



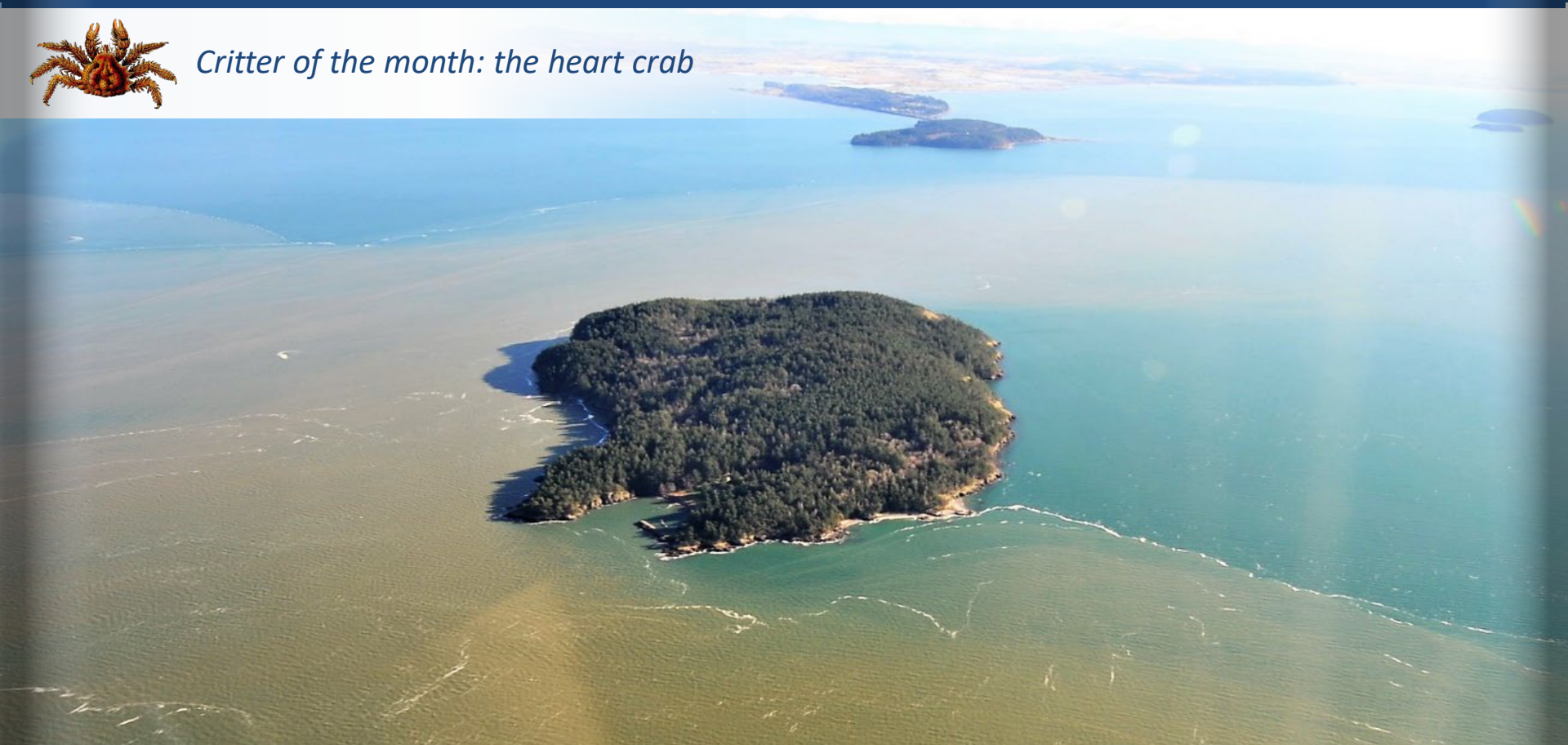
Eyes Over Puget Sound

[Summary](#)[Critters & divers](#)[Climate & streams](#)[Combined factors](#)[Marine water](#)[Aerial photos](#)[Data](#)

Surface Conditions Report: *February 3, 2021*



Critter of the month: the heart crab



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

Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data

Picture by: Jesse Miller



Dany Burgess

The heart crab, [p. 3](#)

Get ready to fall in love with the heart crab – a shy critter that wears its heart on its shell.



Tyler Burks, Skip Albertson

Climate & streams, [p. 6-10](#)

It has been warmer and wetter. Rivers are flowing higher than normal. Despite warmer than expected air temperatures, water temperatures are continuing to drop through winter and already exclude Northern Pacific anchovies in North Sound.



Thank you to many

People send their observations, [p. 4](#), [40](#), [41](#)

Underwater the beauty is in the details. Puget Sound has many species worth showcasing.



Dr. Christopher Krembs

The Aerial photography, [p. 13-39](#)

From patches of jellyfish and snow geese to sediment and early blooms. There is more happening in the winter than you might expect.

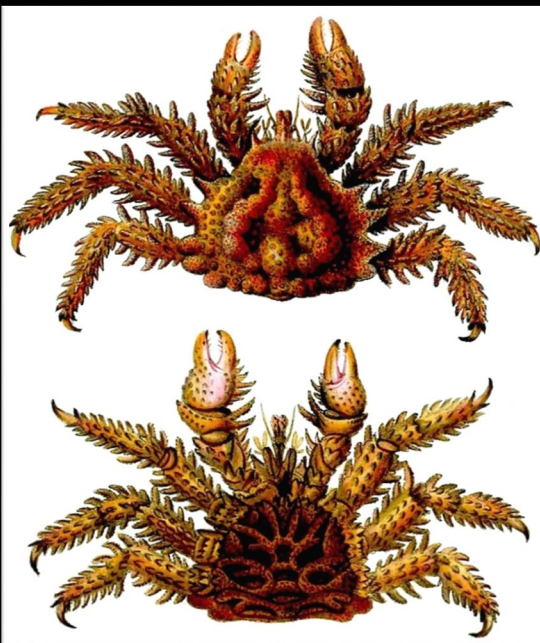
Critter of the Month – The Heart Crab



Dany Burgess
Marine Sediment Monitoring Team

Phyllolithodes papillosus

Get ready to fall in love with the heart crab – a shy critter that wears its heart on its shell. Although it occurs in Puget Sound, we’ve never collected one in over 30 years of sediment sampling!



Fun Heart Crab Facts

- They have a lot in common with hermit crabs
- They like to hide under stinging anemones
- One of their family members is a reality show star



Photo by
Erin McKittrick



Photo by
Erin McKittrick

Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



*Elisa Rauschl is reaching out to
our diving community*



White-lined dirona, Redondo
By Pieter Booth



Blob top jellyfish, Hood Canal
By Kerry Edwards

*SCUBA divers in Puget Sound often encounter
amazing creatures that few of us get to enjoy. Some
divers shared their photos with us.*



Pacific spiny lumpsucker, Redondo
By Jesse Miller



Juvenile PS king crab, Port Townsend
By Jessica Alexanderson



Hooded nudibranchs, Port Hardy BC
By Eric Askilrud

Email erau461@ecy.wa.gov
if you'd like to contribute dive photos



What was the water visibility like for divers?

Only best visibility shown for December, in form of a small diver



Best and worst horizontal visibility at corresponding vertical depth

Location	Best Visibility		Worst Visibility	
	Horizontal Distance (ft.)	Vertical Depth (ft.)	Horizontal Distance (ft.)	Vertical Depth (ft.)
1	12	18	10	2
2	18	3	17	97
3	25	36	10	11
4	19	59	18	10
5	25	92	4	10
6	19	46	4	2
7	65	61	34	8
8	60	36	16	7
9	24	36	11	49
10	97	38	36	5
11	58	49	3	10
12	47	98	4	3

Find depths with high/low visibility



- Best visibility** occurred in Central Puget Sound near Three Tree Point and Dash Point (Location 10).
- Poor visibility (no diver icon)** occurred in the top ten feet in several locations (Locations 5, 6, 11, and 12), also in Central Sound... so get down below 40 ft!

Good

Visibility

Poor



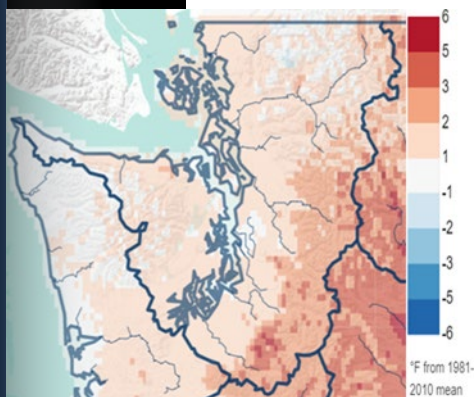
This is a feature we are soliciting feedback on (skip.albertson@ecy.wa.gov).



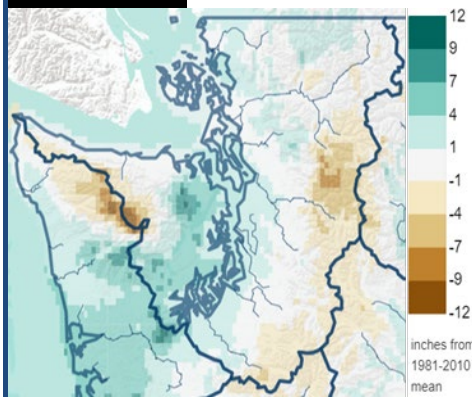
In January, Puget Sound air temperatures and precipitation were generally above normal, with some spatial variation. (A) With two months of snowpack accumulation remaining, watersheds that drain to Puget Sound hold above-normal volumes. (B) Monitoring snowpack and temperature trends will be critical as we transition to spring.

