

Eyes Over Puget Sound

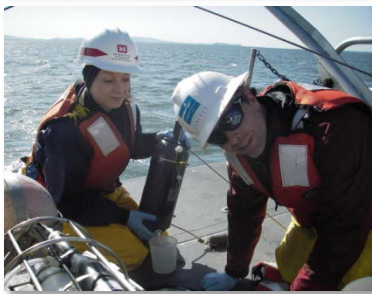
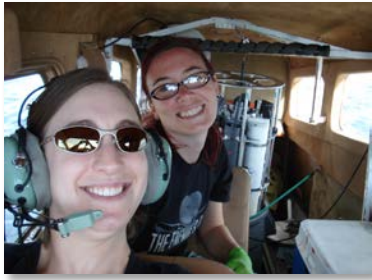
An aerial photograph of Puget Sound, Washington, showing large, winding plumes of orange-brown sediment or algae in the dark blue water. A white aircraft wing and part of the fuselage are visible in the foreground, indicating the photo was taken from an airplane.

Surface Conditions Report

June 20, 2011

Up-to-date observations of visible water quality conditions in Puget Sound and the Straits

Meet us in the field:



Content:

- Personal flight impression p. 4-7
Find out what it's like to be in the field.
- Aerial photography p. 8-33
Find out what you see at the surface.
- Ferry and satellite p. n.a.
Find out what we measure at the surface every day
- *In-situ* mooring data p. 34-36
Find out what we measure below the surface every day

Get your data from Ecology's Environmental Assessment Program

Long – Term Monitoring Network

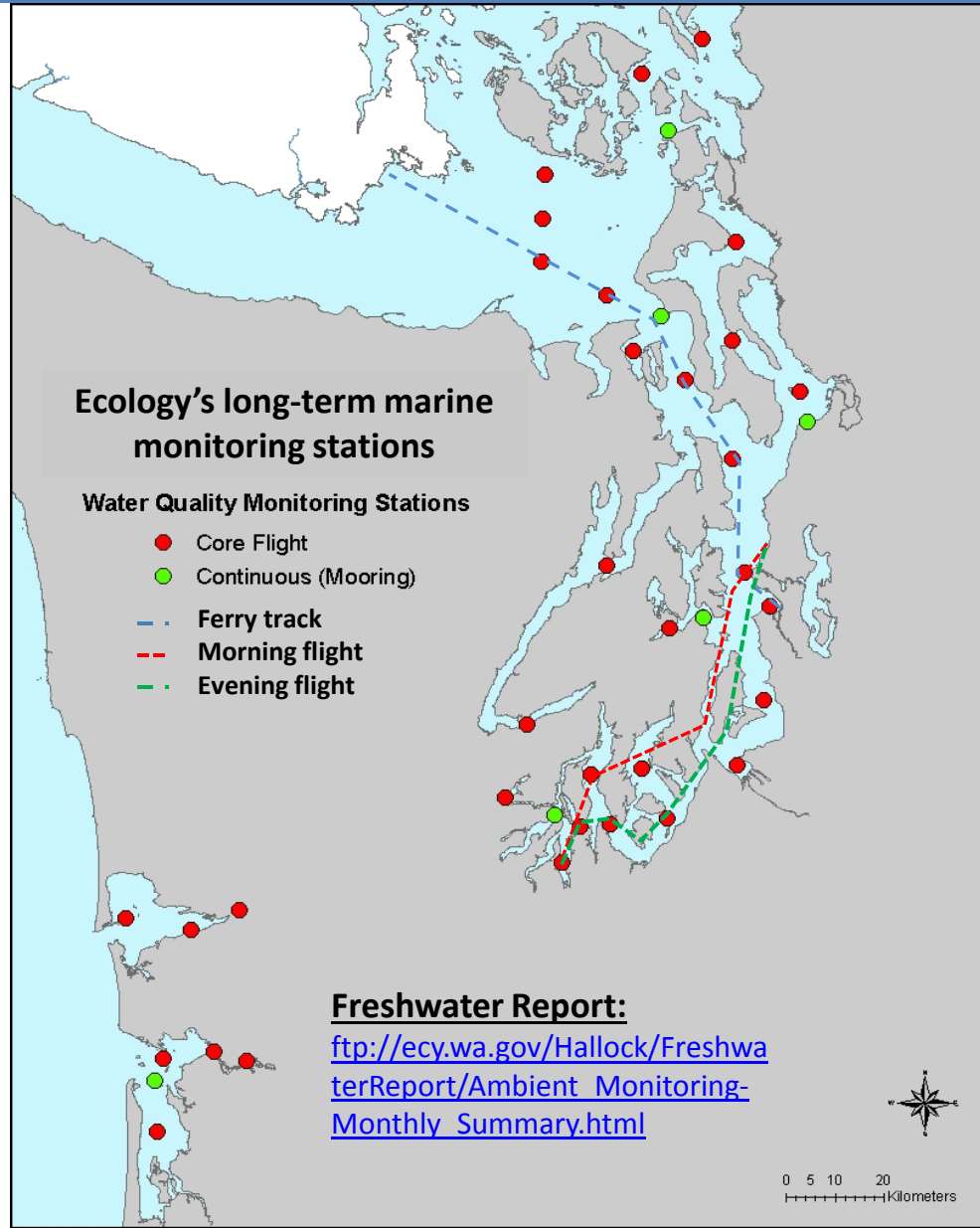


ftp://www.ecy.wa.gov/eap/Flight_Blog/



Access core monitoring data:

<http://www.ecy.wa.gov/apps/eap/marnewq/mwdataset.asp>



Real – Time Sensor Network

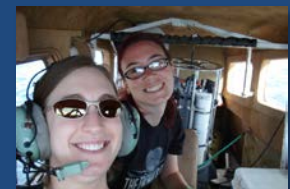


brandon.sackmann@ecy.wa.gov



Access mooring data:

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



Flight Impressions from 6-20-2011

It was a particularly great day for the coast flight. We almost decided to stay in the Puget Sound area because of low clouds, but as we approached the Willapa Hills the sun broke through and we enjoyed clear sunny skies all day. The tide was very low when we were sampling so I checked the depth at each station prior to the cast so we could avoid the dreaded mudplant (when the CTD hits the sediment) (see next page)



The water was so calm it was hard to tell which way was up!



Bon voyage Marissa!



Red streaks in Willapa Bay to the river.



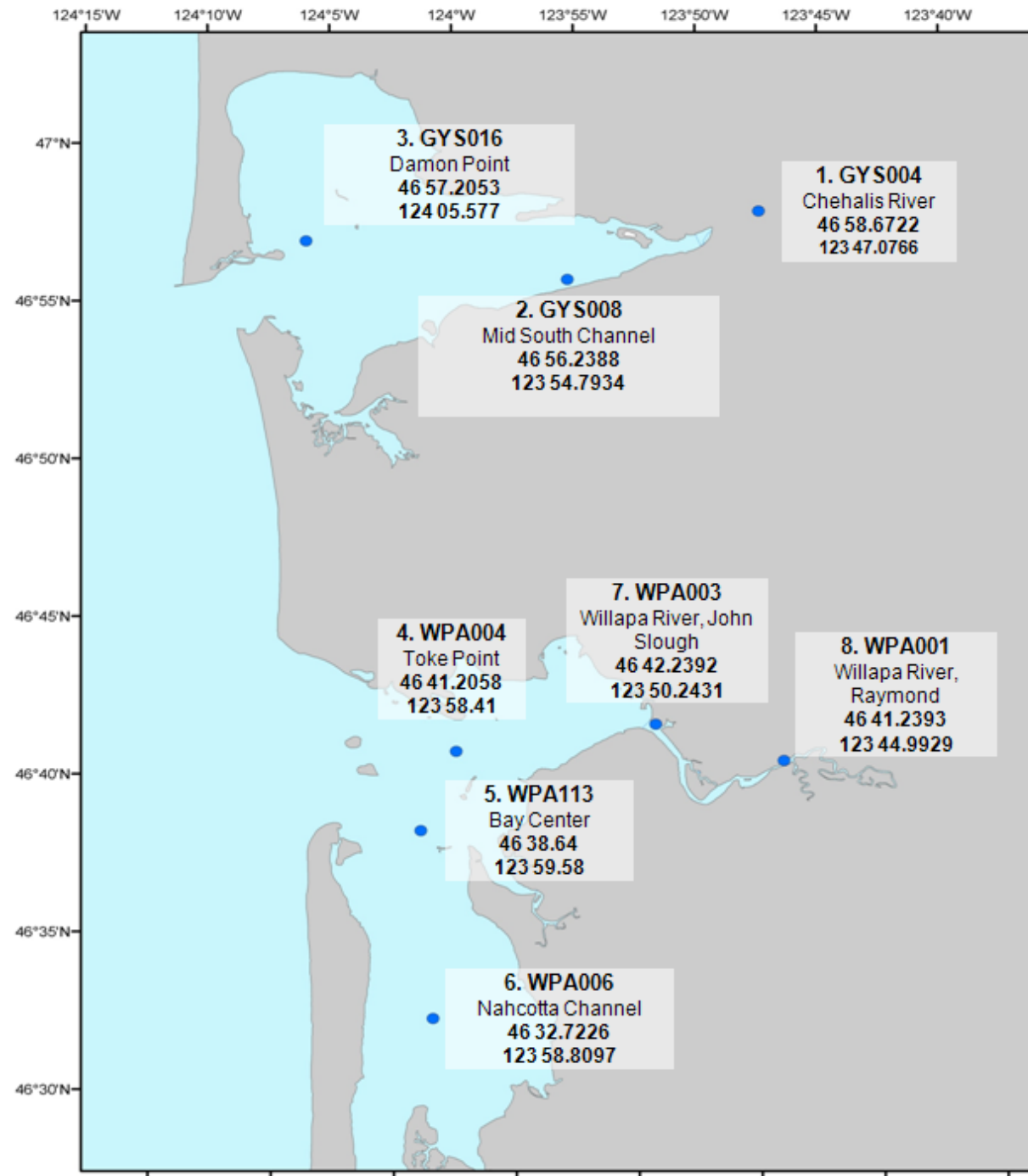
Bloom presence in Grays Harbor.

