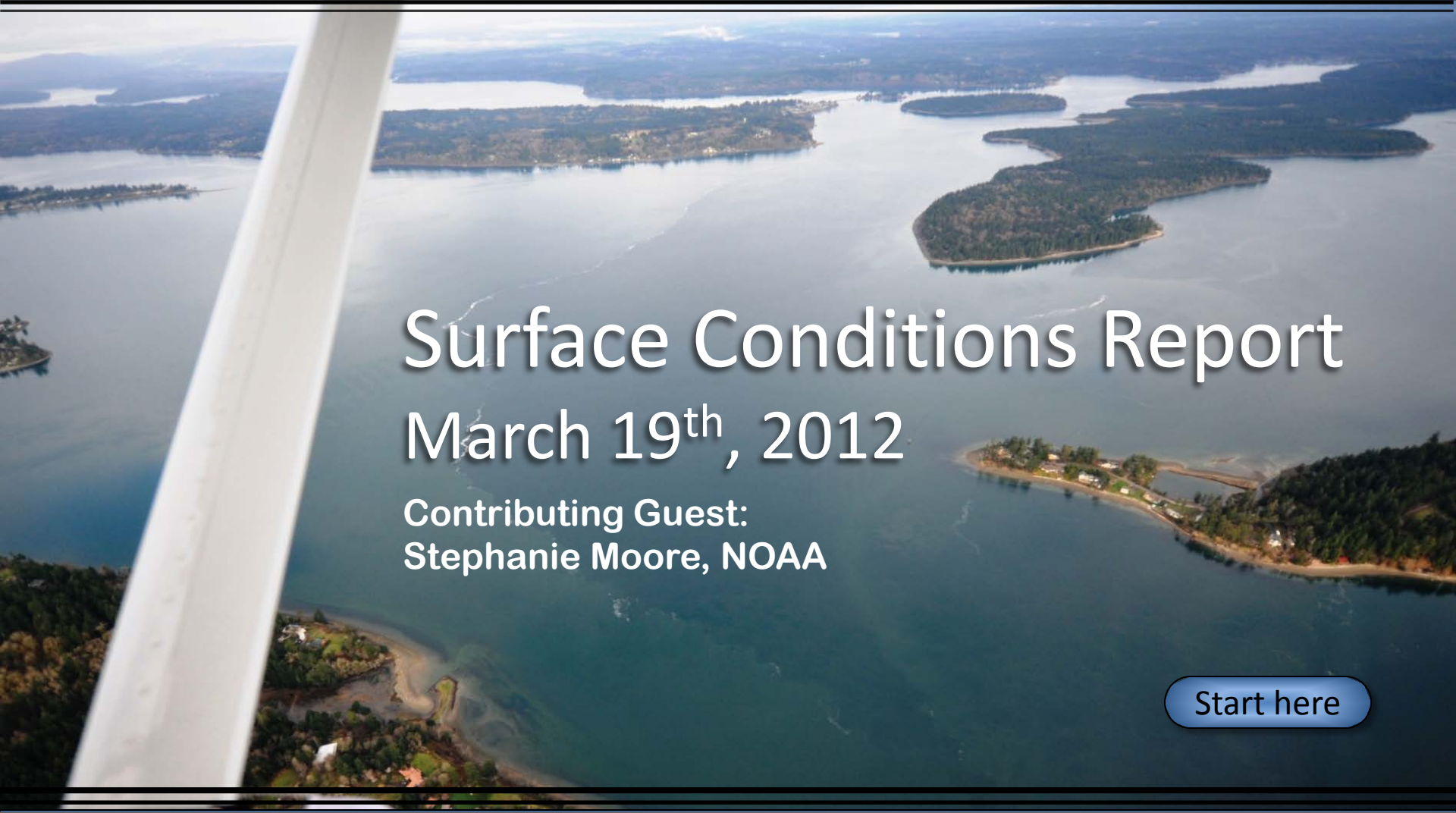
Publication No. 12-03-072

DEPARTMENT OF ECOLOGY State of Washington

Eyes Over Puget Sound



Surface Conditions Report

March 19th, 2012

Contributing Guest:
Stephanie Moore, NOAA

Start here

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

Marine conditions from 3-19-2012 at a glance

LONG-TERM MARINE MONITORING UNIT

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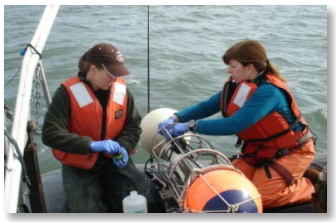


Personal flight impression p. 3-4
Spectacular river plumes, suspended sediment and wind.

Weather conditions p. 7
Cool, wet, cloudy weather with higher-than-normal river flows and little sunshine!

Aerial photography p. 8-27
Freshwater plumes extend far into the waterways. Surface debris abundant.

Ferry and satellite p. 28-29
No data due to weather and yearly ship maintenance work.

In-situ mooring data p. 30
The freshwater layer in Whidbey Basin increased by 2m matching high precipitation.

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

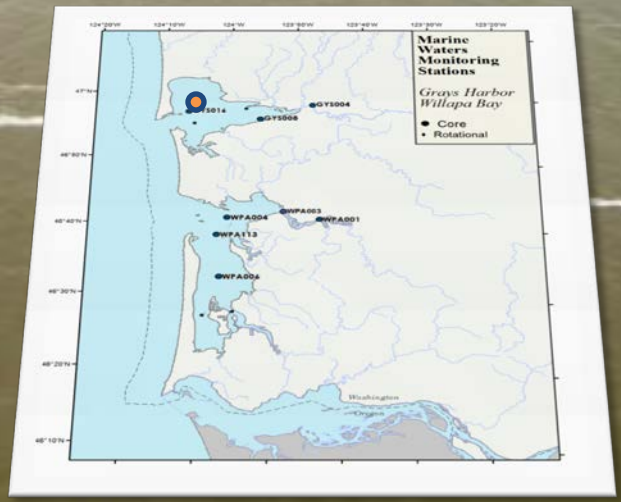
Personal flight impression 3-19-2012

Joe flying over Willapa Bay

The coast flight took place just before the first day of spring. The last days of winter were incredibly rainy and grey, and we saw evidence of this weather on our flight.

