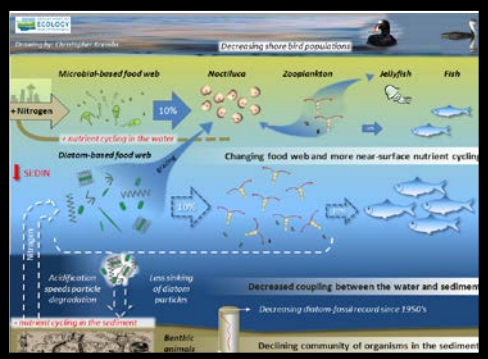
Publication No. 14-03-080

DEPARTMENT OF ECOLOGY
State of Washington

Eyes Over Puget Sound

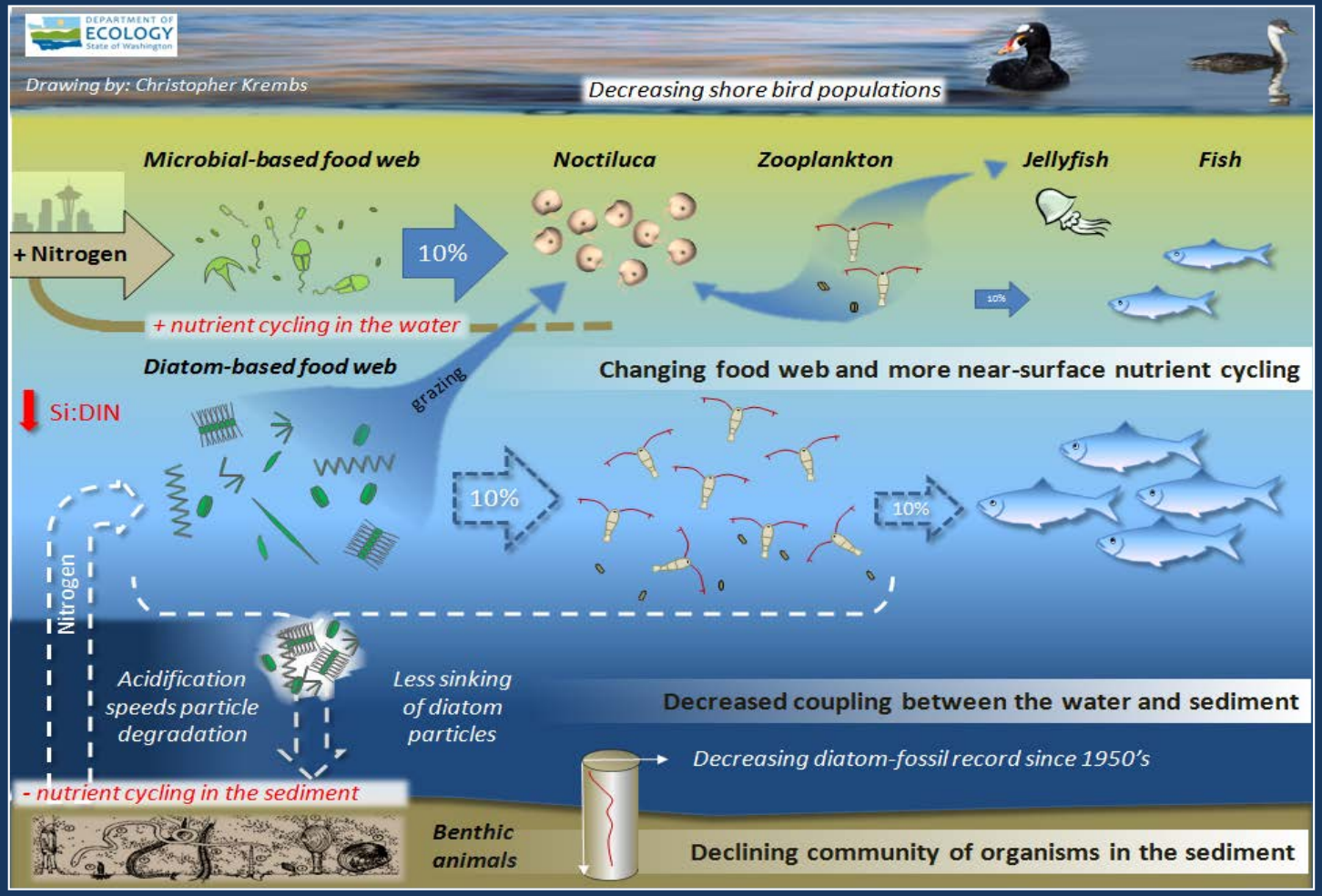
Flight log | People | Water column | Aerial photos | Hypothesis | Start here

2014 Review



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

Hypothesis for combining a series of recent observations affecting energy and material transfer to higher trophic levels



Increases in nitrate concentrations could be caused by a top-down control on phytoplankton biomass.

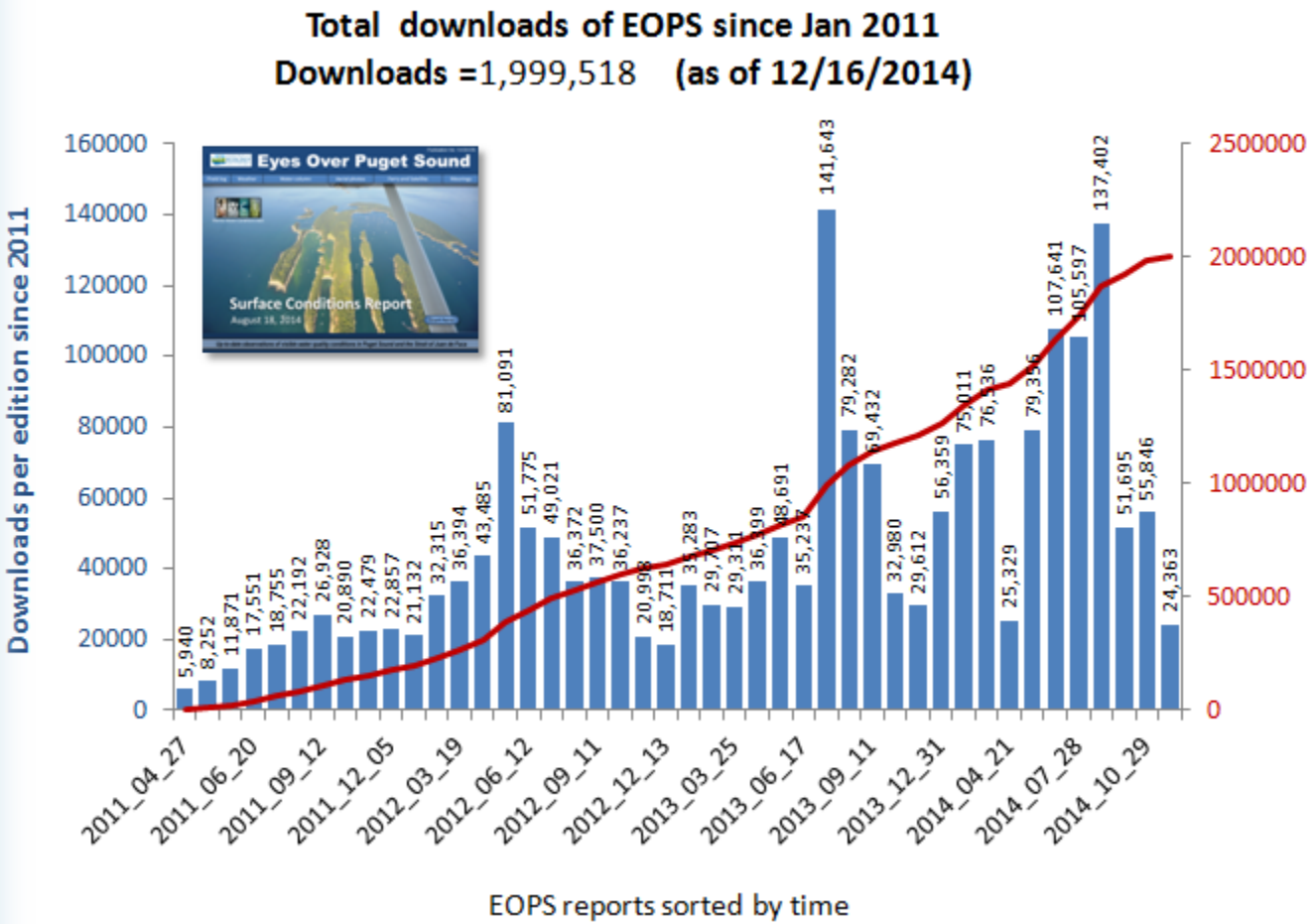
Is *Noctiluca* a visible harbinger of a food web change?