Marine Flight 1 (Coast)

We saw baby seals, bald eagles, groups of blue herons, and bait balls. It was a successful flight with 100% station attainment. We saw very green and red water, which is evidence of phytoplankton growth.



It was the last flight with my amazing co-worker Marissa Jones, who is off to pursue her Masters degree at UW.



Flight 3: Central Sound; 6-21-2011

I was surprised to find myself trying to get out the last flight for the month in the third week of June. During the summer months the weather usually allows us to get all four flights done in the first couple weeks. To make matters worse, foggy conditions delayed our departure for two hours. But once the fog lifted it was a perfect day for sampling. We sampled all ten stations. It was a long field day, which was fitting for the longest day of the year. We enjoyed clear, sunny skies and calm, flat water. If you have been near the Central Sound lately you have no doubt noticed some shocking orange streaks on the surface of the water. We stopped and took a sample near Indianola and later confirmed it was *Noctiluca*, a plankton species that is not harmful to human health. (Although I wouldn't jump in it!) To learn more visit our website http://www.ecy.wa.gov/programs/eap/mar_wat/mwalgae.html.



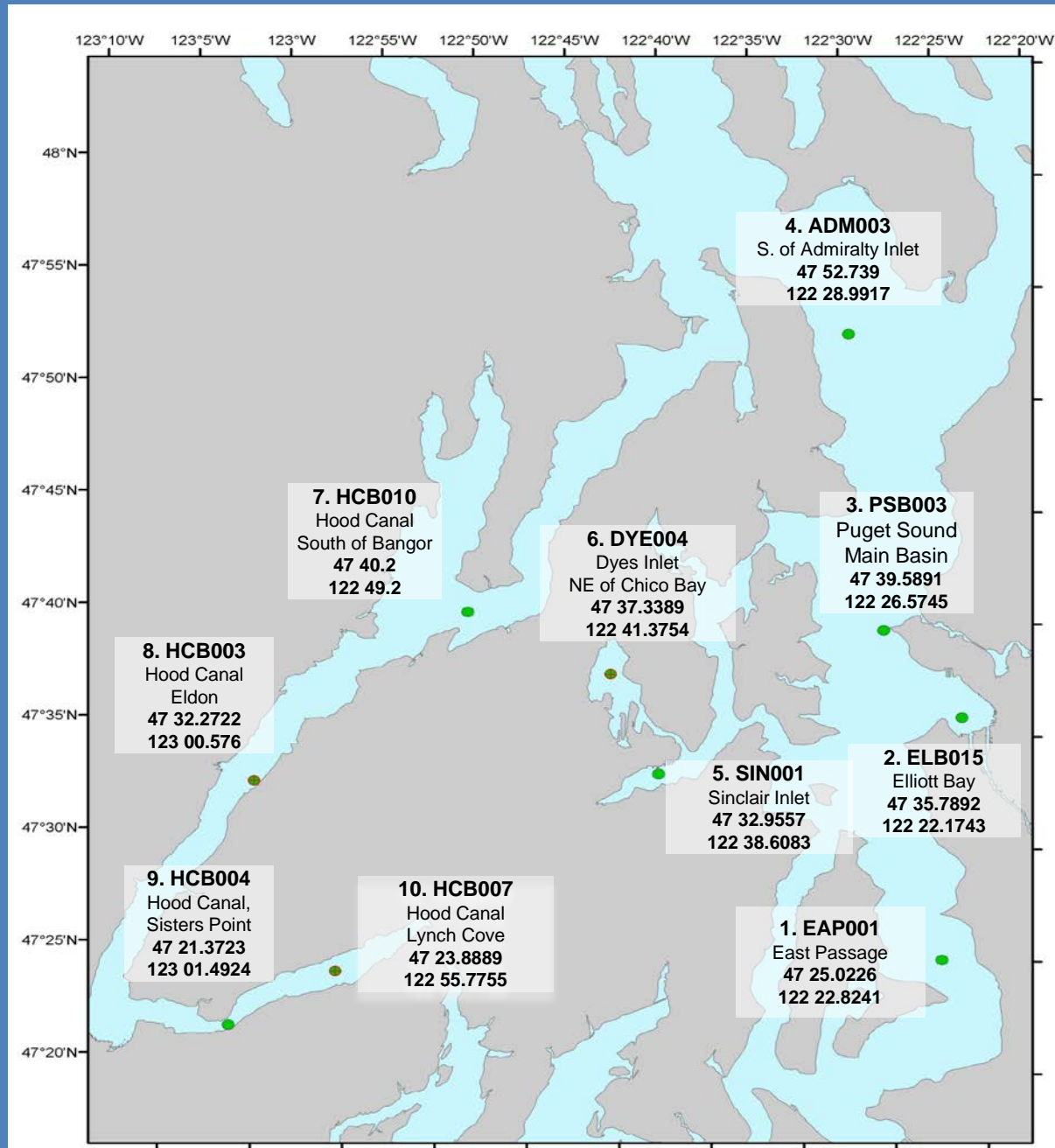
Morning fog still burning off



Noctiluca patches in Central Sound



2011 Marine Flight 3 – Central Sound





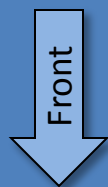
Summary of observation: 6-20-2011

Comment: Extensive Noctiluca bloom (confirmed by microscopy on 6-21-2011) in Central Basin of Puget Sound, red brown and turquoise blooms in South Sound

Extensive Noctiluca bloom in Central Basin



Brown-red bloom in East Bay, Olympia



Mixing and Fronts:

Distinct fronts between Nisqually past Anderson Island (South Sound)



Suspended sediment:

Nisqually, Commencement Bay, Quartermaster Harbor



Visible blooms:

Brown-red in South Sound (Budd Inlet, Dana Passage, Case and Carr Inlet). **Green** in Quartermaster Harbor (Vashon Island) Oro Bay (Anderson Island). Turquoise bloom south of Fox Island, east of Anderson Island and, Nisqually Reach (all South Sound)



Debris (mainly Noctiluca and macroalgae):

Extensive Noctiluca aggregates in Central Basin
Drifting macro algae in middle portions of Carr Inlet



Flight conditions between Olympia and Seattle on 6-20-2011

Find and download all aerial images at ftp://www.ecy.wa.gov/eap/Flight_Blog/

Flight Details:

Flier Christopher Krembs

Morning 8:20 AM:

Seattle via Main Basin, Colvos Passage, Carr Inlet, Case Inlet, Dana Passage, Budd Inlet into Olympia

Evening 4:20 PM:





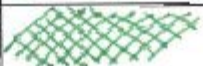




Olympia via Dana Passage, Anderson Island, Nisqually, Gordon Point, Commencement Bay, Quartermaster Harbor, Central Basin, Westpoint/Seattle

Conditions:

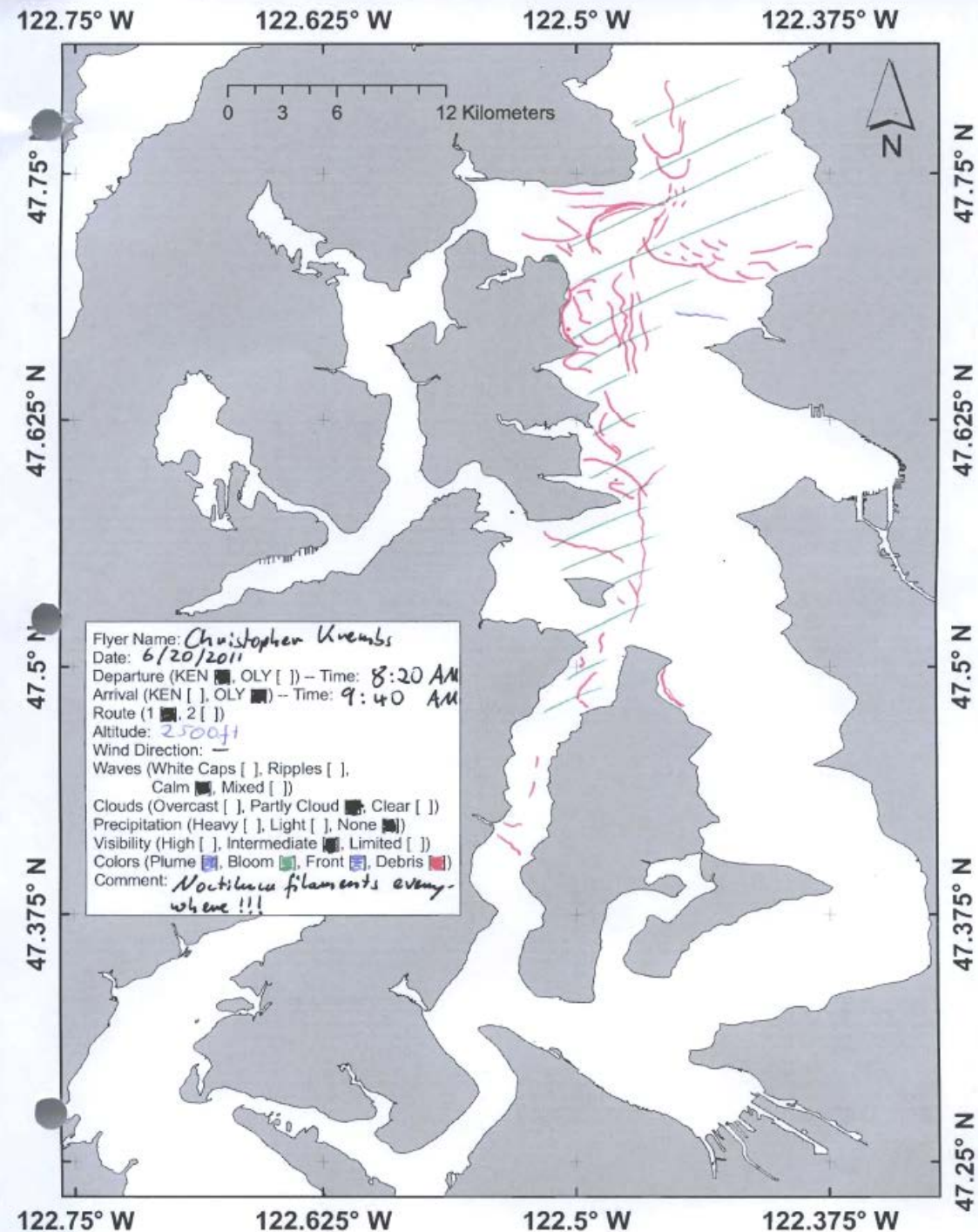
AM: Changes from good to poor visibility past Vashon I.

PM: Good visibility, altitude 2500 ft, sunny, intermediate clouds.

