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TAHOE: STATE OF THE LAKE REPORT 2023

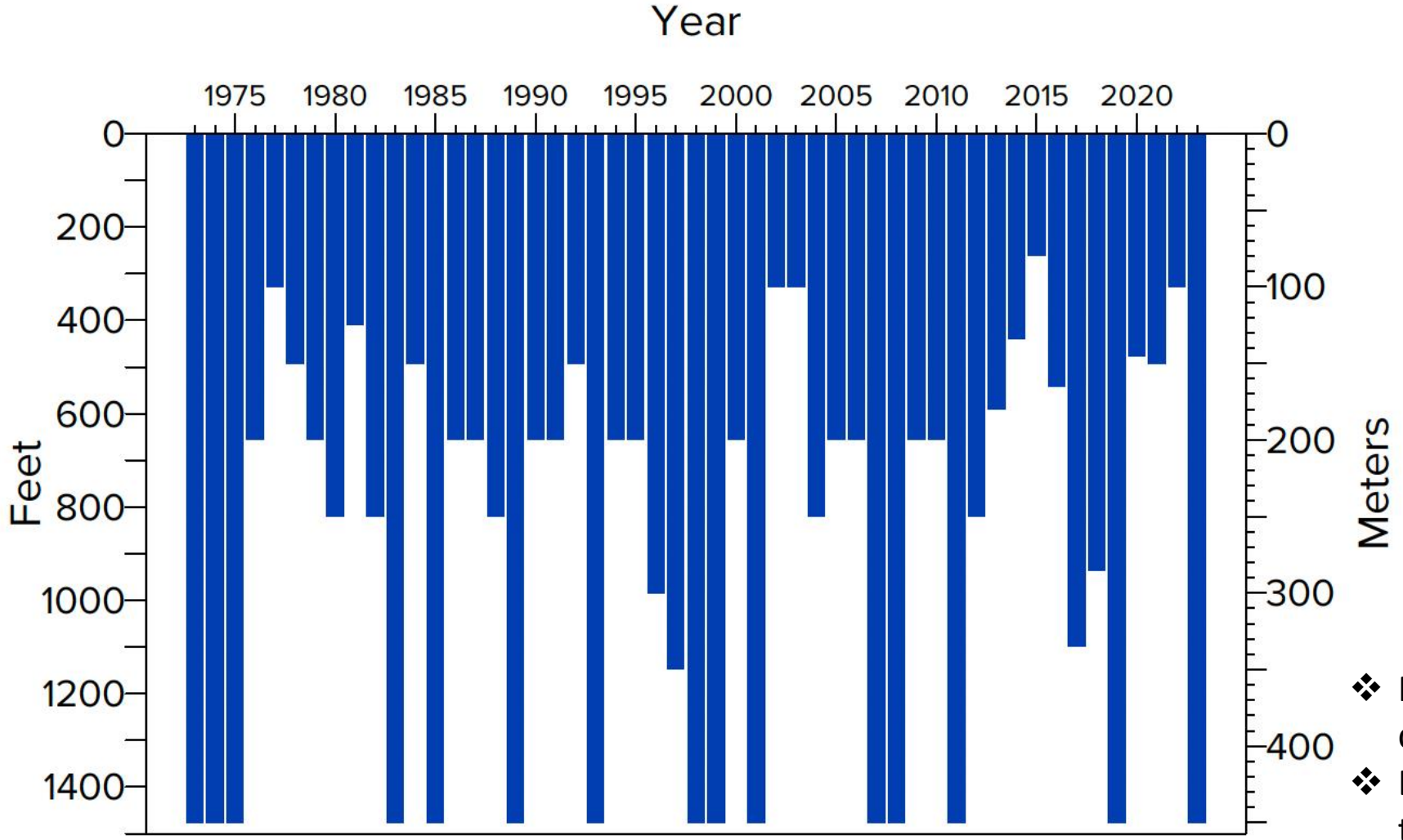
Tahoe Environmental Research Center

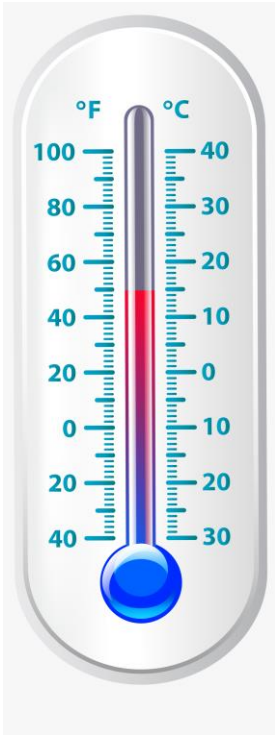
Today's Offering

1. Brrrr. It's cold! What's flippin' happening?
2. Anybody up for a day at the beach?
3. Microplastics are here, there and everywhere.
4. I'm sorry. We're all out of the shrimp special!
5. What has all this done to clarity?
6. What is the State of the Lake?

1. Brrr. It’s cold! What’s flippin’ happening?

Sometimes called “turnover” or deep mixing





- November 2022 was the 3rd coldest month in 110 years.
- December 2022 was well below the long-term average.

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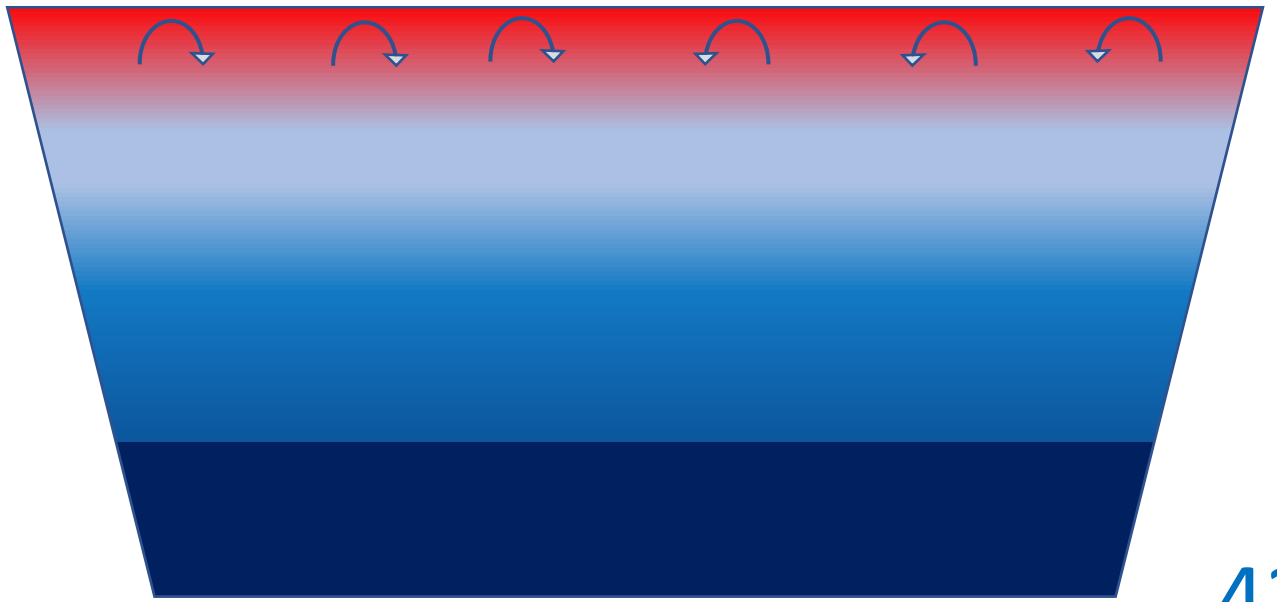
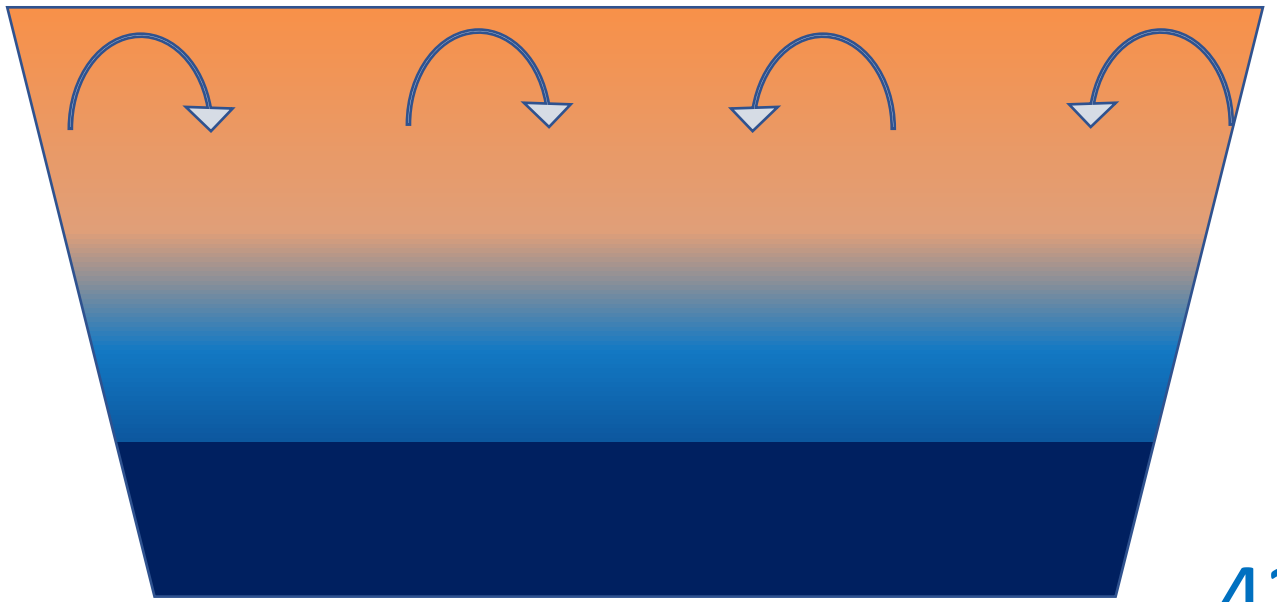
Lake Tahoe in Summer