Are changes in higher tropic levels part of a story of the low food web?

Follow the experts WebEx

2014 – The EOPS team thanks all our viewers

LONG-TERM MARINE MONITORING UNIT, ECOLOGY



Mya Keyzers
Laura Hermanson
Joe Leatherman

Skip Albertson

Julia Bos
Suzan Pool

Dr. Christopher Krembs

Dr. Brandon Sackmann

Thanks to interested viewers, we are approaching an estimated 2 million downloads…

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

New flight stations for the year 2015

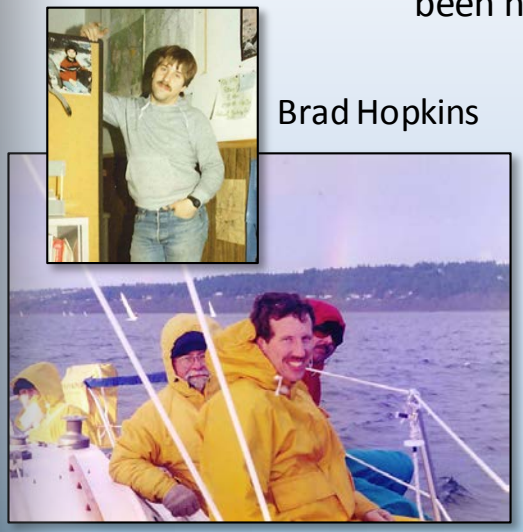
NEW Flight Station Map

We will be focusing on our 37 core stations in 2015. We will continue to collect Total Alkalinity and Dissolved Inorganic Carbon for our pilot project through May (Read QAPP). We are also continuing our collaboration with Ecology's Freshwater Ambient Monitoring program and the University of Washington Fishery Sciences Department. See our 2015 Addendum for all the details.

The flight team

Marine Water Quality Monitoring Staff: Past and Present

As the new year approaches, it is a great time to reflect upon the evolution of the marine monitoring program. **Monitoring is a long-term commitment carried by many**. We would like to acknowledge and thank the marine monitoring staff that has built the foundation for marine flights and moorings since 1973. Many good times have been had, and we have come a long way. The data speak a story!



Brad Hopkins

Skip Albertson & Bernie Strong

Carol Falkenhayn Maloy

Jan Newton

Casey Clishe & John Summers

1973 → **1999**

Dale Norton
Joe Joy
Brad Hopkins
Eric Egbers
Greg Cloud

Gerald McDonald
Will Abercrombie
Dale Clark
Sharon Chase
Ann Haines
Shirley Prescott

Carol Janzen
Wayne Heath
Bernie Strong
Lisa Eisner
Sharon Bell
Mark Golliet
Skip Albertson

Angie Thomson
Casey Clishe
Margaret Edie
Carol Maloy
Jan Newton
Chris Moore

Sandra Weakland
Julia Bos
Eric Siegel
Kara Van Voorhis
John Summers
Anne Petrenko

Marine Water Quality Monitoring Staff: Past and Present

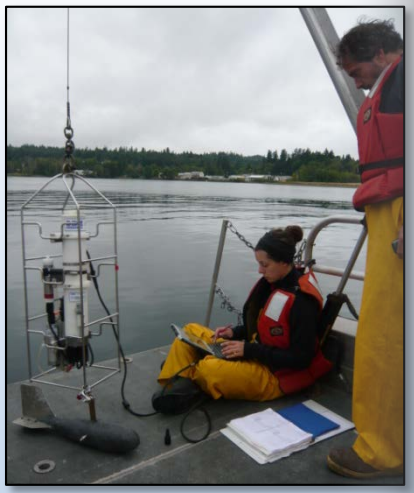
Julia Bos & Stephanie Jaeger

Jessica Archer

Lynn Schneider

Zack Holt

Simone Hoffer, Chuck Perry (pilot), Ryan McEliece



Ashley Carle & David Mora

Thanks to the dedication of many…

2000 → **2014**

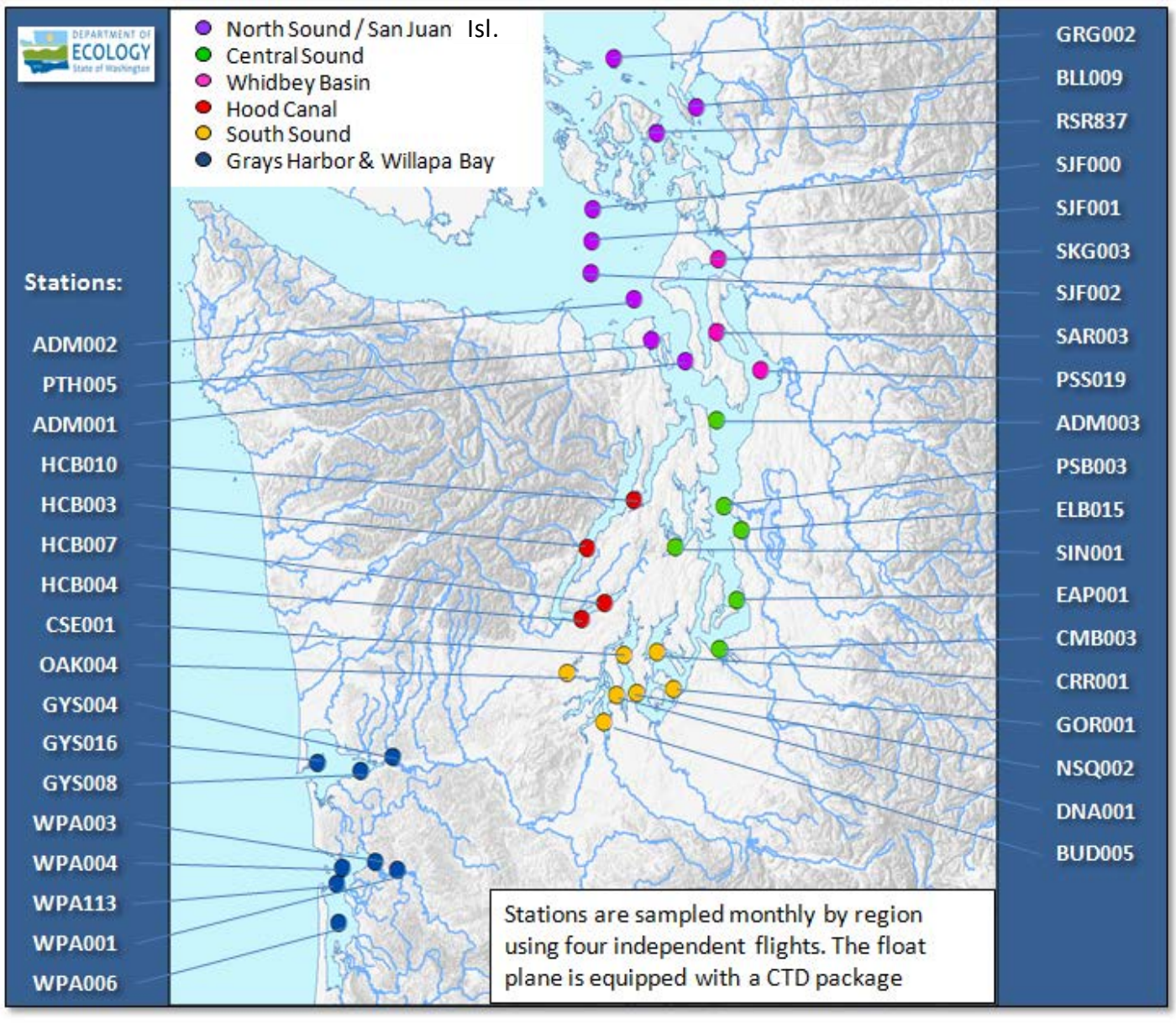
Judah Goldberg
Rick Reynolds
Katherine Cox
Noel Larson
Brion Dolan
Brian Grantham

