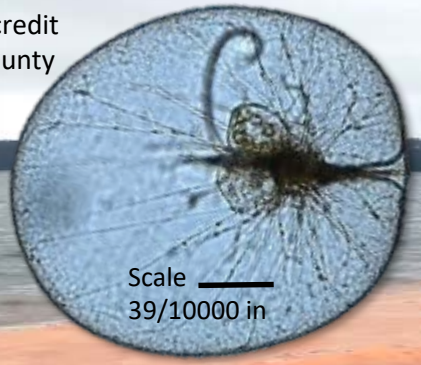
Publication No. 18-03-025

DEPARTMENT OF ECOLOGY State of Washington

Eyes Over Puget Sound

Surface Conditions Report, *May 22, 2018*



Noctiluca is blooming, read at: Encyclopedia of PUGET SOUND

Des Moines, Saltwater Park 6-4-2018

Up-to-date observations of water quality conditions in Puget Sound and coastal bays

Start here

LONG-TERM MARINE MONITORING UNIT

Mya Keyzers
Allison Brownlee

Skip Albertson

Tyler Burks
Jim Shedd

Guest:
Northwest Environmental Moorings group

Dr. Christopher Krembs (Editor)

Personal stories

p. 2

What is that orange stuff out there? Find out.

Climate & Streams

p. 5

Rain levels in May were in the top three lowest ever recorded. Rivers responded differently whether they received water from rain or snow.

With projected dryer and warmer conditions, can the remaining snowpack maintain healthy streamflows this summer?

Northwest Environmental Moorings

p. 9

Meet the team and access real-time anomalies of Puget Sound's mooring network. Yes, the seawater is getting saltier in response to low rain.

Aerial photography

p. 10

Many blooms in many colors. Large *Noctiluca* bloom on the surface from South Sound to Central Sound and into Whidbey Basin. Large accumulations of organic material in many parts of Puget Sound and oil sheens east and west of the Kitsap Peninsula.

Editorial assistance provided by: Allison Brownlee

The BEACH Program kicks off the 2018 season with a non-toxic algae bloom!

Noctiluca bloom at Saltwater State Park, June 4 2018

- BEACH monitors saltwater beaches for fecal bacteria
- Weekly sampling to ensure water is safe for swimming and recreational use
- Follow the BEACH team on Facebook and Twitter!

What was the visibility in the water for divers?

Best and Worst horizontal visibility and corresponding depth (ft)

#	Best		Worst	
1	16	92	8	8
2	11	20	4	7
3	16	39	15	98
4	48	89	6	3
5	20	97	12	3
6	34	98	8	10
7	23	75	12	8
8	30	82	17	7
9	36	80	9	7
10	21	15	7	43
11	32	98	15	5
12	28	92	3	23
13	34	94	3	3
14	11	7	7	46
15	18	62	14	21
16	17	98	12	20
17	17	36	15	94
18	19	25	3	3

Find depths with high/low visibility

- **Best visibility** was 48 feet in Saratoga Passage and quite an improvement over last month.
- **Poor visibility** occurred in Oakland Bay (near Shelton), but also in Bellingham Bay.
- We use transmissometer readings from our CTD package and convert them into horizontal visibility. The poster, Underwater Visibility Maps – a Tool for Scuba Divers, is available at: Click here

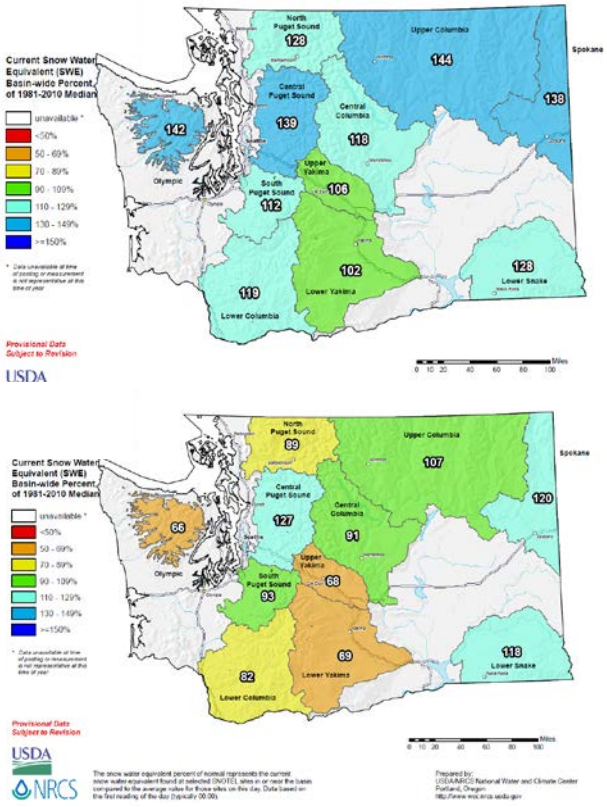
This is a new feature and we are soliciting feedback (salb461@ecy.wa.gov). Eventually we will feature the most recent data.

How much water flows into coastal marine waters?

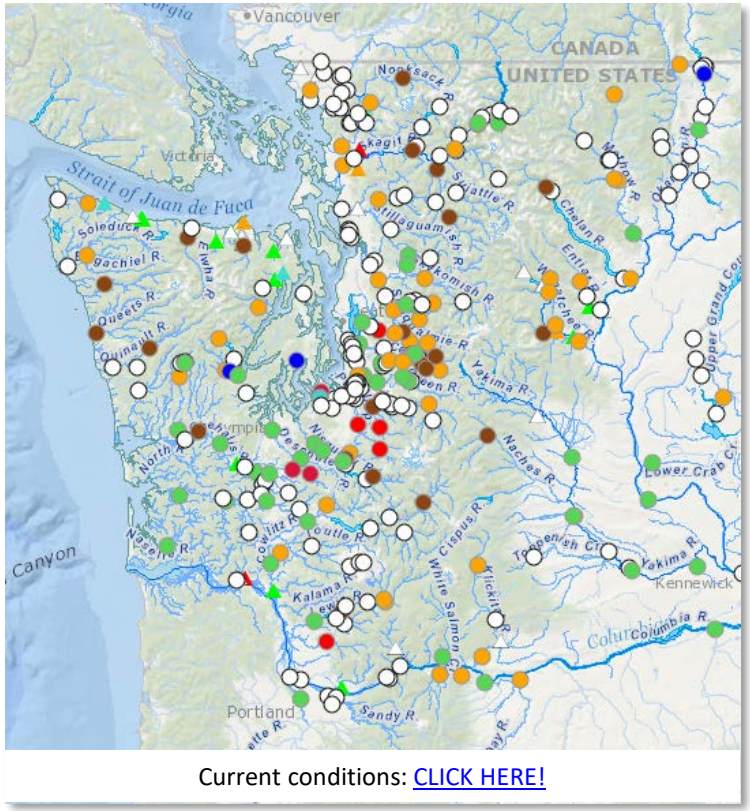
Tyler Burks, Jim Shedd

Near record air temperatures and very low precipitation during the month of May has resulted in highly variable freshwater inputs to Puget Sound by early June (map, center). Rivers with headwaters at high elevation remained above normal, generally peaking early, during the month of May due to rapid snowmelt (map panel, left), while low elevation rivers declined steadily. Rivers that are fed by rainfall or that rapidly lost snowpack are now below normal, while the remainder of rivers are flowing at near-normal levels.

Snowpack Conditions May 1st & June 11th



Current Streamflow Conditions as of 6/11/2018



Current conditions: CLICK HERE!

USGS Real Time Streamflow Values

- Much above normal (>90%)
- Above normal (76-90%)
- Normal (25-75%)
- Below normal (10-24%)
- Much below normal (5-10%)
- Far below normal (>5%)
- Lowest recorded
- Not Ranked