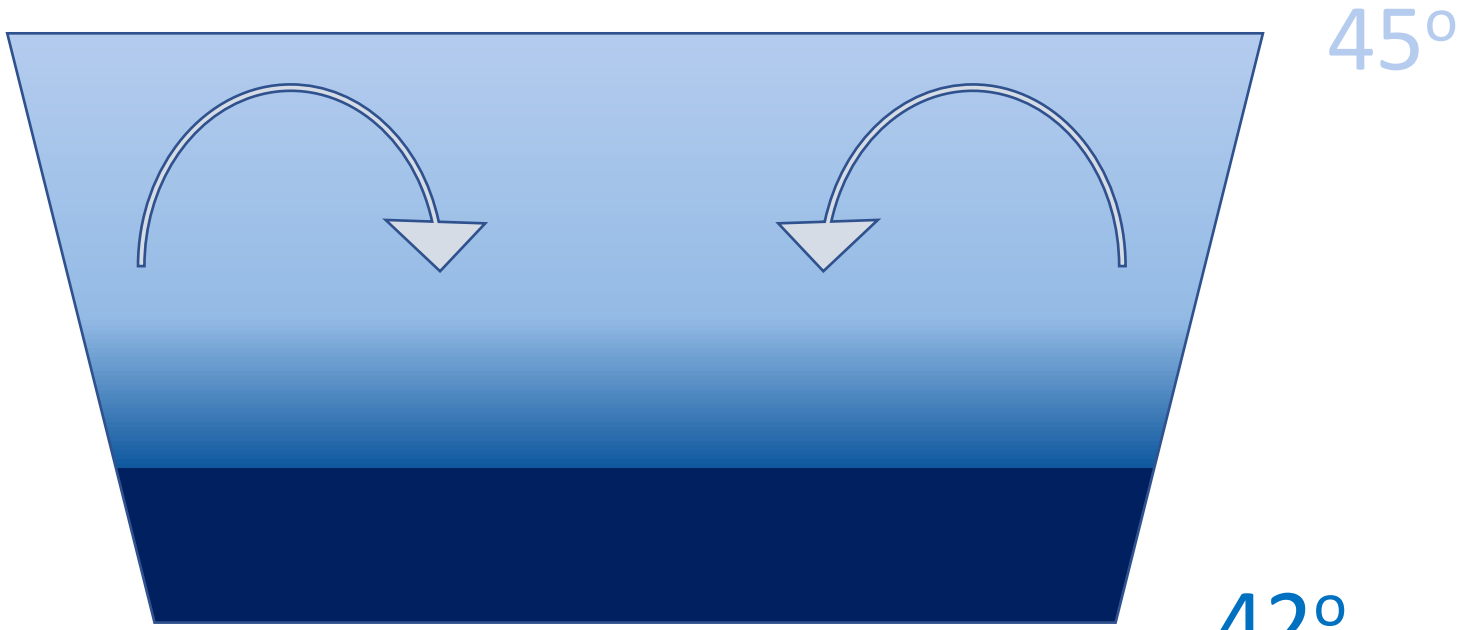
Lake Tahoe in Fall



60°

42°

Lake Tahoe most Winters



41.3°

41.3°

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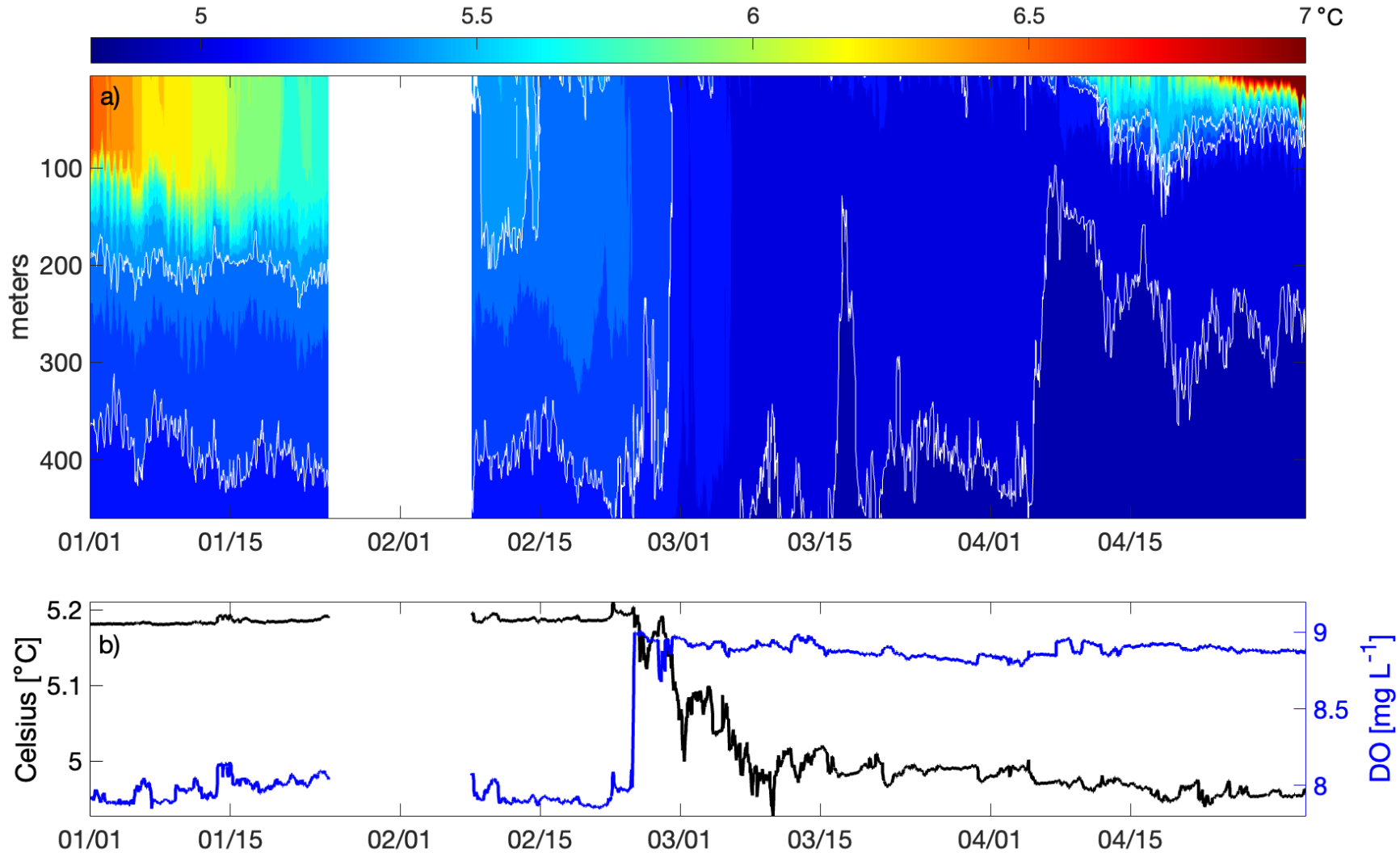
Flipping is Good for the Lake



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Micah Swann

2. Anybody up for a day at the beach?

Photo: Scott Hackley
Conservancy Beach
Sep 29, 2022

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Nearshore Algae are Generally Divided into Two Types