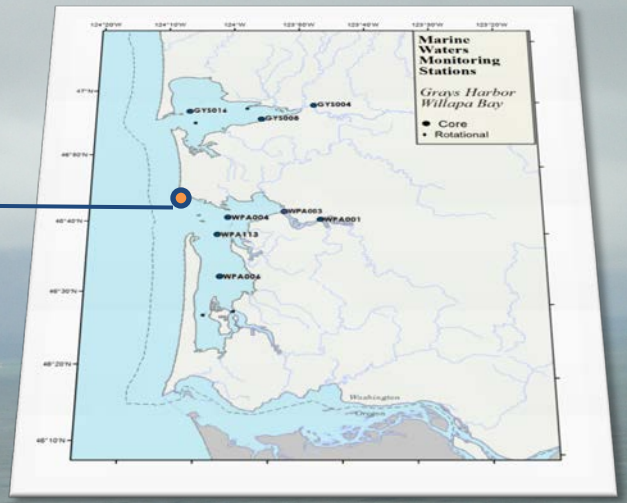
On our approach to Grays Harbor, we encountered patchy fog and scattered snow showers. The Chehalis River, which flows into Grays Harbor, was filled with brown sediment, which extended far into the harbor. The plume looked particularly dramatic on this flight.

Our window of weather did not last and the winds picked up. It forced us to skip two stations as the waves at the surface quickly started to build up.



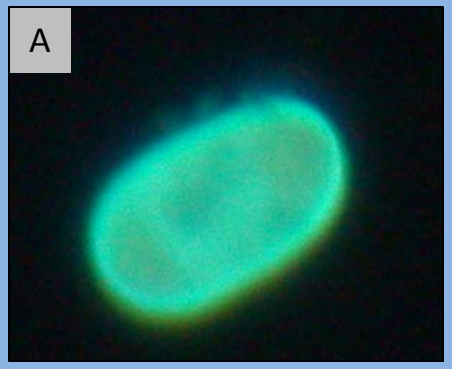
Personal flight impression 3-19-2012

Plume from a stream near Willapa Bay



Near Willapa Bay we spotted a brown plume from a small stream. Willapa Bay is also influenced by river runoff, yet the water was the more typical green-blue color.

Observing a very small but potent dinoflagellate



(A) Alexandrium under microscope, (B) being escorted by orcas, (C) ship cruise on Puget Sound.

The work is available as news story and can be accessed via the PS-AHAB website. link

Contact Stephanie about the Puget Sound *Alexandrium* (PS-AHAB) project, and to join the stakeholder mailing list.

Guest: Stephanie Moore

Under certain conditions , the harmful alga *Alexandrium catenella* blooms and produces neurotoxins which cause human illness or death after consuming contaminated shellfish.

•*Alexandrium* blooms (commonly called red tides) typically occur in summer, but the organism sticks around in winter too. They form dormant resting cysts that settle on the seafloor and provide the innoculum for toxic blooms the following summer.

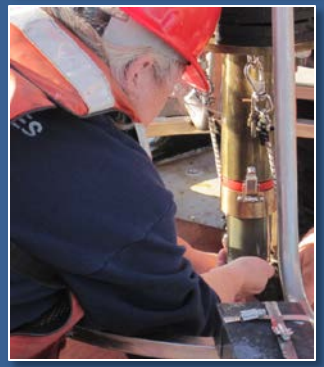
•The PS-AHAB project maps the seafloor and tests if hotspots/or years with many cysts set the stage for high levels of toxin in shellfish the following summer. link

•A PS-AHAB model identifies favorable habitat areas for *Alexandrium* in Puget Sound and tests the effects of climate change.