Stephanie Jaeger
Jessica Archer
Lynn Schneider
Ryan McEliece
Adrienne Stutes
Simone Hoffer

Jessica Bennett
Marissa Jones
Mya Keyzers
Zack Holt
Christopher Krembs
Brandon Sackmann
David Mora

Ashley Carle
Laura Hermanson
Suzan Pool
Julianne Ruffner
Christopher Clinton
Clifton Herrmann
Brooke McIntyre

Our long-term marine monitoring stations in Washington



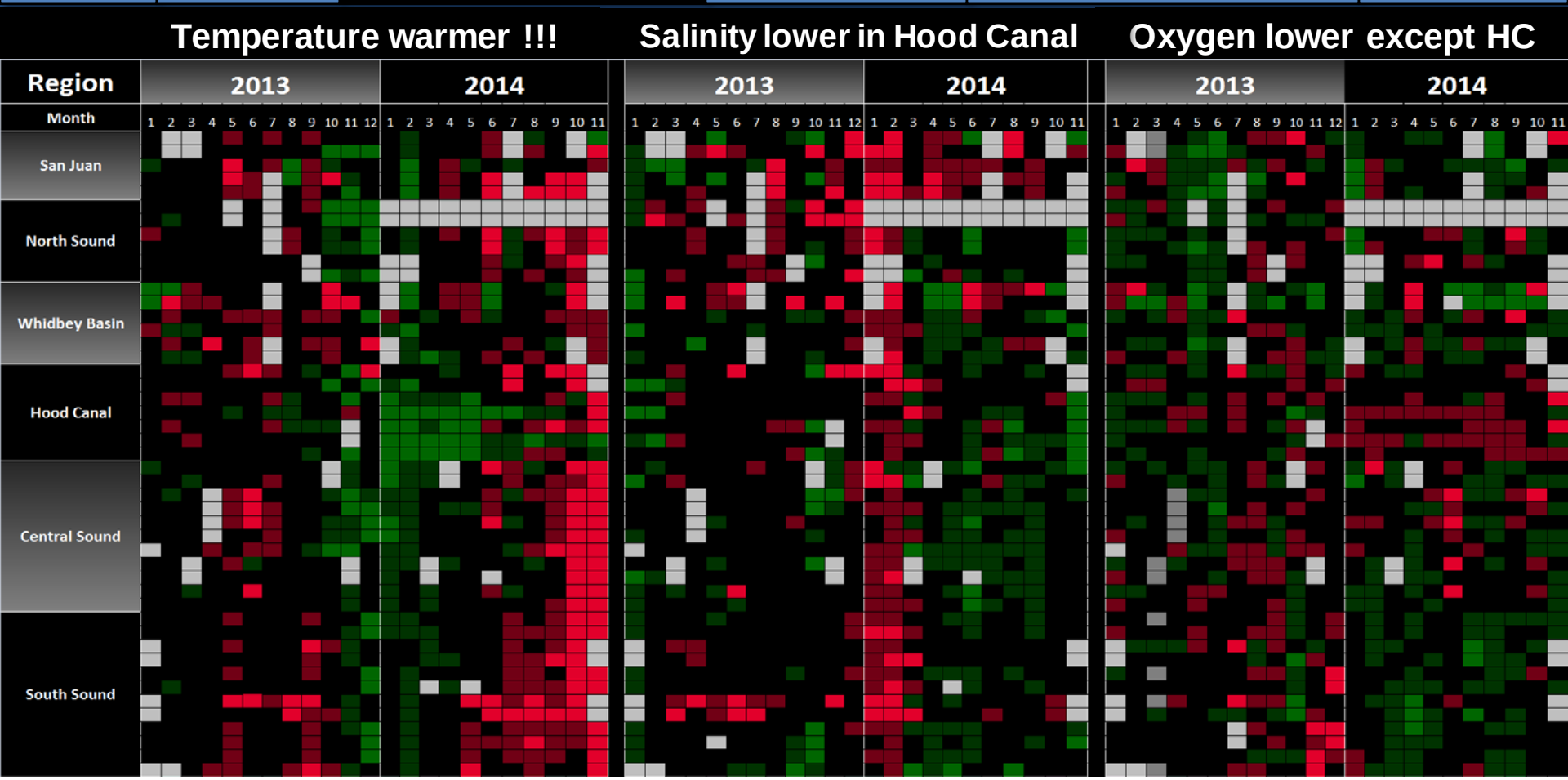
We use a chartered float plane to access our monthly monitoring stations most cost effectively.

Start here

We communicate data and environmental marine conditions using:

1. **Marine Water Condition Index (MWCI)**
2. **Eyes Over Puget Sound (EOPS)**
3. **Anomalies and source data**

2014: Warmer! Fresher in Central & South Sound. Lower DO.



In 2014, water temperatures really warmed up in the summer and fall, related to a warm surface water anomaly in NE Pacific. Salinity was higher early, then Puget Sound proper became fresher in the summer while saltier conditions persisted in the San Juan Islands. Oxygen was mostly lower, except in Hood Canal where a high anomaly persisted into the fall.

2014 Year in Review: Aerial photography

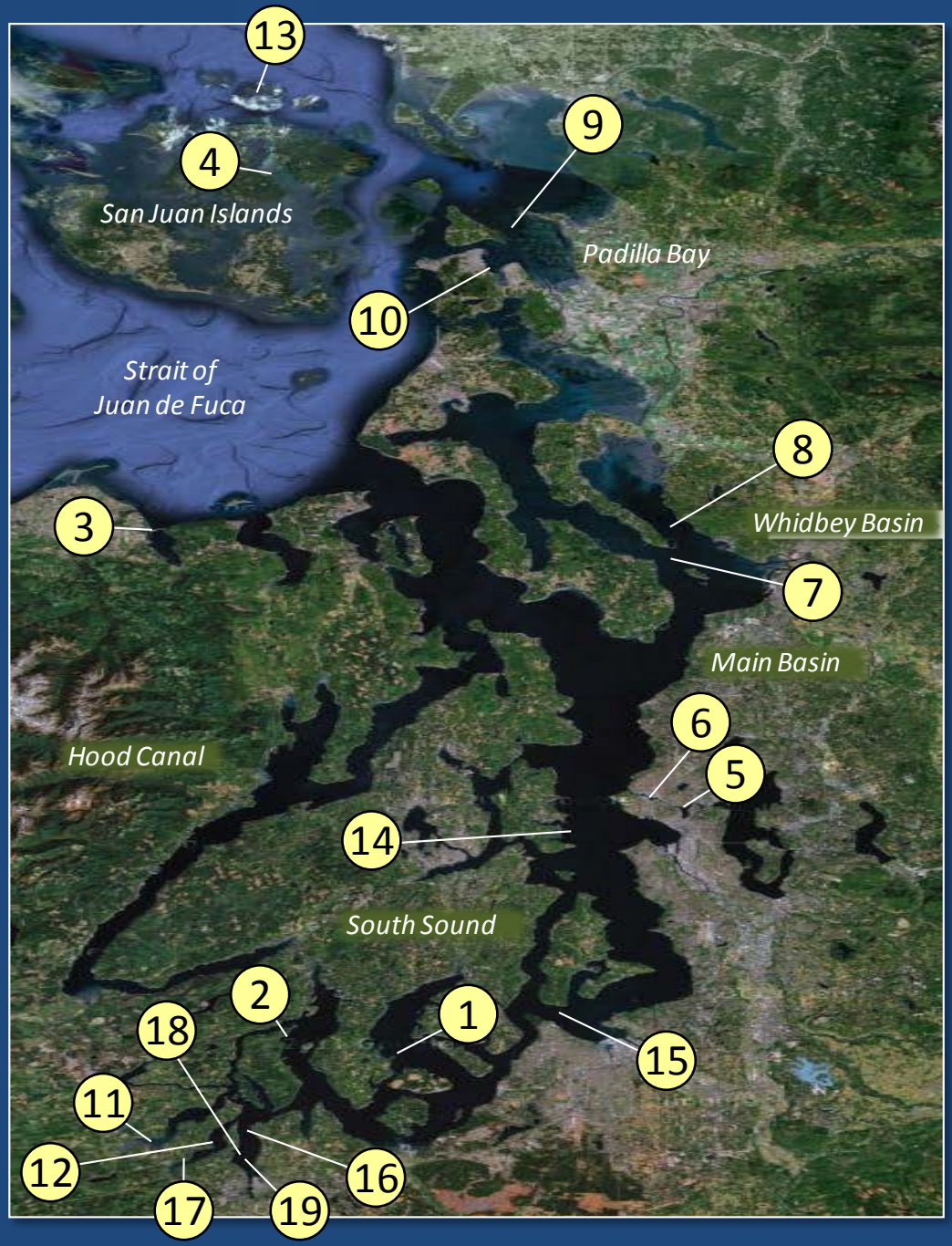
Hood Canal and Puget Sound behaved distinctly different in temperature and dissolved oxygen. Generally warmer conditions, abundant diverse algal blooms, and large pools of organic material are paralleled by reduced oxygen conditions and high abundances of jellyfish in Puget Sound.

