

2022 “What’s Blooming?” Plankton Monitoring Final Report



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2022 Goals & Results

Stream Team partnered with Pacific Shellfish Institute (PSI) to perform its 11th year of the “What’s Blooming?” plankton monitoring program! The goal of this program is to offer engaging activities that educate the public about local water quality issues and encourage environmental stewardship. Monitoring connects the community to their watershed and inspires participants to take evidence-based actions that reduce stormwater pollution, particularly related to nutrients, bacteria and litter. This year, PSI hosted plankton monitoring and community events without Covid-related restrictions. Face masks and hand sanitizer remained available to the public at all events.



Collecting plankton samples from Woodland Creek, June 30th.

During the summer, PSI conducted 5 “What’s Blooming in Budd?” events at the Port Plaza dock. Every other week, PSI also sampled at 6 freshwater lakes throughout Thurston County including Woodland Creek/Longs Pond, the Deschutes River at Tumwater Falls Park, Lake Lawrence, Long Lake, Deschutes River at Pioneer Park and Deep Lake. PSI shared information about the weekly sampling events through enhanced “blog-style” entries (Appendix A) on [PSI’s website](#), [PSI’s Facebook](#) (Appendix B) and [PSI’s Instagram](#) pages.

| 2022 Task Summary | | | | |
|---|-----------------|-----------------|-----------------|------------------|
| Task | # Events | FB Reach | IG Reach | In-Person |
| What's Blooming Olympia ? Budd Inlet | 5 | 985 | 558 | 151 |
| TOTAL OLYMPIA | 5 | 985 | 558 | 151 |
| What's Blooming Lacey ? Woodland Creek/Long Lake | 2 | 157 | 212 | 17 |
| Lacey Fish-In | 1 | | 160 | 50 |
| Lacey Kid's Day | 1 | 363 | | 300 |
| Discover Plankton Lendable Kit - Lacey Timberland Library | | | | |
| TOTAL LACEY | 4 | 520 | 372 | 367 |
| What's Blooming Tumwater ? Tumwater Falls/Pioneer Park | 2 | 300 | 78 | 40 |
| Discover Plankton Lendable Kit - Tumwater Timberland Library | | | | |
| TOTAL TUMWATER | 2 | 300 | 78 | 40 |
| What's Blooming Thurston ? Lake Lawrence/Deep Lake | 2 | 368 | 220 | 15 |
| TOTAL THURSTON | 2 | 368 | 220 | 15 |
| GRAND TOTAL | 13 | 2173 | 1228 | 573 |

PSI completed a total of 11 sampling events and 2 community outreach events reaching 3,974 individuals – 86% of those being contacts via social media, and 14% (or 573) being in-person. PSI posted 14 Facebook and 12 Instagram entries resulting in 3,401 people reached via Facebook (2,173) and Instagram (1,228). PSI also created 2 Discover Plankton Lendable Kits to be housed at the Lacey and Tumwater Timberland Libraries as part of their [Library of Things](#) collection.

For the “What’s Blooming?” monitoring events, PSI collected water quality and phytoplankton data between June 23rd and September 1st. The phytoplankton were viewed under a field microscope and the results were displayed to the public using an A-frame board left on-site until dusk. Plankton samples were further analyzed in the lab to determine species diversity and harmful algal bloom (HAB) concentrations using SoundToxins protocols. SoundToxins is a monitoring program designed to provide early warning of HABs to minimize human health risk and losses to fisheries. Data was entered into NOAA’s [SoundToxins](#) phytoplankton monitoring database. Sampling at freshwater lakes was conducted similarly with a focus on water quality, plankton species composition and HABs. The connection between stormwater pollution, downstream water quality, and stewardship was highlighted throughout the program.

The “What’s Blooming?” program lent itself to supporting additional partnerships and applications. For example, campers from Olympia Community Sailing helped sample water quality, collect plankton samples, and screen samples for HAB species on 5 sampling dates. PSI also maintained close communication with NOAA throughout the summer regarding the June 30th *Dinophysis* bloom, July 13th *Heterosigma* bloom, and August 4th mysterious silicoflagellate bloom. NOAA maintains an Imaging FlowCytobot in lower Budd Inlet and used “What’s Blooming?” data to evaluate spatial variation in cell concentrations and confirm the presence of unusual species.