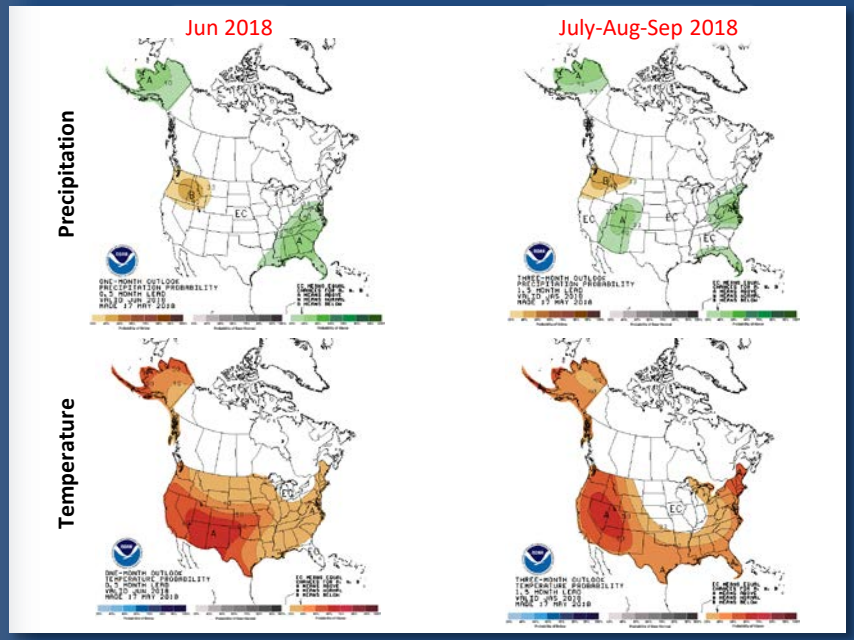
Ecology Daily Streamflow

Daily Streamflow

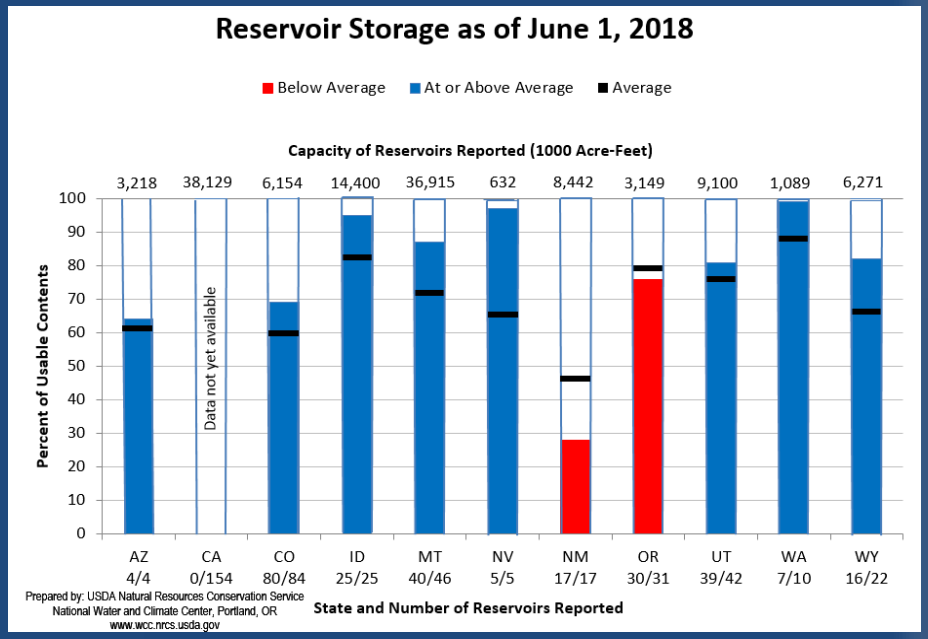
- Highest recorded
- Much above normal (>90%)
- Above normal (76-90%)
- Normal (25-75%)
- Below normal (10-24%)
- Much below normal (<10%)
- Lowest recorded
- Not ranked

How much water flows into coastal marine waters?

Climatologists predict drier and warmer conditions this summer. The dwindling La Niña is expected to transition to ENSO-neutral. Will the current favorable snowpack translate to healthy stream flows in September? WA reservoirs are still above average, that is good.



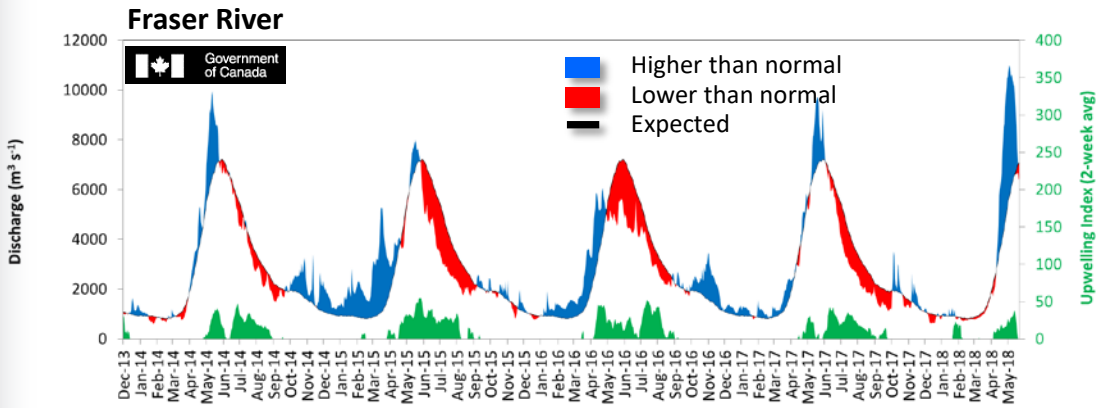
The maps on the top show higher probability of below normal precipitation in the NW. The maps on the bottom show a higher probability of higher temperatures in the SW Click here



WA reservoir levels as are currently well above average, though river flows have most recently sharply dropped Click here

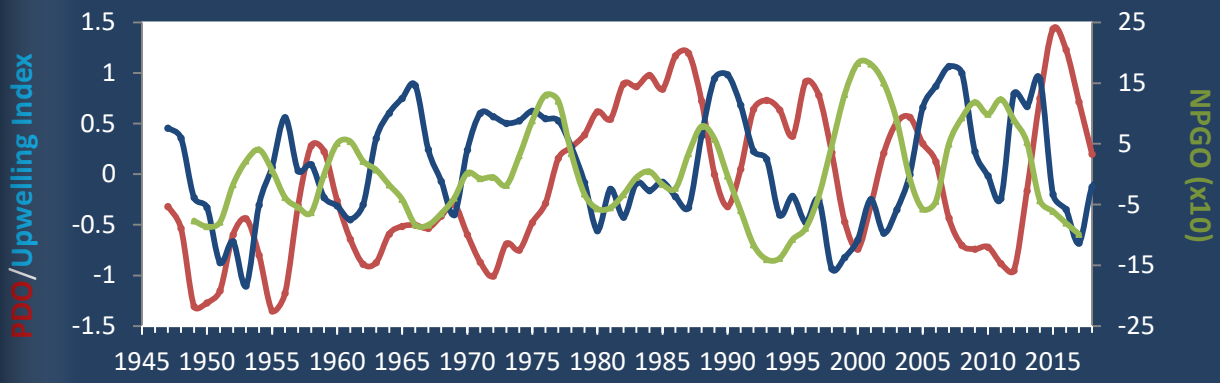
Climate influences: How well is Puget Sound exchanging its water?

Historically, peaks of coastal upwelling and the freshet are in sync. Will they be this year?



The Fraser River is the major driver of estuarine circulation and water exchange with the ocean.
Fraser River flows are presently high and the snowpack in BC is well above 100% (Basin Snow Water Index)

Three-year running average of PDO, Upwelling, and NPGO indices



How do ocean boundary conditions affect the quality of water we exchange with the ocean?
Past years' warm water is gone (PDO), upwelling is neutral (Upwelling Index anomaly), and surface productivity along the coast is lower (NPGO).

*Pacific Decadal Oscillation Index (**PDO, temperature**, explanation). Upwelling Index (anomalies) (**Upwelling, low oxygen**, explanation). North Pacific Gyre Oscillation Index (**NPGO, productivity**, explanation).*

What's the story of influences affecting water quality?

Climate and natural influences include weather, river flows, and the adjacent ocean conditions that affect our marine waters. This graphic provides context for interpreting Puget Sound marine conditions. All data are from public sources: weather from UW GRAYSKIES; river flows from USGS and Environment Canada; indices from NOAA, UW (PDO), and E. Di Lorenzo (NPGO).

Summary (May):