Start here

	Jan.	No EOPS flight, instead a compelling hypothesis about nutrients and the lower food web.
1 2	Feb.	Unusually strong sediment transport in many places. Hood Canal is very cold and high in oxygen.
3 4	Mar.	Red-brown and orange blooms and jellyfish in smaller inlets. Oil sheens in bays and a devastating landslide.
5 6	Apr.	Multiple oil sheens in Lake Washington Ship Canal. The effect of the Oso landslide become visible in the Sound.
7 8 9	May	Large amounts of sediment-laden water leaving Port Susan and flowing into Central Basin. Blooms and large debris lines present in Bellingham Bay, Padilla Bay, and Samish Bay.
10	Jun.	Strong plankton blooms in many colors and many patches of macro-algae. Jellyfish are increasing in numbers. We missed the timing of a large *Noctiluca* bloom. Puget Sound begins to warm up fast.
11	Jul.	Abundant organic surface debris. Strong plankton blooms in many colors. Jellyfish numerous in all southern South Sound bays.
12 13 14 15	Aug.	Organic surface debris is high. Red-brown blooms and numerous patches of jellyfish. B rown-green and green blooms in Whidbey Basin. Glacial flour in rivers. Sea surface temperatures >15 °C.
16	Sept.	Glacial flour in northeastern regions. Debris in Hood Canal, Central Sound, and South Sound inlets. Oxygen is returning to expected levels.
17 18	Oct.	Very dense and large patches of jellyfish in South Sound. Red-brown blooms remain strong in smaller bays, particularly in South Sound.
19 20	Nov.	Abundant patches of jellyfish in South Sound. Red-brown blooms remain strong in South Sound, coinciding with abundant jellyfish. Red-brown bloom also in Willapa Bay.

Aerial photography & navigation guide

Date: 2014



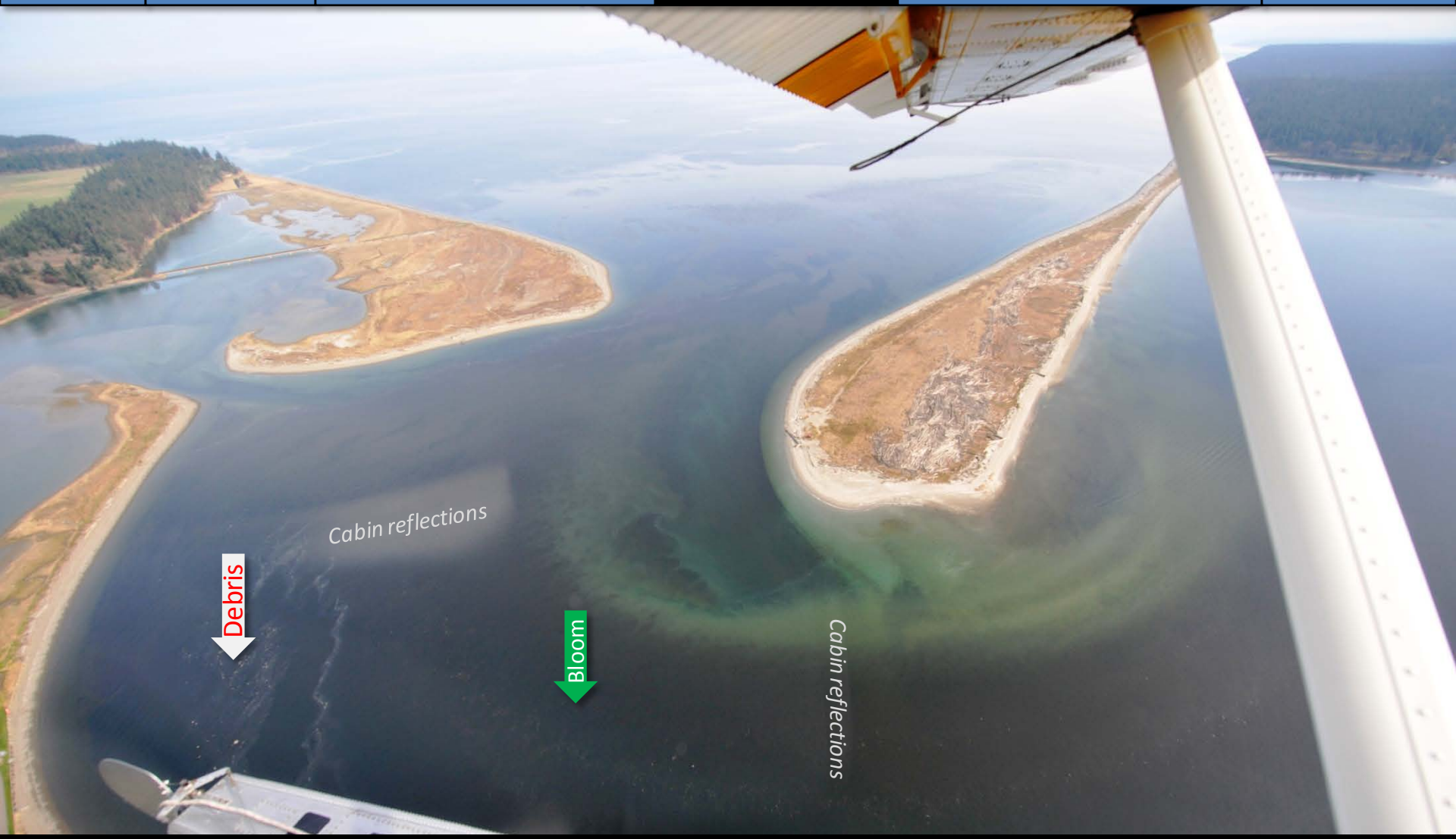
Click on numbers

Large tidal eddy transporting suspended sediment from beach into Carr Inlet.

Location: Near Pitt Passage (Carr Inlet), 2:50 PM.

Very sediment-laden water near northern beach of Harstine Island facing Case Inlet.

Location: Harstine Island (South Sound), 4:13 PM.



Strong red-brown algal bloom lined by milky water at entrance to Sequim Bay.

Location: Sequim Bay (Strait of Juan de Fuca), 11:06 AM.

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Aerial photography 3-24-2014

Orange-red bloom, likely Noctiluca, *in East Sound.*
Location: Orcas Island (San Juan Islands), 12:05 PM