Periphyton

Metaphyton

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2022 Periphyton Blooms were spatially extensive

Continuous images of entire shoreline can be quantified and categorized to determine spread

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These were the worst metaphyton blooms ever observed

Kiva Beach, August 2022

Regan Beach, August 2022

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The Connection between metaphyton and Asian Clams

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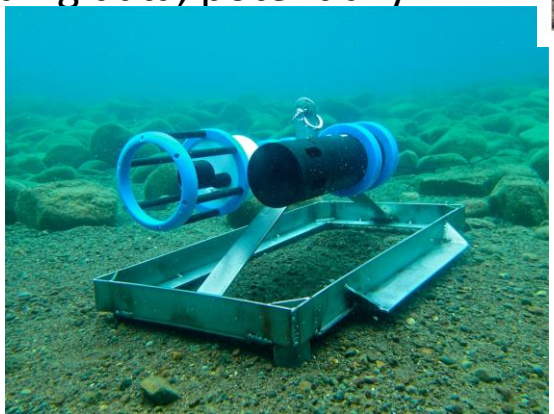
2023 Launched a year-round, 5-pronged monitoring strategy

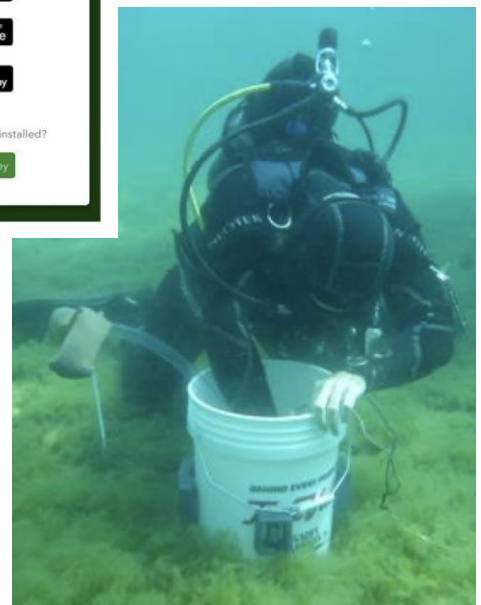
1. Drones – high resolution demarcation at specific sites

2. Helicopter – rapid, entire shoreline surveys, cross-correlated with drone data

3. Scuba Surveys – provide “ground-truthing”, biomass estimates

4. Citizen Science – to get the community providing data, potentially identifying new hot-spots





5. Nearshore Network of real-time sensors

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3. Microplastics are here, there and everywhere

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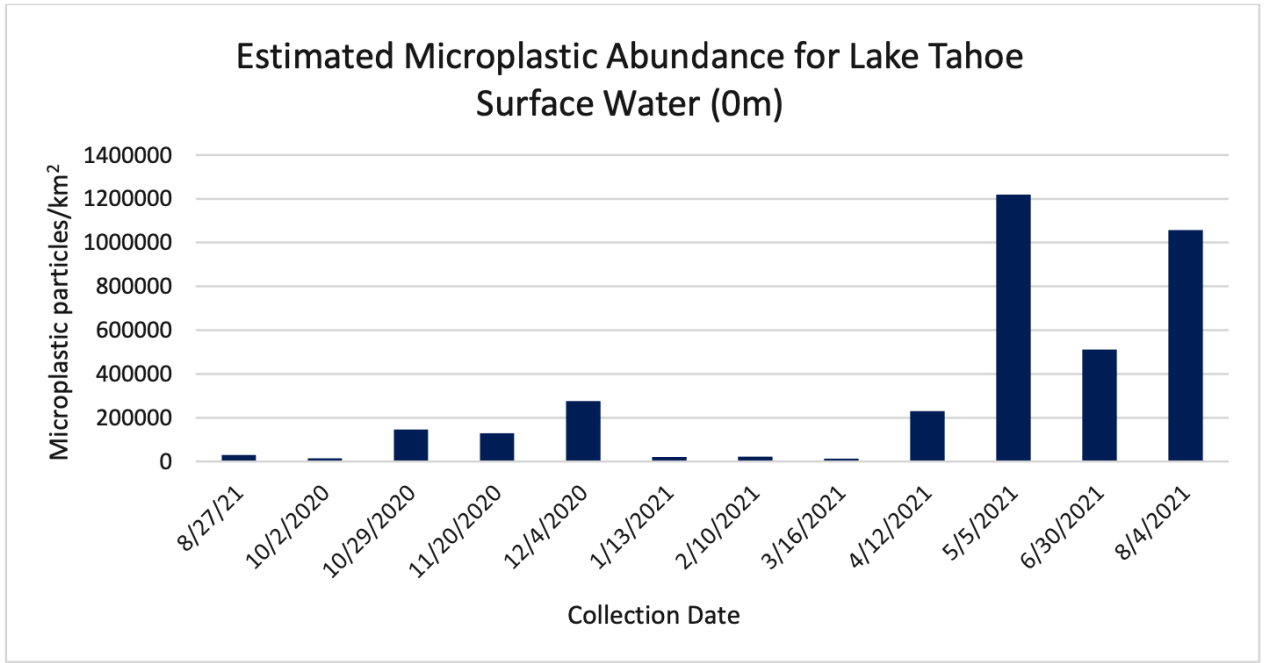