EOPS generates spatial context for collaborators

Field log	Weather	Water column	Aerial photos	Ferry and Satellite	Moorings

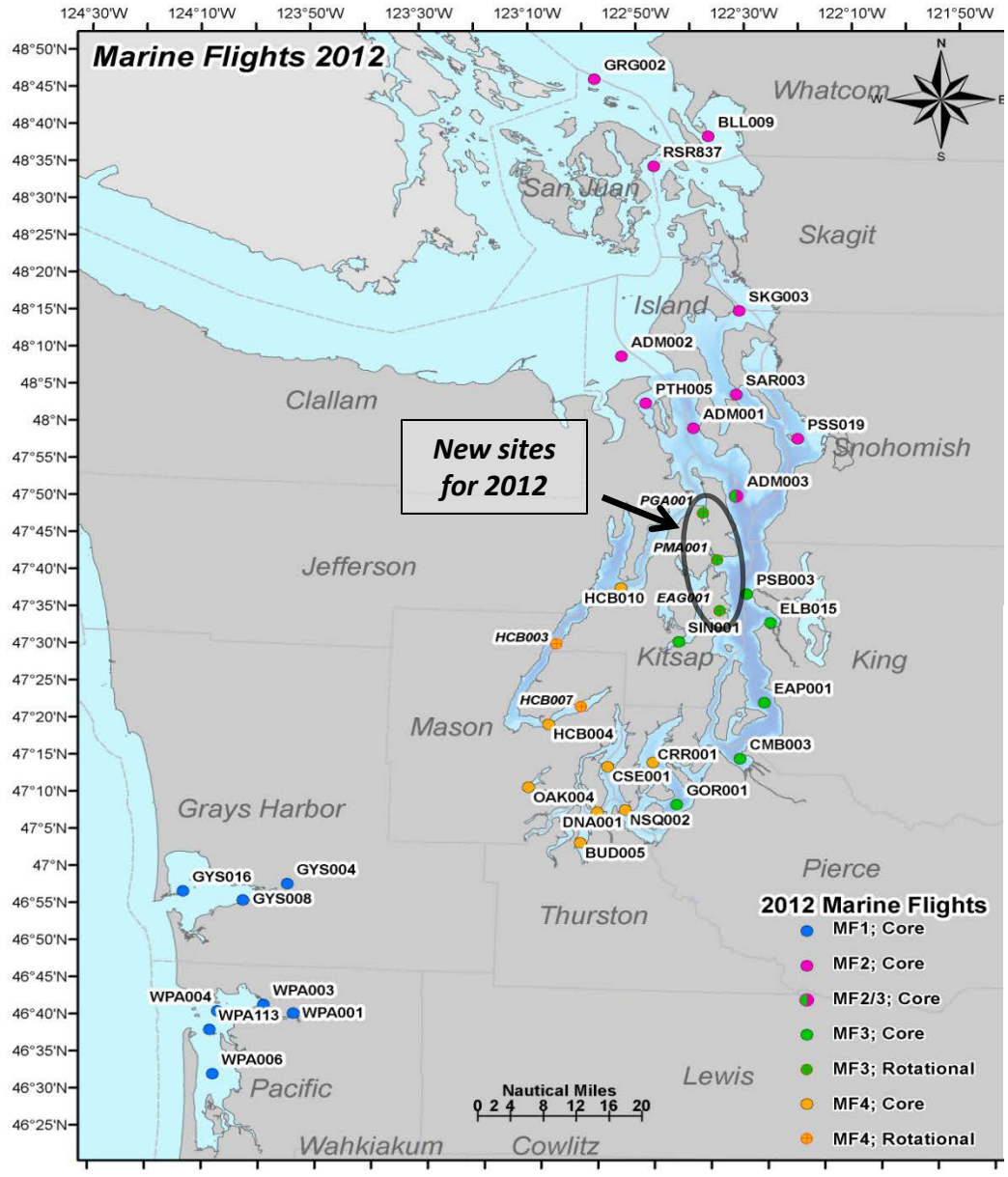
PS-AHAB



Highest levels of *Alexandrium* cysts are found in Quartermaster Harbor and Bellingham Bay. A map is available for download on the PS-AHAB website.

We conduct cyst mapping each year in winter aboard the research vessel Clifford A. Barnes. This year the cruises took place January 13-22 and January 29-February 4. Cold but dedicated researchers and crew persevered through the January snow storm and amazingly missed sampling only 2 of the 99 stations.

New flight and stations for the year 2012



Flight and Station Maps 2012

Port Gamble (PGA001) - This site was last visited in 2001. It was considered impaired for DO and bacteria in previous water quality assessments and has undergone sediment remediation activities.

Port Madison (PMA001) - Sampled most recently in 1995, this location has had several improvements & shellfish harvest has recently been restored in this bay.

Eagle Harbor (EAG001) - A super-fund site, this location has been part of clean-up efforts conducted by EPA and WSDOT at a ferry maintenance site.

Weather of the last two weeks of 3-19-2012

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

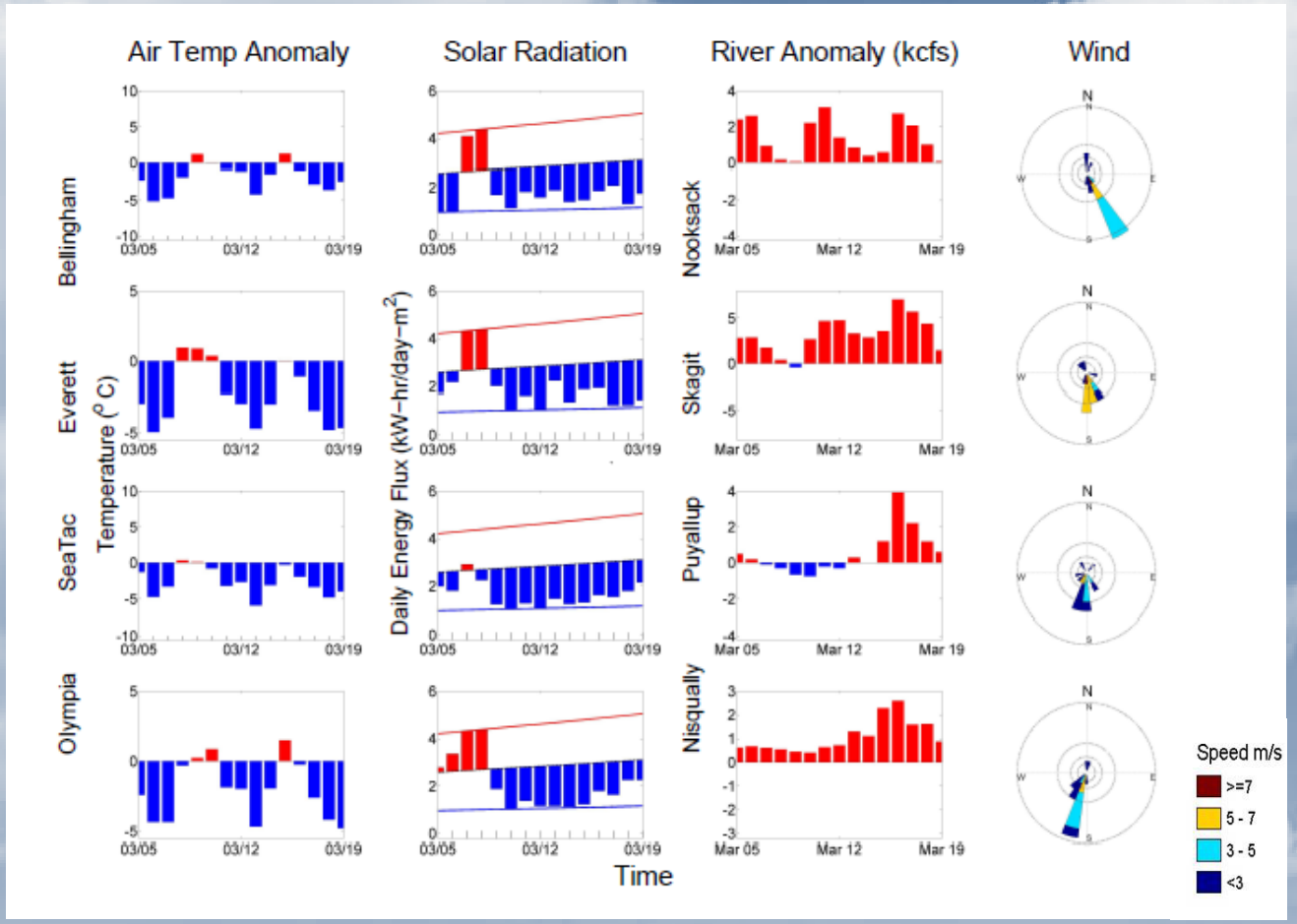
Summary:

Air temperatures have been colder than normal, and an end to this condition is not in sight.