A. Northwest Climate Toolbox

Temperature



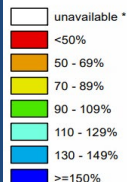
Precipitation



B. Washington SNOTEL, USDA/NRCS

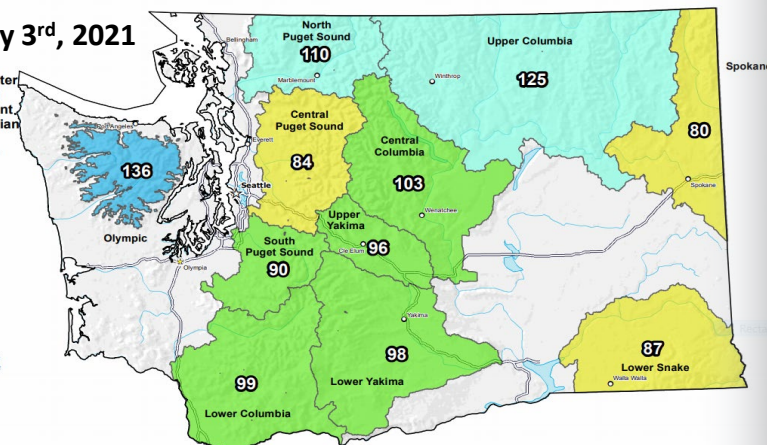
February 3rd, 2021

Current Snow Water Equivalent (SWE)
Basin-wide Percent
of 1981-2010 Median



* Data unavailable at time of posting or measurement is not representative at this time of year

Provisional Data



Temperature Anomaly

from historical mean daily ranged from -2 to +6 °F in the Puget Sound region during the past 30 days.

Precipitation Anomaly

from historical mean ranged from -9 to +9 inches in the Puget Sound region during the past 30 days.

Snow water equivalent percent of median for watersheds draining to Puget Sound are just above normal. As we move toward the typical peak of seasonal snowpack accumulation, April 1st, snow water equivalents are at 105% of the historical median.

Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

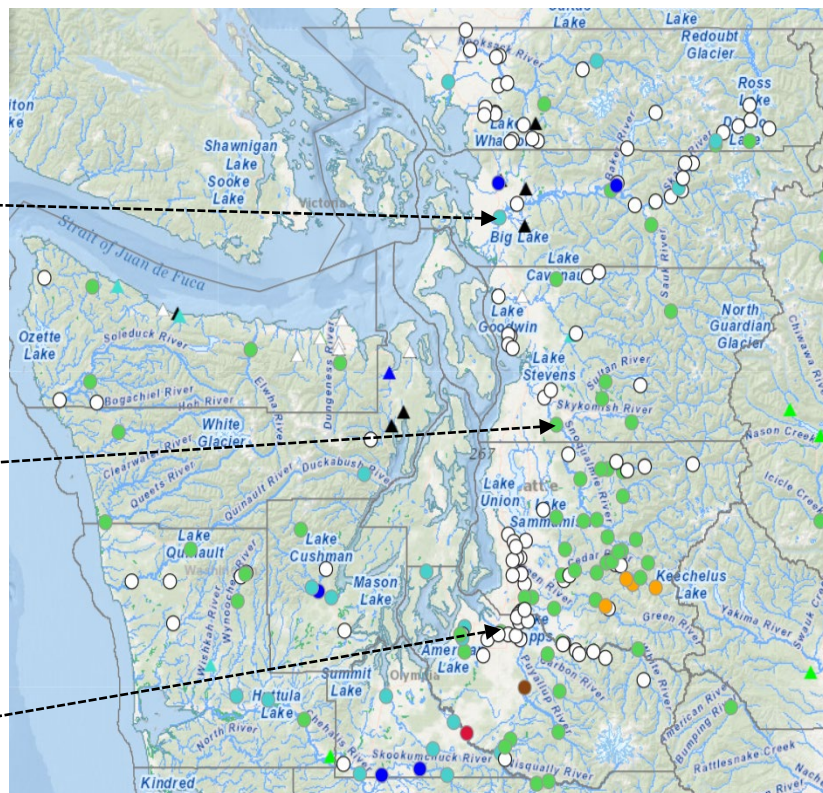
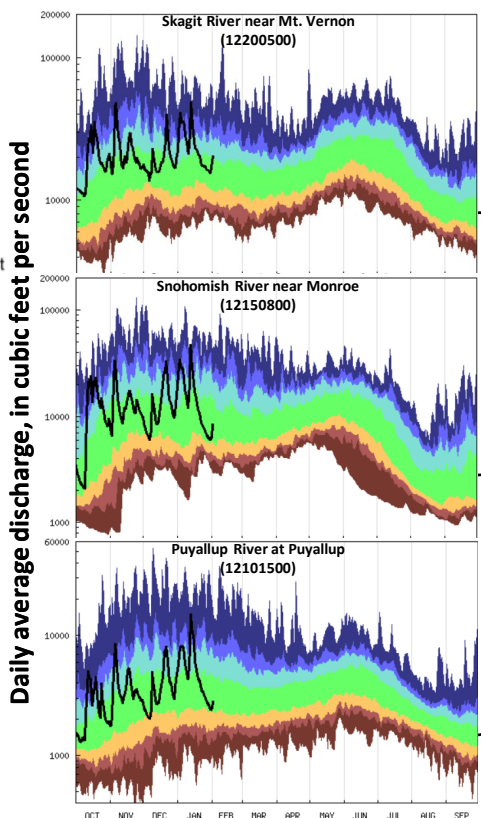
Data

Temporal: Following a series of notable precipitation events, a brief dry period resulted in a return to normal freshwater inputs from major Puget Sound rivers to Puget Sound (trend charts, left).

Spatial: Geographic variation in streamflow (map, right) is dependent on the distribution and dominant form of precipitation falling in the watershed, leading to normal and above normal conditions.

Select Puget Sound Streamflow Trends

Current Streamflow Conditions as of 02/03/2021



USGS Real Time Streamflow Values

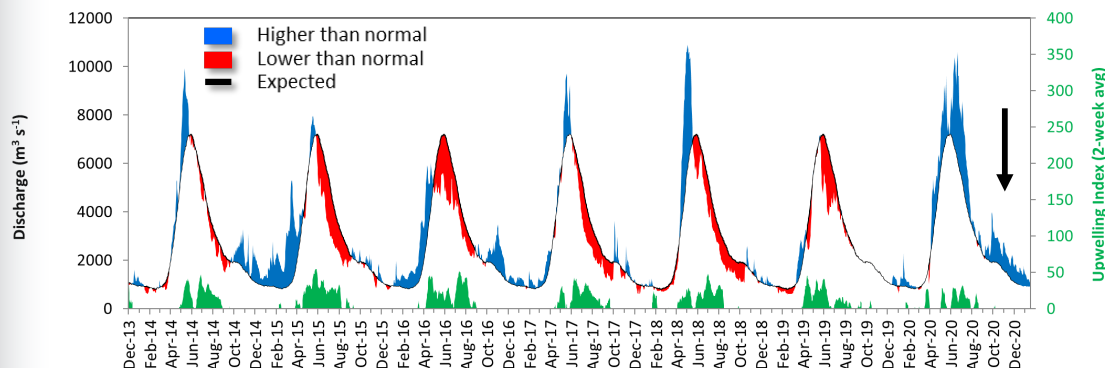
- Much above normal (>90%)
- Above normal (76-90%)
- Normal (25-75%)
- Below normal (10-24%)
- Much below normal (5-10%)
- Far below normal (>5%)
- Lowest recorded
- Not Ranked

Ecology Daily Streamflow

- ▲ 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

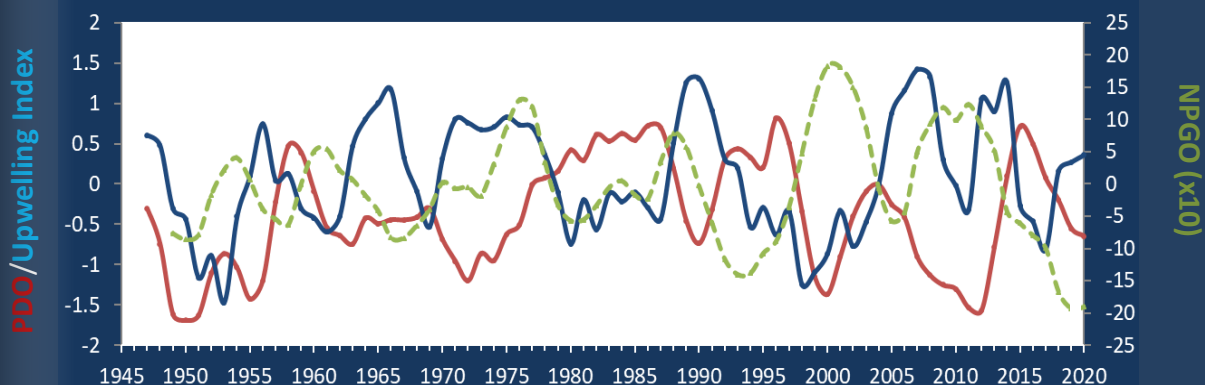
Historically, the peaks of coastal upwelling and the [freshet](#) are in sync..

Fraser River (at midnight)



The Fraser River is the major driver of [estuarine circulation](#) and water exchange between the Salish Sea and the ocean. The Fraser River continues to flow consistently higher in 2020 even into winter 2021.

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



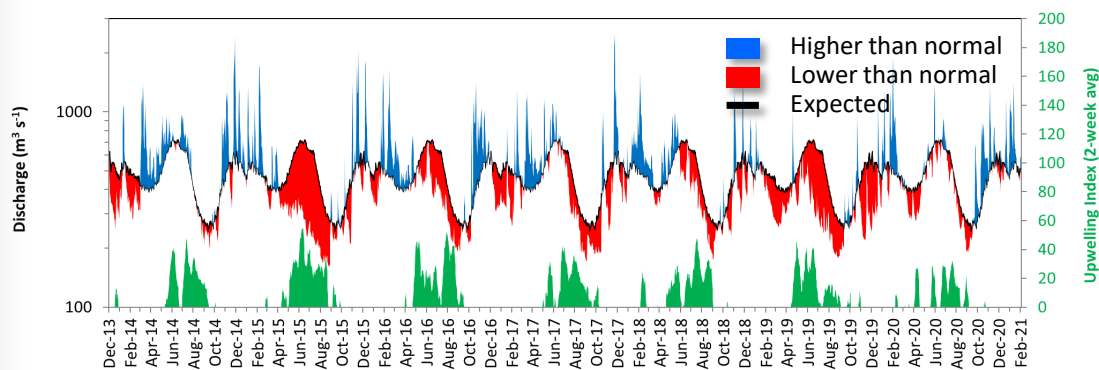
How do ocean boundary conditions affect the quality of water we exchange with the ocean?

Recent years' warm water is mostly gone (PDO). Upwelling (Upwelling Index [anomaly](#)) is relatively expected. NPGO, which reflects the surface productivity along the coast, has fallen to one of its lowest numbers (note updated past 7/2020).