Olympia Community Sailing campers investigating plankton diversity.



Kids picking up garbage & flagging poo piles, Pioneer Park.

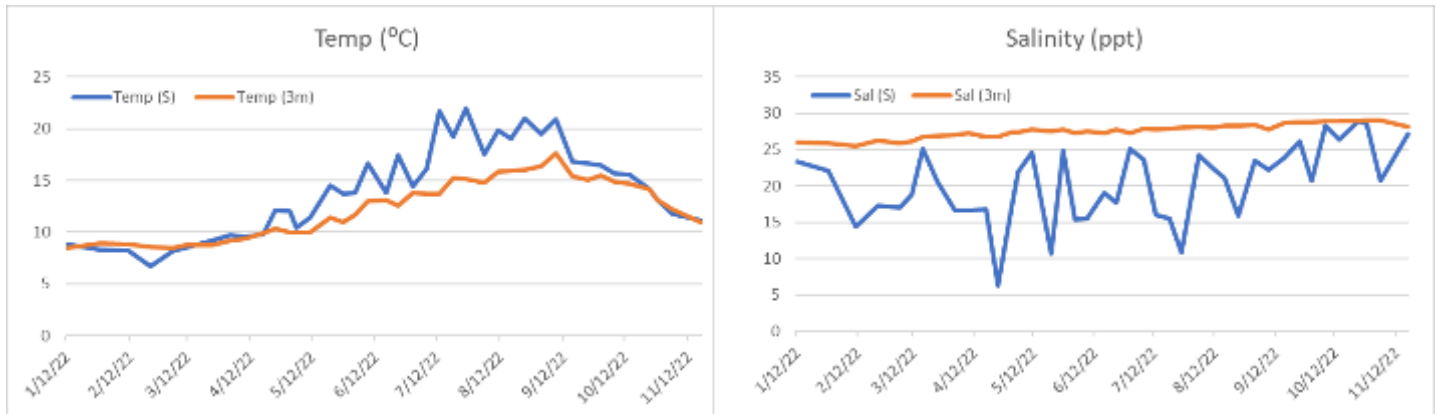
Finally, PSI used the “What’s Blooming?” platform to utilize PSI’s Sound Science Stewards sticker program to inspire water quality knowledge and stewardship at Pioneer Park. At this event, kids picked up 85 pieces of garbage, flagged and scooped 15 piles of poop and distributed several Bags-on-Board to dog owners. PSI also promoted their Discover Plankton lendable kits and lent out the first one to a family at the September 1st “What’s Blooming?” event. On July 21st, PSI had our first guest contributor to our weekly plankton reporting! Charlotte Freestone submitted a reflection piece about her plankton sampling experience. Her entry can be found in Appendix A – Blog Entries.



The Freestone Family, Budd Inlet, July 21st.