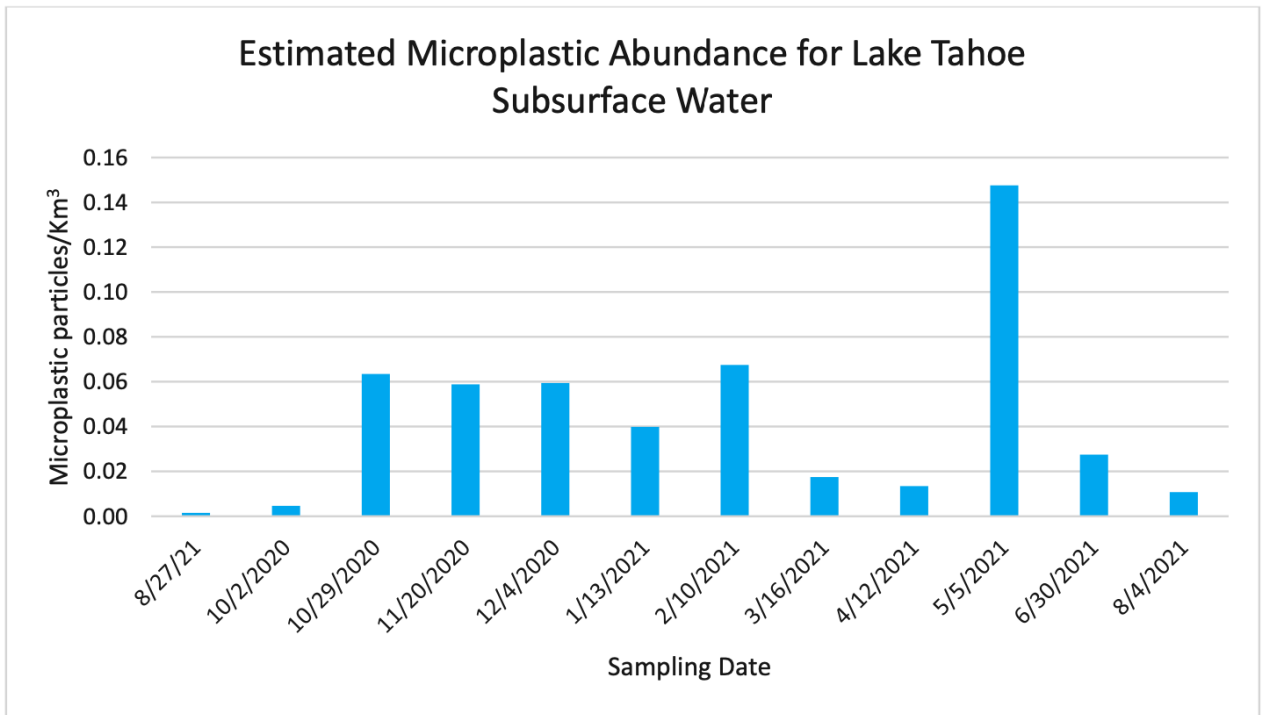

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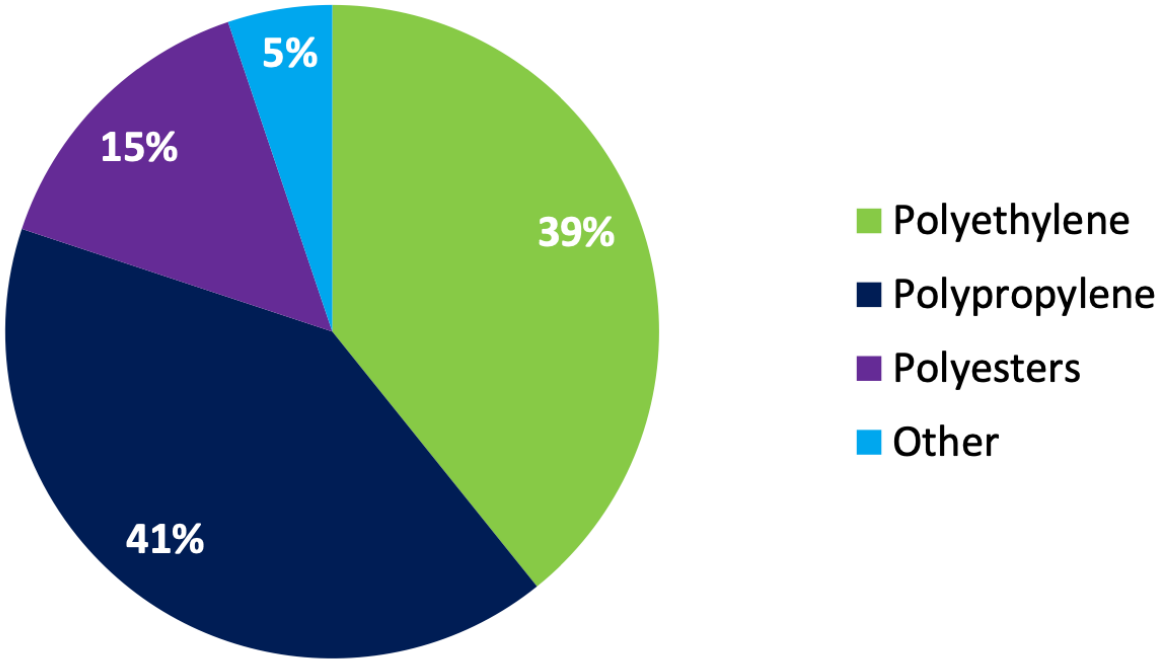
Plastic Types in Surface Waters of Lake Tahoe



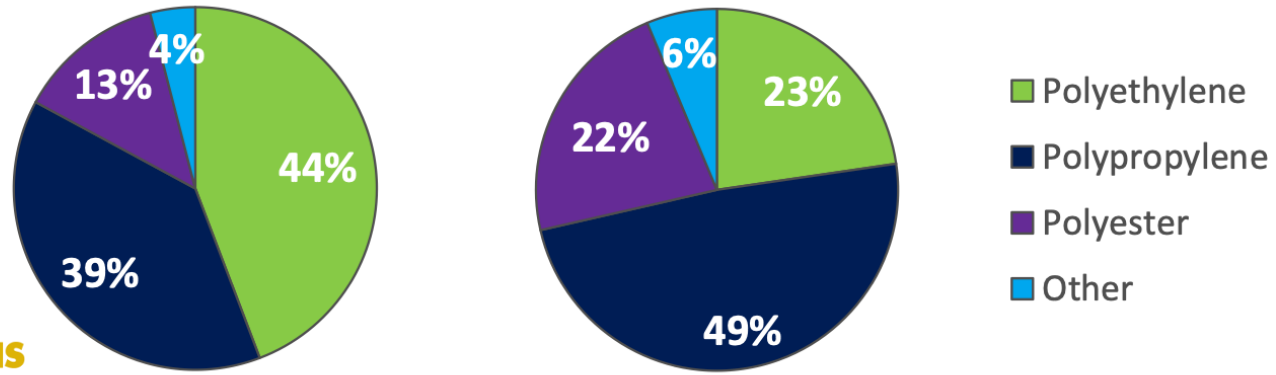
Polyethylene - most widely used plastic in the world, products ranging from clear food wrap and shopping bags to detergent bottles, car tires….

Polypropylene - plastic packaging, plastic parts for machinery and equipment, fibers and textiles…..

Polyester – clothing, home furnishings, tires, bottles, sports equipment…

Lake Surface (0m)

Subsurface Water



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4. I’m sorry. We’re all out of the shrimp special!

Biologically, Lake Tahoe displayed greater change in 2022 than in any year since year-round monitoring commenced in 1968, and much of it seemed to center on the introduced *Mysis* shrimp

Mysis Shrimp Population Abundance

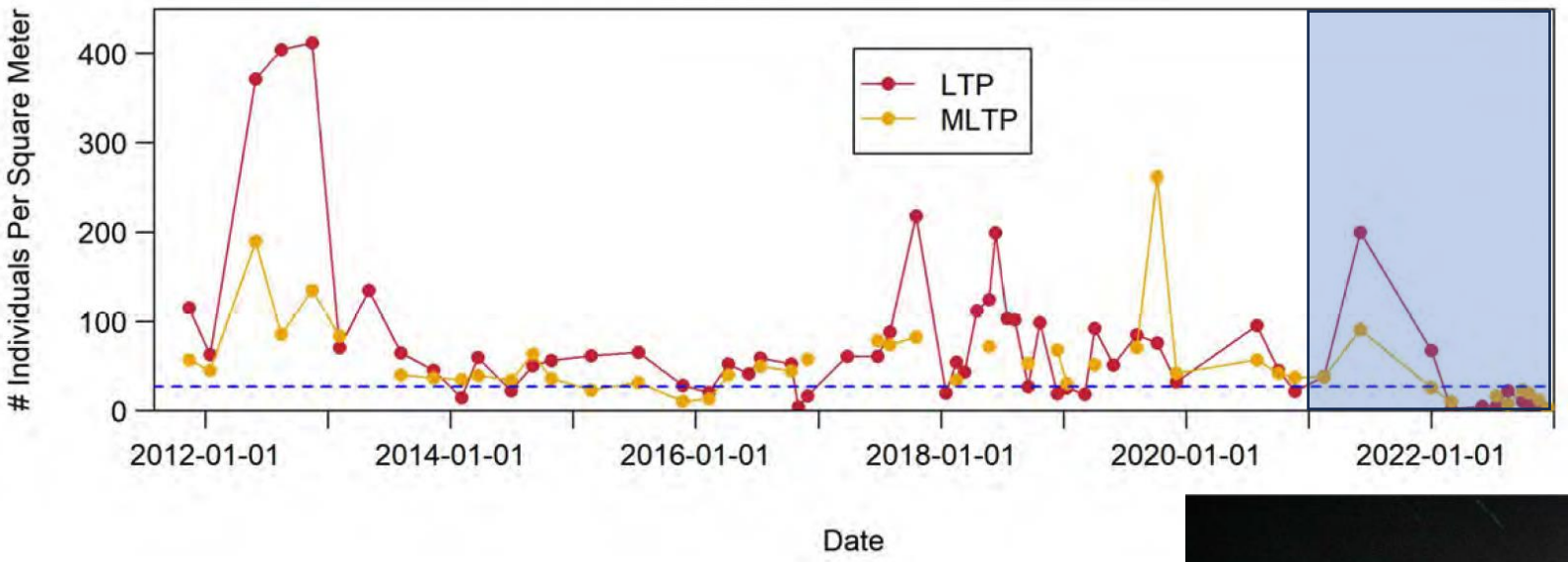

Photo:
Brian Feulner
SF Chron.