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

The Skagit River is the largest freshwater source for Puget Sound. It is a river that is regulated.

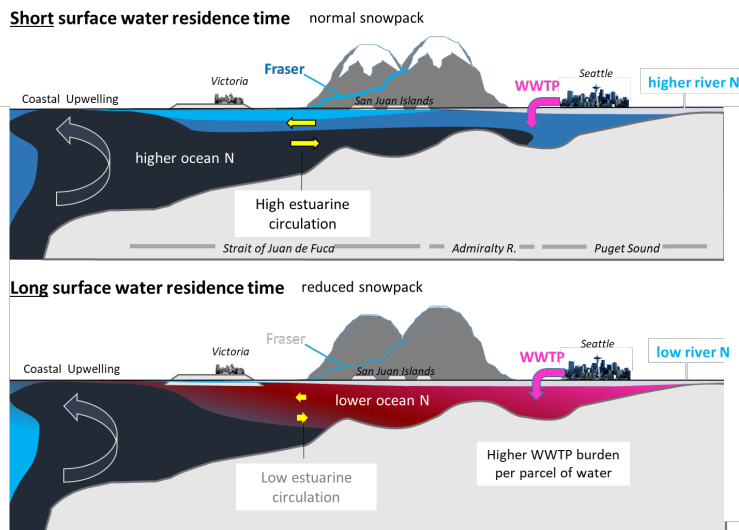
Skagit River (at midnight USGS)



The Skagit River freshet is no longer clearly pronounced, because it is a regulated system for hydroelectric power generation. However, drought years and low flows can be seen in the river's discharge data. In the last year flows of the Skagit appear more normal than the Fraser River.

Normal river flows drive **"natural"** nutrient inputs and keep the **water cool**.

Low river flows change the **nutrient balance** and make **water warmer**.

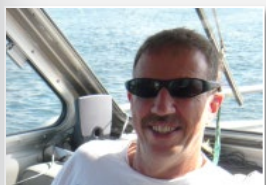


River flows and upwelling in the summer influence our water quality.

Rivers strengthen estuarine circulation in the Salish Sea. This is important in the summer.

Upwelled ocean water provides cool, nutrient-rich water.

For that to happen, we need northerly winds and good river flows (a good snowpack) during periods of water exchange through Admiralty Reach (neap tides).



In the anomaly plot, we want to connect different factors influencing water quality in the context of space and time. We do this with a heat map and anomalies by month for selected regions from north to south. For recent river and stream inflow, [see page 6](#).

Conditions leading up to February:

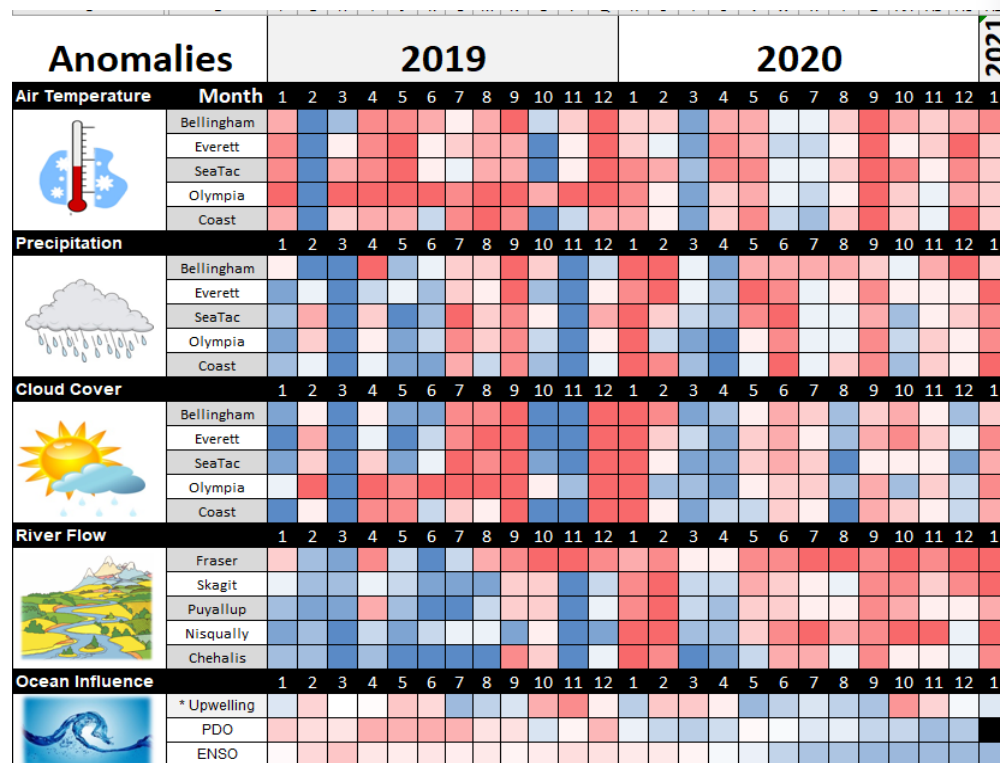
Air temperatures were generally warmer this winter through January.

Precipitation was above normal after October.

Cloud cover levels were slightly above normal, generally being closer to normal than in 2019.

River flows were higher than normal through January. Flows in 2020 were generally higher than in 2019.

Upwelling was weaker. PDO is lower and La Niña is gaining strength. Downwelling is less pronounced than normal.



All data are from public sources: UW GRAYSKIES; river flows from USGS and Environment Canada; indices from NOAA & UW (PDO).

*Upwelling/downwelling Anomalies (PFEL)

PDO = Pacific Decadal Oscillation

ENSO = El Niño Southern Oscillation

higher expected lower

No data

Summary

Critters & divers

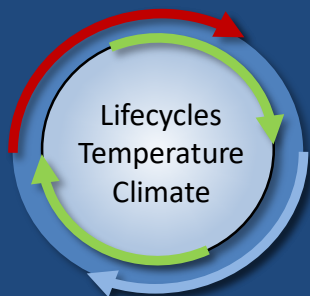
Climate & streams

Combined factors

Marine water

Aerial photos

Data



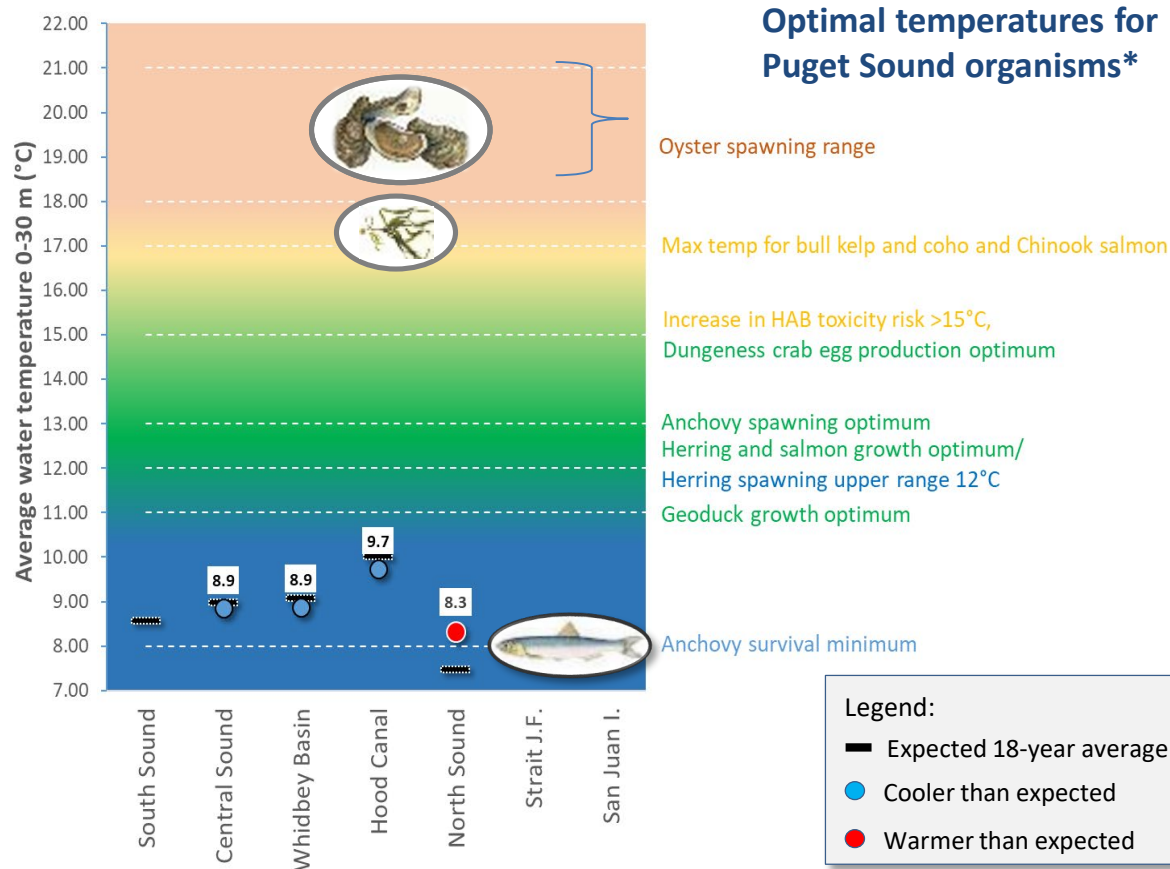
Can organisms thrive and survive?

The life cycles of organisms respond to temperature. To be successful, the timing of early life stages must line up with good growth conditions.

Temperature is important for growth, but also dictates if certain organisms can overwinter in Puget Sound (e.g., northern anchovy).

* Help us get these right. We scoured the literature for temperatures important to the success and survival of marine organisms.

In January, average surface water (0 – 30 m) temperatures were slightly below expected across many regions. Water temperatures were in ranges for spawning for herring, but were approaching the minimum survival temperature for anchovies of about 8.2 °C. Coldest water temperatures in North Sound are approaching 8.2 °C. Temperatures are expected to further drop until the end of March.



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data

Stay up-to-date on unfolding stories relevant to our region



The **Marine Waters Work Group** (PSEMP) releases a summary of its bimonthly **Marine Condition Update**, covering the Puget Sound region, coastal waters, and the North Pacific.