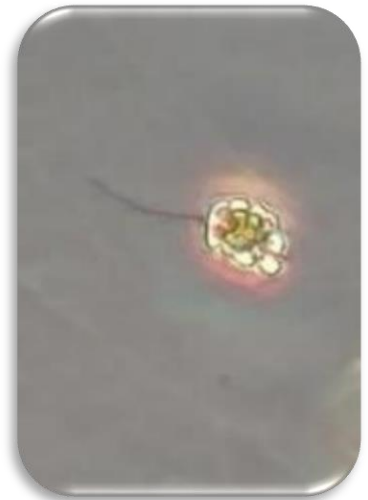
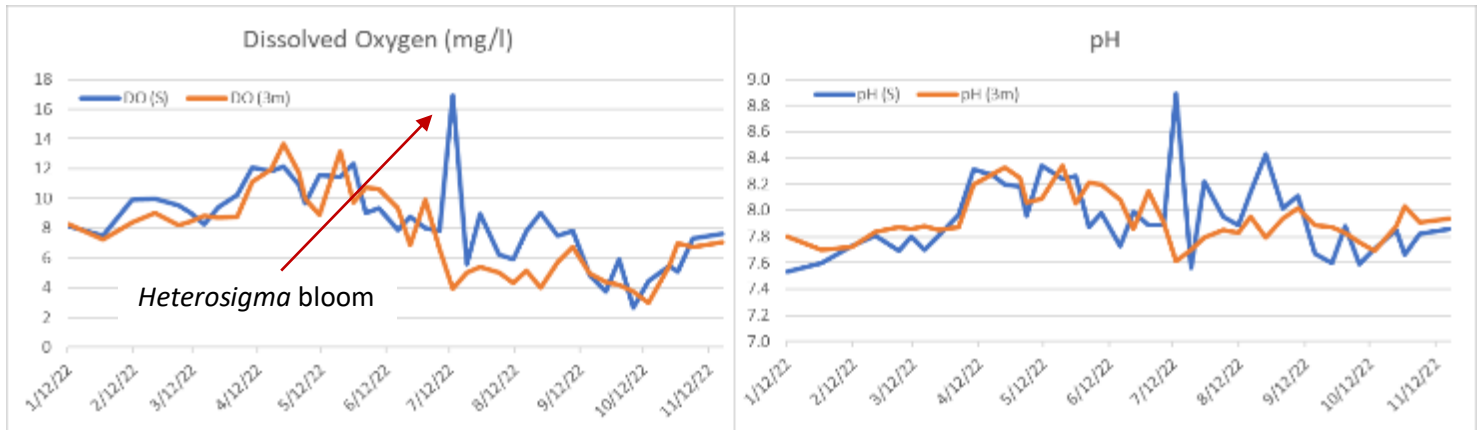
Budd Inlet Water Quality Data

The “What’s Blooming?” program continues to contribute to a long-term data set for Budd Inlet. This summer – unlike last summer – Budd Inlet did not experience a triple digit heat dome in late June resulting in a surface temperature of 23.2°C. Instead, peak surface temperatures reached 22.0°C on July 26th. Surface salinity values fluctuated weekly ranging from 6.3ppt at the surface on April 24th to almost 29 ppt in late October when the water column became well mixed.



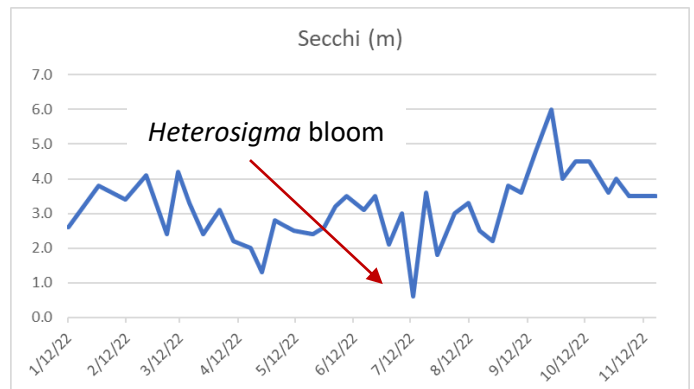
PSI continued to monitor dissolved oxygen (DO) and pH levels throughout the entire year. In general, DO and pH tend to move in sync with one another and are highly influenced by phytoplankton concentrations. For example, when phytoplankton are blooming (spring and summer), oxygen and pH levels are elevated due to photosynthesis. When phytoplankton concentrations are low (winter), oxygen and pH levels decline. In Budd Inlet, DO and pH levels also decline at depth in mid-late summer due to the bacterial decomposition of settled phytoplankton at the bottom of the Inlet. Budd Inlet has long suffered from dangerously low oxygen levels in late-summer due to excess nutrients that fuel rich phytoplankton blooms. Preventing nutrient sources such as animal waste, fertilizer, grass clippings, and soaps from entering stormwater that reaches Budd Inlet is a key step in protecting water quality.

During the “What’s Blooming?” season, DO levels peaked at 16.9 mg/l on July 13th during a dense *Heterosigma* bloom. Interestingly, DO levels fell to 3.93 mg/l at 3-meter depth. The lowest DO levels encountered throughout the season were 2.99 mg/l on October 14th. This late season drop in DO is typical of Budd Inlet due to the settling and decomposition of plankton at depth. In 2021, peak DO values also occurred on July 13th (14.3 mg/l), but the peak low occurred earlier, August 5th (2.96 mg/l). Levels below 4 mg/l are stressful to marine life; below 2 mg/l have been shown to cause mortality.