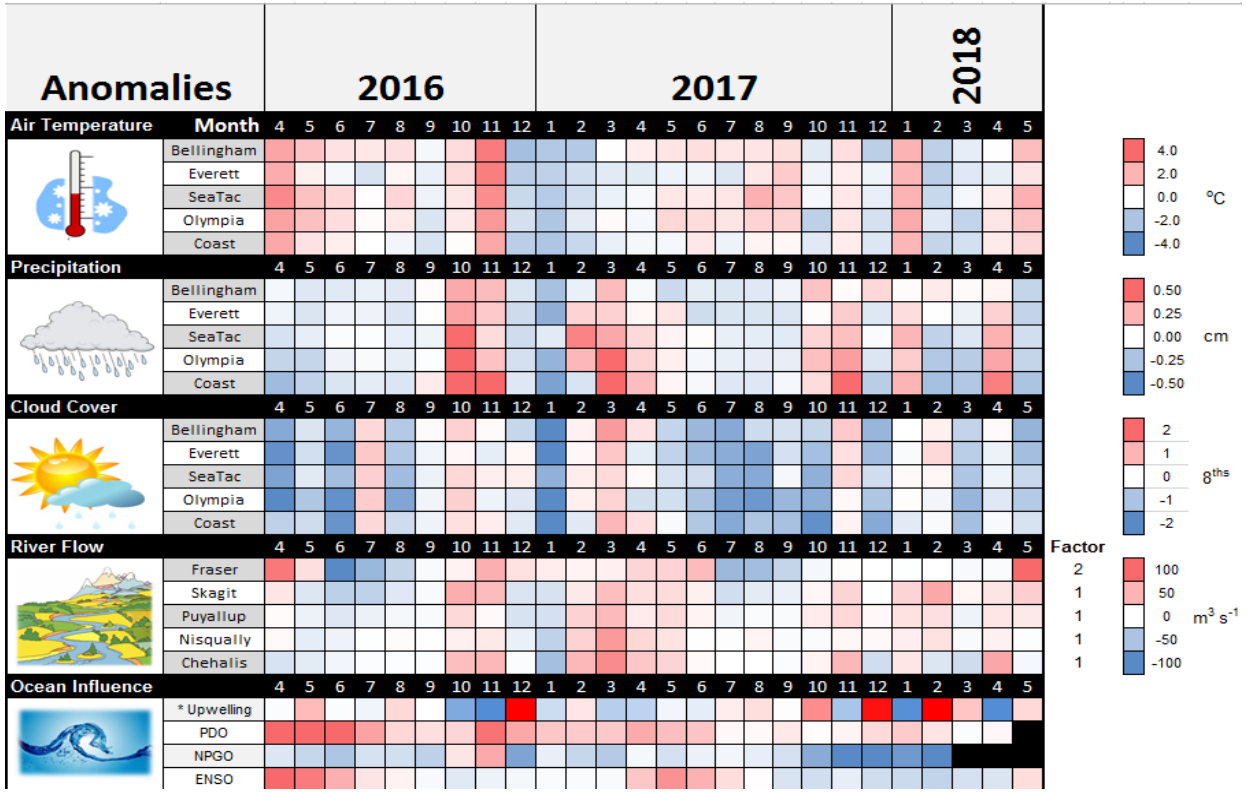
Air temperatures were above-normal for May. SeaTac recorded its warmest May ever, especially overnight temperatures.

Precipitation levels were in the top three lowest ever recorded.

Sunshine levels have been above normal.

River flows were above normal, especially to the north.

Upwelling was normal. ENSO (MEI) was slightly positive, indicating the end of La Niña.



*Upwelling/downwelling Anomalies (PFEL)
PDO = Pacific Decadal Oscillation
NPGO = North Pacific Gyre Oscillation
ENSO = El Niño Southern Oscillation

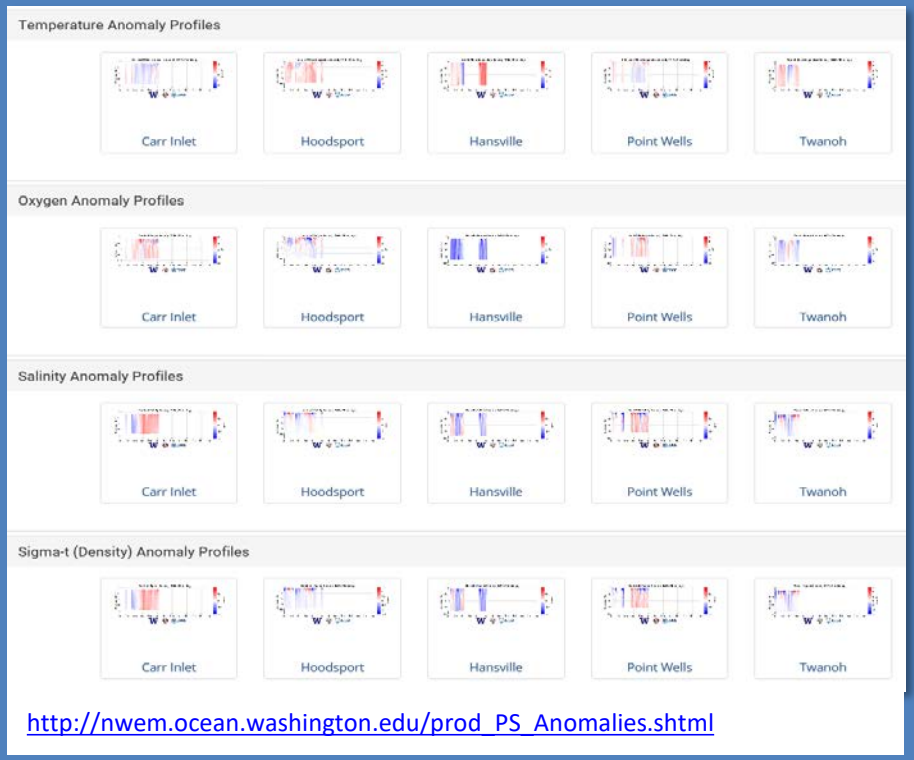
higher — expected — lower

No data

How did water quality respond to recent conditions?

Anomalies in Puget Sound in real-time

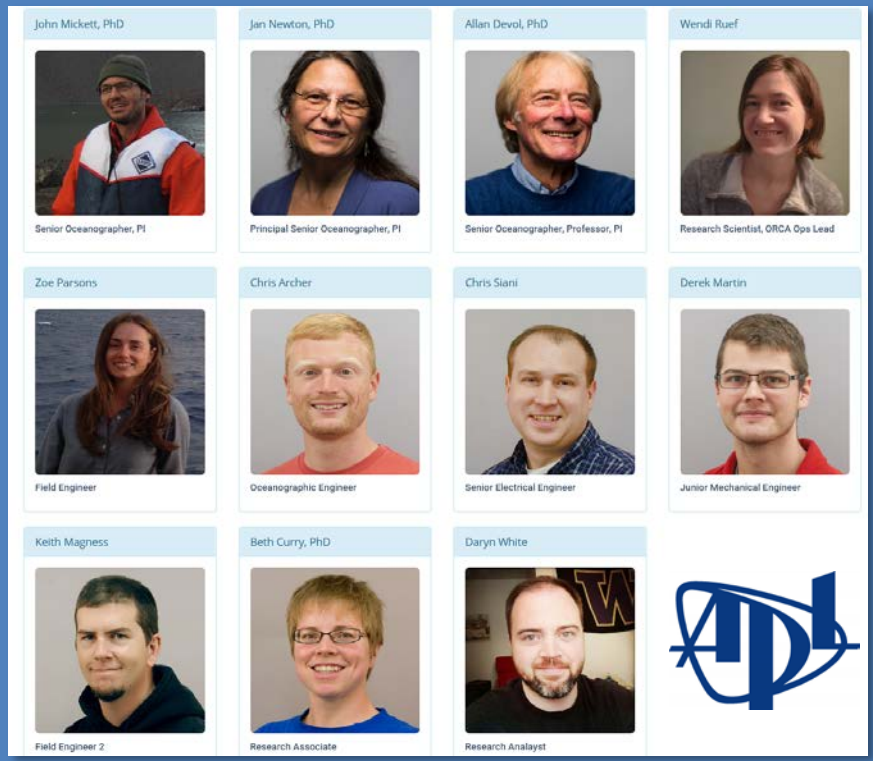
Look at the individual moorings on the map and click through to view the products that mooring produces.



http://nwem.ocean.washington.edu/prod_PS_Anomalies.shtml

Northwest Environmental Moorings

About the Group: Using specialized oceanographic moorings we design and build, we record long-term, real-time measurements to track the health and changes of coastal and inshore waters of the Pacific Northwest.



What are conditions at the surface?

Many blooms in many colors. Large bloom in Central Sound supporting a large Noctiluca bloom particularly in the south. Localized Noctiluca patches also in Budd Inlet and Saratoga Passage. Large accumulations of organic material in other parts of South Sound, Whidbey Basin and northern Hood Canal. Oil sheens east and west of the Kitsap Peninsula.

Oils sheen off Pilot Point, 6-4-2018

Whale in the shallows, Saratoga Passage, 5-22-2018

Start here

Front

Mixing and Fronts:
Tidal fronts visible in Colvos Passage and Admiralty Inlet

Jellyfish:
No visible jellyfish patches, instead lots of schooling fish in Carr Inlet and Liberty Bay

Plume

Suspended sediment:
Suspended sediments entering with rivers is low

Bloom

Visible blooms:
Bright green: Mystery Bay, Oro Bay
Red-brown: Mystery Bay, Port Townsend Bay
Golden brown: Central Sound, Wollochet Bay
Orange green: Budd Inlet, Commencement Bay, Edmond, Saratoga Passage

Debris

Debris:
Abundant organic debris in South Sound, Northern Hood Canal, Central Sound, Colvos Passage, and Saratoga Passage

Aerial photography and navigation guide

Date: 5-22-2018

Tide data from May 22, 2018 (Seattle):