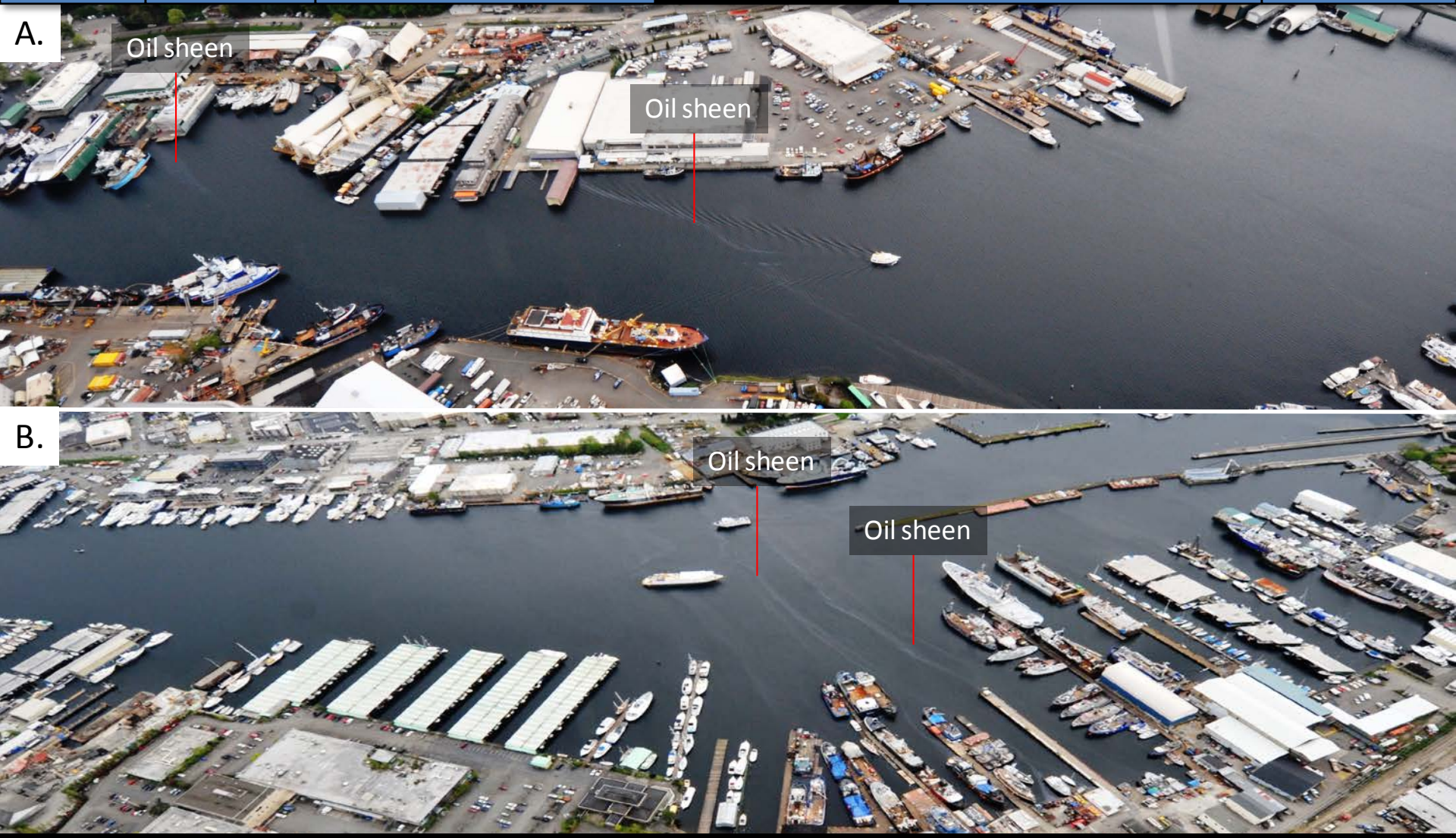
Aerial photography 4-21-2014

A.

B.

Reported oil sheen between docked boats and ships.

Location: A. West of Gas Works Park, Lake Union; B. Lake Washington Ship Canal (Seattle), 5:16 PM.



Reported multiple oil sheens located between docked boats and ships.

Location: A. Lower Queen Anne Ship Canal; B. Salmon Bay (Seattle), 5:17 PM.

Sediment-rich water from Port Susan meeting water from Saratoga Passage during outgoing tide.
Location: Possession Sound (Whidbey Basin), 10:12 AM.

Sediment-rich water leaving Port Susan at Camano Island during outgoing tide.
Location: Possession Sound (Whidbey Basin), 10:13 AM.

Large and frequent mats of organic surface debris floating in strong phytoplankton bloom.

Location: Samish Island (Padilla Bay), 11:56 AM.

Mats of organic material from macro-algae and intense green phytoplankton bloom stain water .

Location: Fidalgo Bay (North Sound), 12:44 PM

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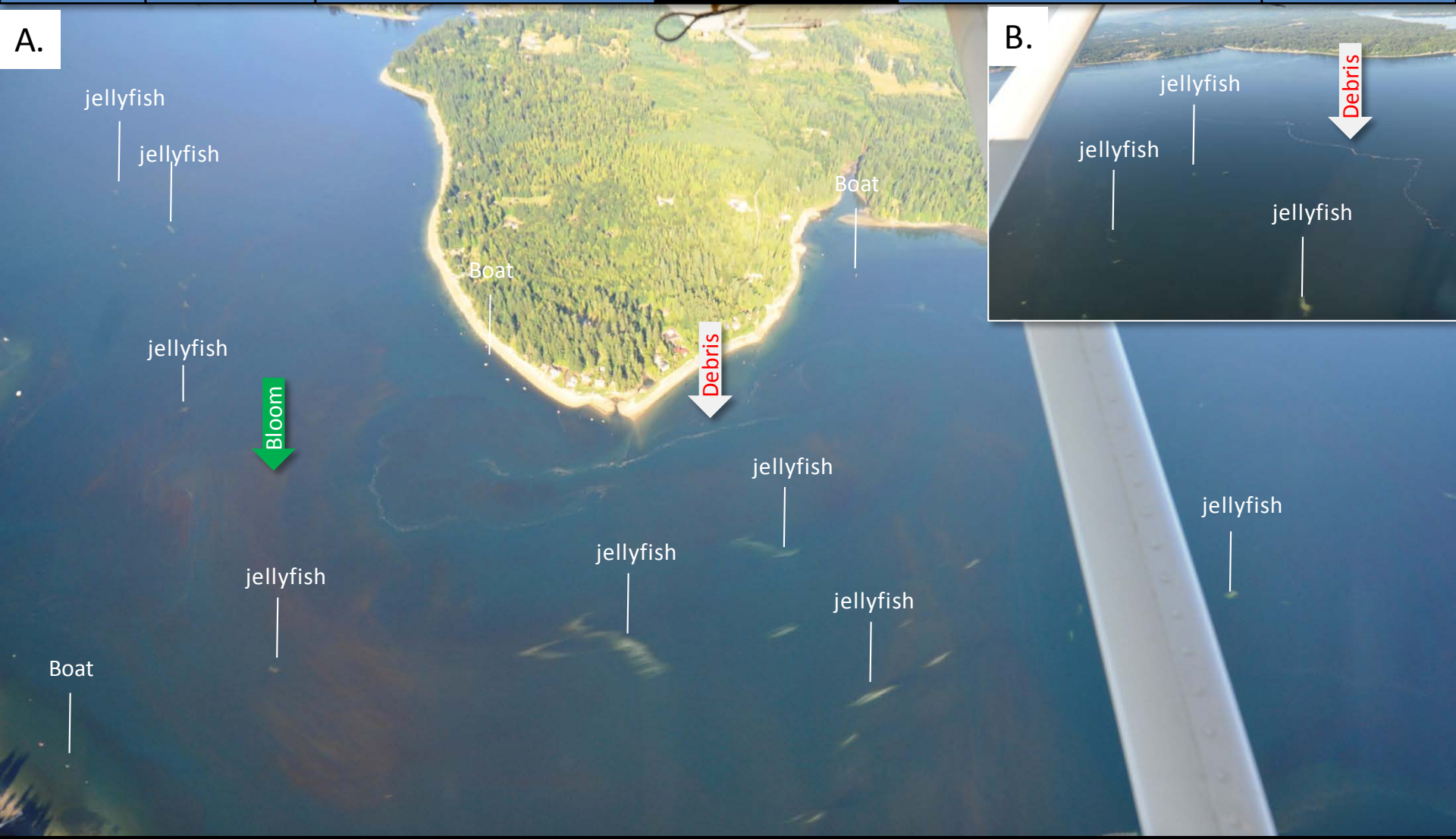
Aerial photography 7-28-2014

Red-brown bloom mixed into sediment-rich river plume. Jellyfish patches.

Location: Deepwater Point, Totten Inlet (South Sound), 10:27 AM.

Aerial photography 8-18-2014



Red-brown bloom and numerous patches of jellyfish.

Location: A. Flapjack Point, Eld Inlet; B. Across Butler Cove, Budd Inlet (South Sound), 9:14 AM.