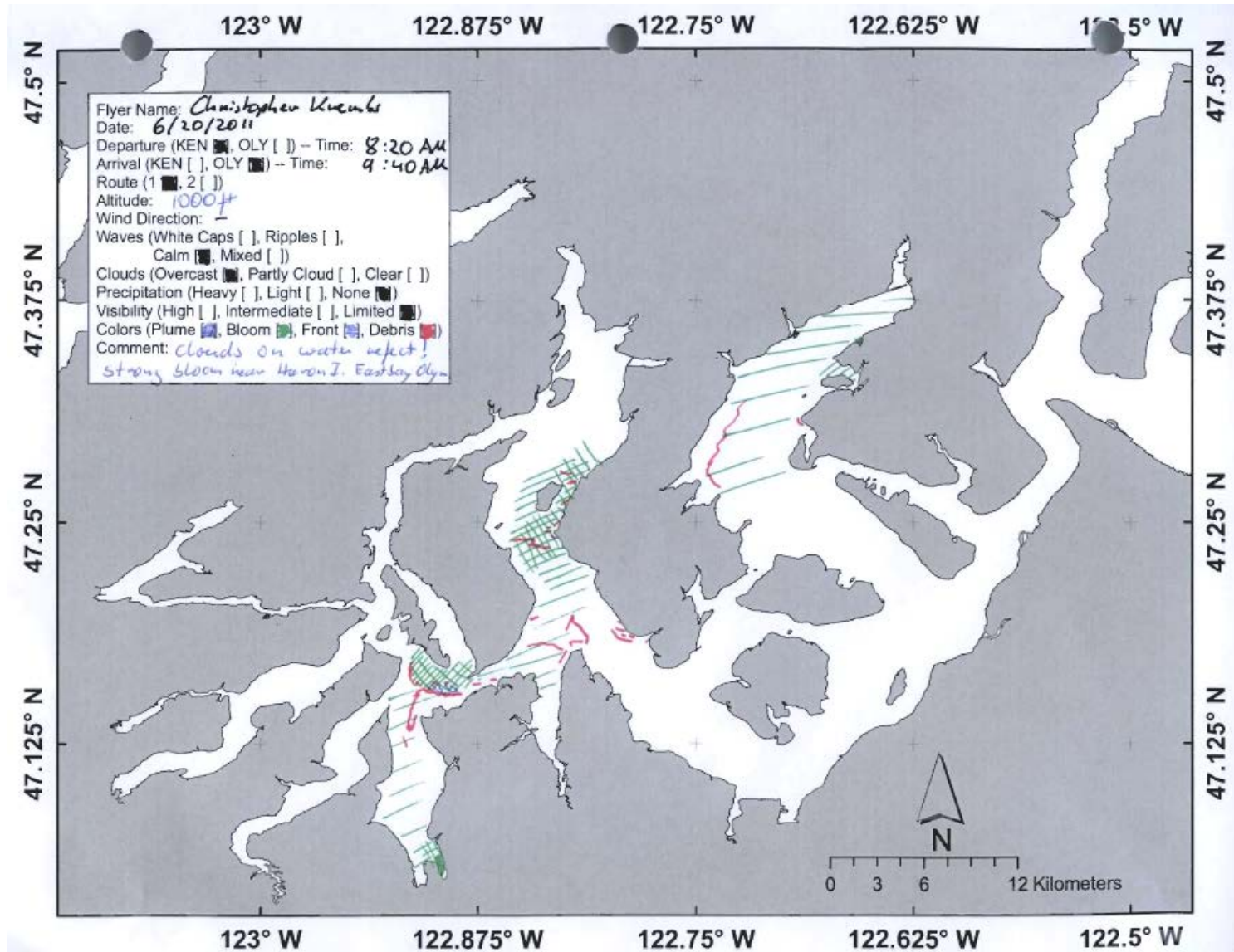
Legend to map annotations

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	

Central
Sound
8:20-9:38
AM

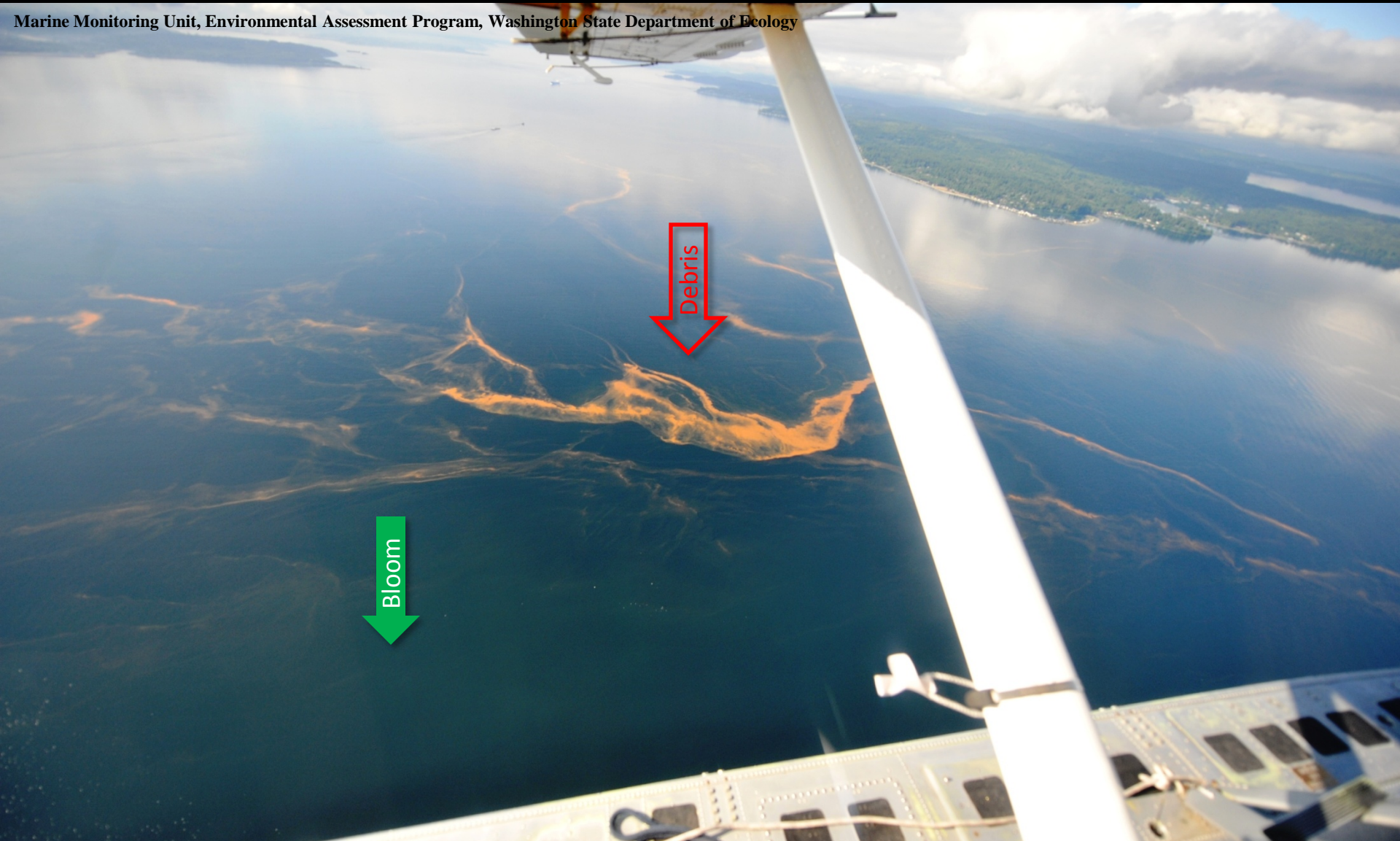


South Sound: 8:20-9:38 AM



Morning flight from Seattle to Olympia at <2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca surface aggregations looking south into Central Basin (Bainbridge Island to the right)
8: 29 AM

Morning flight from Seattle to Olympia at <2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca surface aggregations looking north into Central Basin (Kingston in the far back)
8: 26 AM

Morning flight from Seattle to Olympia at <2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca surface aggregations looking north into Central Basin (Port Madison to the left)
8: 27 AM

Morning flight from Seattle to Olympia at <2500 ft altitude

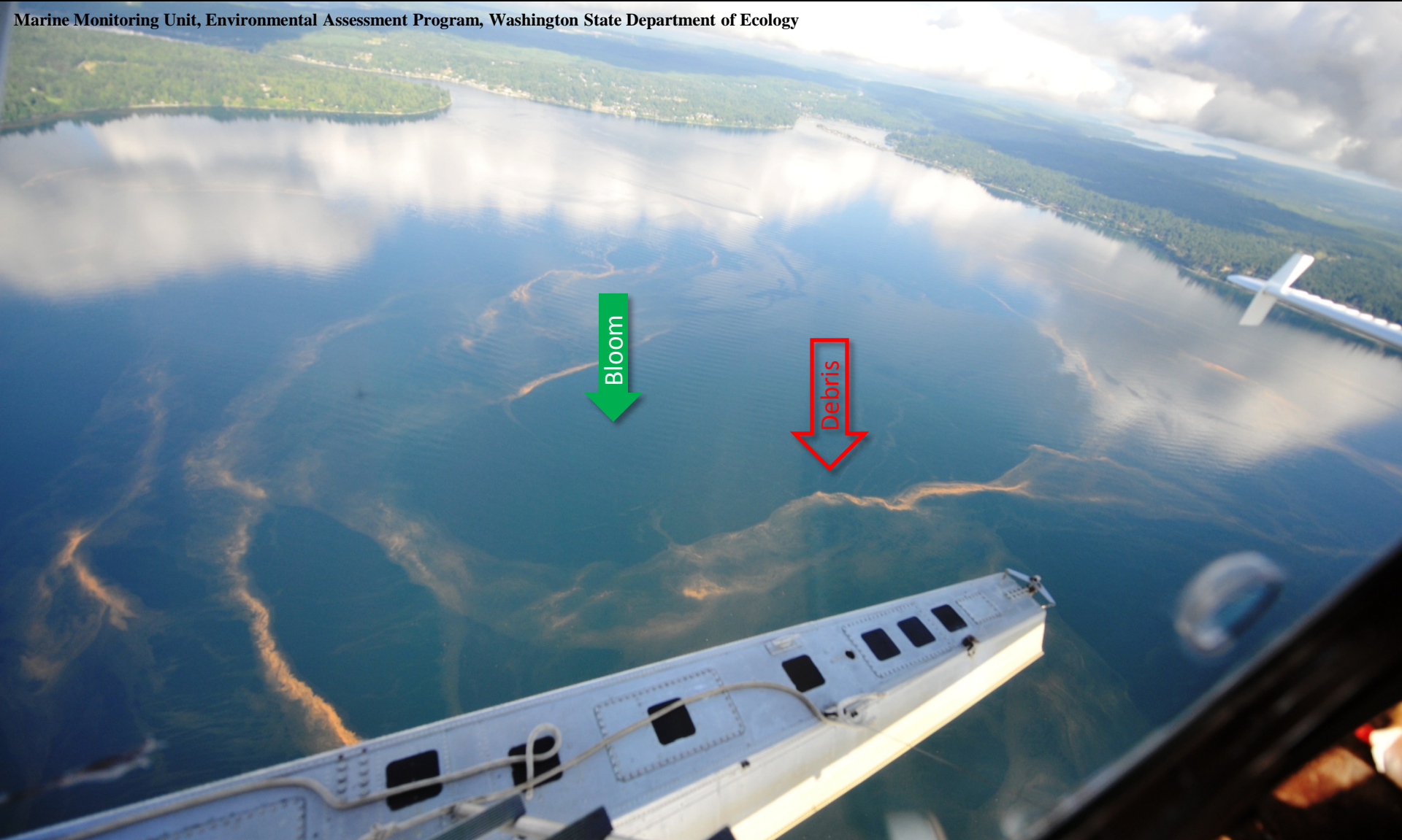
Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca surface aggregations looking south into Central Basin (Bainbridge Island to the right)
8: 29 AM

Morning flight from Seattle to Olympia at <2500 ft altitude

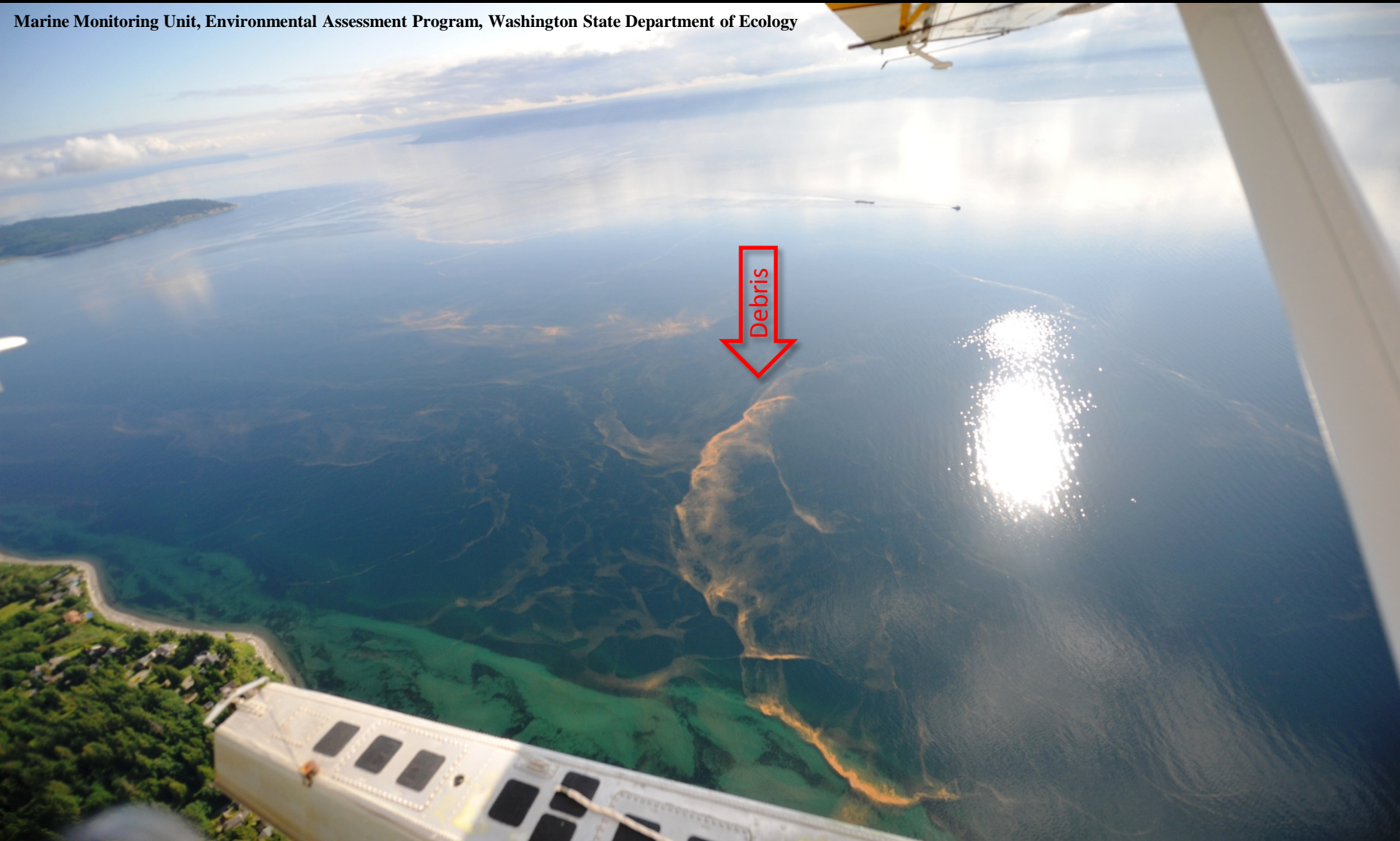
Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca surface aggregations looking west into Central Basin (Port Madison)
8: 32 AM