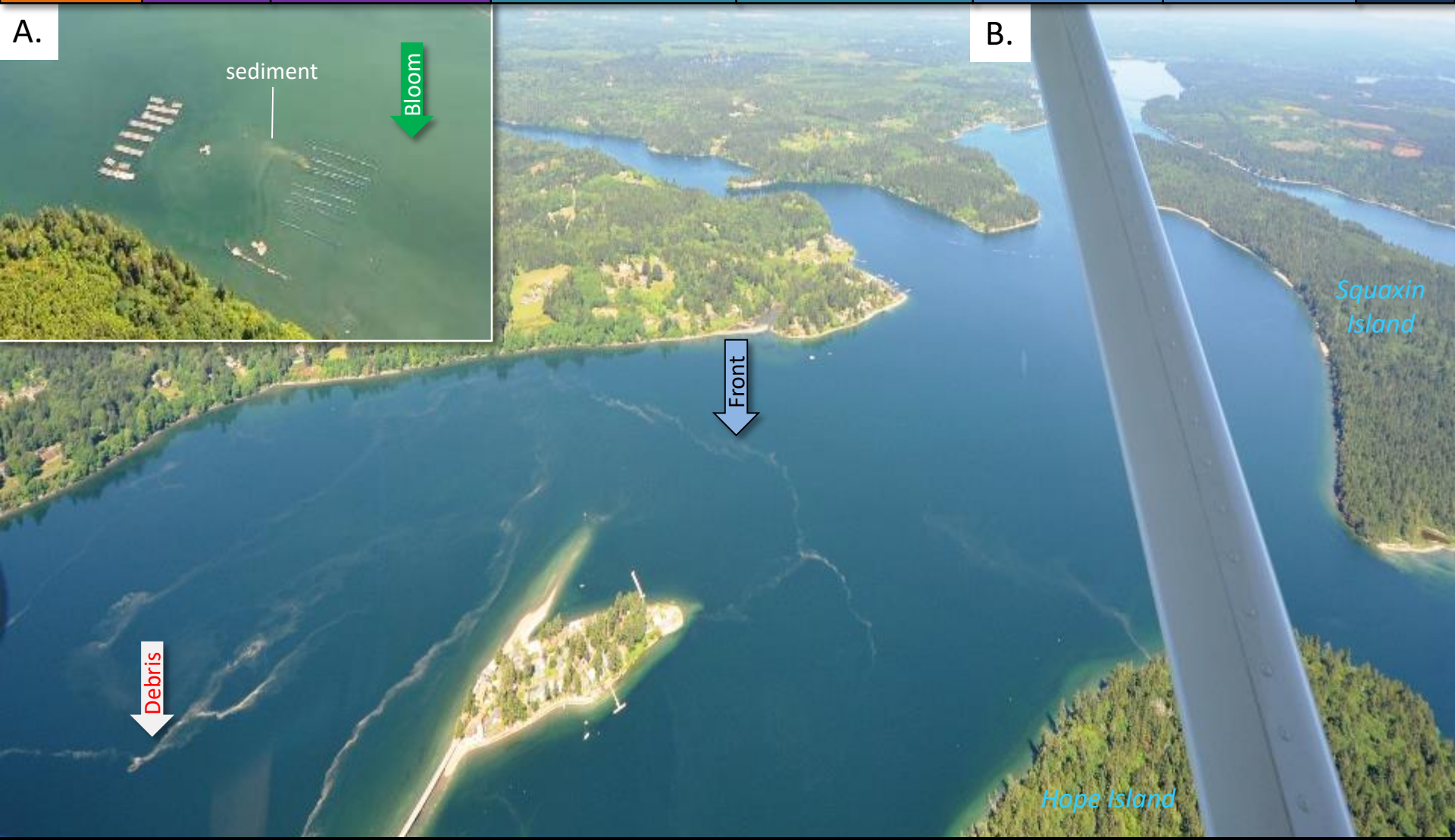
	Height (ft)	High/Low
12:02 AM	11.75	H
6:29 AM	5.28	L
11:13 AM	8.07	H
5:35 PM	0.72	L

Flight Information:

Sunny and broken cloud ceiling.

Flight routes

A. Noctiluca bloom surfacing near Priest Point Park, low altitude. B. At higher altitude.
Location: Budd Inlet (South Sound), 12:12 PM