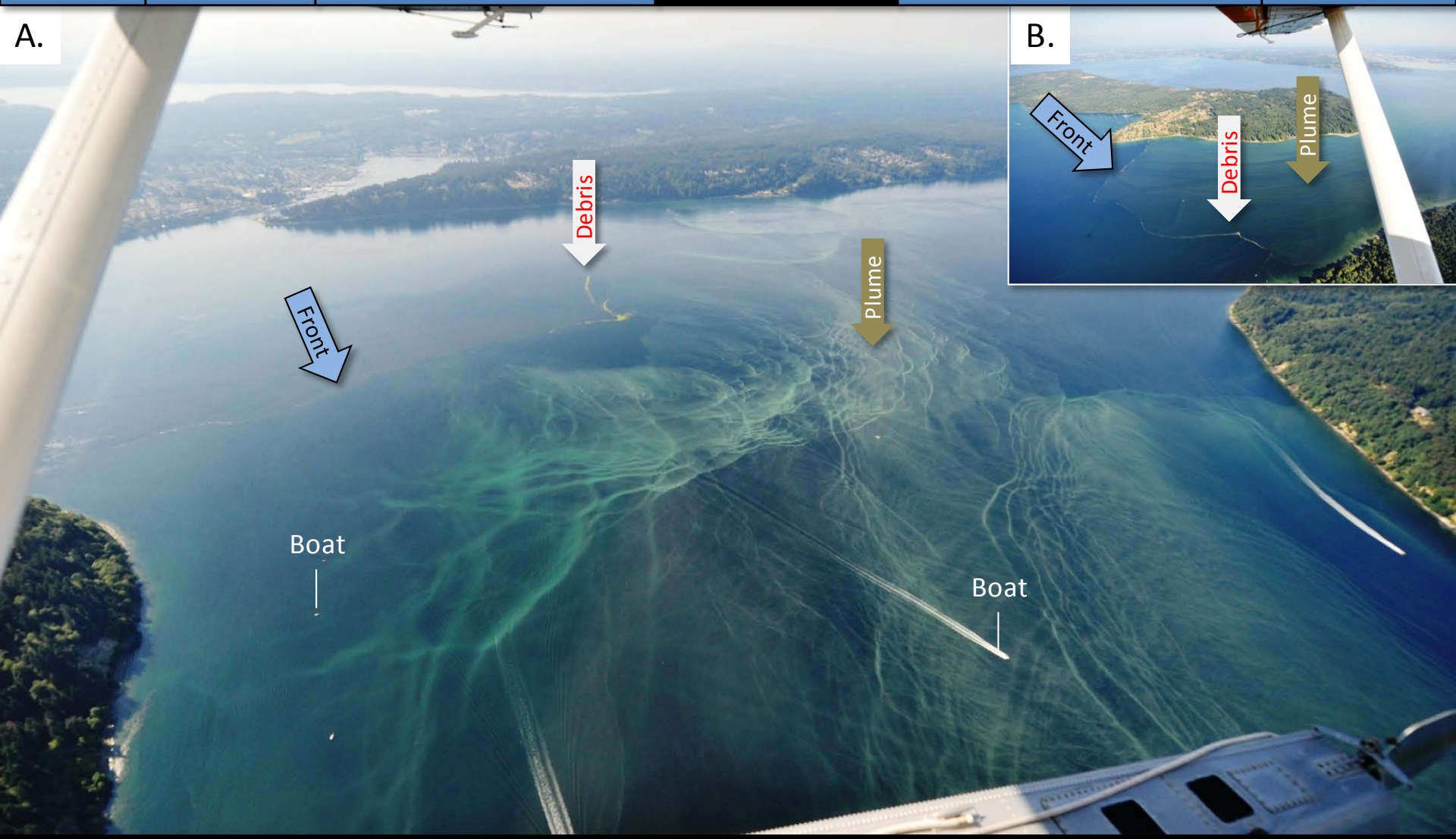
Intense yellow-green phytoplankton bloom inside bay.

Location: Fossil and Mud Bays, Sucia Island (San Juan Islands), 11:22 AM.

Large and numerous patches of organic surface debris across from Seattle.

Location: Eagle Harbor, Bainbridge Island (Central Sound), 4:20 PM.

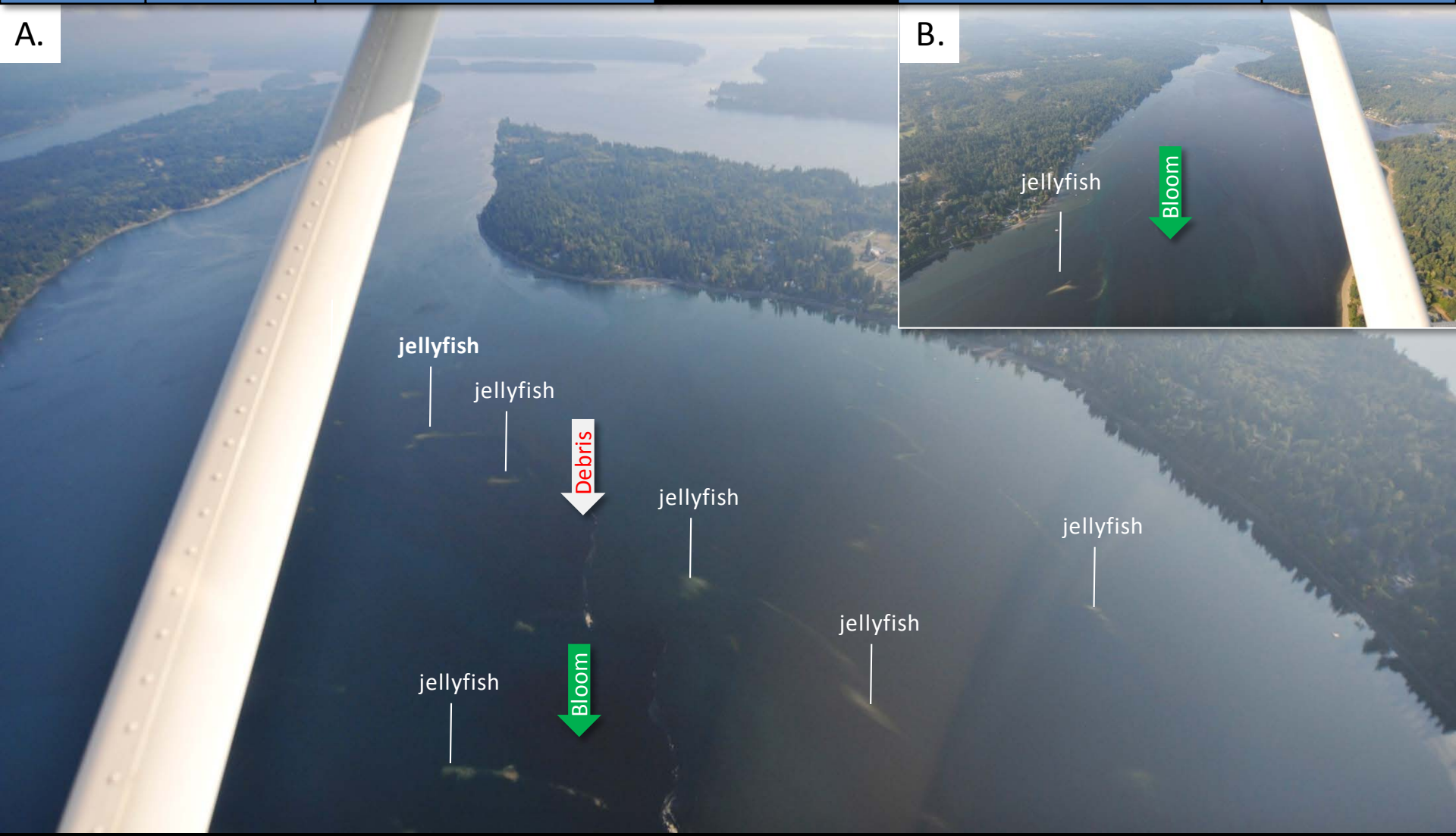
Aerial photography 8-18-2014



Organic surface debris and patterns of Puyallup River sediments at surface affecting large area.

Location: A. Off Point Defiance; B. Quartermaster Harbor (Central Sound), 4:30 PM.