To participate in the webinar every other month, join our email list by emailing Iris Kemp (ikemp@ltk.org) or the Marine Waters Work Group (marinewaters@psemp.org).

Stay plumbed into the the information stream...

What's the story so far?

Go to the [webpage](#) and read detailed discussion summaries.

[Summary](#)
[Critters & divers](#)
[Climate & streams](#)
[Combined factors](#)
[Marine water](#)
[Aerial photos](#)
[Data](#)


Southern Hood Canal is blooming at the beginning of February. Many nearshore environments show significant amounts of suspended sediment, including sloughs in Skagit County. Jellyfish are present in Sinclair Inlet, and large flocks of snow geese are drifting at the surface of Padilla and Skagit Bays.

[Start here](#)

1/20/2021, Possession Sound. Rendezvous with ORCA students and research vessel



Flying in winter for EOPS. Weather is always a challenge.



Mixing and fronts:

Tidal eddies around Vashon Island and Holmes Harbor; distinct fronts in the Strait of Juan de Fuca with woody debris.



Jellyfish and fish:

Jellyfish abundant in Sinclair Inlet.



Suspended sediment:

Many places with suspended sediment in the nearshore. Nooksack River and Stillaguamish River both carrying very brown, sediment-rich water into adjacent bays.



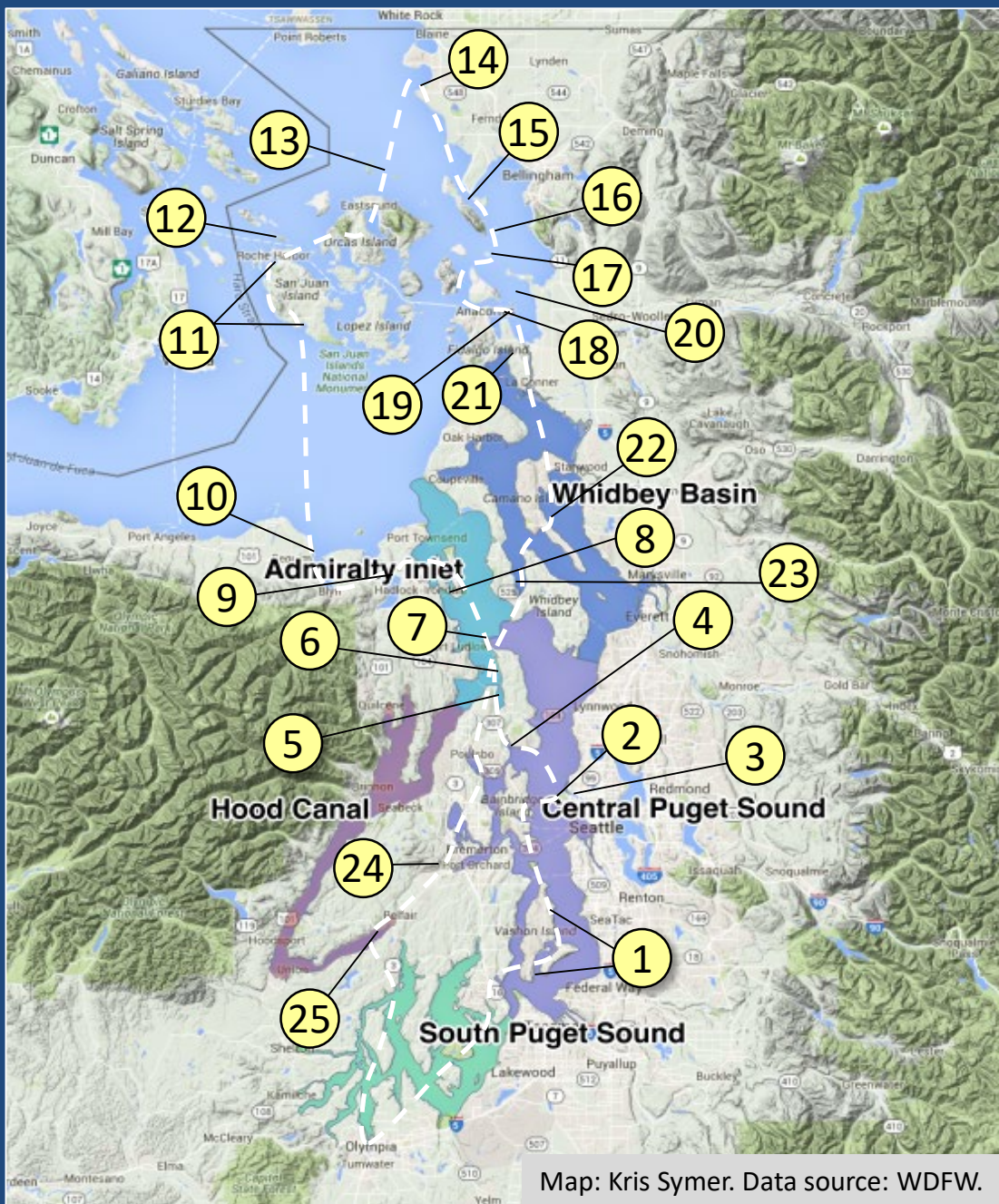
Visible blooms:

Visible brown-red bloom in southern Hood Canal.



Debris:

Large woody debris in Port Susan and in the Straits.



Map: Kris Symer. Data source: WDFW.



DEPARTMENT OF
ECOLOGY
State of Washington



Aerial navigation guide

Date: 2/3/2021

Click on numbers

Flight Observations

South Sound: low clouds; north of
Tacoma: broken ceiling, sunny.

Contributed observations



26

27

Tide data from 2-3-2021 (Seattle):

Time	Pred (ft)	High/Low
01:47 AM	8.03	H
07:52 AM	1.92	L
03:10 PM	11.25	H
09:39 PM	3.82	L



Summary

Critters & divers

Climate & streams

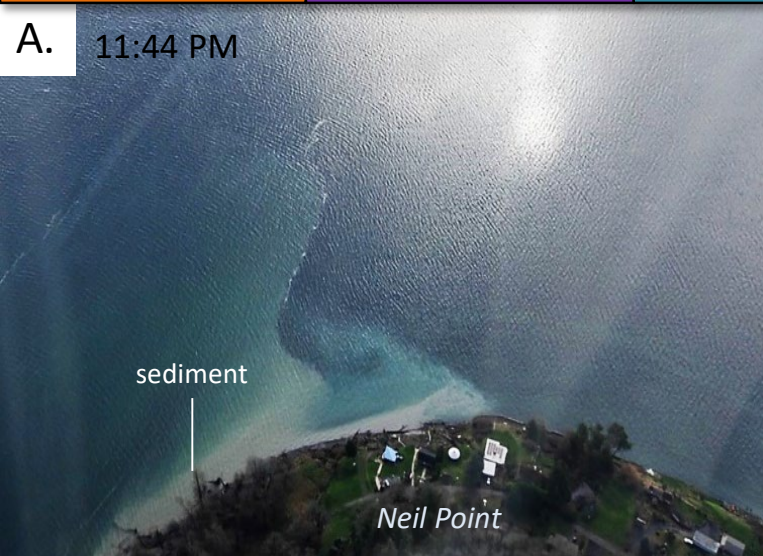
Combined factors

Marine water

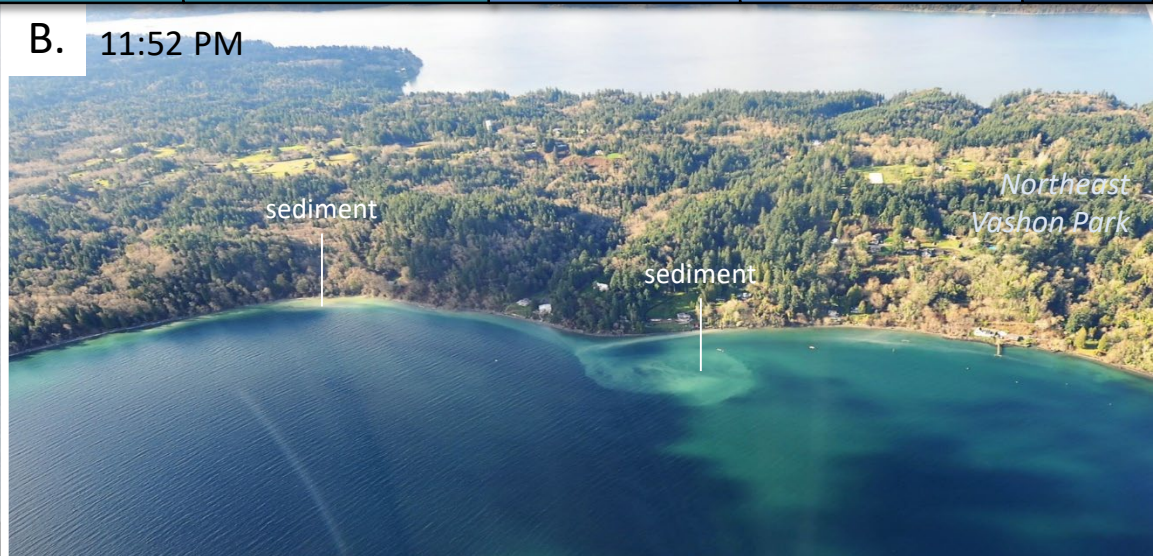
Aerial photos

Data

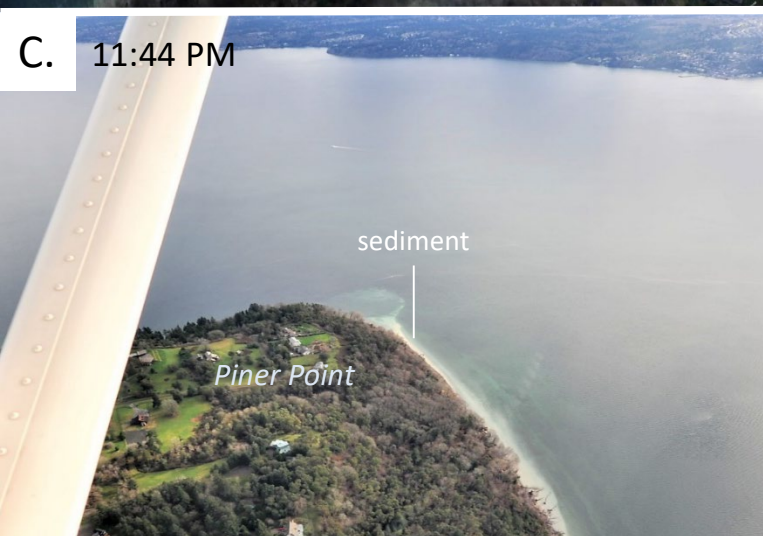
A. 11:44 PM



B. 11:52 PM



C. 11:44 PM



D. 11:52 PM



Suspended sediment near the shoreline in many places around Vashon Island.
Location: A. Neil Point, B. near Northeast Vashon Park, C. Piner Point, D. north of Point Beals.