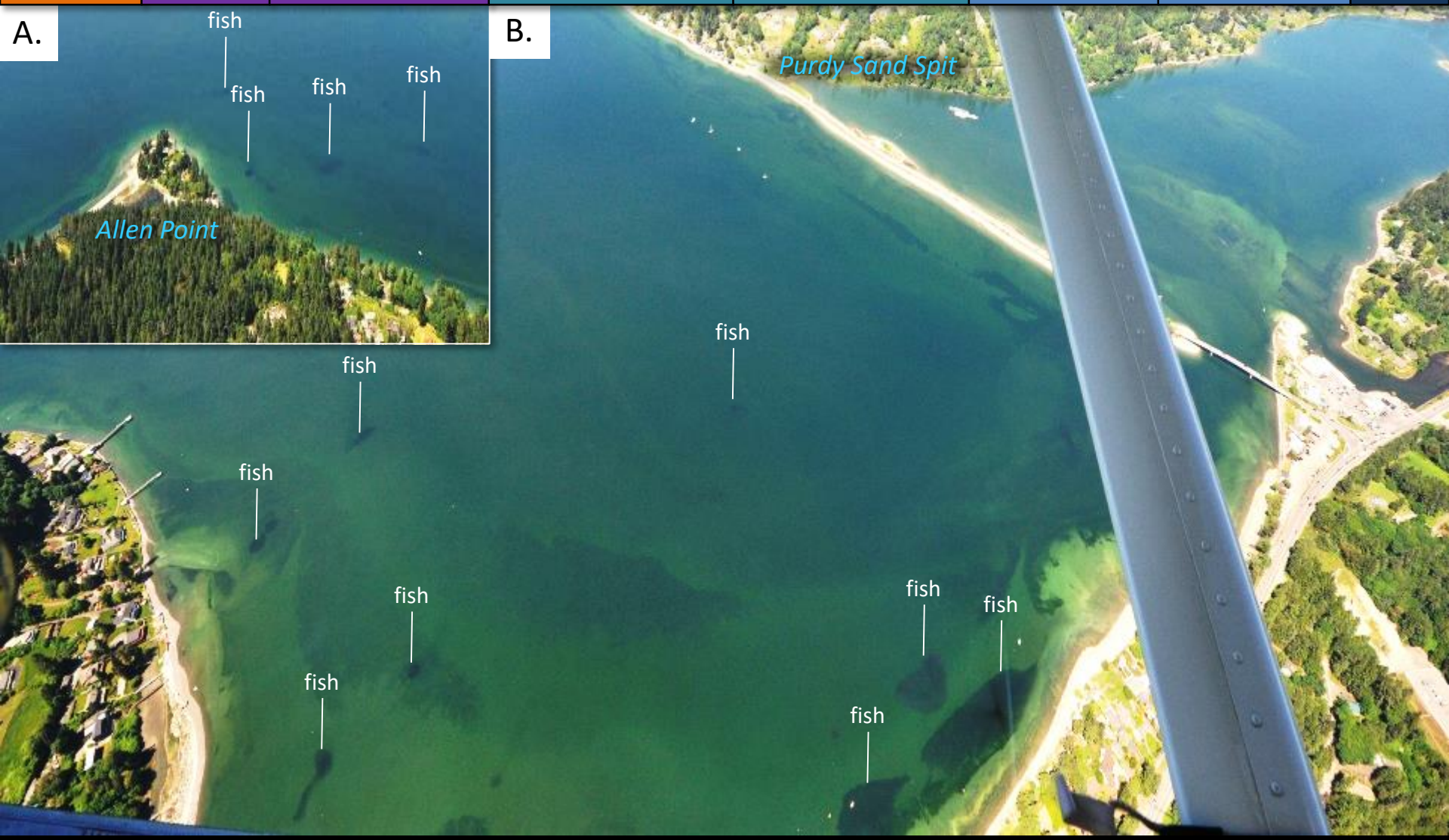


A. Aquaculture operations in Totten Inlet. B. Organic material accumulating along tidal fronts

Location: Henderson Inlet (South Sound), 12:21 PM

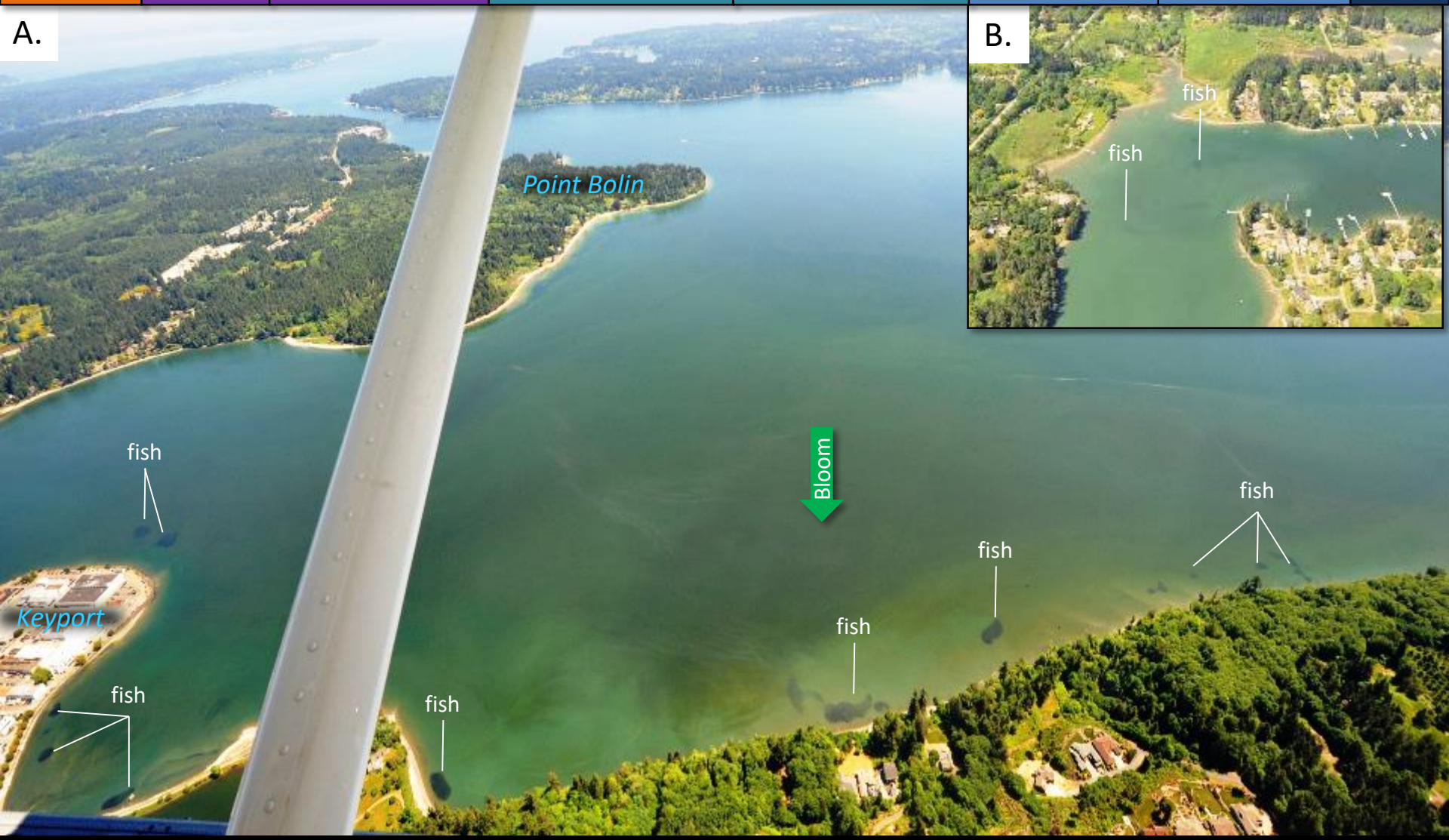
Green and patchy bloom.

Location: Carr Inlet (South Sound), 12:33 PM



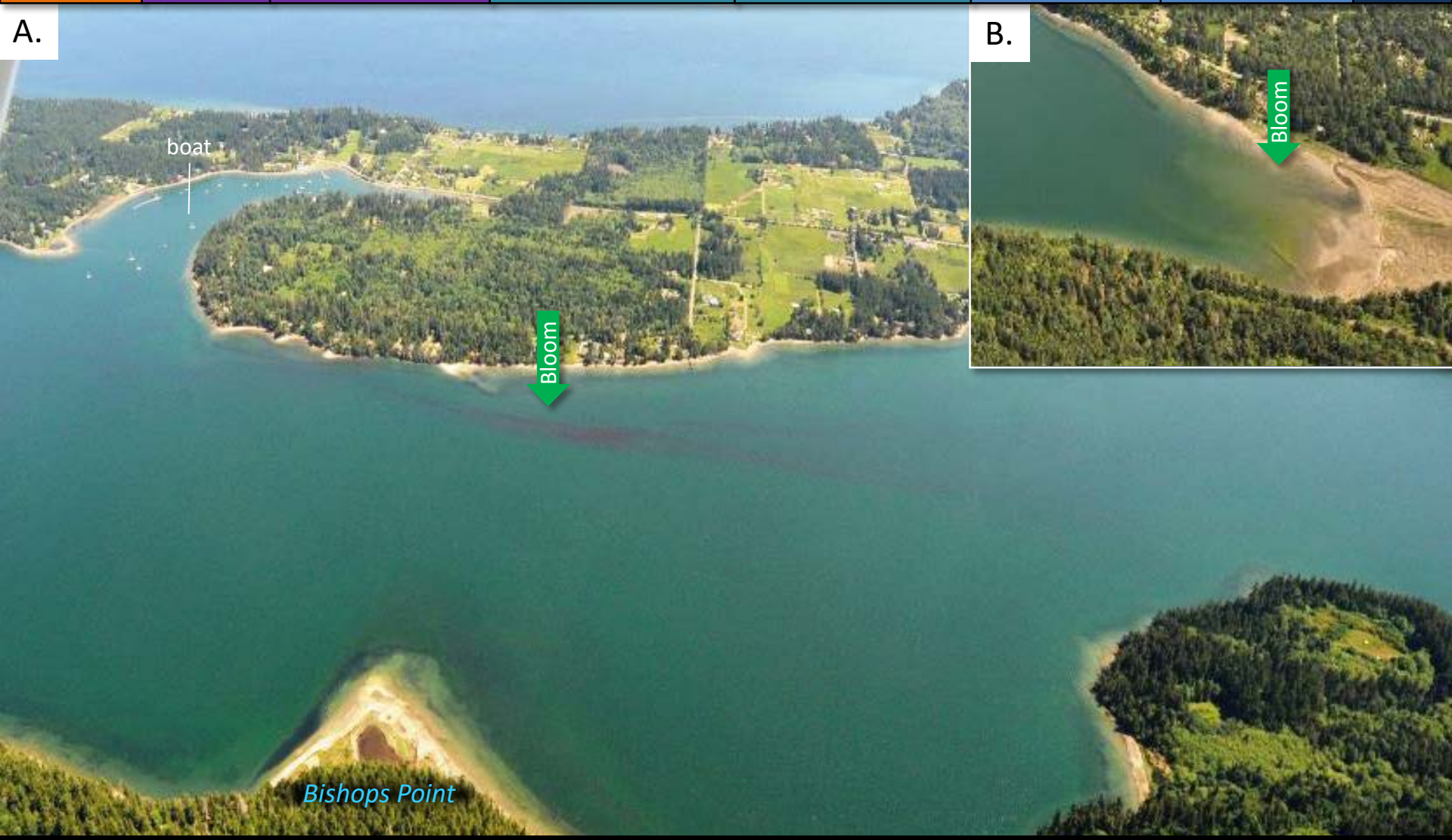
Many patches of schooling fish

Location: A. near Allen Point, B. near Purdy Sand Spit (South Sound), 12:00 PM



Many patches of schooling fish, bloom in olive-brown present A. At the entrance, and B. in Liberty Bay

Location: Keyport Lagoon (Central Sound), 12:03 PM



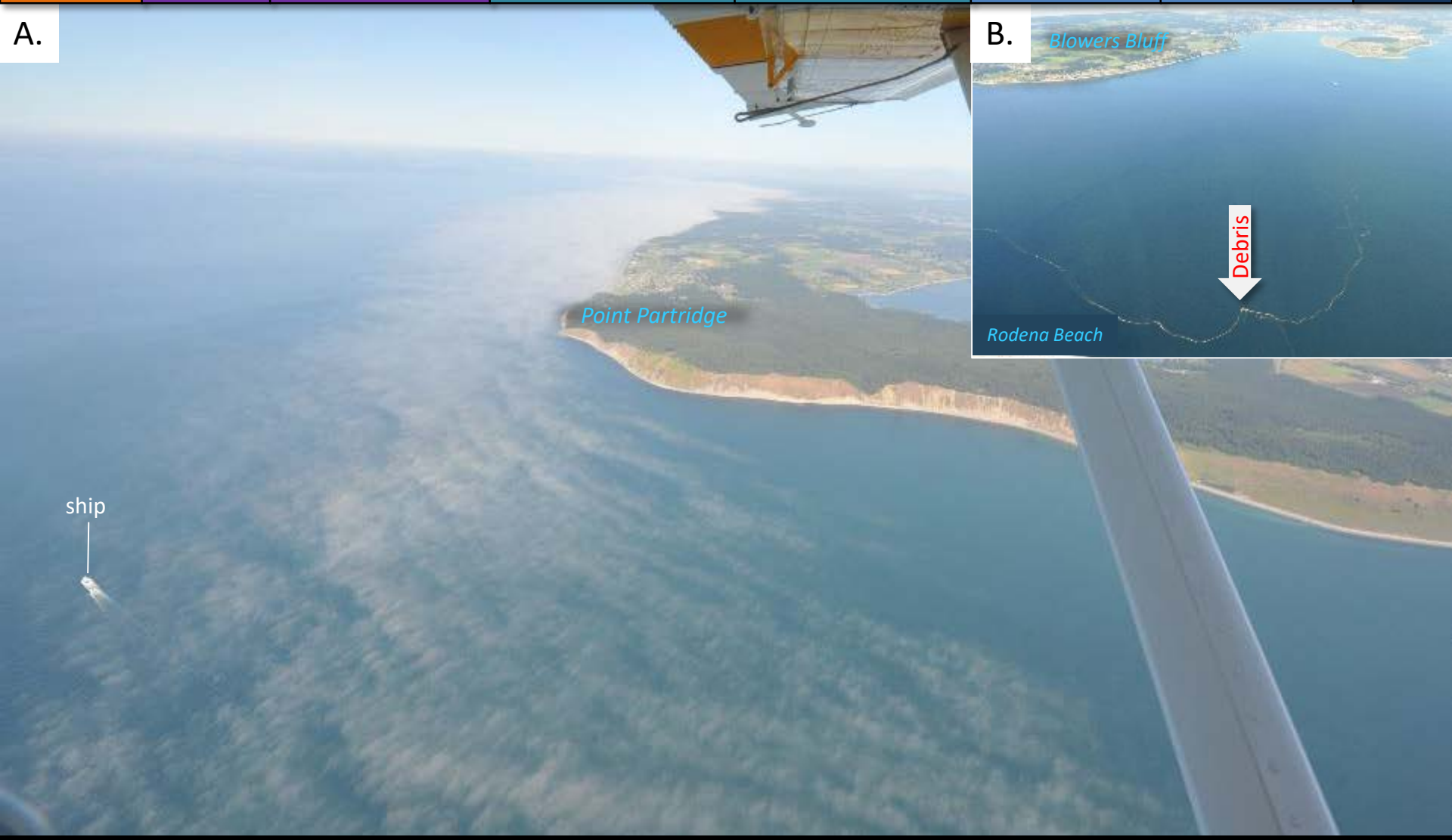
A. Red-brown bloom across Bishops Point. B. Yellow green bloom at the end of Scow Bay