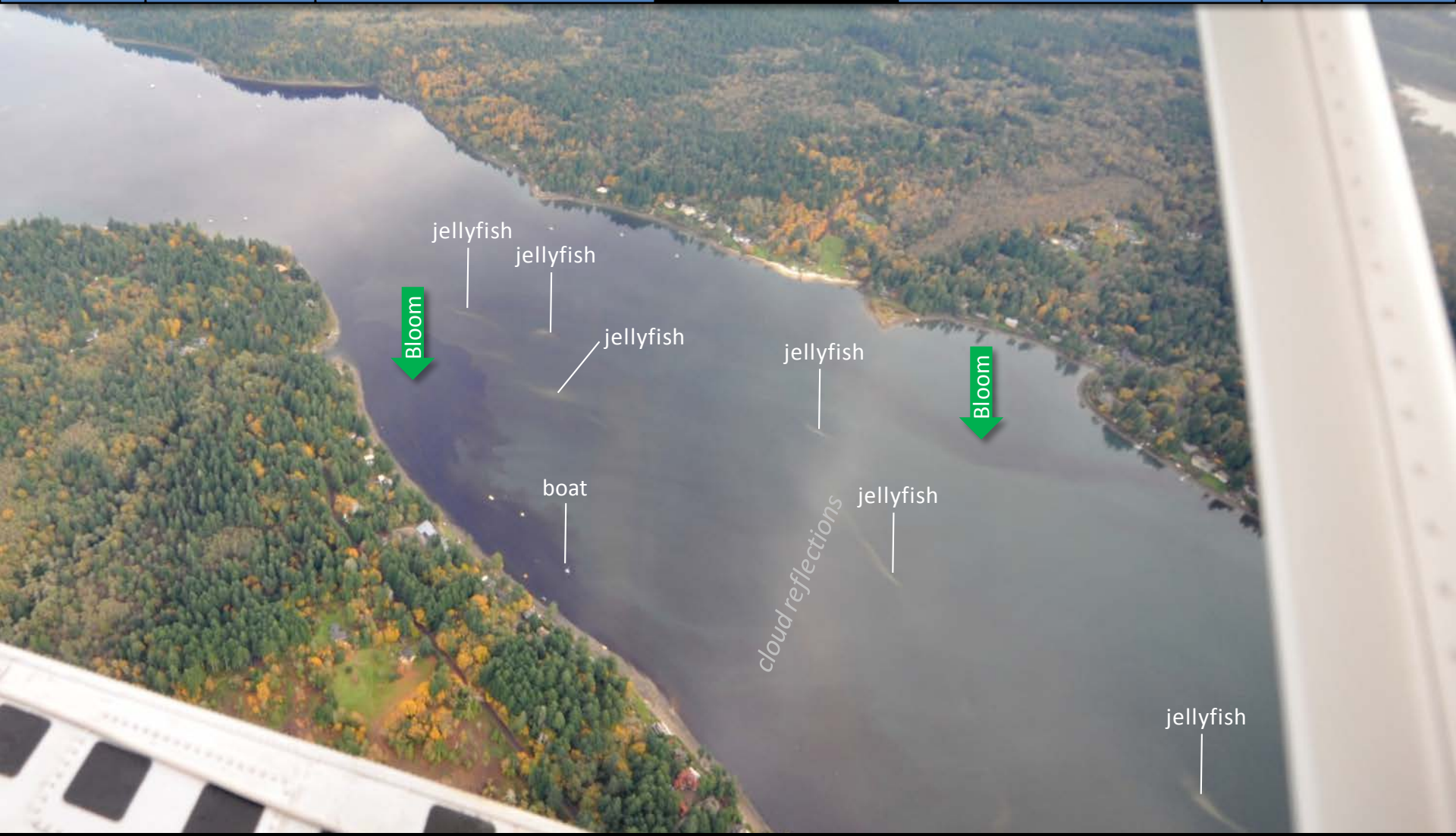
Aerial photography 9-16-2014



Red-brown bloom and many jellyfish patches.

Location: A. Off Frye Cove; B. Near Young Cove, Eld Inlet (South Sound), 9:35 AM.

Aerial photography 10-29-2014



Red-brown bloom and patches of jellyfish.

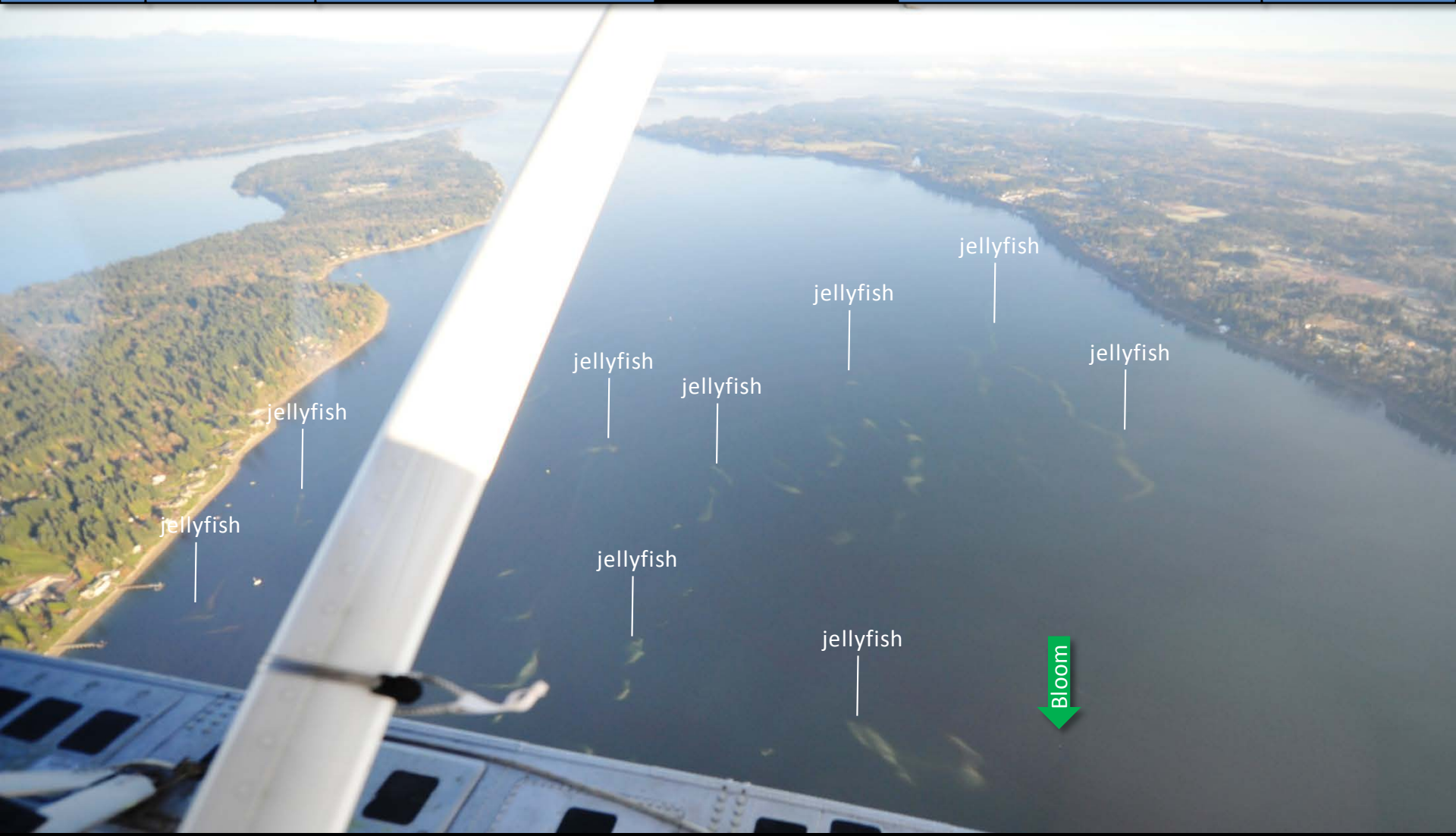
Location: Off Shell Point, Eld Inlet (South Sound), 3:46 PM.

Aerial photography 10-29-2014

A.

Extensive smacks of moon jellies, both in size and density with pinkish tint.