Summary

Crittters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data

Bainbridge Island

sediment

West Point

sediment

sediment

Suspended sediment near the shoreline extending into Central Sound.

Location: West Point (Central Sound), 12:01 PM



Summary

Critters & divers

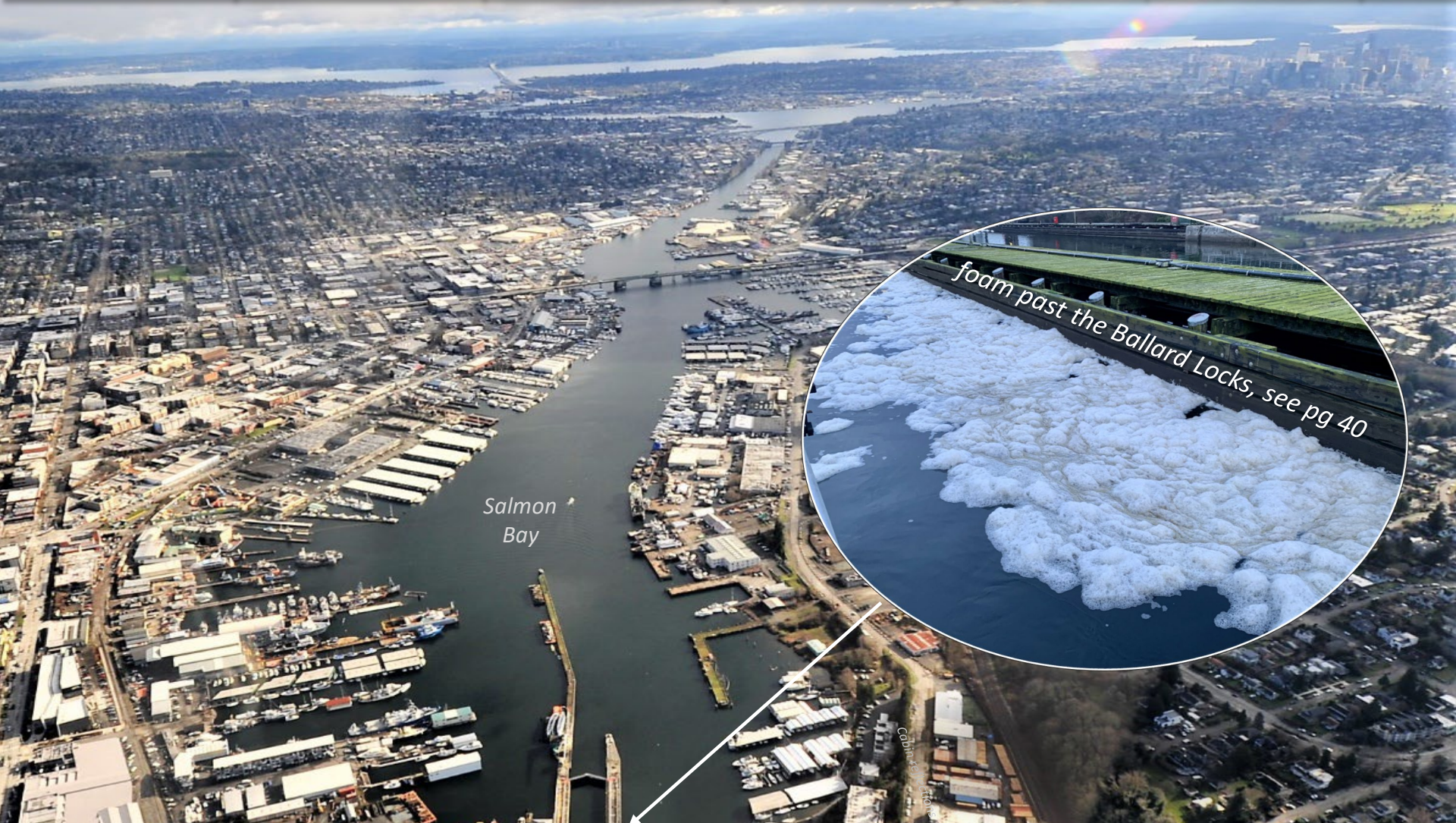
Climate & streams

Combined factors

Marine water

Aerial photos

Data



Salmon Bay is an urban waterway. On 1/19/2021 large amounts of foam were seen past the Ballard Locks.
Location: Salmon Bay Seattle (Central Sound), 12:01 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Brown boggy water, likely from a nearby creek of the same color.

Location: Indianola (Central Sound), 12:07 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

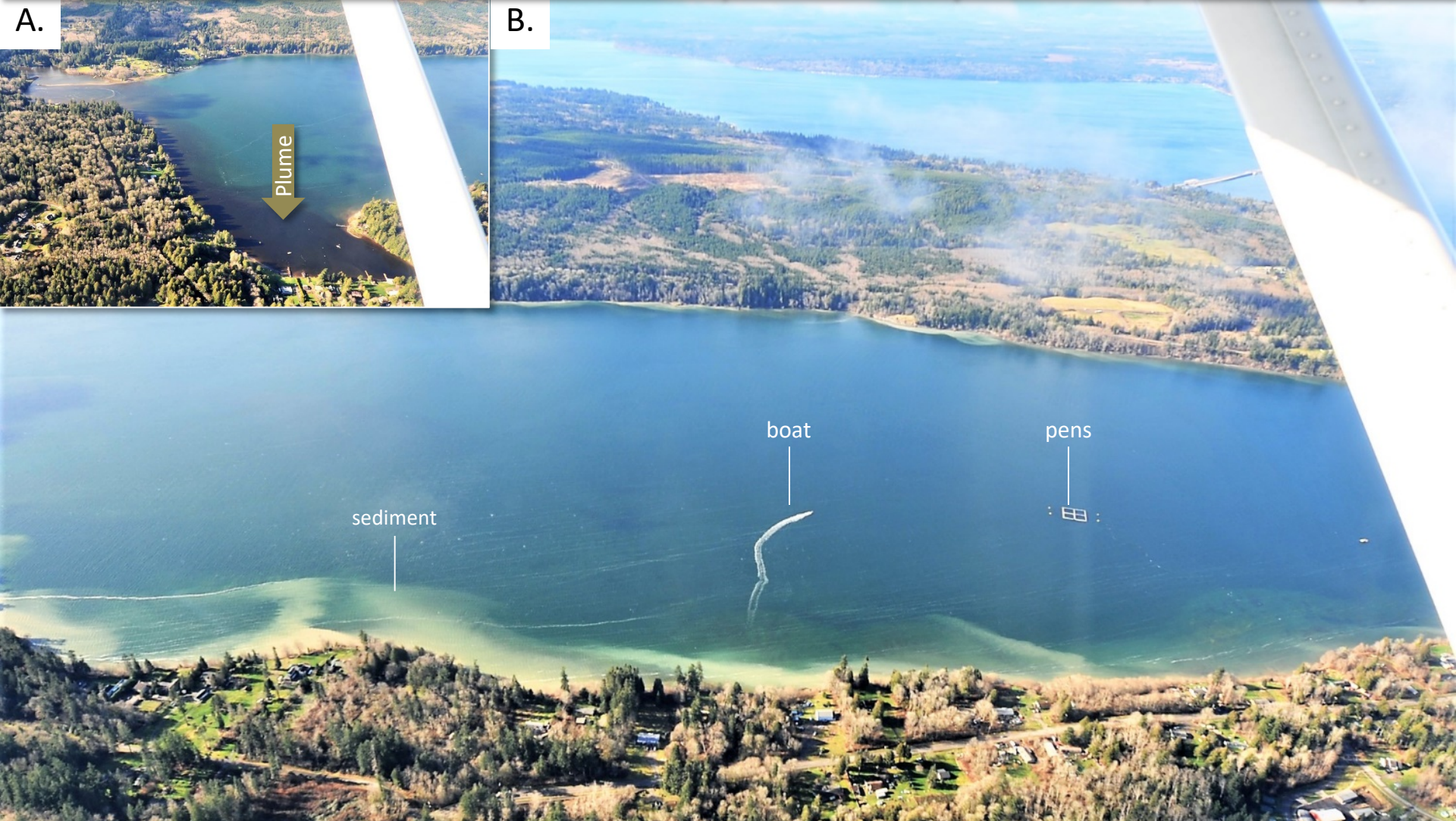
Aerial photos

Data

A.



B.



A. River plume with brown boggy water. B. Suspended sediment near the shoreline in many places.

Location: Port Gamble (Hood Canal), 12:11 PM



Summary

Crittters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Front with organic material and suspended sediment near the shoreline.