A. Location: Marrowstone Island (Central Basin), 1:07 PM

Aerial photography 5-22-2018

Red-brown bloom and blue water entering through Portage Canal

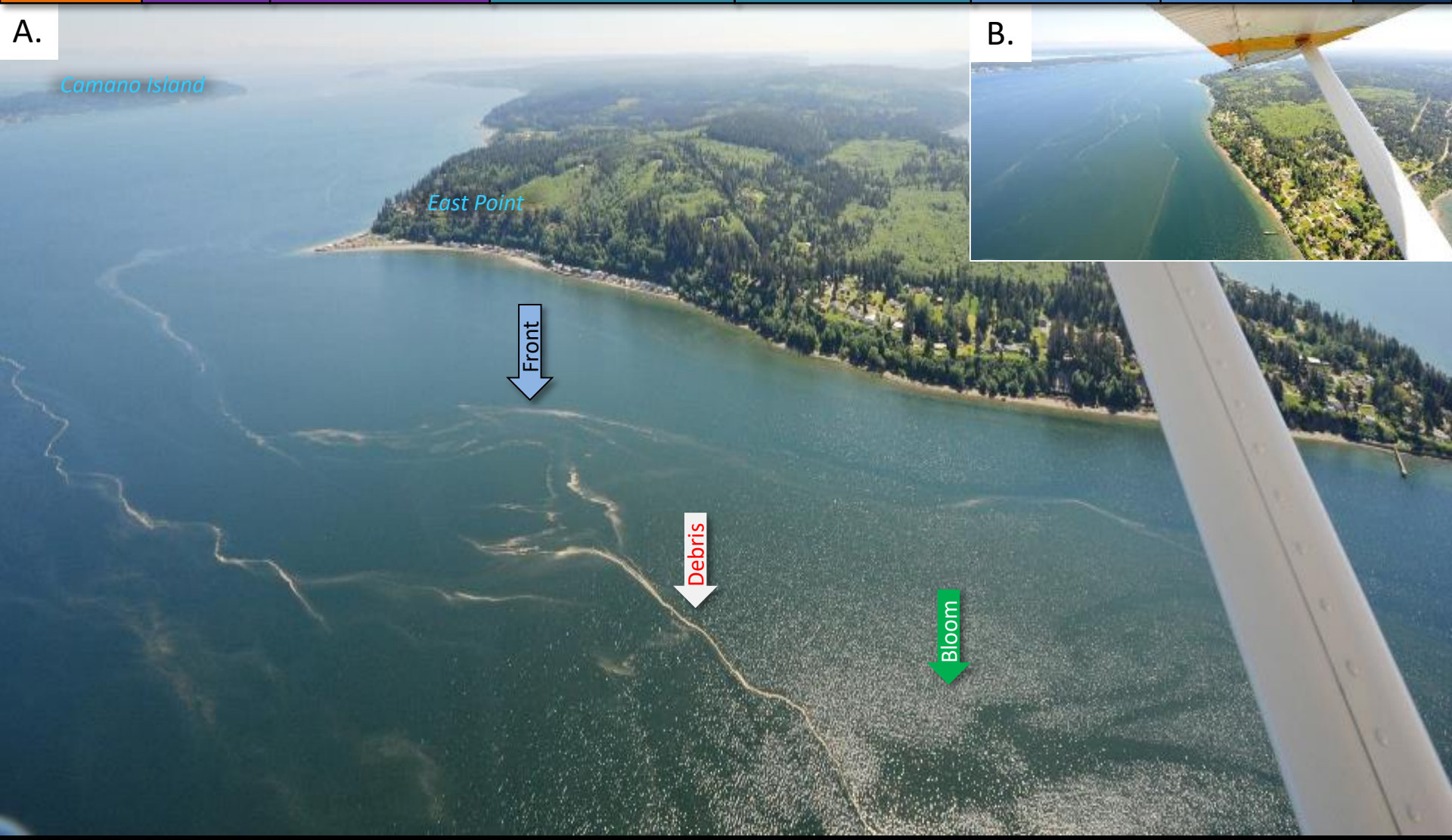
Location: Port Hadlock (Central Basin), 1:08 PM