Sunshine has been very low although the days are getting longer nearing the equinox.

Rivers have been running above normal for the past several days.

Winds have been mostly from the SE in the north, to the SW in the south. Strongest winds occurred near Everett.



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

Summary: Aerial photography 3-19-2012

River plumes extend into South Sound and Central Basin. Jellyfish aggregations in Sinclair Inlet. Long debris lines and fronts in South Sound.

Start here

Ship with spill beam in Elliot Bay, 8:21 AM

Long front near Squaxin Island 8:49 AM

Front

Mixing and Fronts: 1 7 8 9 10 11 15

Central Basin, Elliott Bay, Case Inlet, Dana Passage, Budd Inlet

Plume

Suspended sediment: 3 8 9 10 11 15

Extensive in Elliott Bay and Budd Inlet.

Bloom

Visible blooms: 2 14

First signs near Fox Island and Sinclair Inlet.

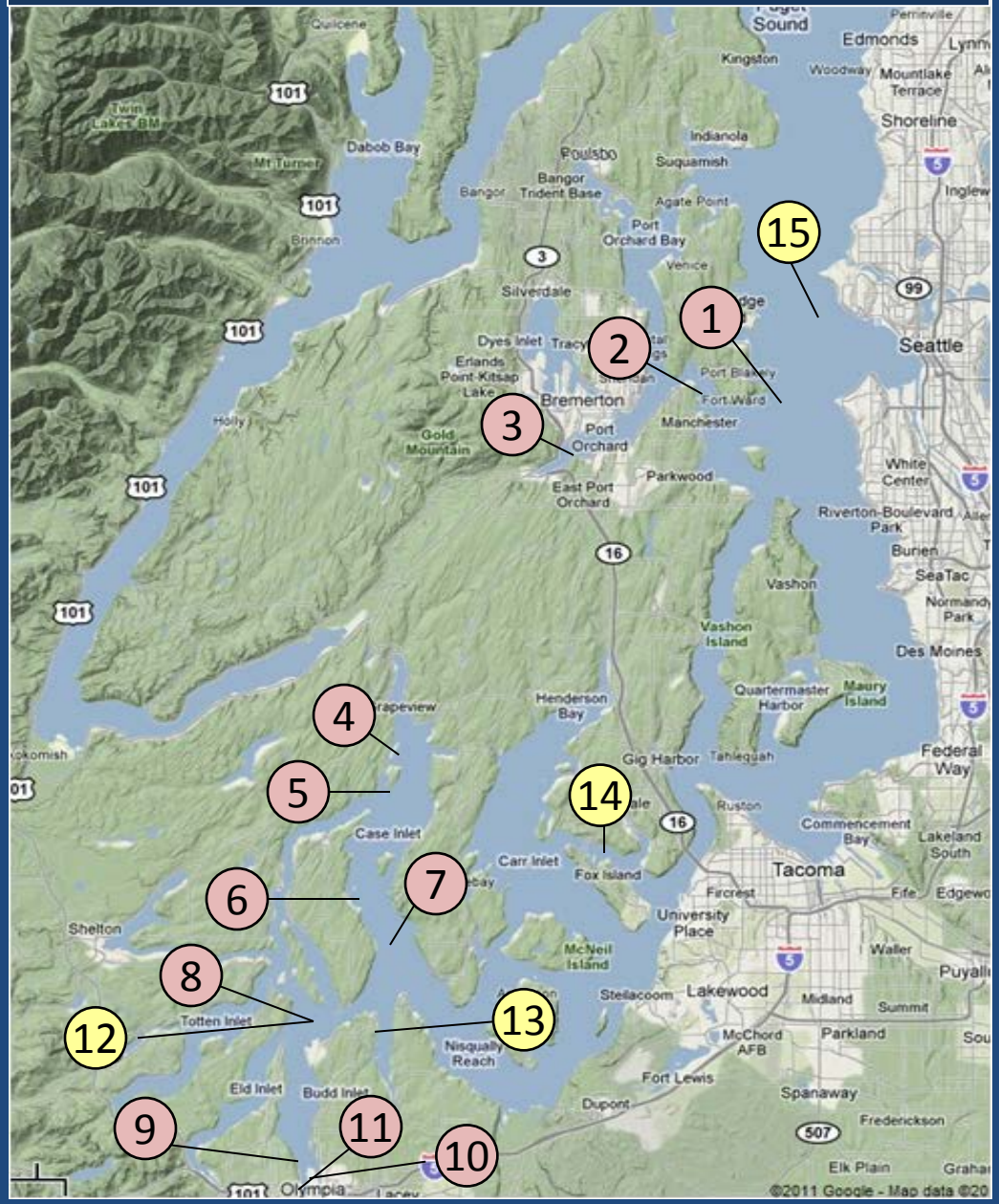
Debris

Debris 1 2 3 4 5 6 8 9

South Sound: Case Inlet, Dana Passage, Budd Inlet

Central Basin: Elliott Bay, off Bainbridge

High tides : 4:50 AM, 4:14 PM Low tides: 10:43 AM , 10:22 PM



Aerial photography image guide

3-19-2012

Click on numbers

Flight Information:

Morning flight:
Freezing temperature, high visibility, calm

Evening flight:
Intermediate visibility, snow flurries, gusty

Observation Maps:

Central Sound

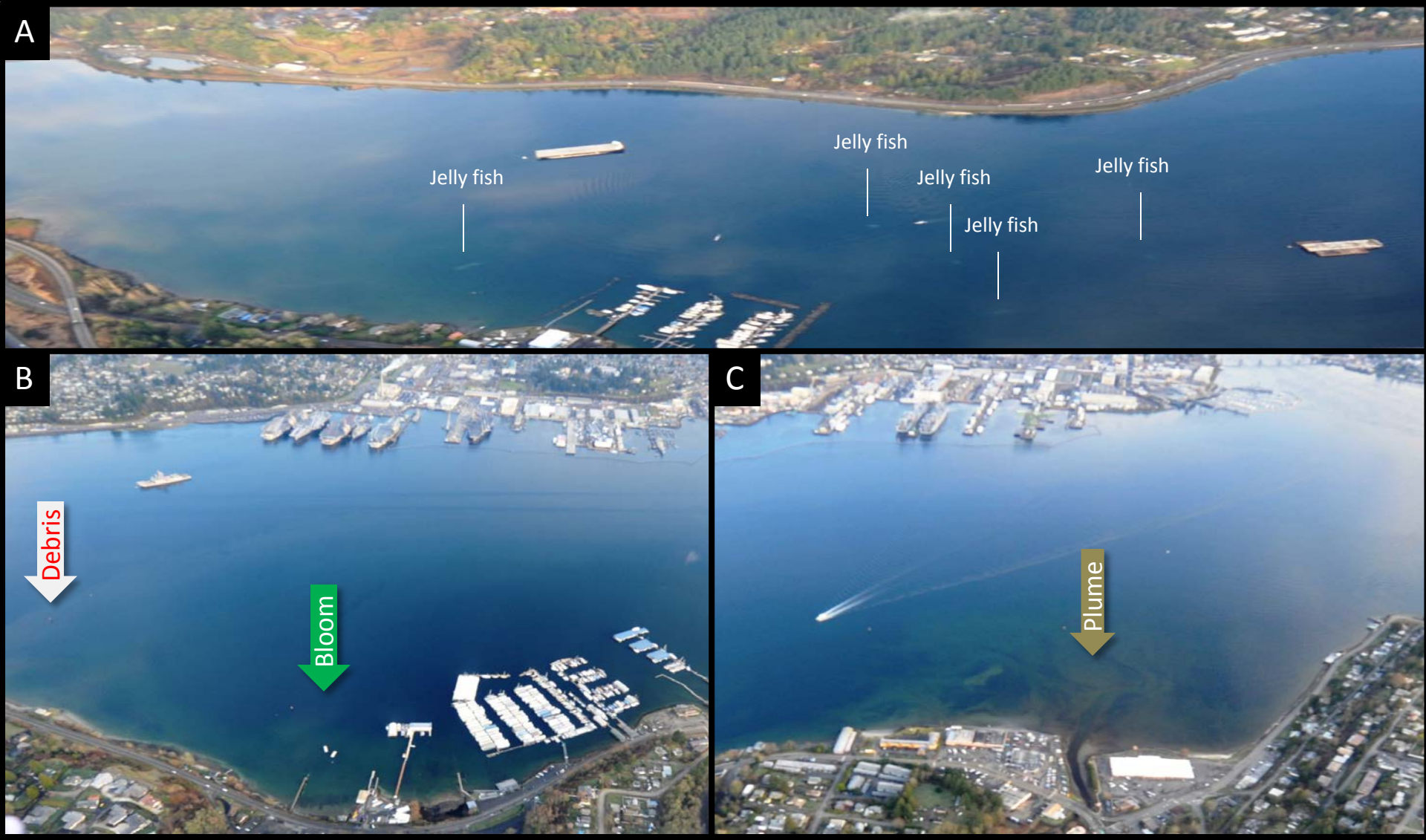
South Sound

Fronts in central Basin. Location: West of Elliott Bay looking south, 8:24 AM

Aerial photography

Debris leaving Sinclair Inlet near net pens. Location: Near Manchester, 8:27 AM

Aerial photography



Jelly fish (A), algae bloom (B) and plume (C). Location: Sinclair Inlet, 8:30 AM

Debris line. Location: Case Inlet (South Sound), 8:41 AM

Aerial photography

Debris line. Location: Case Inlet (South Sound), 8:41 AM

Debris line. Location: Case Inlet (South Sound), 8:45 AM

Aerial photography

Very strong front. Location: Case Inlet near Dana Passage (South Sound), 8:47 AM

Front, plume and debris (during ebb tide). Location: Squaxin Island (South Sound), 8:49 AM

Aerial photography

Deschutes river plume, front and debris. Location: Budd Inlet (South Sound), 8:53 AM (2:40 PM)

Aerial photography

Port of Olympia. Location: Budd Inlet (South Sound), 8:55 PM

Aerial photography

Sediment laden Deschutes water meets clear water freshwater. Location: Capitol Lake (Olympia), 8:55 AM

Front during flood tide. Location: Dana Passage (South Sound), 2:41 PM

Suspended sediment near beach. Location: Henderson Inlet, 2:47 PM

Signs of a beginning algal bloom . Location: Fox Island (South Sound), 2:50 PM

Aerial photography

Beach erosion and Duwamish River plume. Location: Off West Point (Seattle), 3:01 PM