Location: Across from Hood Canal Bridge (Hood Canal), 12:14 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Suspended sediment near the shoreline extending into Admiralty Reach.
Location: Twin Spits, northern end of Kitsap Peninsula (Central Sound), 12:17 PM



Summary

Crittters & divers

Climate & streams

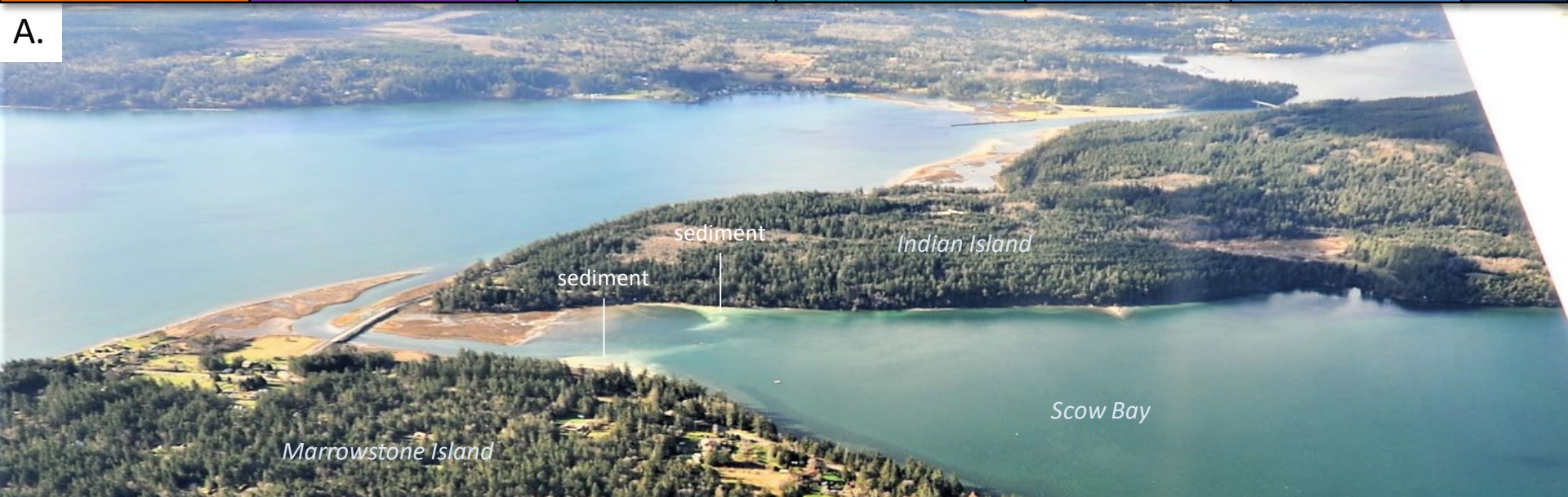
Combined factors

Marine water

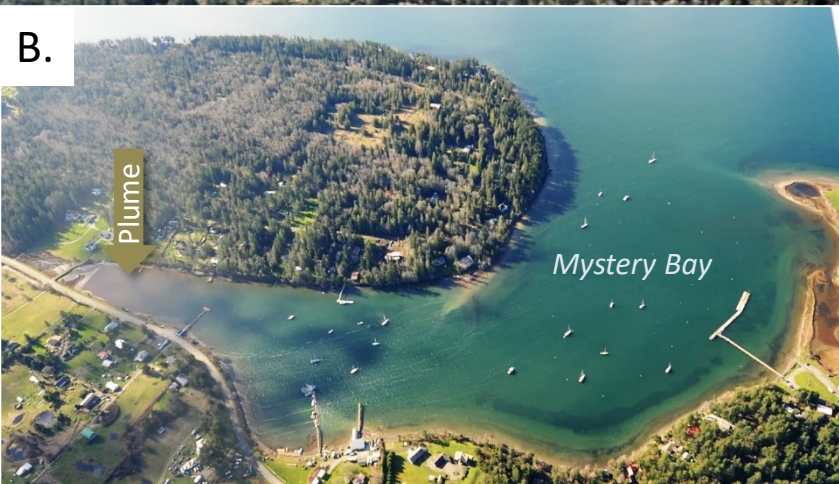
Aerial photos

Data

A.



B.



A. Two tidal eddies visible by suspended sediment coming from shore. B. A plume of boggy creek water.

Location: Marrowstone Island (Central Sound), 12:21 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Suspended sediment near the shoreline extending into Discovery Bay.

Location: Discovery Bay (North Sound), 12:29 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Entrance to Sequim Bay during outgoing tide. No blooming activity.
Location: Sequim Bay (North Sound), 12:35 PM



Summary

Crittters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data

A. 12:55 PM



B. 12:55 PM



C. 12:59 PM



D. 12:59 PM



Exploring new flight route over Friday Harbor. A. False Bay with B. creek. C-D. Roche Harbor.
Location: Friday Harbor (North Sound).



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Exploring new flight route over Spieden Island.
Location: Spieden Island (North Sound), 1:03 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Strong currents between Sucia and Matia Islands visible by different water masses.

Location: San Juan Islands (North Sound), 1:14 PM



Summary

Critters & divers

Climate & streams

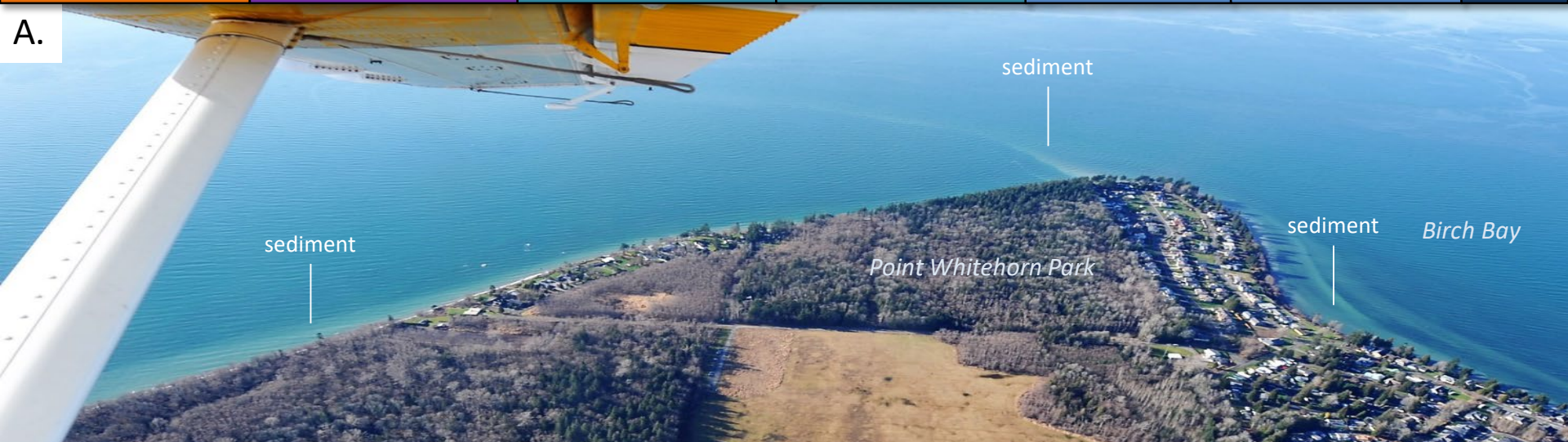
Combined factors

Marine water

Aerial photos

Data

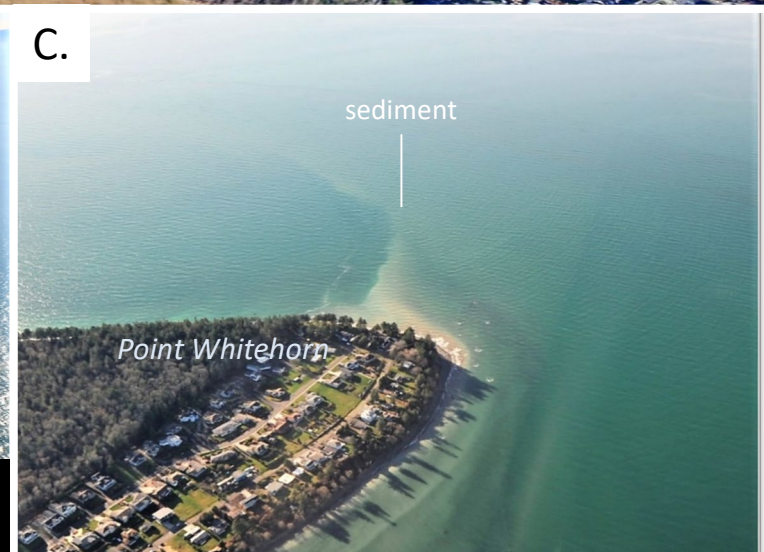
A.



B.



C.



Suspended sediment near the shoreline in many places near Point Whitehorn.

Location: A. Birch Bay, B. Cherry Point Aquatic Reserve, C. Point Whitehorn (North Sound), 1:20 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Nooksack River plume carrying lots of brown sediment across the portage.

Location: Portage Bay (North Sound), 1:28 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

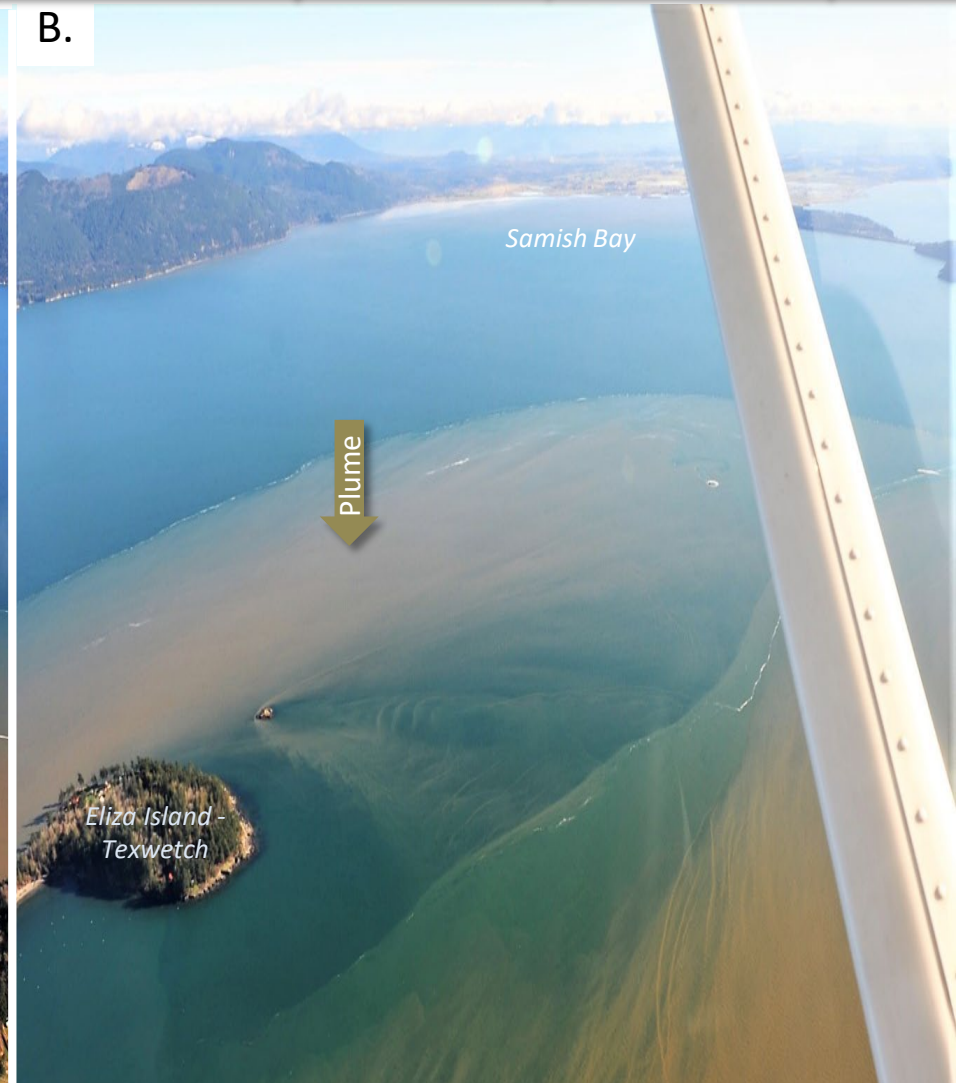
Aerial photos

Data

A.