A. Cloud formation likely due to colder water in Admiralty Reach. B. Organic material at tidal front

Location: A. Admiralty Reach, B. Whidbey Basin, (North Sound), 1:30 PM

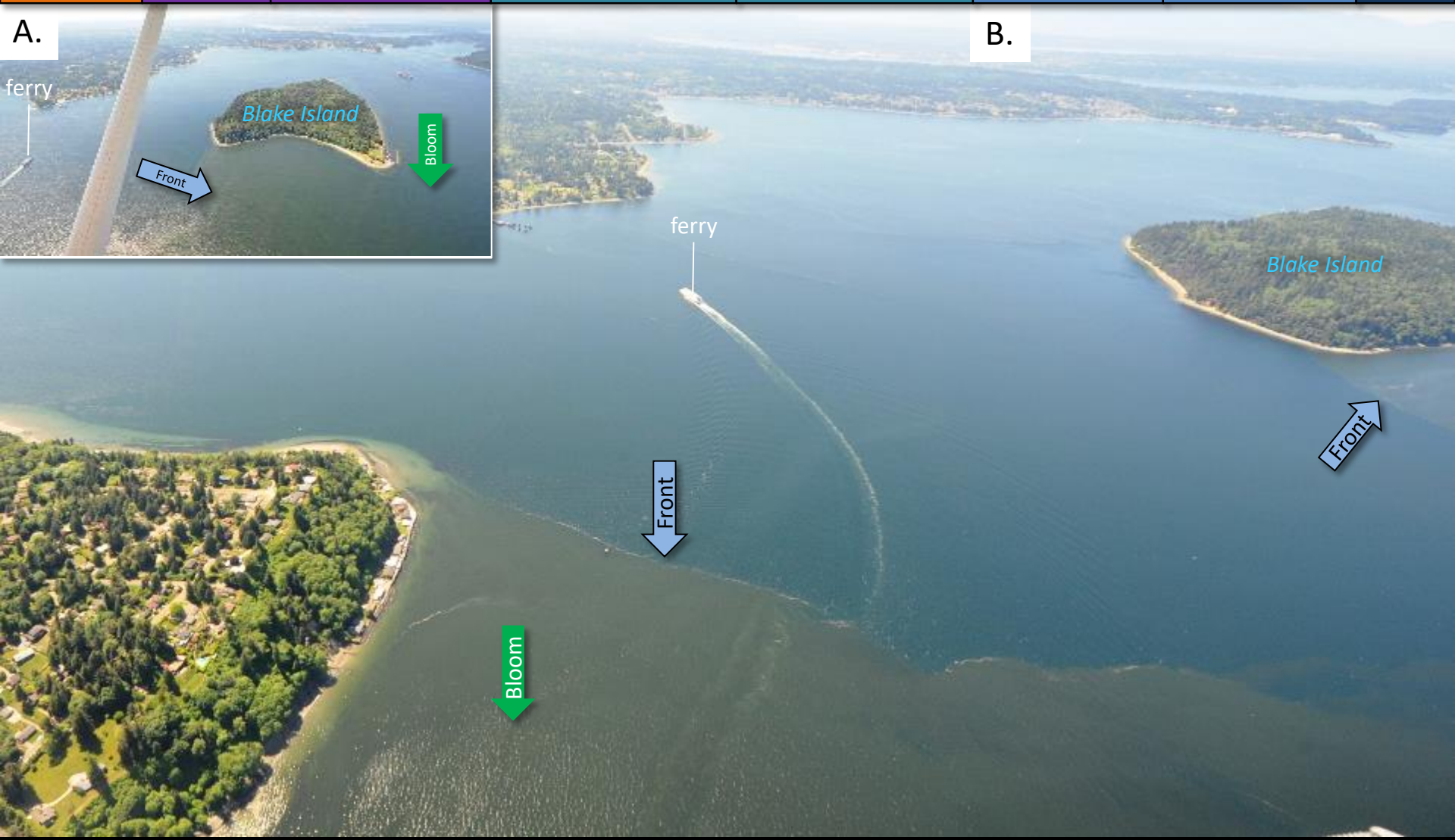
Aerial photography 5-22-2018



A. Large ribbons of organic material, likely Noctiluca. B. Algal bloom extending north

Location: A. Saratoga Passage (Whidbey Basin), 1:44 PM

Aerial photography 5-22-2018



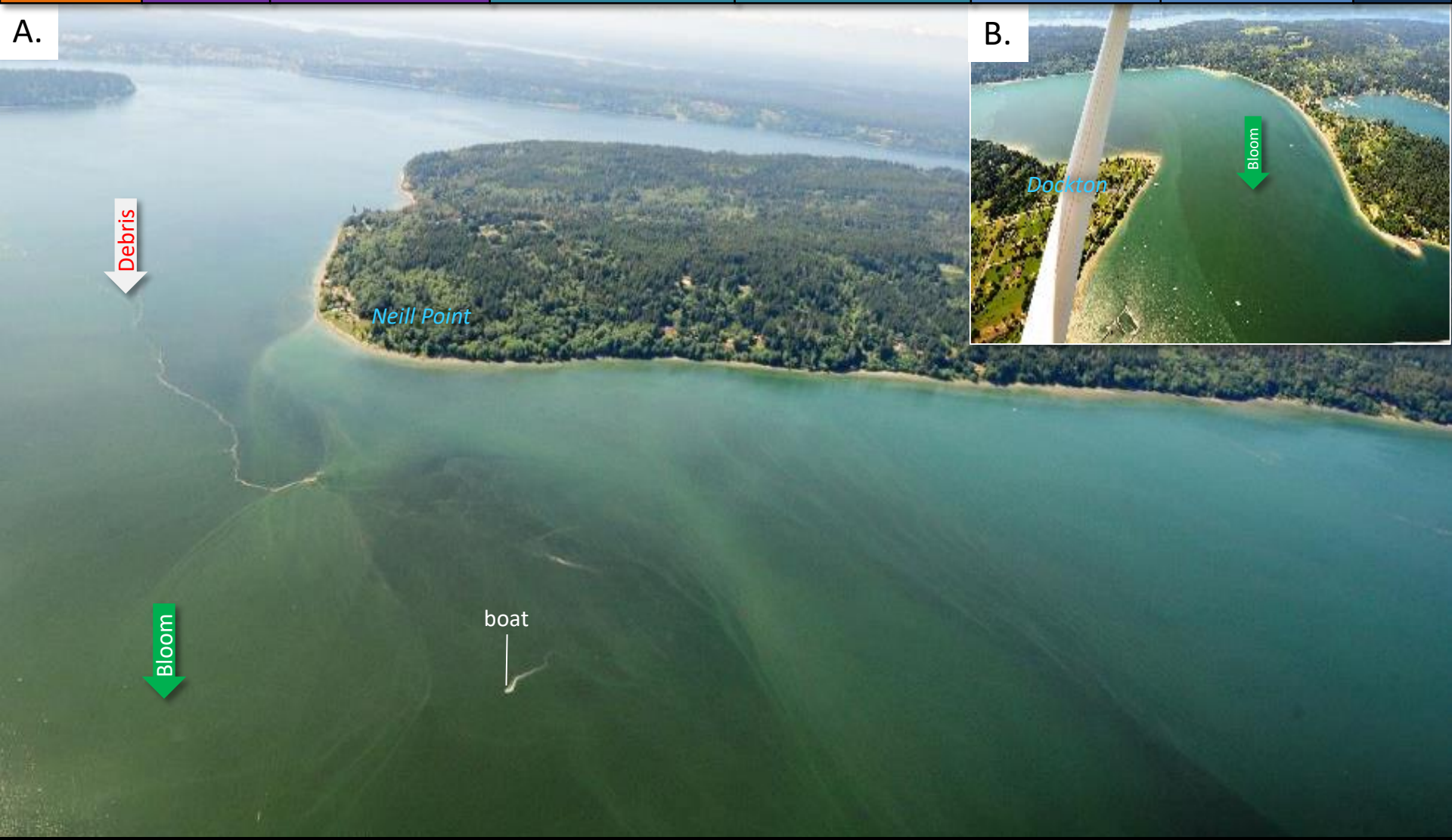
Strong algal bloom in main Basin contrasted against Colvos Passage water. A & B. tidal fronts

Location: Blake Island (Central Basin), 2:40 PM

Aerial photography 5-22-2018

Mats of organic material accumulating along tidal fronts.