Morning flight from Seattle to Olympia at <2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca surface aggregations looking north into Central Basin (Bainbridge Island to the left)
8: 38 AM

Morning flight from Seattle to Olympia at <2000 ft altitude

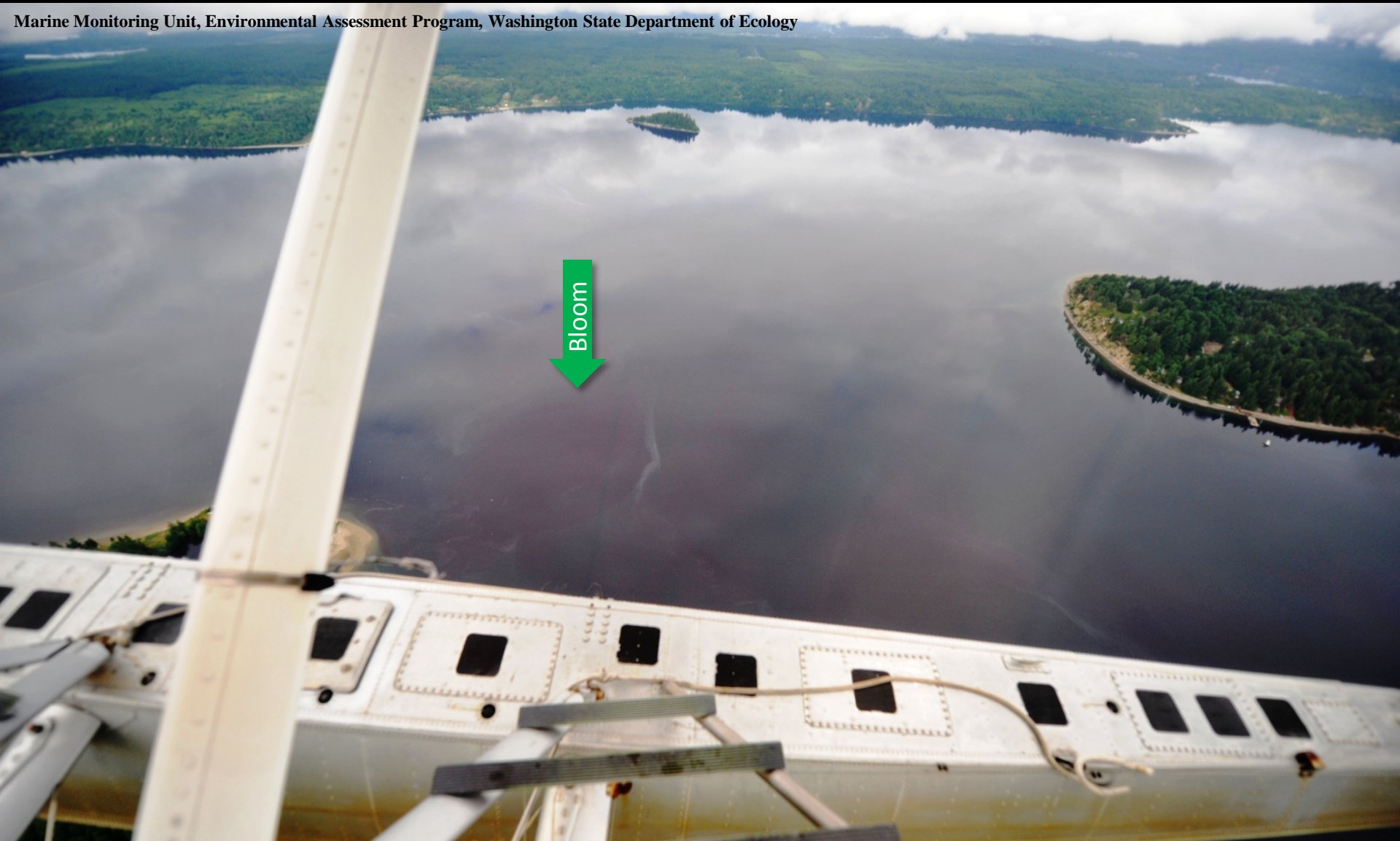
Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca surface aggregations looking west into Eagle Harbor (Bainbridge Island)
8: 39 AM

Morning flight from Seattle to Olympia at <1000 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Red Brown bloom in Case Inlet east of Harron Island 9:25 AM

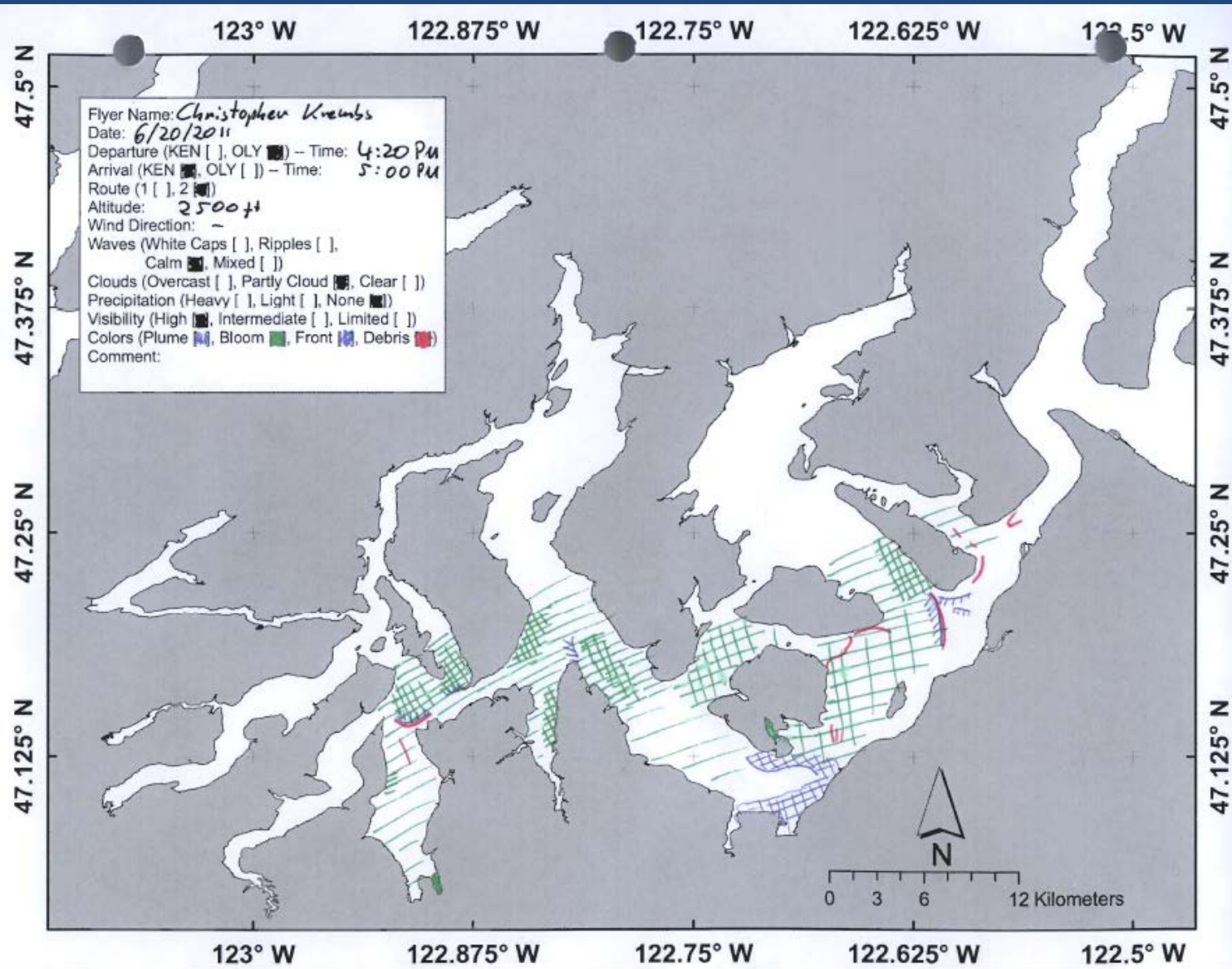
Morning flight from Seattle to Olympia at <1000 ft altitude