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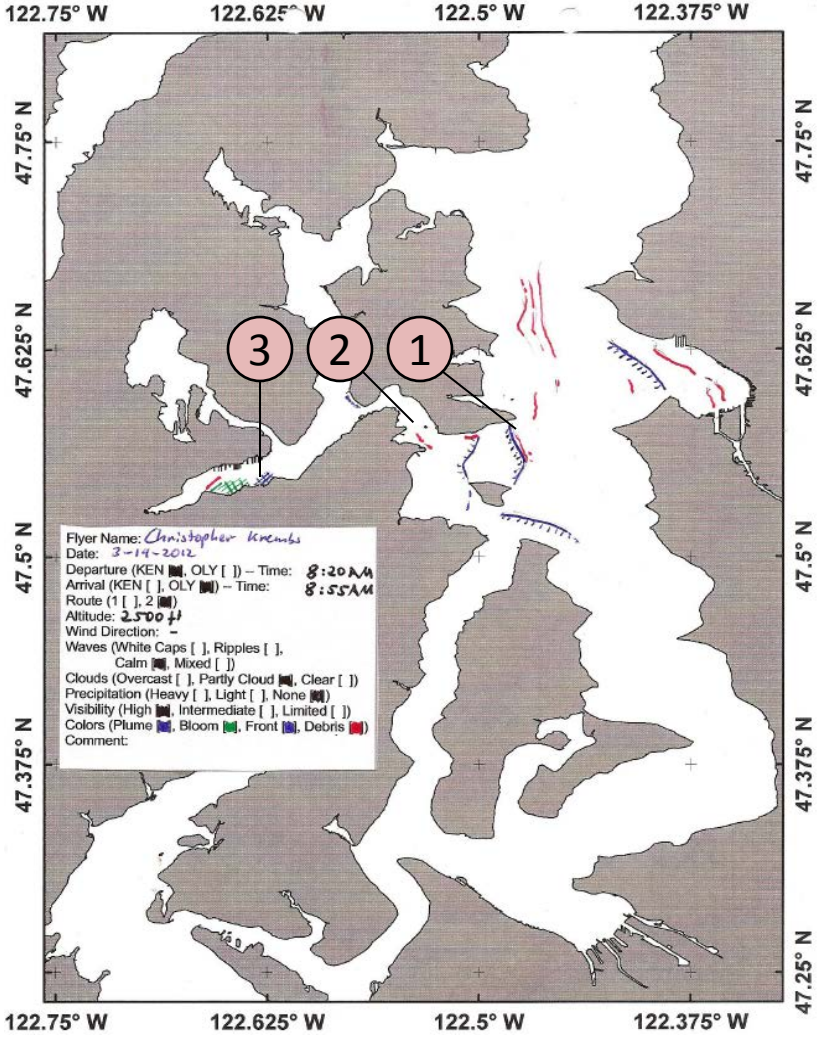
Aerial photography, observations in Central Sound