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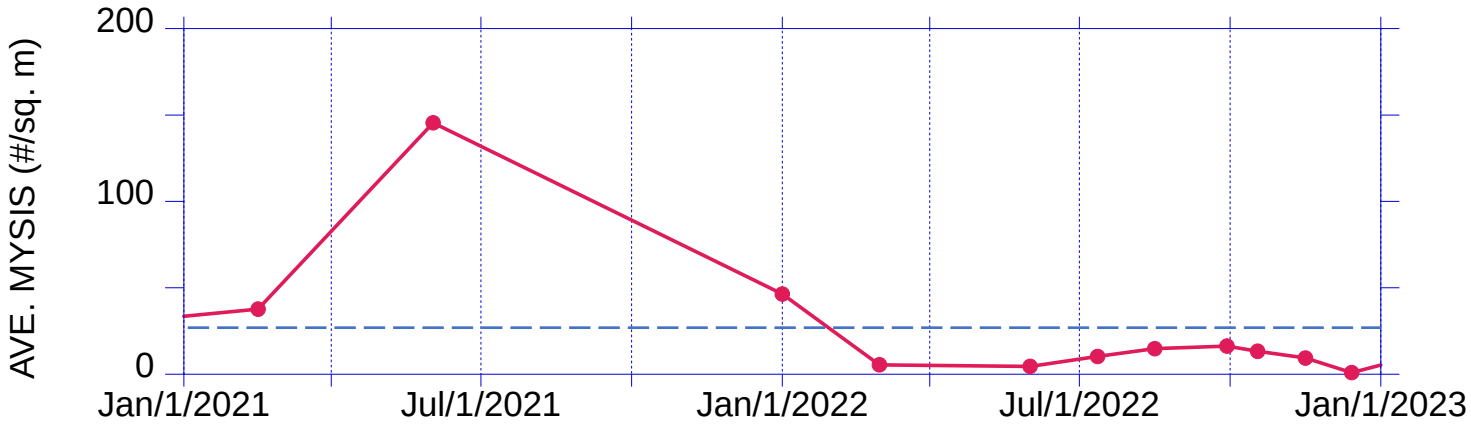
A Chronology of Foodweb-Mediated Clarity Improvement



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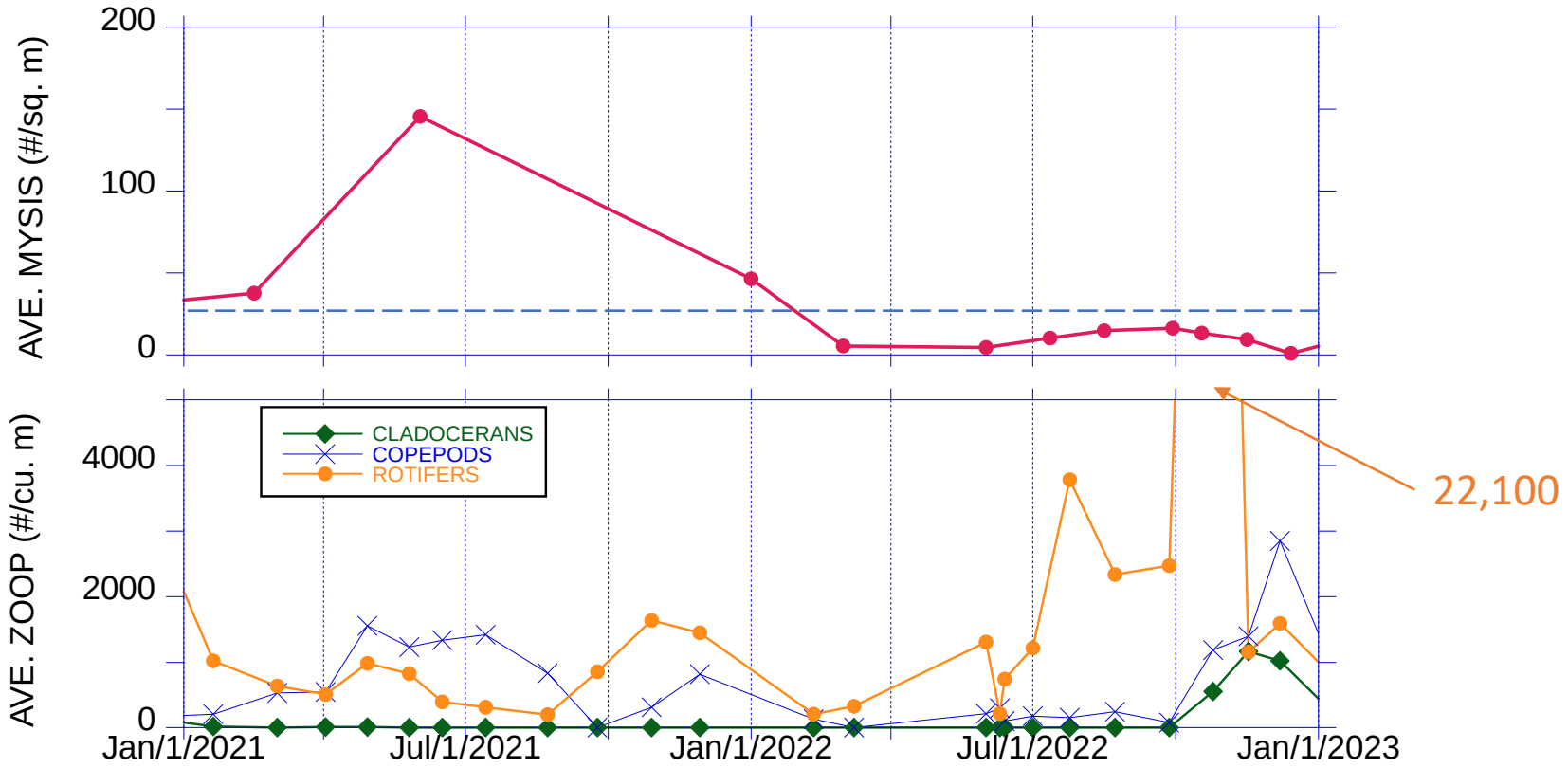