Emilie (NOAA) with a jug of *Heterosigma*; Secchi disc showing 0.6-meter visibility; single *Heterosigma* cell.

The pH values mirrored DO levels with the highest pH recorded near the surface (8.89) on July 13th during the *Heterosigma* bloom. The lowest pH values were detected at depth during that same time (7.61) and again on October 14th (7.69).

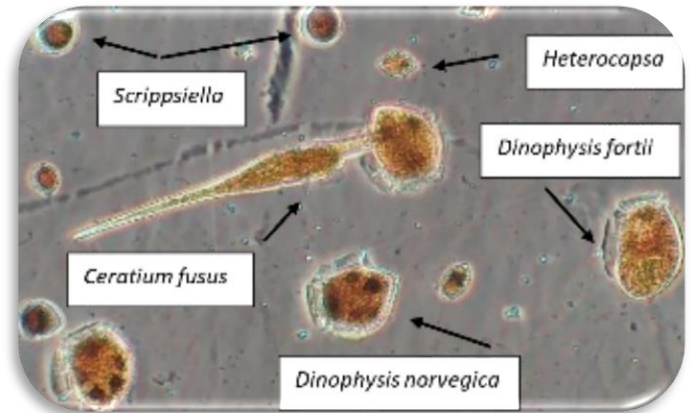


Harmful Algal Blooms (HABs)

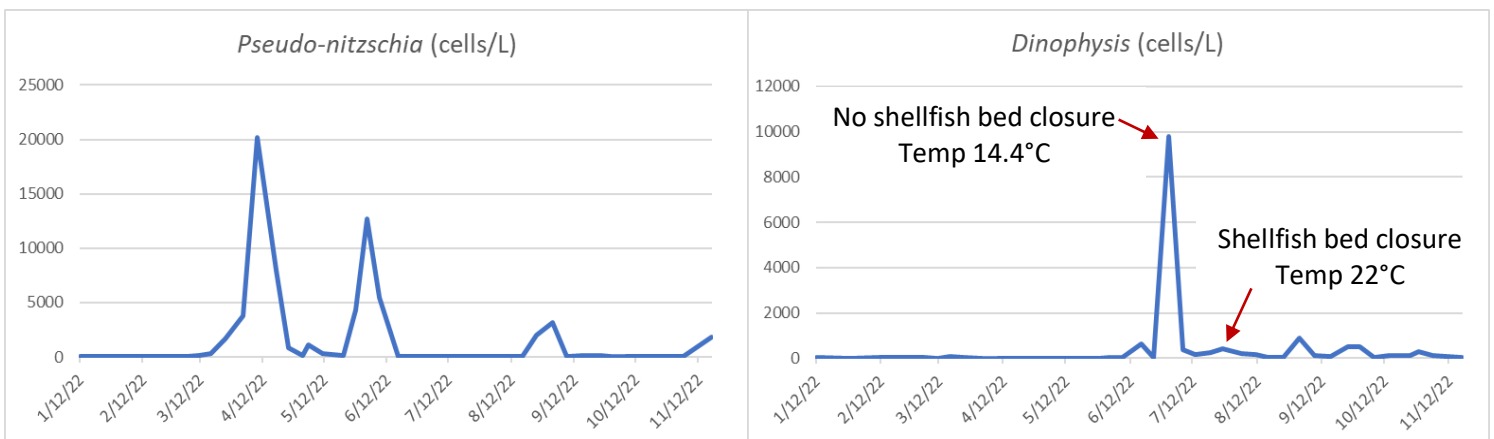
Plankton samples were screened for HAB species including *Dinophysis*, *Pseudo-nitzschia*, and *Alexandrium*. This year, *Akashiwo sanguinea*, *Protoceratium reticulatum* and *Mesodinium* were also screened as “Species of Concern” or “Interest.” *Akashiwo sanguinea* and *Protoceratium reticulatum* have been associated with shellfish mortality events, and *Mesodinium rubrum* is an important food source for *Dinophysis*.

