Eyes Over Puget Sound

Surface Conditions Report
February 27, 2012

Contributing Guest:
Donovan Rafferty, Air Quality Program

Up-to-date observations of visible water quality conditions in Puget Sound and the Strait of Juan de Fuca
# Marine Conditions from Feb. 27, 2012 at a Glance

<table>
<thead>
<tr>
<th>Field log</th>
<th>Weather</th>
<th>Water column</th>
<th>Aerial photos</th>
<th>Ferry and Satellite</th>
<th>Moorings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mya Keyzers</td>
<td>Laura Friedenberg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skip Albertson</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Dr. Christopher Krembs</td>
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<td>Dr. Brandon Sackmann</td>
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<td>David Mora</td>
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<td></td>
</tr>
</tbody>
</table>

## Personal Flight Impression
We got a sunny day and are testing an ozone sampler.

## Weather Conditions
Little sunshine, cold air temperatures, and higher river flows in the second part of February.

## Aerial Photography
Freshwater plumes extend far into the waterways. First blooms begin in South Sound.

## Ferry and Satellite
Chilly surface temperatures and pulses of high CDOM waters in Central Sound.

## In-situ Mooring Data
A thinner freshwater layer at Mukilteo reflects a low discharge of the Snohomish river.

The weather this month made getting our last flight out very unpredictable. Luckily, there was a break in the weather on Monday and we were able to get it done. It turned out to be a stellar day for sampling! It was clear with some sun but cold with wind 10kts or below. Everything was working great (including field crew) and we successfully worked our way through all 10 stations. The Olympics looked particularly gorgeous with a dusting of snow in the foothills.

We started a new collaboration this month with Donovan Rafferty from Ecology’s Air Quality Program. We will be taking his ozone analyzer along on flights to sample the air we pass through looking for ozone plumes. Ozone in the lower atmosphere is a pollutant and also acts as a greenhouse gas. It can cause eye and respiratory tract irritation, as well as damage to plants by inhibiting photosynthesis and growth. Monitoring for ozone can help us understand where it comes from and in what concentrations.

Donovan has rigged up a special box to hold the ozone sensor, a fan, a battery pack and a GPS unit. A GPS receiver is strung through to the front window of the plane and tubing which connects to the analyzer is threaded out of the cabin vent to “sniff” and gather data. We are in the testing phase right now. We want to be ready to collect quality data this summer when ozone plumes can be found in our more urban areas. Collaborations like this provide more data for the public and managers without additional costs. It also makes our time in the plane even more valuable and expands the contextual envelope for our own data.
Donovan (Air Quality Program, Ecology) and Joe (pilot, Kenmore Air) getting the ozone analyzer set up
Donovan assembles the portable ozone analyzer (A) and installs GPS (B) and tubes for the air intake (C) on board the float plane.

The instrument is turned on and continuously records ozone concentrations, position, and altitude during the routine marine flight. This saves resources and time.

Guest: Donovan Rafferty

Seasonally, elevated ozone concentrations occur in the Puget Sound Basin. At the ground they can affect public and environmental health.

- Air quality models forecast high concentrations near the San Juan Islands.

- Placing a portable ozone analyzer on marine flights can test and verify ozone model predictions.

- We are currently testing the ozone monitoring package on marine flights to prepare for summer measurements over the Central Salish Sea.

Many thanks to the Marine Monitoring Unit and Kenmore Air pilot Joe.
New Flight and Stations for the year 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.
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** during the past few days have been increasingly colder than expected. This follows a weak warm spell a week ago.

**Sunshine** has been very low except on the day of the marine flight.

**Rivers** have been running above normal for the past week.

**Winds** have been predominantly from the SE in the north, to the SW in the south.

River plumes extend largely into Central Basin. Some jellyfish aggregations persist in Budd Inlet. South Sound has first signs of algae blooms.

**Mixing and Fronts:** Commencement Bay, Blake Island, Central Basin Dana Passage

**Suspended sediment:** Extensive in Central Basin and Commencement Bay and near major river estuaries.

**Visible blooms:** South Budd Inlet and Henderson Inlet

**Debris**
South Sound: West of Harstine Island, Dana Passage
Central Basin: Off Shilshole Bay

Collaborating with Air Quality, (Ecology)

Eddy north of McNeil Island 4:20 PM
Aerial photography image guide
2-27-2012

Click on numbers
- Morning Flight
- Evening Flight

Flight Information:
Morning flight:
Freezing temperature
High visibility but de-icing
Left residue on window

Evening flight:
High visibility, altitude 2500ft

Observational maps (AM)
Observational maps (PM)
Plume along shore. Location: Bremerton, Sinclair Inlet, 8:28 AM
Aerial photography

Front, debris line and plume. Location: Harstine Island, Case Inlet 8:31 AM
Debris near Harstine Island Bridge. Location: West of Harstine Island (South Sound) 8:40 AM
Debris line. Location: West of Squaxin Island (South Sound) 8:41 AM
Aerial photography

Debris line. Location: Dana Passage (South Sound), 8:44 AM
Beginning bloom. Location: Near Swantown Marina, Budd Inlet (South Sound), 8:46 AM
First signs of an algal bloom. Location: Henderson Inlet (South Sound), 4:10 PM
Algal bloom and weak front. Location: Henderson Inlet (South Sound), 4:15 PM
Eddy with suspended sediment. Location: McNeil Island (South Sound), 4:20 PM
Front north of Tacoma Narrows. Location: Gig Harbor (Central Sound), 4:21 PM
River plume west of Tacoma. Location: Vashon Island (Central Sound), 4:22 PM
Front and river plume. Location: Entrance to Quartermaster Harbor, Vashon Island (Central Sound), 4:23 PM
Beginning algal bloom. Location: Quartermaster Harbor 4:28 PM
Aerial photography

Front . Location: Near Blake Island (Central Sound), 4:36 PM

mixing

Front
Aerial photography

Front stretching in direction of Edmonds.  Location: Off Carkeek Park (Seattle), 4:39 PM
Aerial photography observations in Central Sound

Date: 2-27-2012

Morning

Numbers on map refer to picture numbers for spatial reference

Evening

Numbers on map refer to picture numbers for spatial reference
Aerial photography

Observations in South Sound: 2-27-2012

Numbers on map refer to picture numbers for spatial reference
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.
Current Conditions:
Localized areas of high colored dissolved organic material (associated with higher river flows); surface temperatures are 7-8 °C throughout Central Sound and the Strait of Juan de Fuca.

--- Daily ‘Quick-Look’ Products Available ---
(http://www.ecy.wa.gov/programs/eap/mar_wat/eops/clipper.html)
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.

Pulses of colored water have been seen making their way from Whidbey Basin into Central Puget Sound, associated with recent rainfall and high river flows.
Mooring observation and trends

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

Summary: On February 19 the freshwater layer thickness was low reflecting the Snohomish discharge minimum (see previous page).

The mooring report is currently limited to describing 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.
Get your data from Ecology’s Environmental Assessment Program

Long – Term Monitoring Network

Access core monitoring data:

Ferry track
Morning flight
Evening flight

Real – Time Sensor Network

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

Access mooring data:

Freshwater Report:

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

Dr. Christopher Krembs
ckre461@ecy.wa.gov

Marine Monitoring Unit
Environmental Assessment Program
WA Department of Ecology

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