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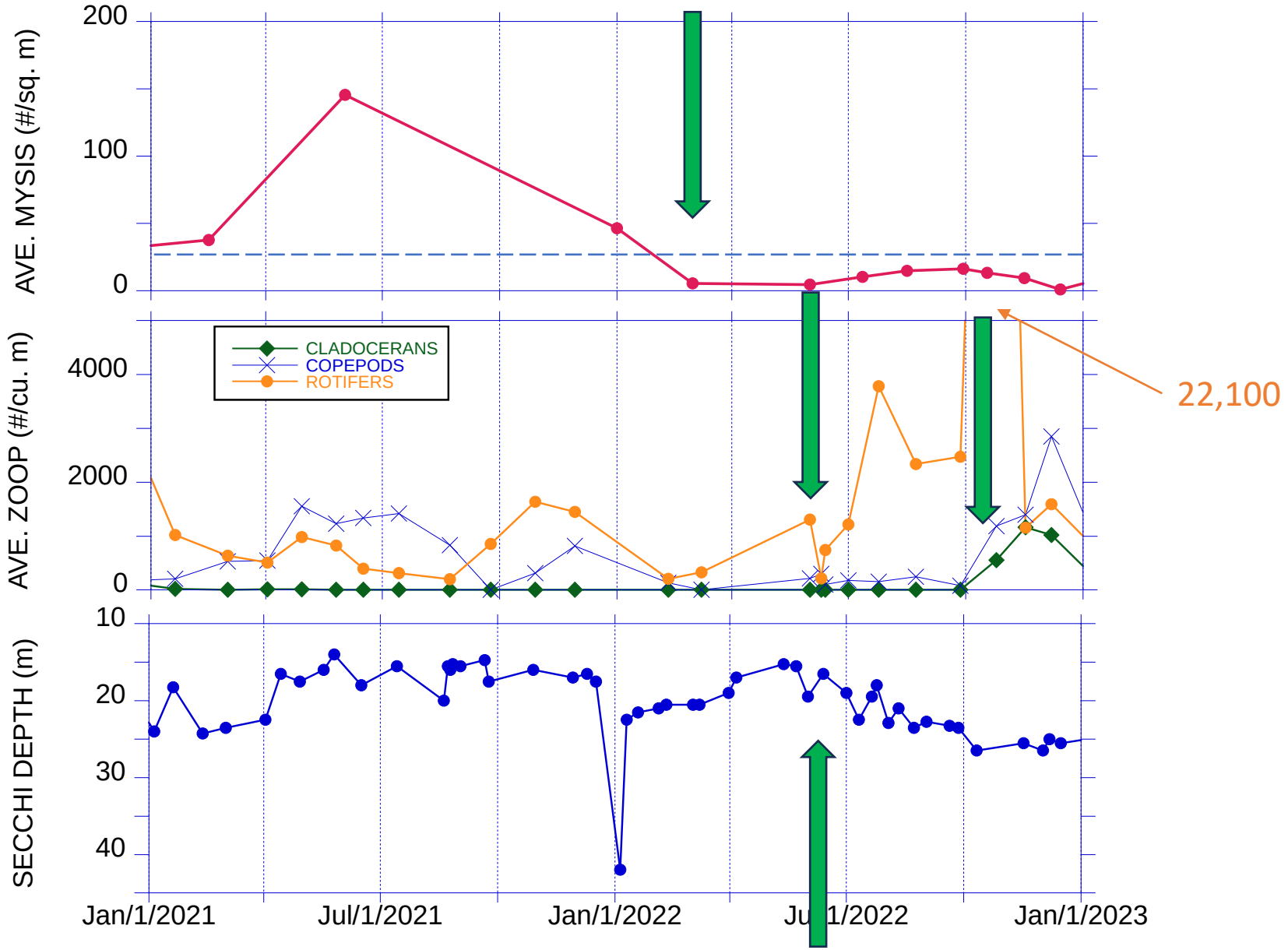
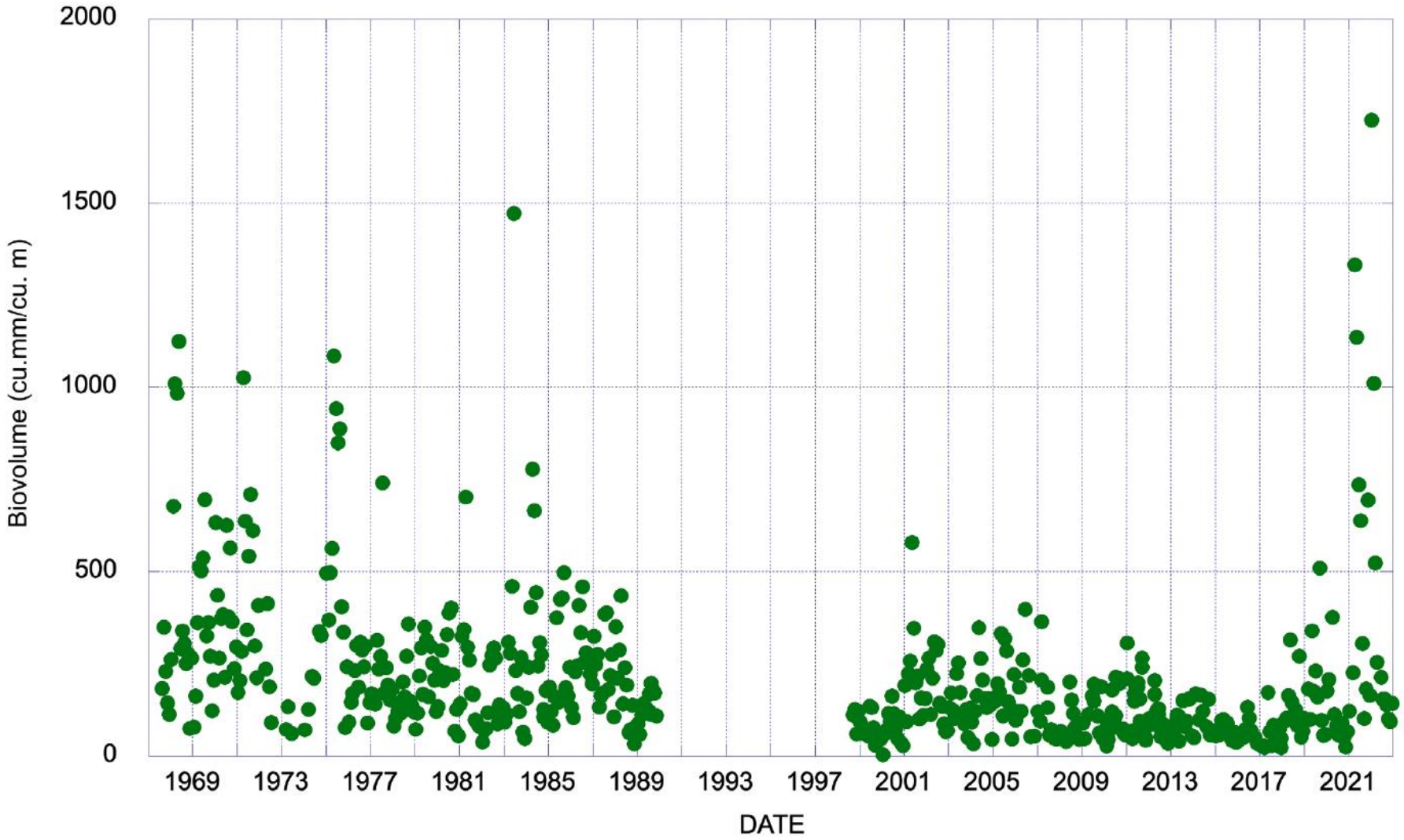


Algal Biovolume is High – Similar to the 1970s and 1980s



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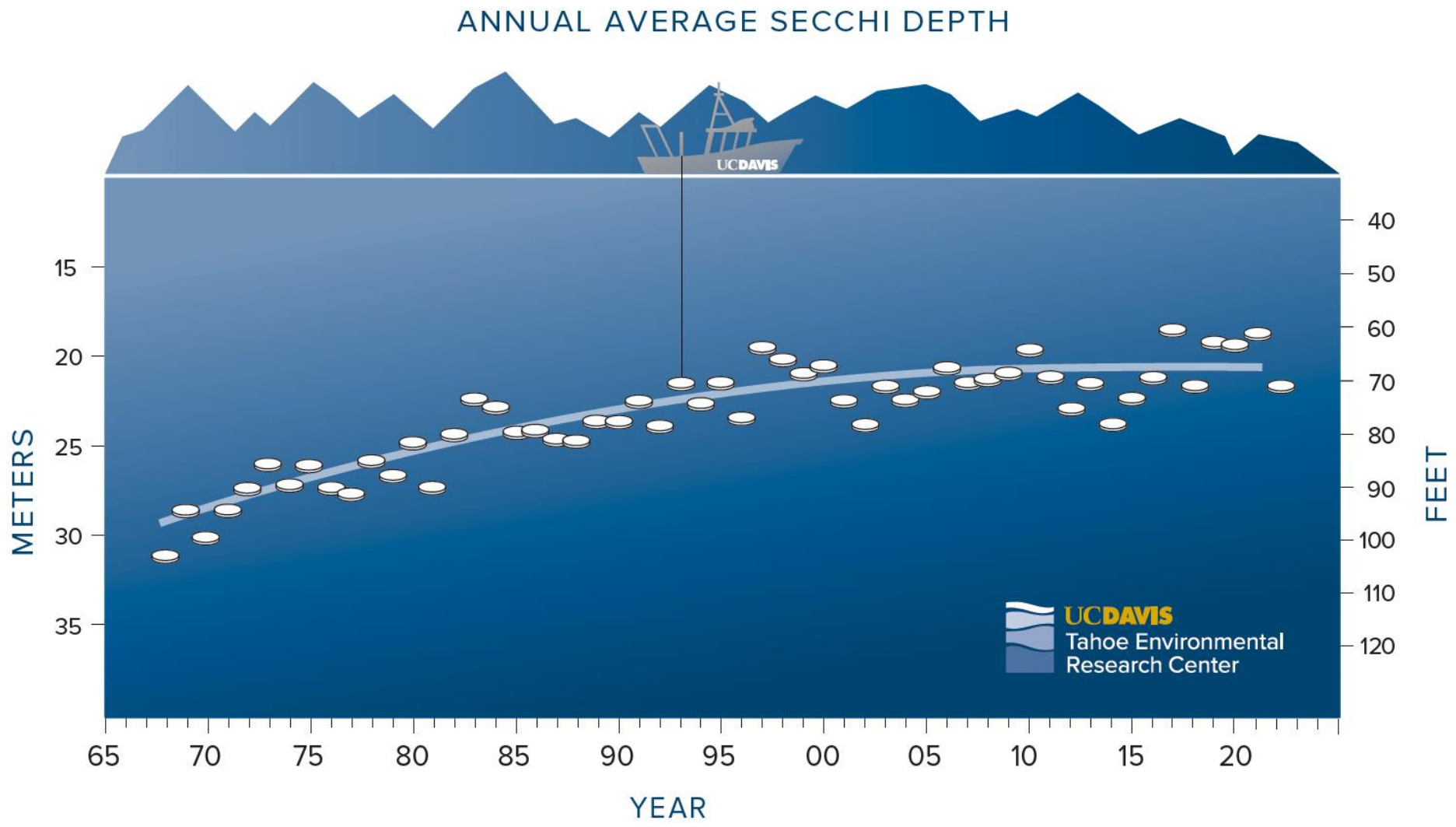
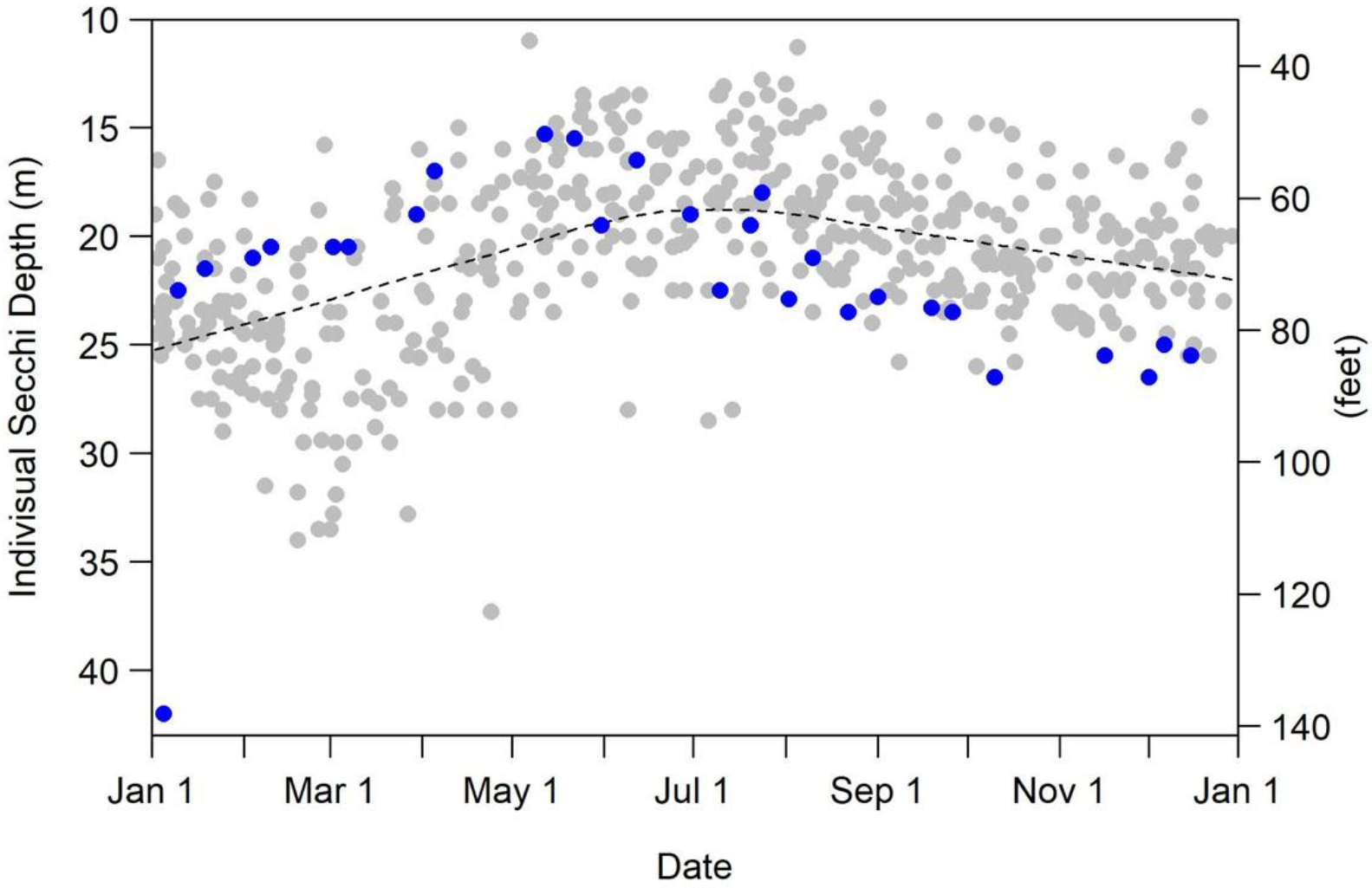
5. What has all this done to clarity?