Location: Colvos Passage (Main Basin), 2:45 PM

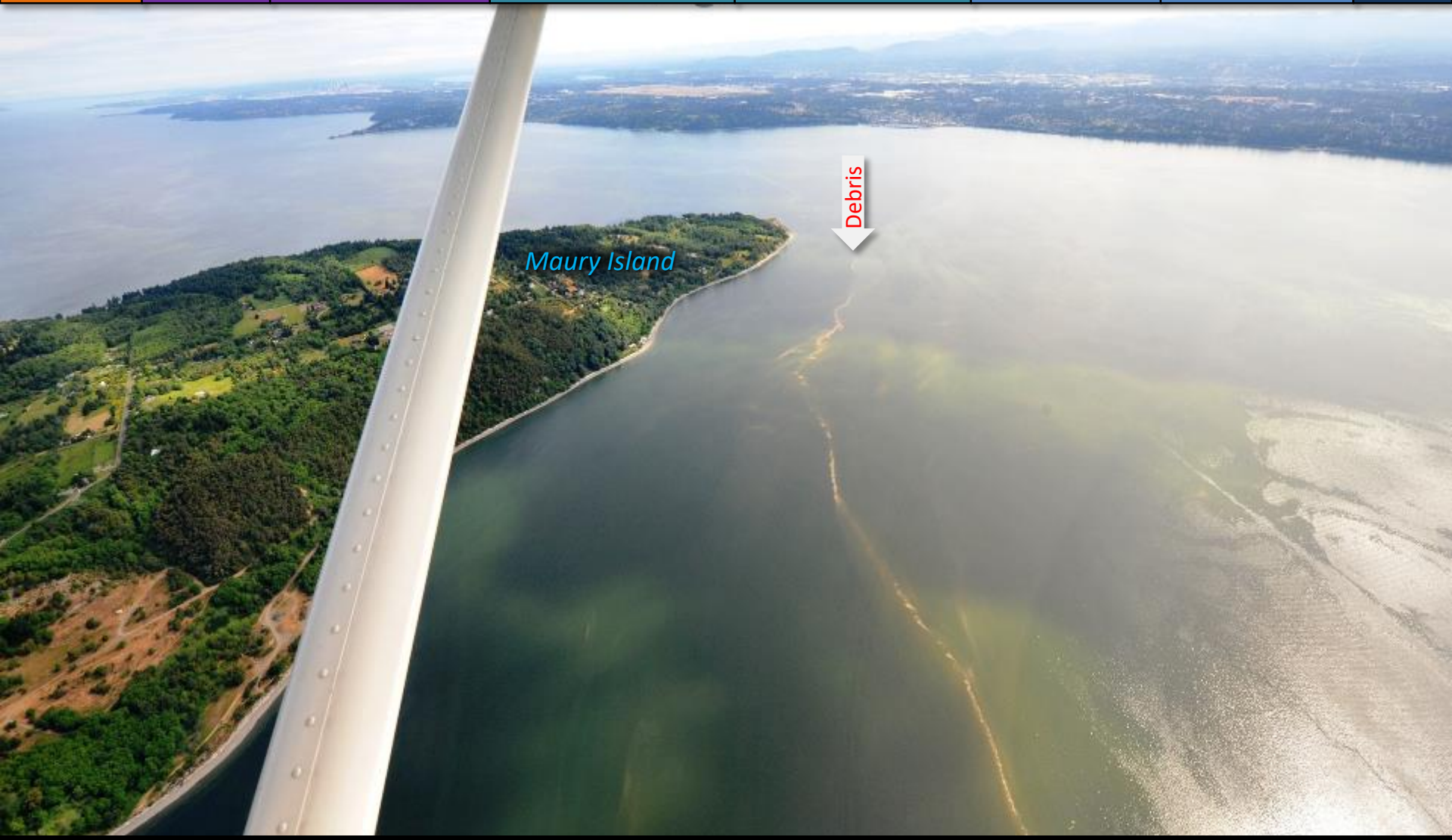


A. Green-yellow bloom of Noctiluca at entrance to Quartermaster Harbor, B. Bloom near Dockton

Location: Quartermaster Harbor (Central Basin), 2:50 PM

Noctiluca bloom surfacing two weeks later and accumulating along tidal fronts

Location: North of Commencement Bay (Central Sound), 10:16 AM

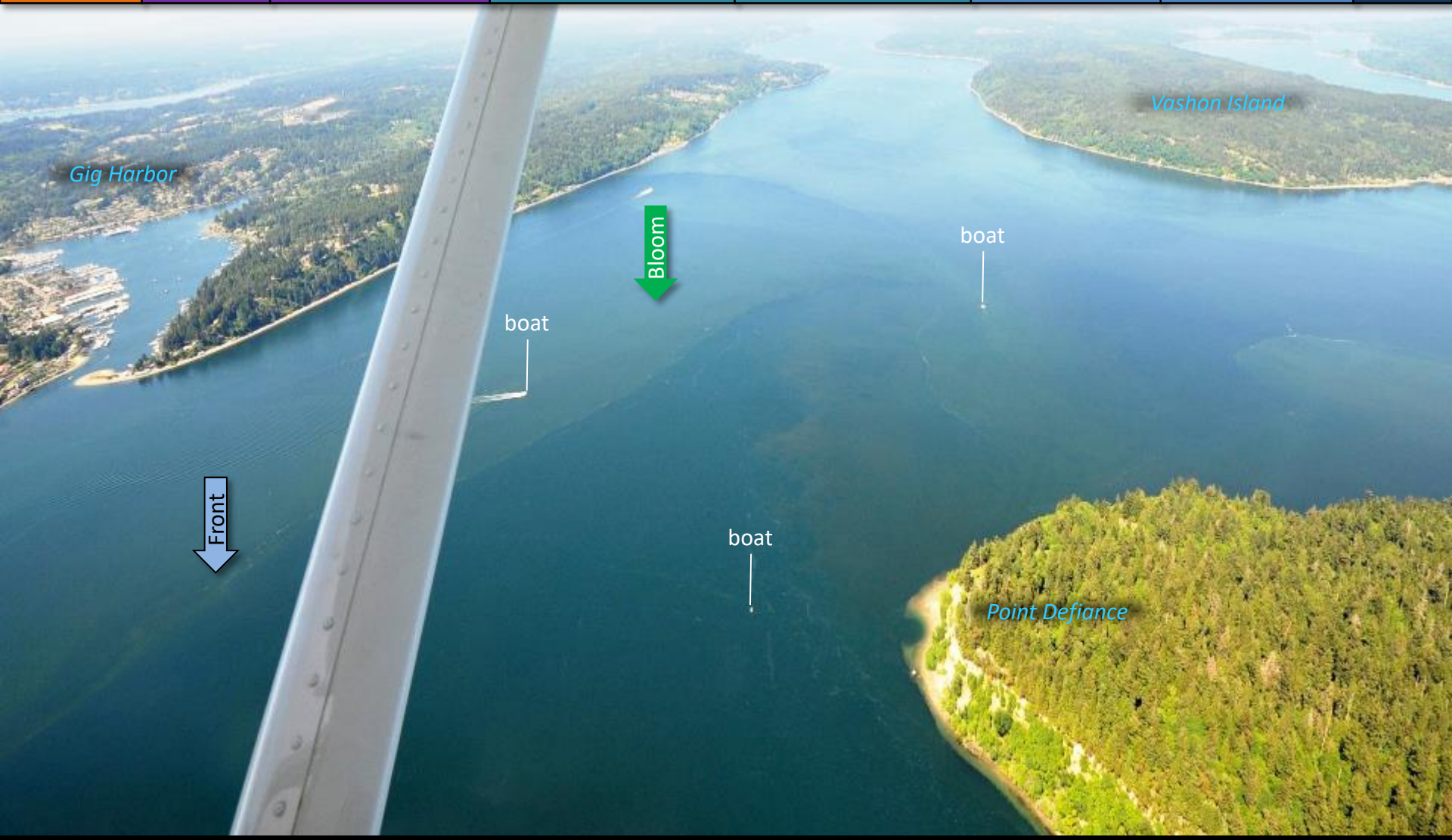


Noctiluca bloom surfacing two weeks later and accumulating along tidal fronts. Patchy sun light

Location: East of Maury Island (Central Sound), 10:16 AM

Green-yellow bloom of Noctiluca with first signs of cells accumulating at the surface

Location: Commencement Bay (Central Basin), 2:55 PM



Water leaving the Tacoma Narrows has minor algal blooms. Tidal fronts make contrast visible

Location: Point Defiance (Central Sound), 2:56 PM

Algal bloom at entrance to Wollochet Bay and Hale Passage

Location: Hale Passage (South Sound), 1:48 PM

Aerial photography 5-22-2018

A. Bloom leaving Carr Inlet. B. Organic material 14 days later 6-5-2018. C. Organic material off Sunset Beach

Location: South of the Tacoma Narrows (South Sound), 2:59 PM

Yellow-green bloom in East Oro and Oro Bay

Location: Anderson Island (South Sound), 3:04 PM

Organic material floating south of Dana Passage

Location: Great Bend (South Sound), 3:09 PM

Find past editions of EOPS with images on last pages

We have published 71 editions!

Find all previous Eyes Over Puget Sound editions at the end of this document.

Recommended Citation (*example from August 2017*)**:**

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Shannon Point Marine Lab (WWU),
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Marine Monitoring Unit
Environmental Assessment Program
WA Department of Ecology

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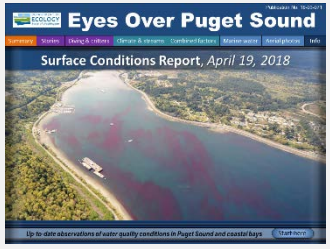

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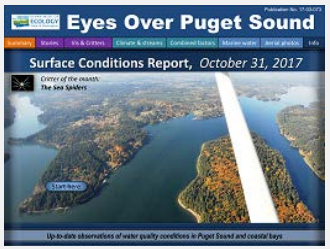

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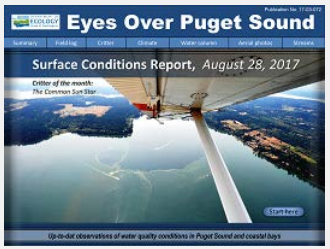

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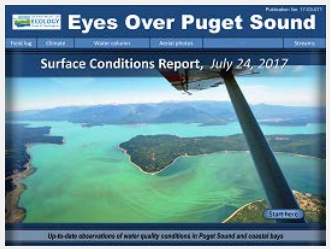

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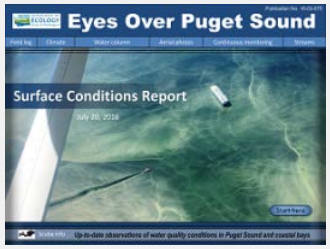

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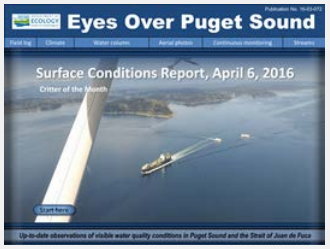

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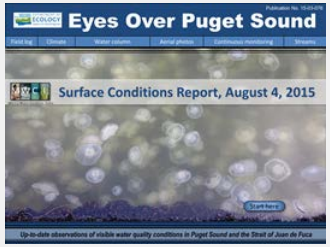

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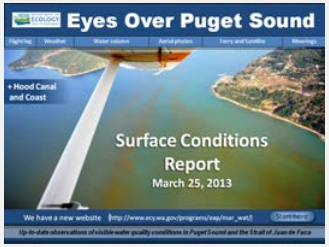

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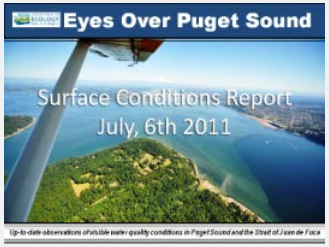
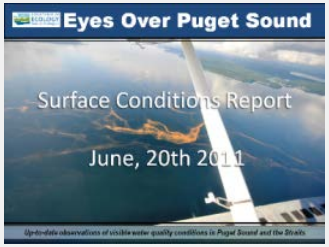
Publication No. 11-03-079

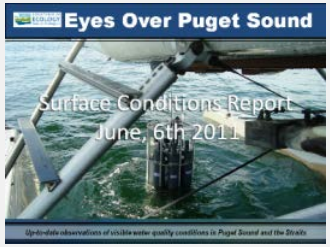
August_8_2011,
Publication No. 11-03-078



July_6_2011,
Publication No. 11-03-077



June_20_2011,
Publication No. 11-03-076



June_6_2011,
Publication No. 11-03-075

May_4_2011,
Publication No. 11-03-074

April_27_2011,
Publication No. 11-03-073