Pseudo-nitzschia, the species responsible for Amnesic Shellfish Poisoning (ASP) bloomed on April 9th and June 2nd reaching concentrations of 20,167 and 12,702 cells/L respectively. The highest concentration detected over the past decade via the “What’s Blooming?” program was 22,000 cells/L in 2016. While it is not uncommon for *Pseudo-nitzschia* to bloom in Budd Inlet, ASP closures are rare in South Sound. In fact, while cells are often present, or even common, they remain non-toxic in this region.

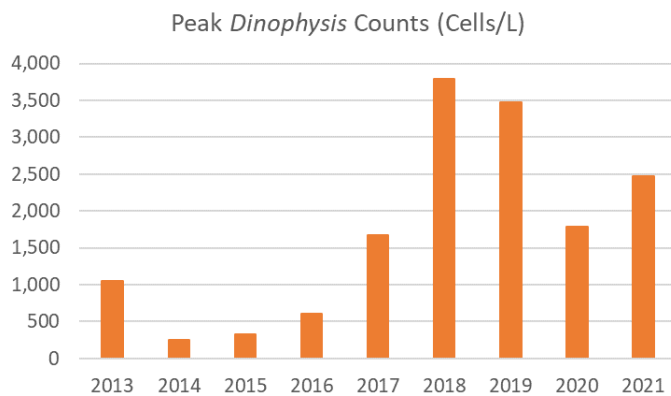
Dinophysis, the species responsible for Diarrhetic Shellfish Poisoning (DSP), was found in every sample collected this summer, blooming on June 30th at a concentration of 9,780 cells/L (68% of cells were *D. fortii*). This bloom did not result in a shellfish bed closure – the level of DSTs (Diarrhetic Shellfish Toxins) in blue mussels only reached 10 µg/100 g tissue. However, WDOH did close Budd Inlet to shellfish harvesting on August 2nd due to elevated DST levels. Shellfish measured 16 µg/100 g tissue, meeting the closure limit of 16. Interestingly, cell counts were only 400 cells/L (61% *D. fortii*) prior to this closure. Surface temperatures peaked at 22°C during this time.



Dinophysis in Budd Inlet, June 30th.



As we continue to collect information from Budd Inlet, this long-term data provides clues to help answer important questions. For example, 1) When are DSP closures most likely to occur and 2) What species of *Dinophysis* are responsible for toxin production? This summer's *Dinophysis* data added to this discussion.



Since 2015, almost all DSP closures were initiated in late summer or early fall with some notable exceptions. In June 2016, Budd Inlet set a national record for the highest level of DSP toxins measured in mussels – 250 µg/100 g tissue! During every closure, *Dinophysis fortii* and *D. acuminata* have been common. In 2018 and 2019, elevated cell counts (~3,500 cells/L) were detected in June/July but did not

result in shellfish toxicity. In those two instances, *D. norvegica* was blooming. In 2021, *D. fortii* bloomed in June/July resulting in a DSP closure. This suggested that closures might occur during any season if *D. fortii*/*D. acuminata* are common. However, this June, these two species bloomed to almost 10,000 cells/L (!) and did NOT result in a closure. Why? Perhaps the bloom didn't persist long enough or perhaps it didn't produce biotoxins because of the cooler temperatures (14.4°C). In 2021, the temperature was 22°C during the June/July closure.

Alexandrium, the species responsible for Paralytic Shellfish Poisoning (PSP) was not found in notable concentrations throughout the entire summer which is consistent with previous years.

Please refer to Appendices A (Blog posts) and B (Facebook entries) for photos and a detailed description of each week's sampling adventures.

Acknowledgements

PSI is incredibly grateful to Stream Team for financially supporting the "What's Blooming?" program over the past 11 years! This ever-growing data set is now revealing its true colors and being used by researchers and students to better understand water quality and HABs in our local region and promote environmental stewardship. Thank you to the Port of Olympia for supporting research and education at Port Plaza and to Washington SeaGrant for managing the SoundToxins program. Thank you to our student interns and to all of the plankton enthusiasts that follow along each year. See you on the dock next year!



Exploring the entire food chain from plankton to Pumpkinseed Sunfish, Deep Lake, August 25th.