How did the 2022 readings compare to the last 20 years?



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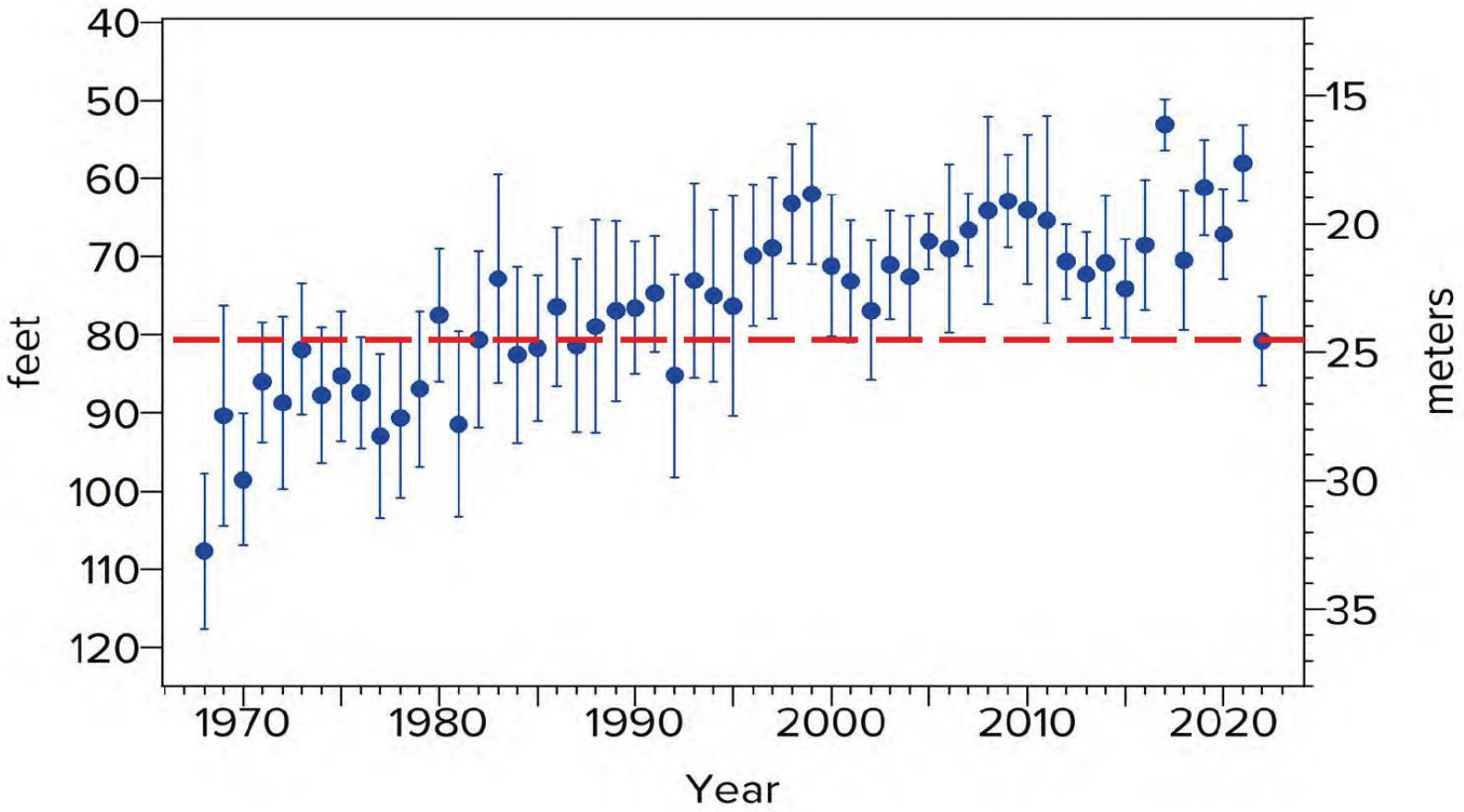
August – December Secchi Depth at Tahoe the best since the 1980s



6. What is the State of the Lake?

- We do not provide a scorecard
- The current improvement in clarity is temporary – the *Mysis* will return, and with them the old clarity levels
- In 2022 the natural system taught us that clarity can change in a very short time. **What are the lessons we need to learn and** add to current management strategies?