B.



*Nooksack River plume carrying lots of brown sediment across Bellingham Bay. A. looking north, B. looking south.
Location: Eliza Island – Texwetch (North Sound), 1:30 PM*



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Nooksack River Plume carrying lots of brown sediment south past Vendovi Island.

Location: Vendovi Island (North Sound), 1:32 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data

A.



B.



A. Sediment-rich water of Telegraph Slough entering Padilla Bay. B. Sediment-rich water extending into Padilla Bay.
Location: A. Padilla Bay, B. Fidalgo Bay (North Sound), 1:35 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



*A long band of sediment-rich water originating from Padilla Bay and extending into Guemes Channel.
Location: Padilla Bay (North Sound), 1:35 PM*



Summary

Critters & divers

Climate & streams

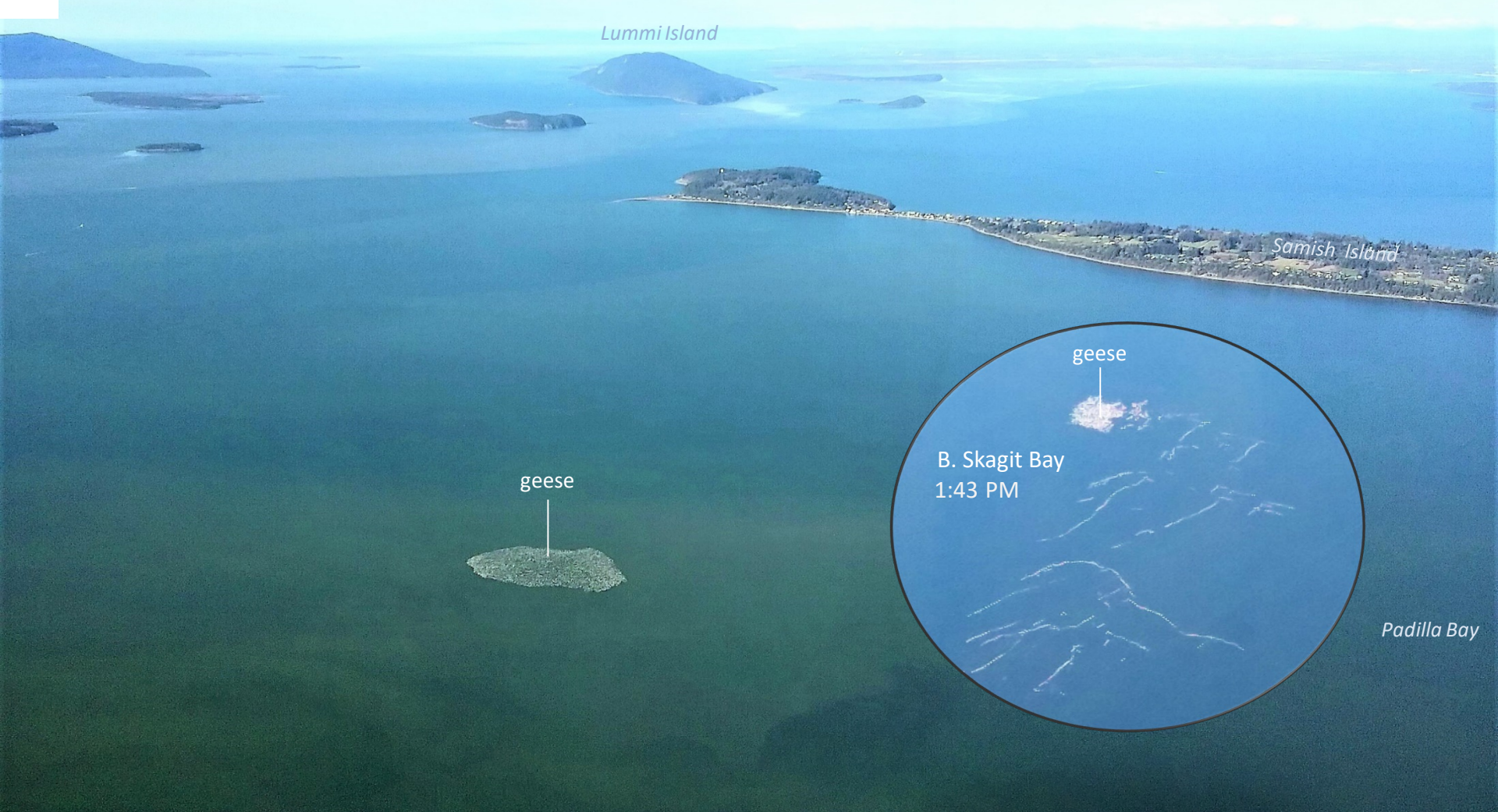
Combined factors

Marine water

Aerial photos

Data

A.



A. Large flock of geese floating in open water. B. Geese landing in formation in open water. Read more [here](#)

Location: A. Padilla Bay, B. Skagit Bay (North Sound), 1:35 PM



Summary

Critters & divers

Climate & streams

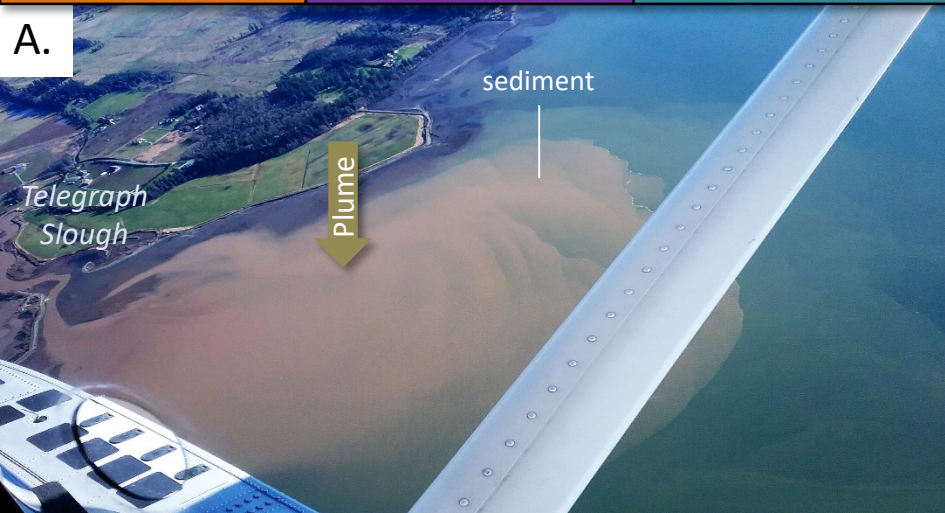
Combined factors

Marine water

Aerial photos

Data

A.



B.



C.



D.



*Sediment-rich water from sloughs enter A. Padilla Bay, B-C. the Swinomish Channel, and D. the Skagit River.
Location: North and south of La Conner (North Sound), 1:38 PM*



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data

A.



Sediment-rich water of the Stillaguamish River plume carrying wood debris and logs.

Location: Port Susan, Camano Island (Whidbey Basin) 1:48 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Suspended sediment near the shoreline and tidal eddies. Location: Holmes Harbor (Whidbey Basin), 1:53 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Jellyfish aggregations and early signs of phytoplankton growth. Location: Sinclair Inlet (Central Sound), 2:12 PM