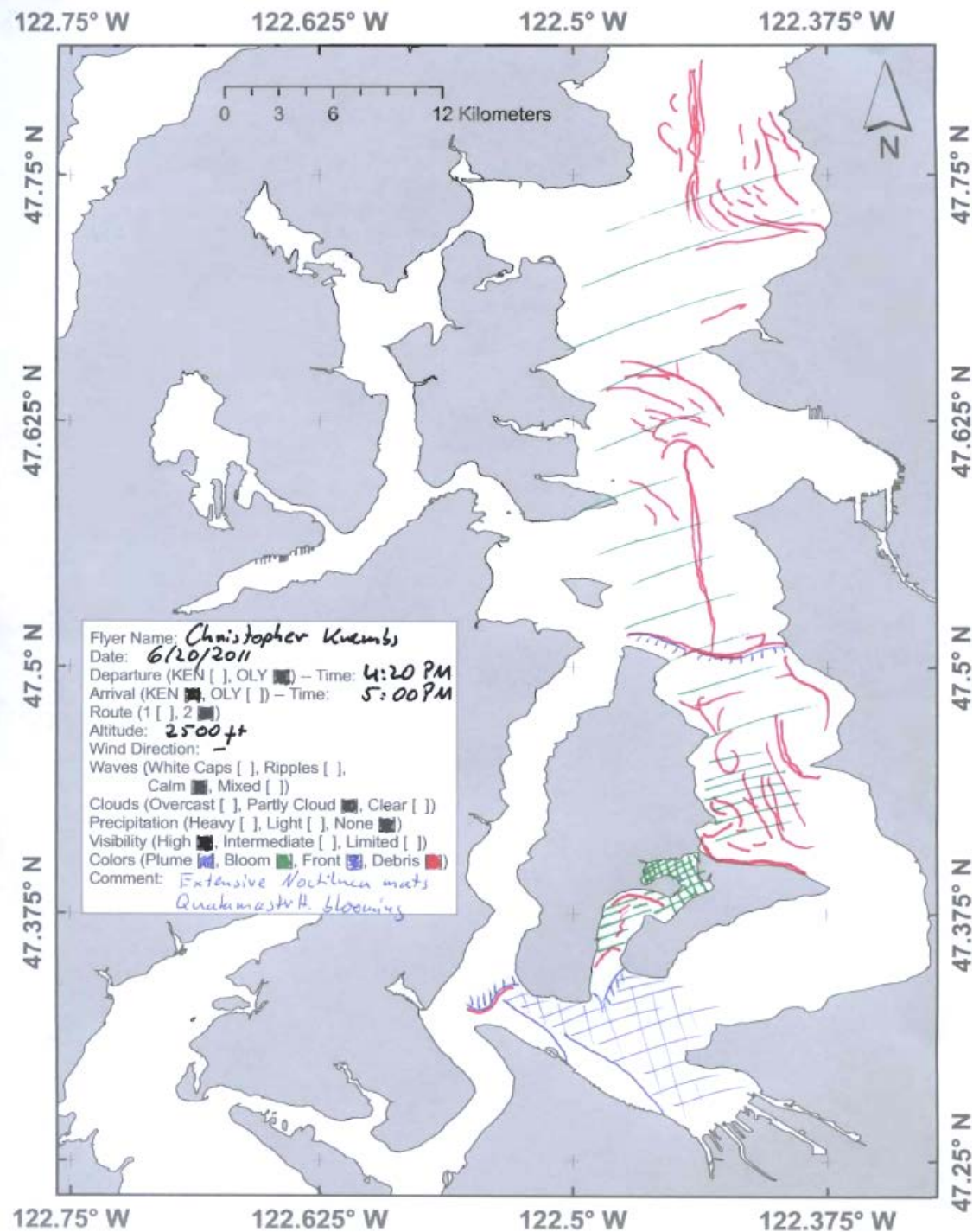
Bloom

Red brown bloom in East Bay around Swantown Marine, Butt Inlet, Olympia 9:32 AM

Evening, South Sound 4:25-5:00 PM



Evening
Central
Sound
4:25-5:00
PM



Evening flight from Olympia to Seattle at 2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Red brown bloom near Boston Harbor near Dana Passage, South Sound 4:30 PM

Evening flight from Olympia to Seattle at 2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Red brown bloom in Case Inlet looking west into Case Inlet from Dana Passage 4:34 PM

Evening flight from Olympia to Seattle at 2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Quarter master Harbor (Vashon Island) with algae bloom and Puyallup river plume front
4:40 PM

Evening flight from Olympia to Seattle at 2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Strong algae bloom in, Quartermaster Harbor (right), Vashon Island and long Noctiluca filaments on the water and beaches (Des Moines in far back) 4:43 PM

Morning flight from Seattle to Olympia at <1000 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Strong algae bloom in, Quartermaster Harbor (right), Vashon Island and long Noctiluca filaments on the water and beaches (Des Moines in far back) 4:43 PM

Evening flight from Olympia to Seattle at 2500 ft altitude

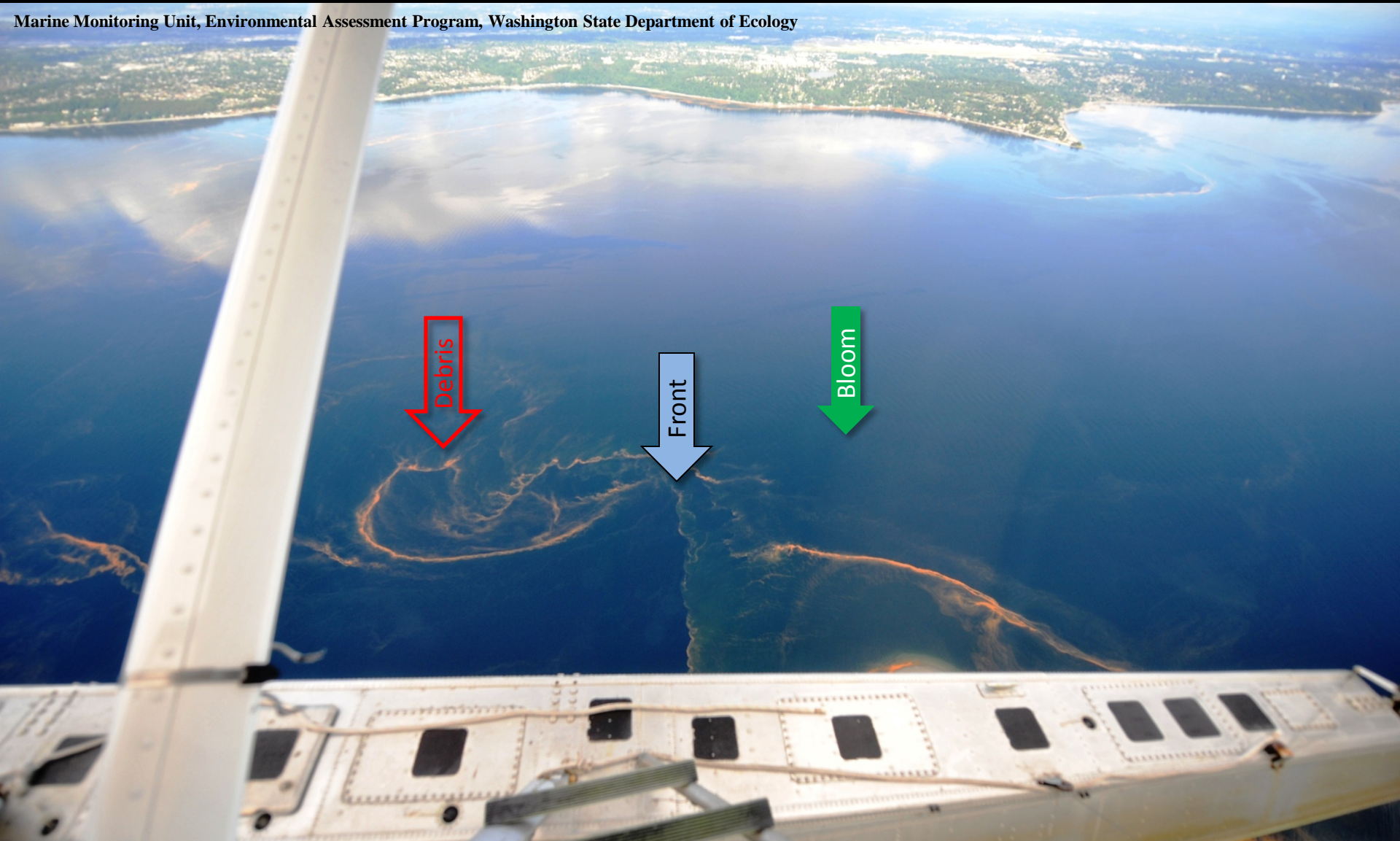
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Noctiluca filaments drifting at the surface east of Vashon Island, looking onto Des Moines. The eastern tip of Vashon Island can be seen to the right 4:44 PM