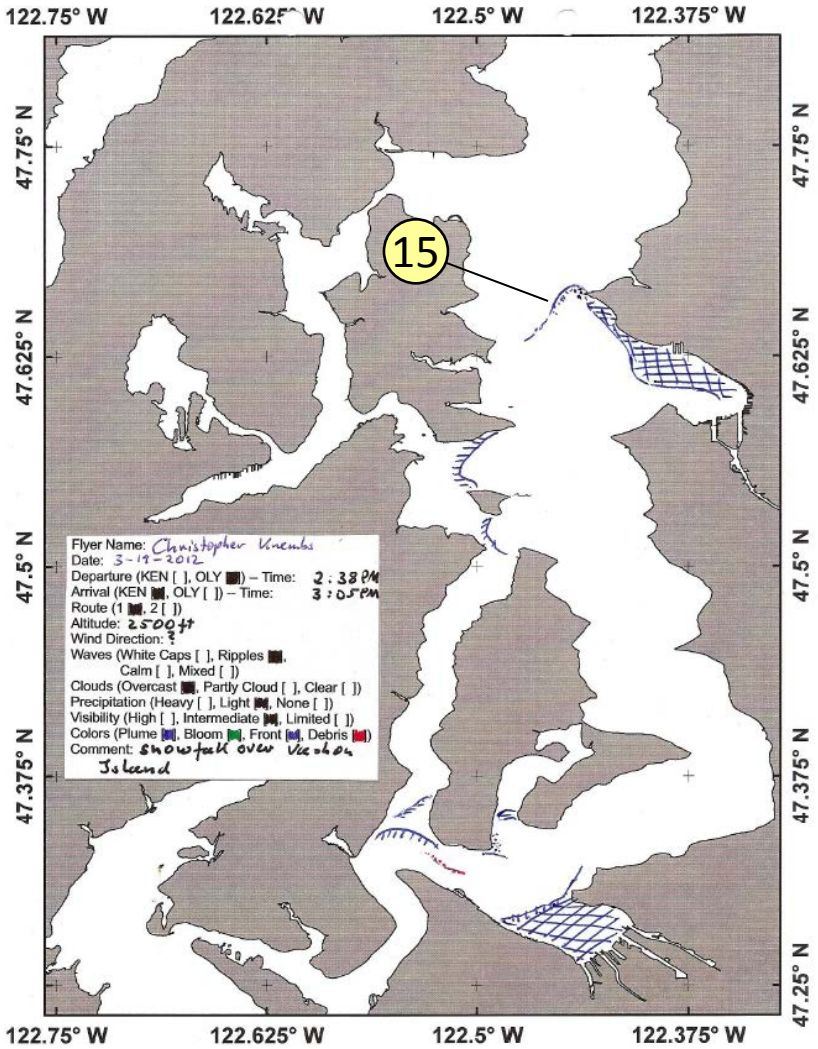
Navigate

Date: 3-19-2012

Morning



Evening



Numbers on map refer to picture numbers for spatial reference

Navigate

Aerial photography

Observations in South Sound: 3-19-2012

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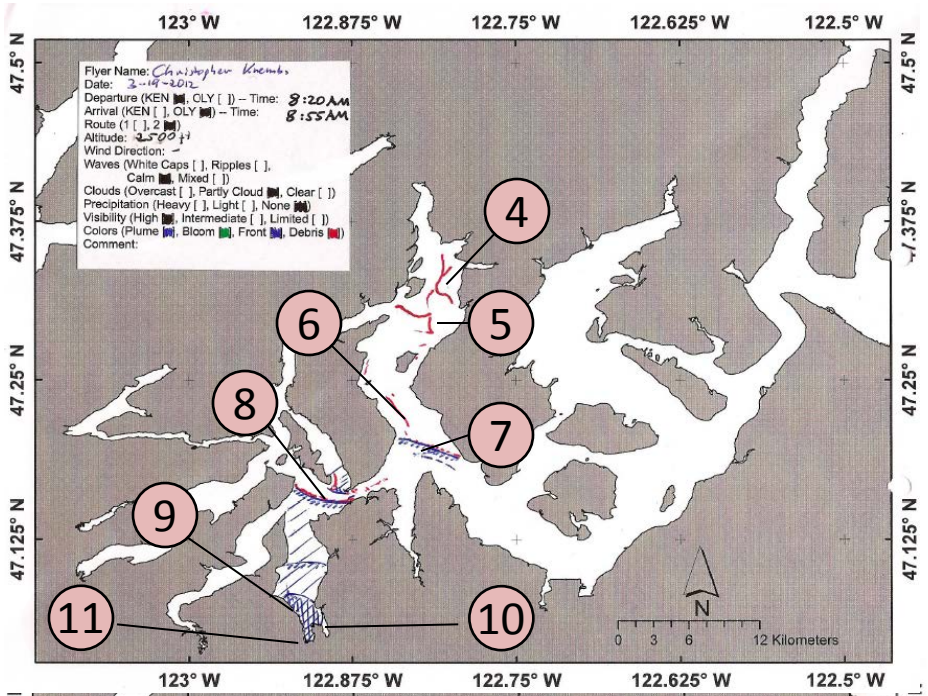
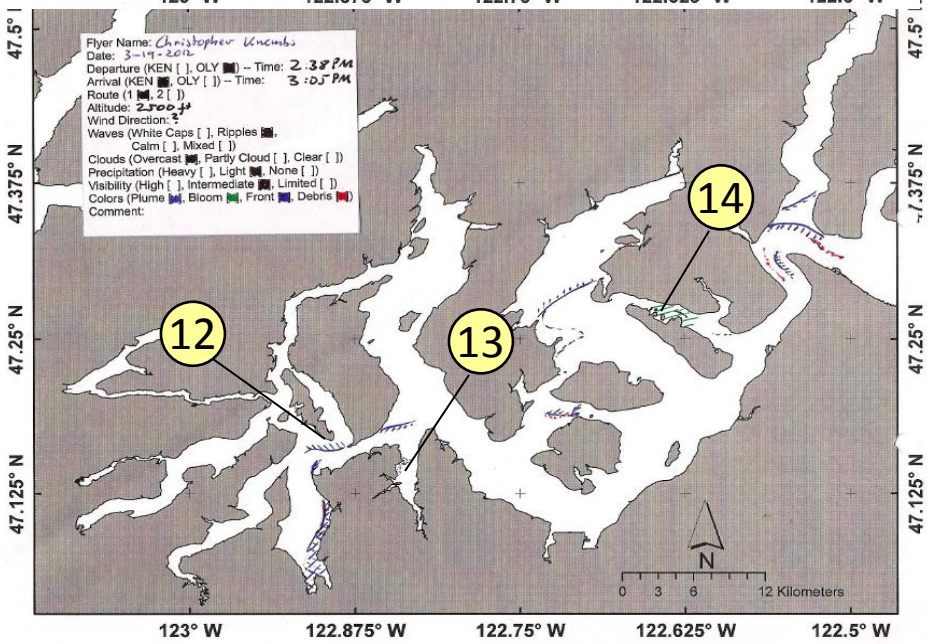
Numbers on map refer to picture numbers for spatial reference

Morning



Evening



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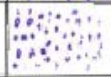
Legend to map annotations

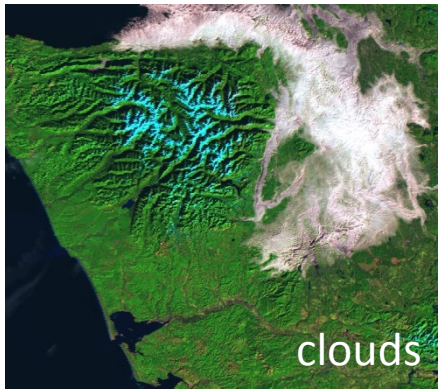
Plumes	
• Freshwater with sediment **solid**	
• Freshwater with sediment **dispersed**	
• Coastal erosion with sediment	
Blooms	
• Dispersed	
• Solid	
Debris	
• Dispersed	
• Solid	
Front	
• Distinct water mass boundaries	
• Several scattered	

Comments:
Maps are produced by observers during and after 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.

Daily ferry and satellite observations in Central Sound, 3-19-2012

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



The Victoria Clipper vessels get annual maintenance and goes into "dry dock" from Mar 3-26, 2012 (source article).

Current Conditions:

No report available due to annual ferry maintenance and cloudy conditions.

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

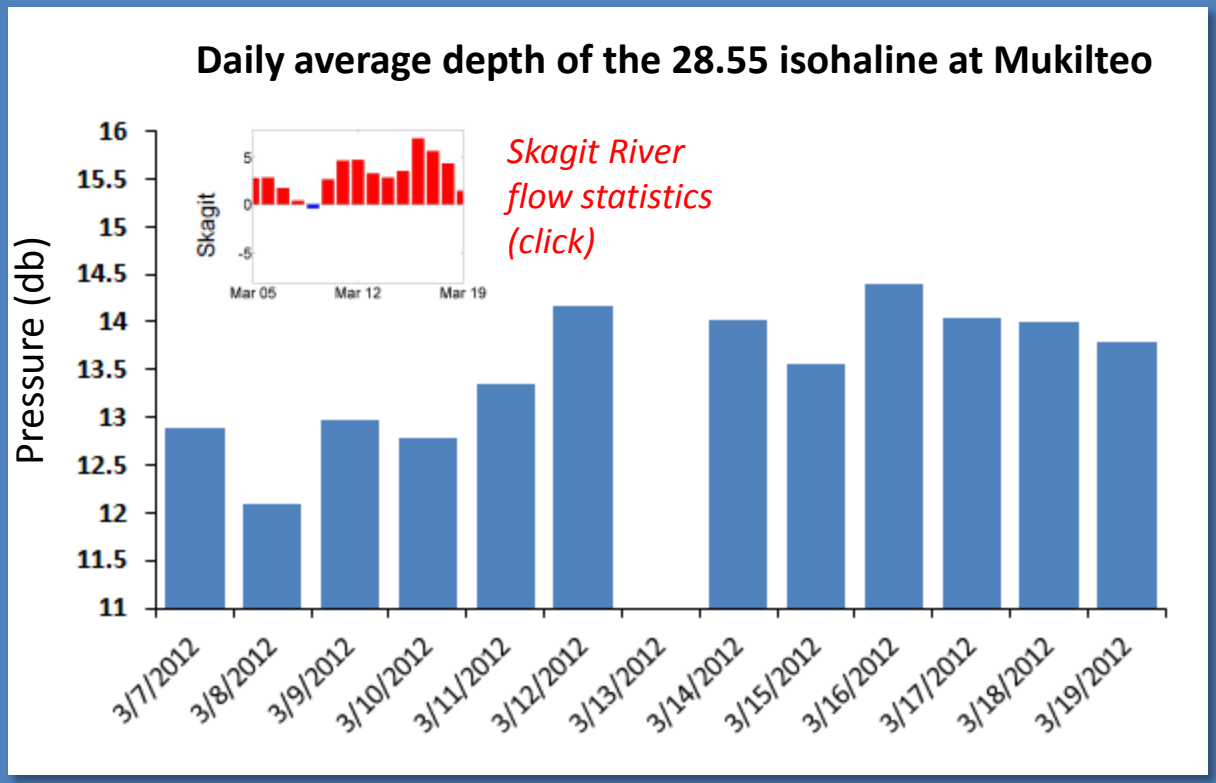
(http://www.ecy.wa.gov/programs/eap/mar_wat/eops/clipper.html)