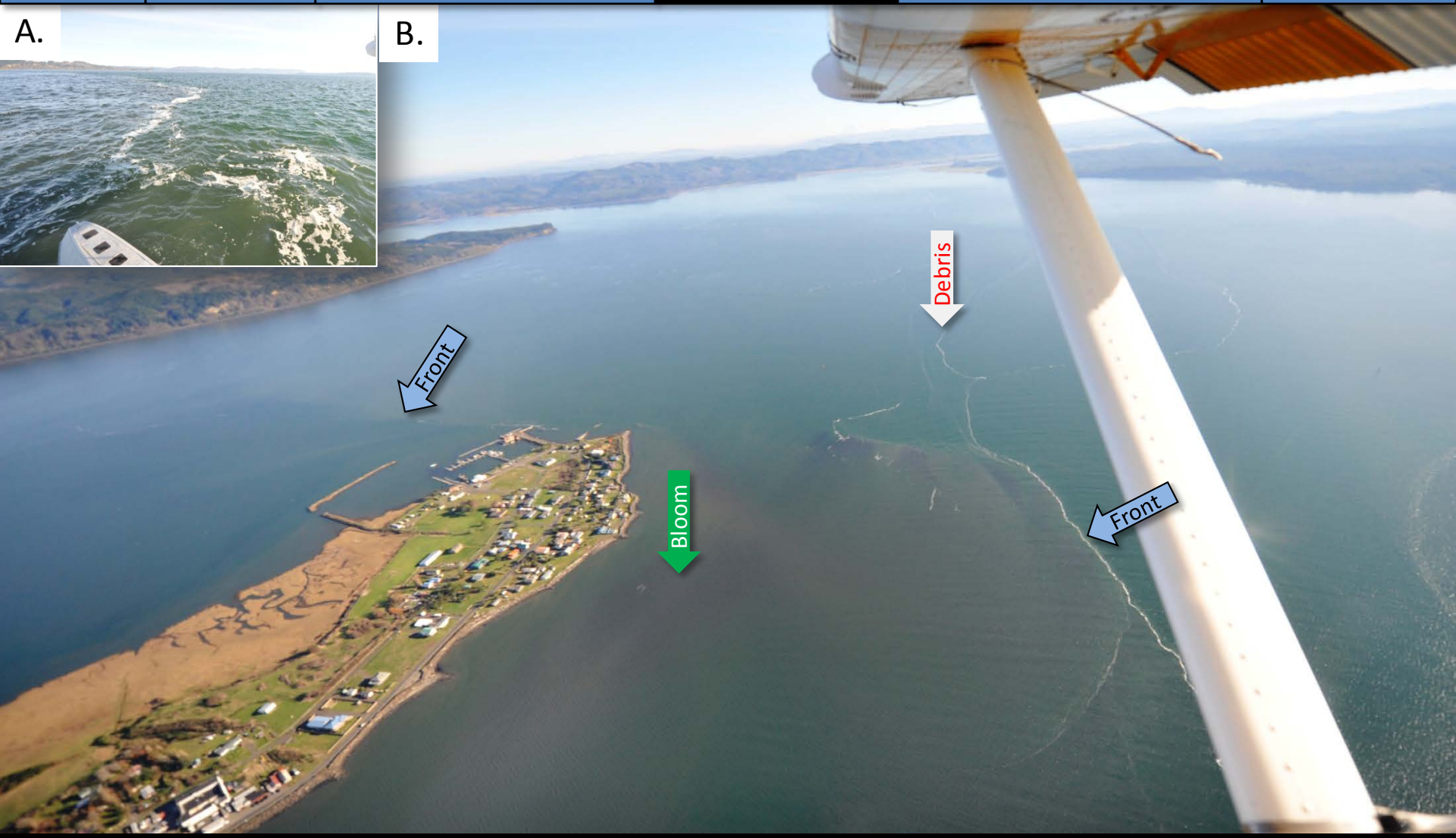
Location: A. On the water; B. From air showing location on the water, Budd Inlet (South Sound), 3:50 PM.



Numerous jellyfish smacks with underlying red-brown bloom.

Location: Off Little Tykle Cove, Budd Inlet (South Sound), 9:25 AM.

Aerial photography 11-17-2014



Red-brown bloom mixed with local humic-rich, dark freshwater, and organic debris along tide lines.

Location: A. On the water; B. Above Tokeland (Willapa Bay), 10:44 AM.

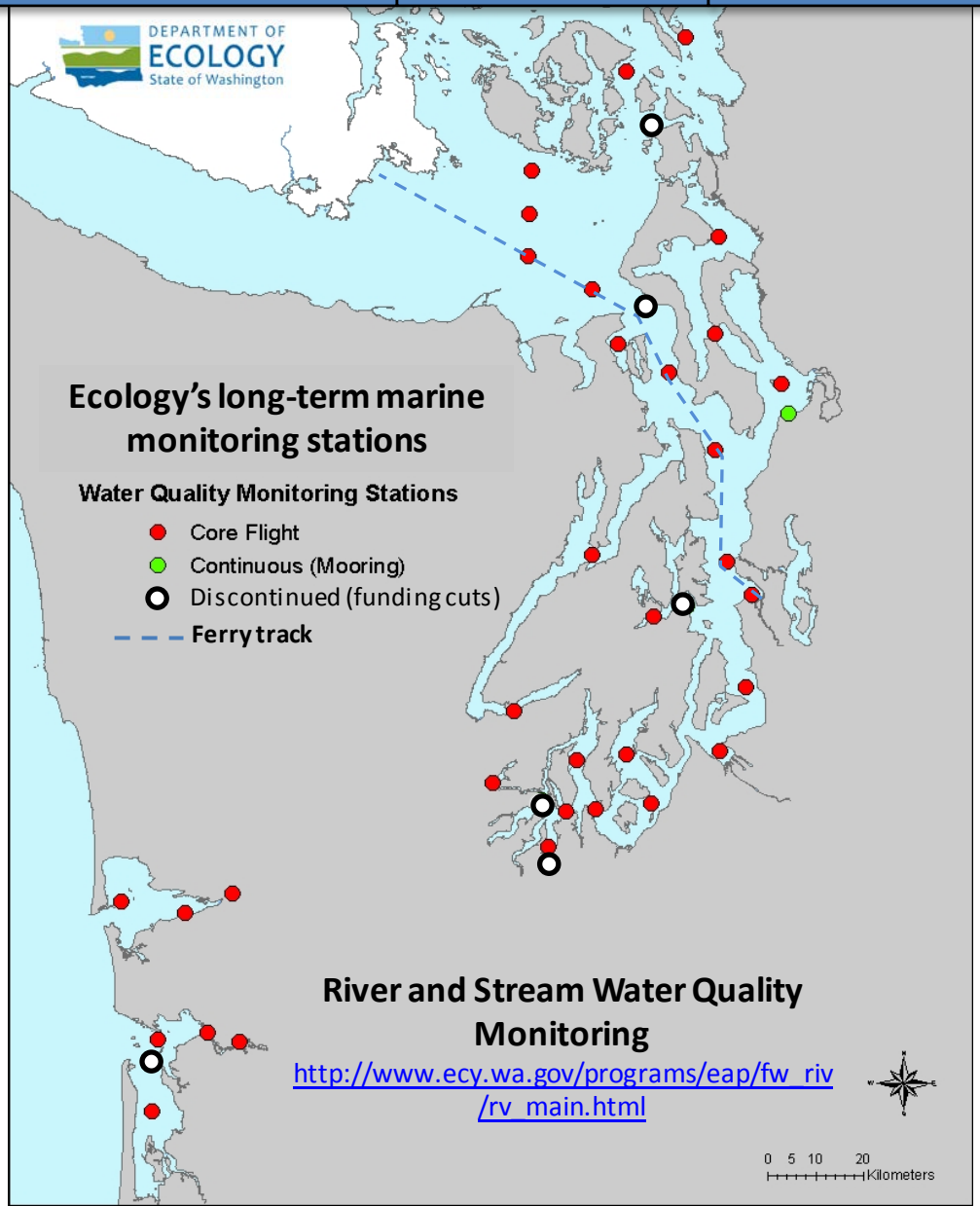
Get data from Ecology's Monitoring Programs

Flight log	People	Water column	Aerial photos	Hypothesis	-

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

Suzan.Pool@ecy.wa.gov

Access mooring data:
ftp://www.ecy.wa.gov/eap/Mooring_Raw/Puget_Sound/

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
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Marine Monitoring Unit
Environmental Assessment Program
WA Department of Ecology

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