Evening flight from Olympia to Seattle at 2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca filaments eddy and front east of Vashon Island, looking onto SEATAC 4:45PM

Evening flight from Olympia to Seattle at 2500 ft altitude

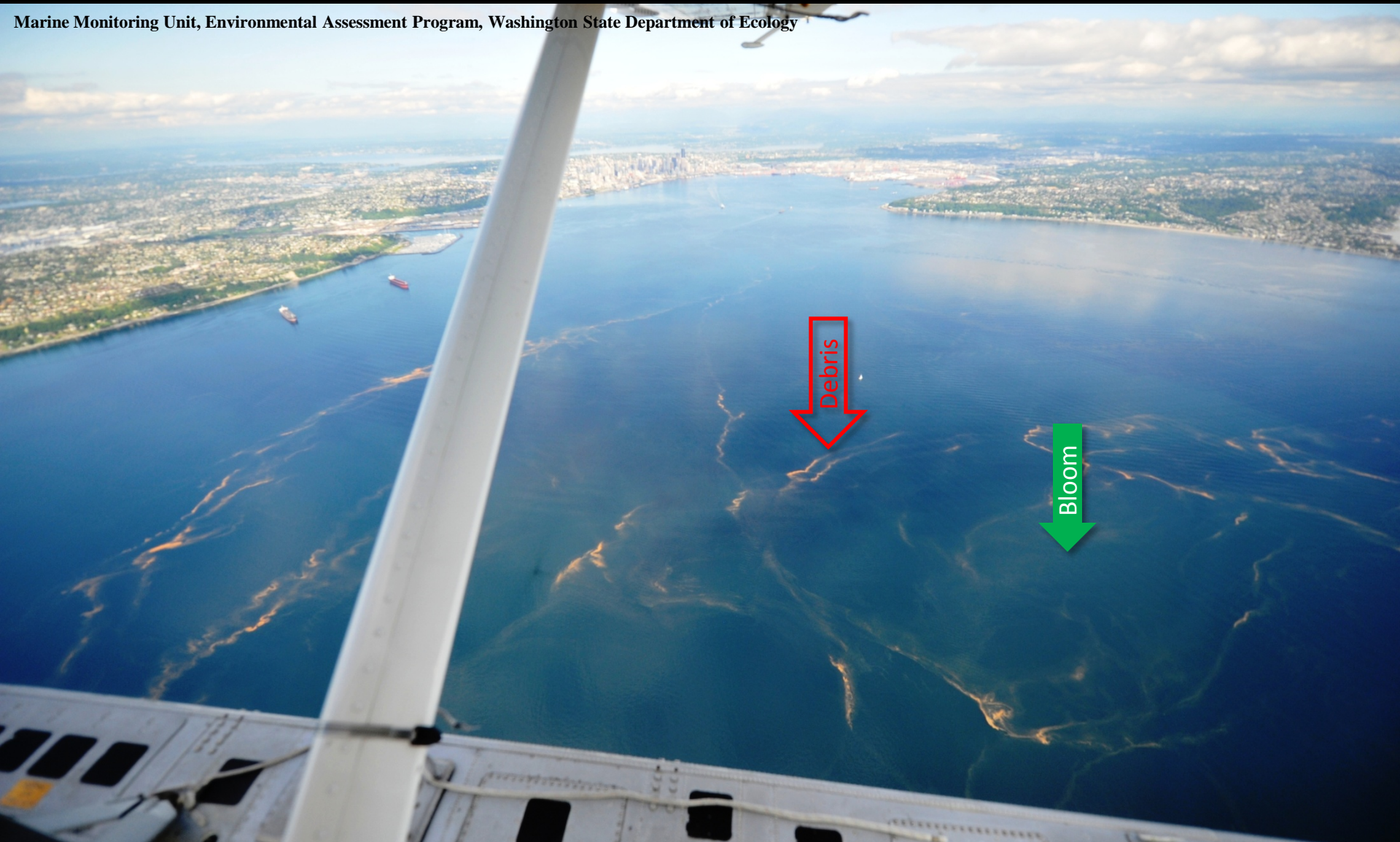
Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca filaments eddy and front east of Vashon Island, looking onto Seattle, 4:45PM

Evening flight from Olympia to Seattle at 2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Noctiluca filaments near Seattle (Elliott Bay), Central Basin 4:50 PM

Evening flight from Olympia to Seattle at 2500 ft altitude

Marine Monitoring Unit, Environmental Assessment Program, Washington State Department of Ecology



Long Noctiluca filaments in Central Basin looking north towards Admiralty Reach 4:55 PM



Mooring observation from June 7-21, 2011



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

Summary: Decreasing dissolved oxygen (DO) values at Mukilteo and Manchester mooring Stations

Mukilteo, Whidbey Basin near Everett

MUK01BR (16 m): DO values dropped 1.0 mg/L with mean daily values decreasing from 9.5 mg/L to 8.5 mg/L; mean value was 9.0 mg/L. Salinity mean value was 28.5 PSU. Temperature increased by 0.8 °C with mean daily values rising from 9.5 ° C to 10.3 ° C.

MUK01SR (0 m): Mean daily salinity values varied around 24.0 PSU (4.5 PSU less than MUK01BR). The temperature mean value was 11.9 °C, an increase of 0.3 ° C from previous month.

Manchester, Main Basin

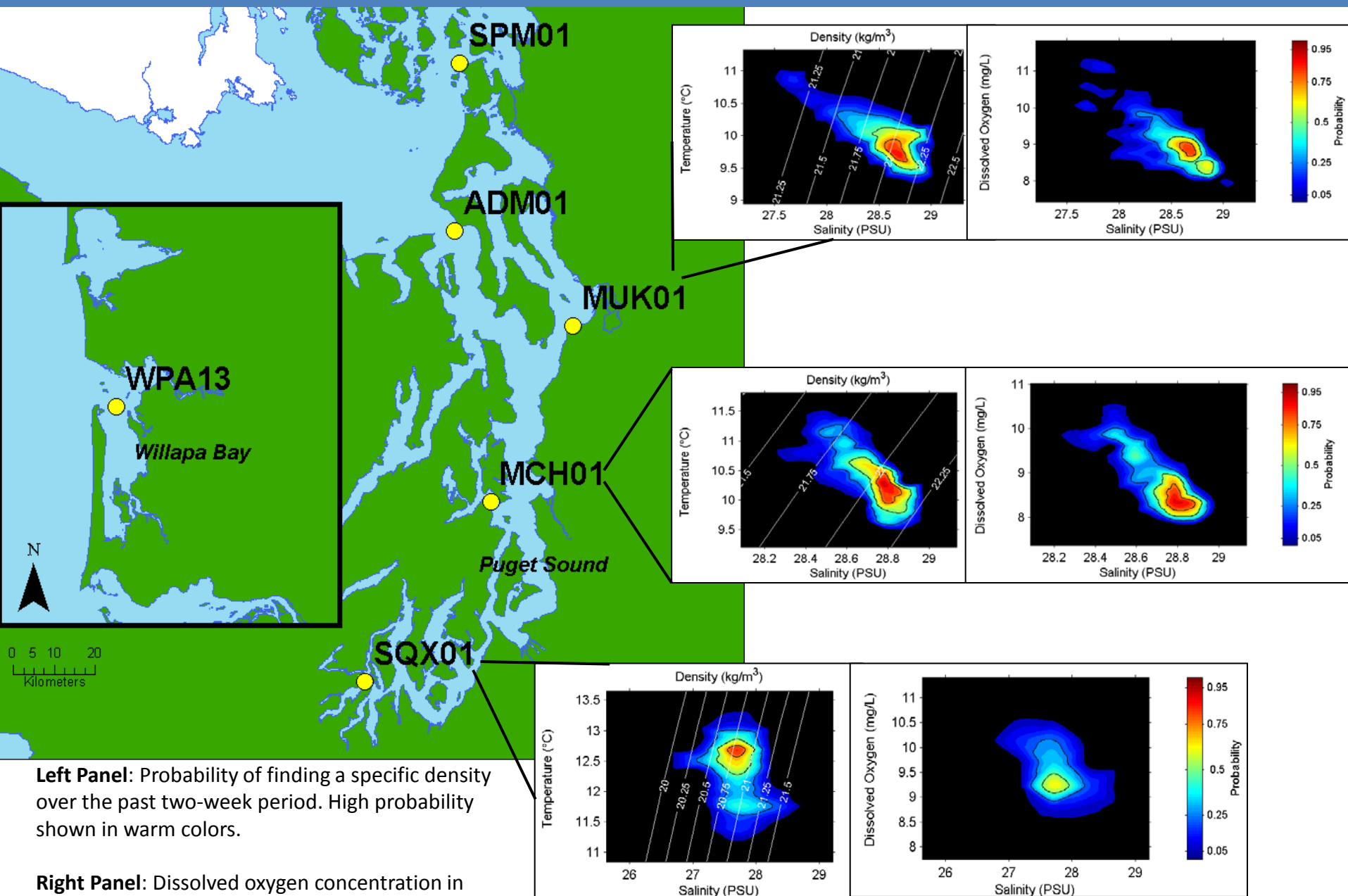
MCH01BR (11m): DO values dropped 1.6 mg/L with mean daily values decreasing from 9.8 mg/L to 8.2 mg/L; mean value was 8.9 mg/L. Salinity mean value was 28.7 PSU. Temperature mean value of 10.4 ° C.