No good satellite images are available due to persistent cloud cover over the last two weeks

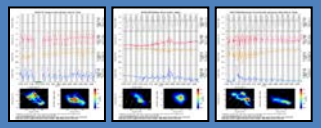
Mooring observation and trends, 3-19-2012

Summary: Both lower dissolved oxygen conc. and warmer water correlated with higher salinity. The freshwater layer increased in thickness by 2 meters past March 11 matching high levels of precipitation and river discharge.

We currently focus on the thickness of the freshwater layer between Whidbey Basin and Central Basin.



We track the depth of the isohaline 28.55 (±0.05) and measure the thickness of the freshwater layer at our Mukilteo station. The sensor experiences tidal pressure variations of 11.8 to 15.6 dbar.



Real-time data online (click)

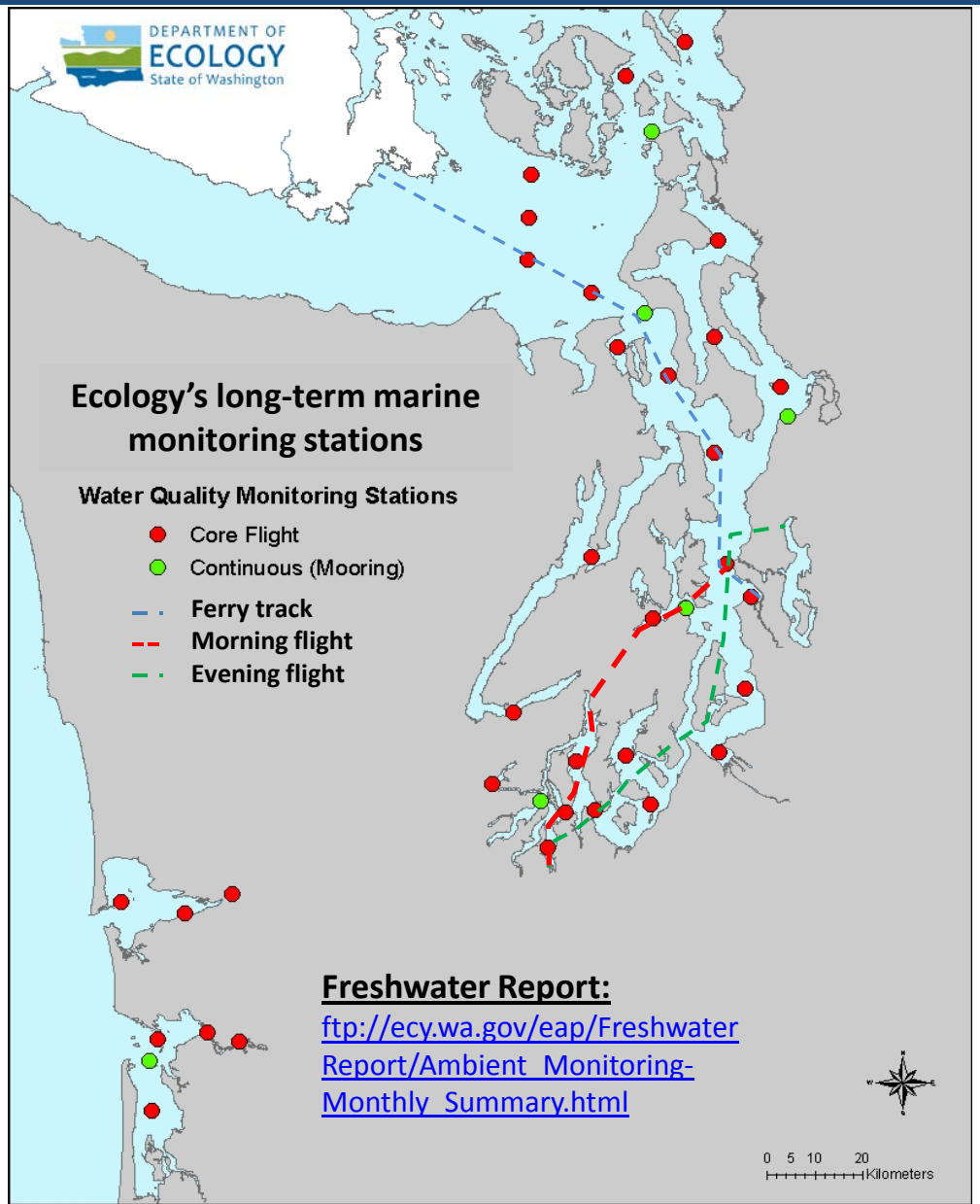
Get your data from Ecology's Environmental Assessment Program

Long – Term Monitoring Network

christopher.krembs@ecy.wa.gov

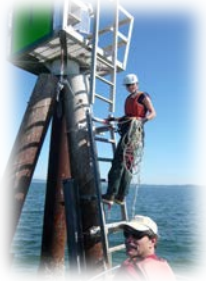
Access core monitoring data:

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/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

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