Summary

Critters & divers

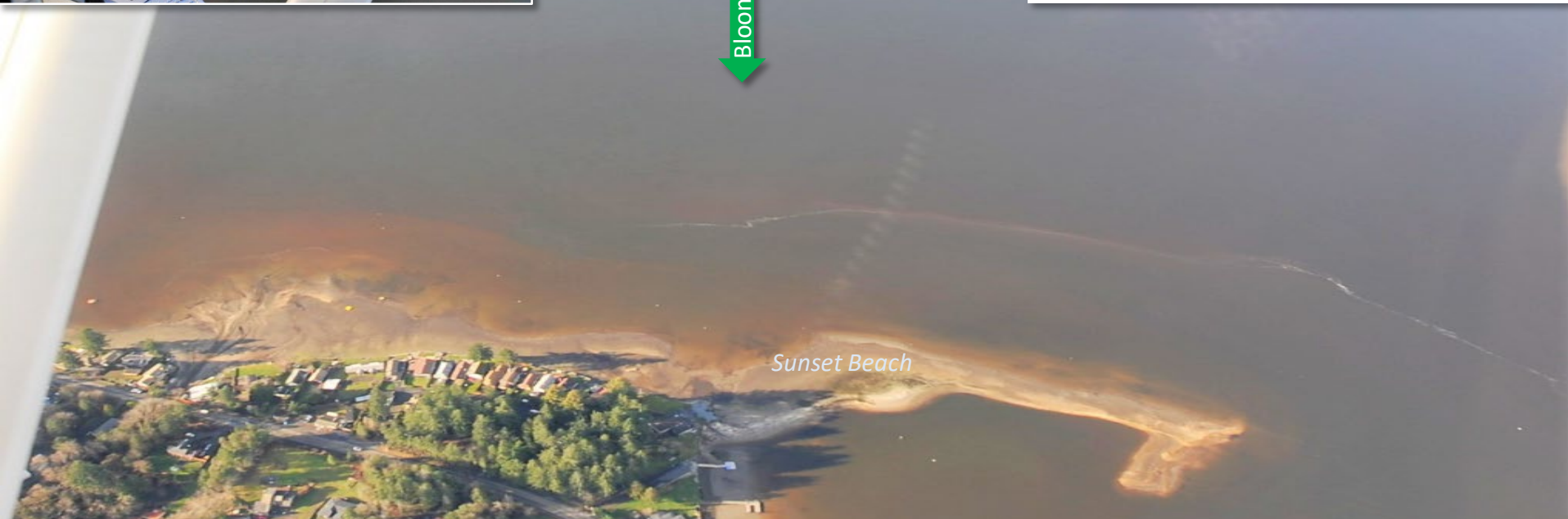
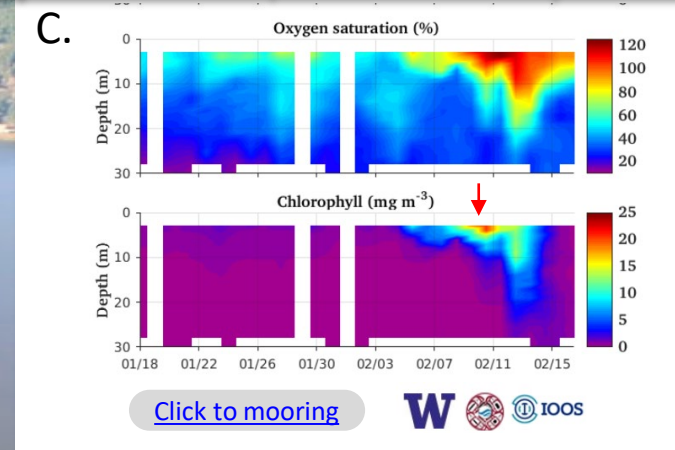
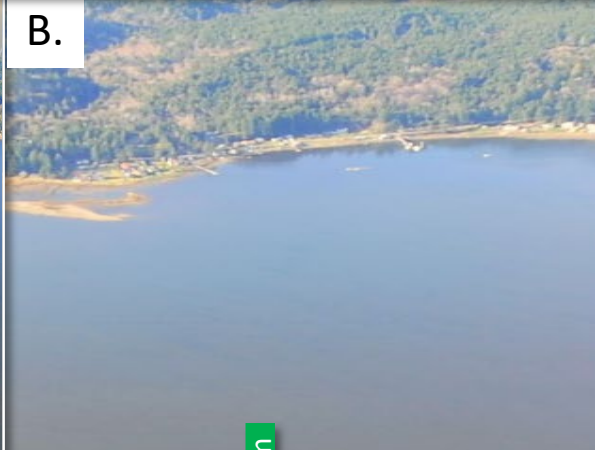
Climate & streams

Combined factors

Marine water

Aerial photos

Data



A-B. Strong red-brown bloom between Twanoh and Belfair State Parks C. ORCA Twanoh mooring confirming bloom with high oxygen saturation and high Chlorophyll. Location: Sunset Beach (Hood Canal), 3:23 PM



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

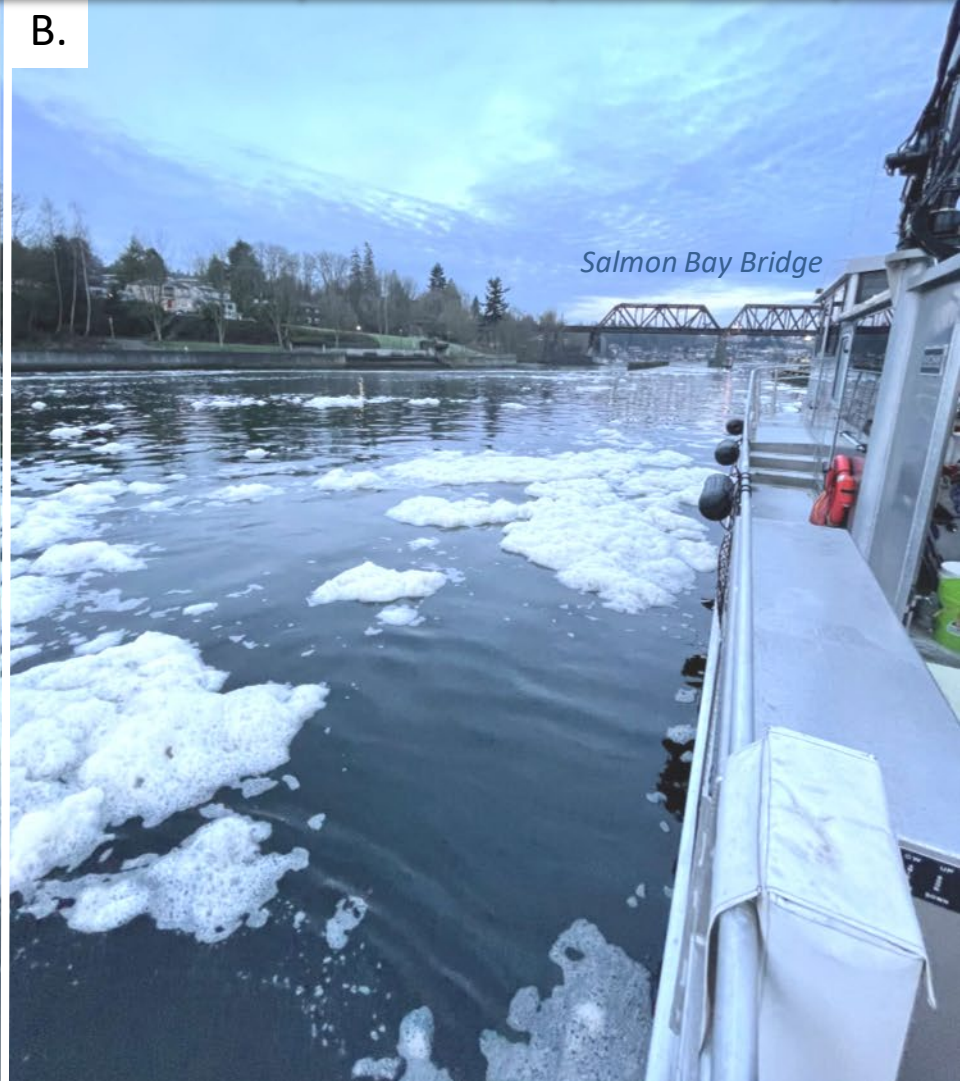
Aerial photos

Data

A.



B.



1/19/2021, King County Boat crew inspecting foam past the Ballard locks. A. looking east, B. looking west.



Summary

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



1/9/2021, Scott Steltzner, downtown Olympia with thousands of moon jellies.

Summary

Stories

Critters & divers

Climate & streams

Combined factors

Marine water

Aerial photos

Data



Summary	Stories	Critters & divers	Climate & streams	Combined factors	Marine water	Aerial photos	Data
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We have published 90 editions!

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

Recommended Citation (example for September 2018 edition):

Washington State Department of Ecology. 2018. Eyes Over Puget Sound: Surface Conditions Report, September 17, 2018. Publication No. 18-03-075. Olympia, WA.
<https://fortress.wa.gov/ecy/publications/documents/1803075.pdf>.



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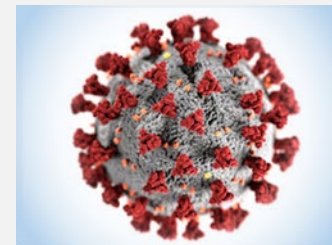
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**No coverage due to COVID-19
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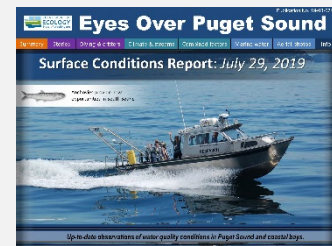
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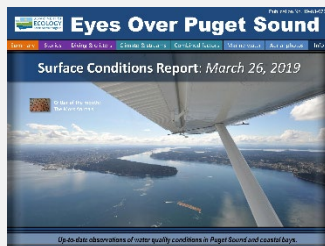
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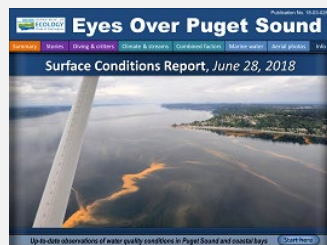
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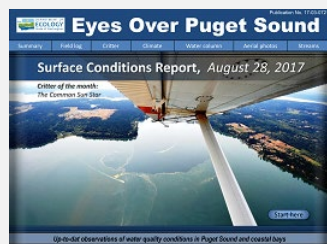
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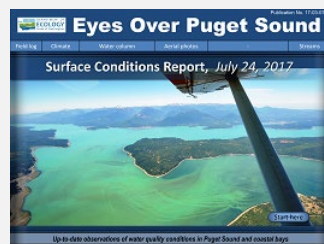
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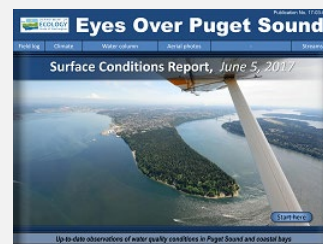
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[Publication No. 17-03-070](#)



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April_6_2016,
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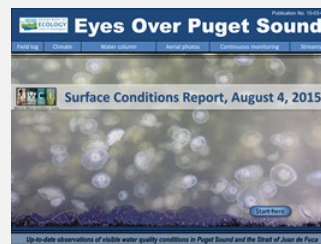
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[Publication No. 15-03-076](#)



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[Publication No. 15-03-074](#)



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March_24_2015,
[Publication No. 15-03-072](#)



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[Publication No. 15-03-070](#)



December_30_2014,
[Publication No. 14-03-080](#)



November_17_2014,
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[Publication No. 14-03-073](#)



April_21_2014,
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November_21_2013,
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[Publication No. 13-03-075](#)



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[Publication No. 13-03-073](#)



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May_14_2012,
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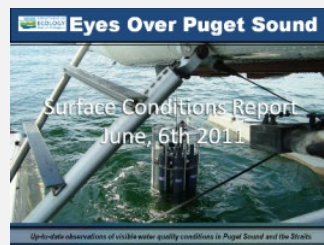
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