MCH01SR: Salinity mean value was 28.6 PSU. Temperature mean value was 10.6 ° C

Squaxin Passage (South Sound) near Olympia

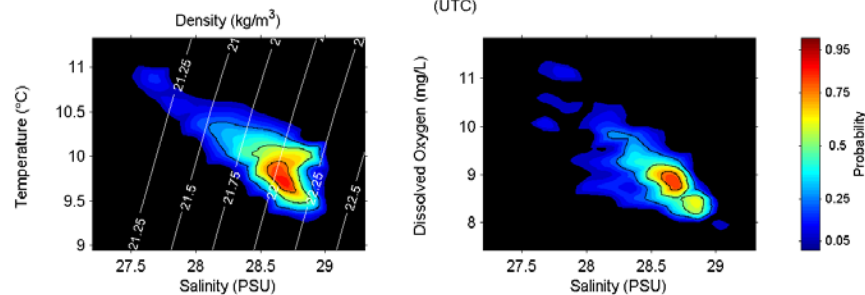
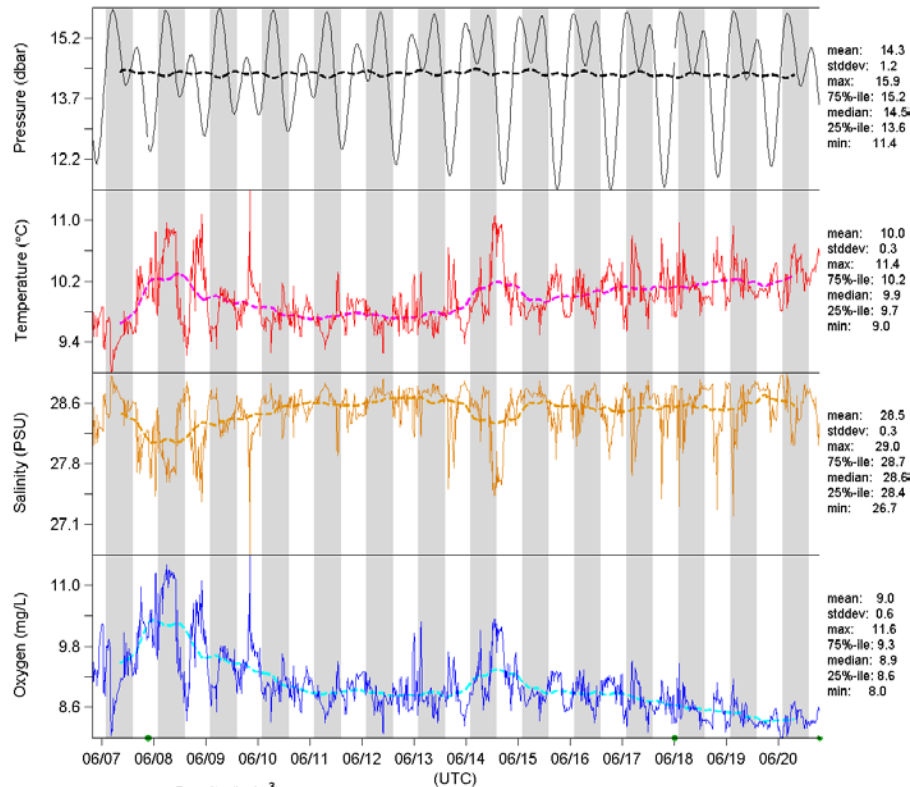
SQX01CR: Mean daily DO values decreased by 0.9 mg/L from 10.4 mg /L. 9.3 mg/L. with a mean value of 9.5 mg/L. Salinity increased by 0.3 PSU with mean daily values rising from 27.5 to 27.8 PSU. Temperature increased by 0.4 ° C with mean daily values rising from 12.2 ° to 12.6 C.

Puget Sound Water Masses and DO from our mooring: 6/7/11-6/20/11



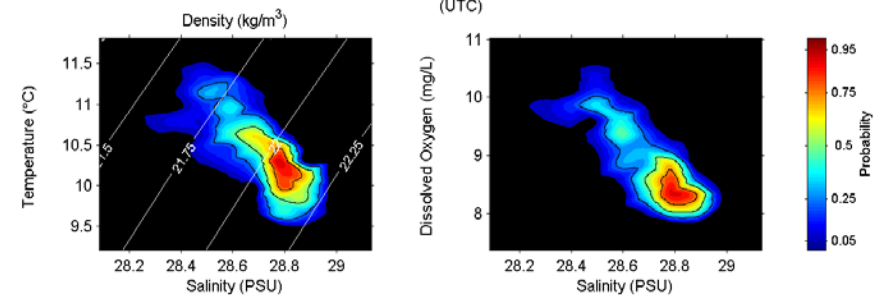
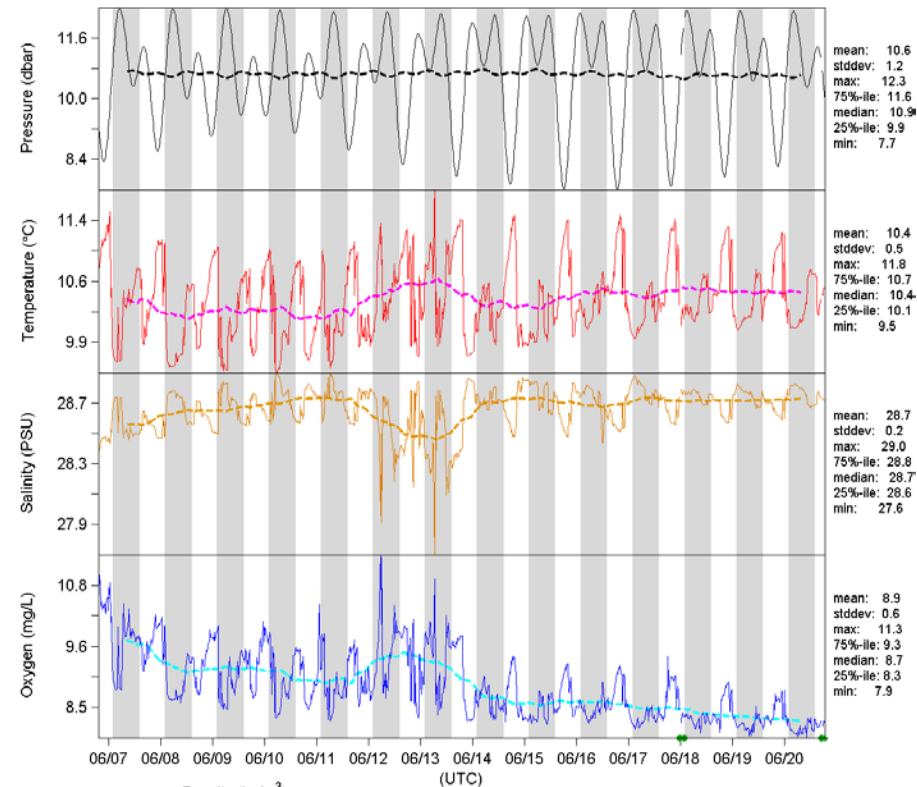
Mooring data from Squaxin Passage (South Sound) and Mukilteo (Whidbey Basin) confirming high DO concentrations and warming water

MUK01BR Mukilteo (Near Bottom, Rigid)



Top panels: Two-week time series and 24 h avg. (12/12 h day/night cycle in local time shown by gray bands).
Green dots superimposed onto x-axis are periods of missing data.
Bottom left: Probability of finding a specific density over the past two-week period. High probability shown in warm colors.
Bottom right: Dissolved oxygen concentration in relation to salinity. High probability shown in warm colors

MCH01BR Manchester Environmental Laboratory (Near Bottom, Rigid)



Top panels: Two-week time series and 24 h avg. (12/12 h day/night cycle in local time shown by gray bands).
Green dots superimposed onto x-axis are periods of missing data.
Bottom left: Probability of finding a specific density over the past two-week period. High probability shown in warm colors.
Bottom right: Dissolved oxygen concentration in relation to salinity. High probability shown in warm colors

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<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

Ecology



Thank you for your interest