Lesson 1. Measure more often

Lesson 2. Measure more places

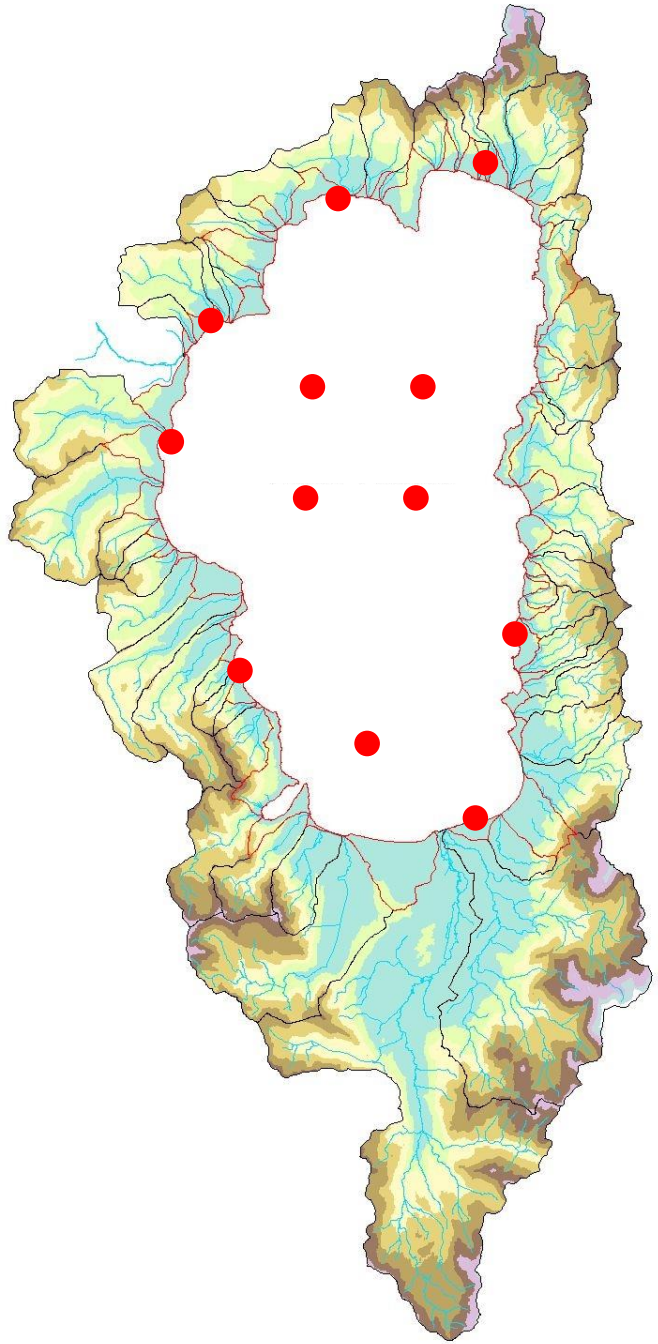
Lesson 3. Measure smarter – using models to guide monitoring and experiments

Lesson 4. Do it all

When will we achieve all that?

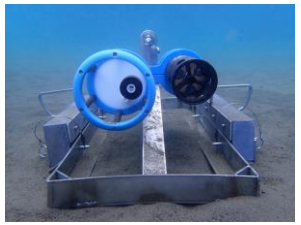
Surprise!! We already have the infrastructure in place

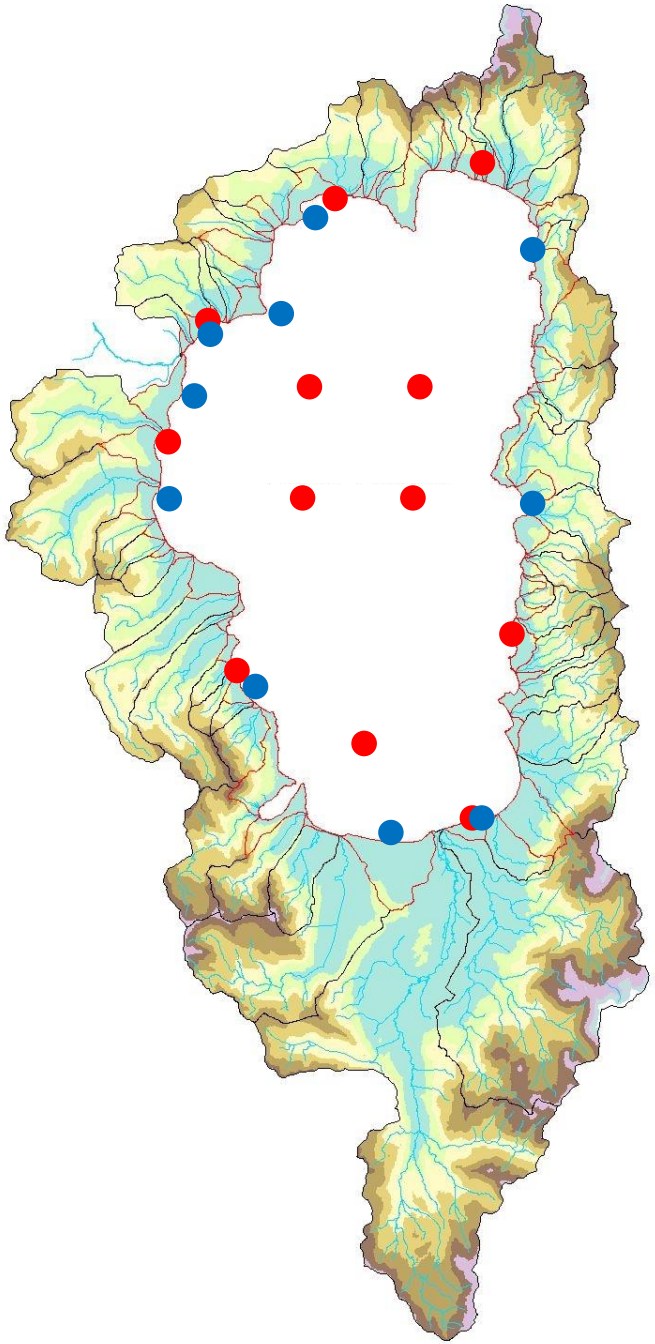
Real-time Meteorological Network



Real-time Meteorological Network

Real-time Nearshore Network





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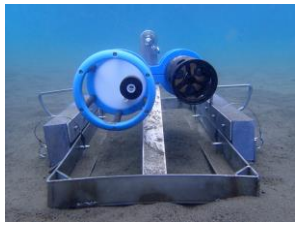
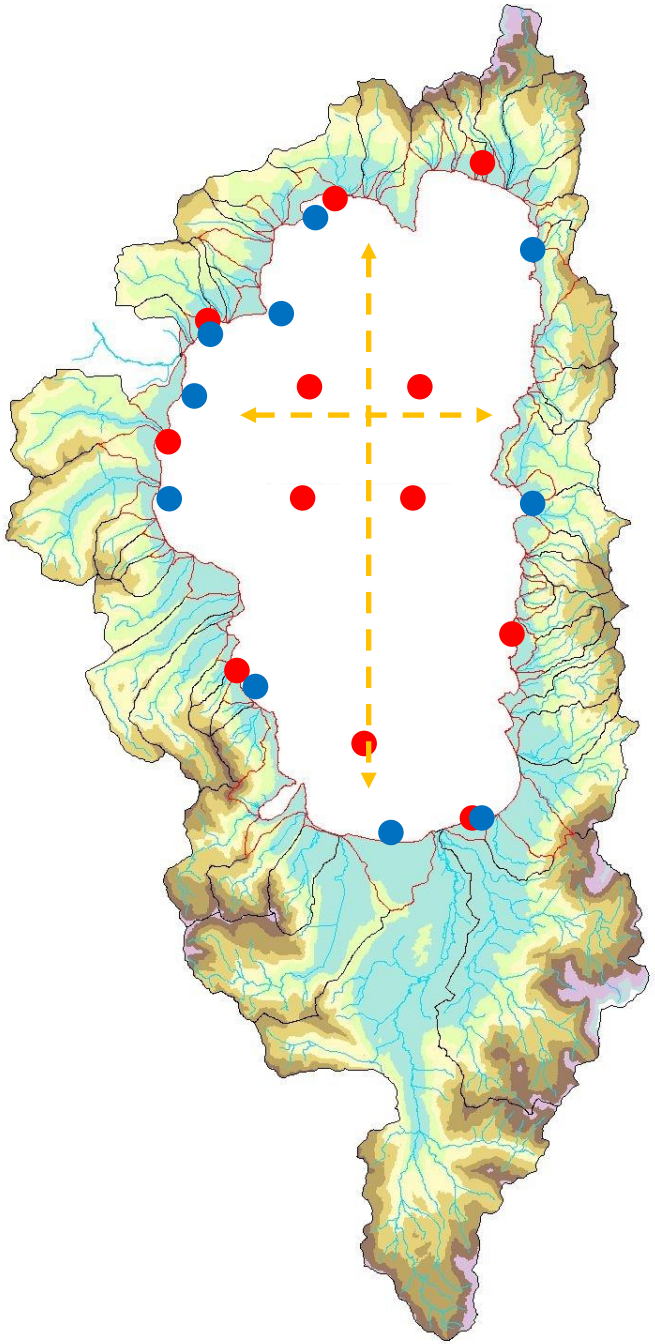


Gliders and AUVs



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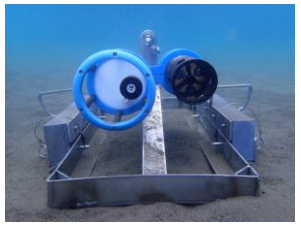

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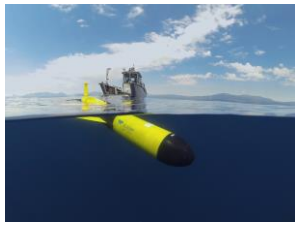
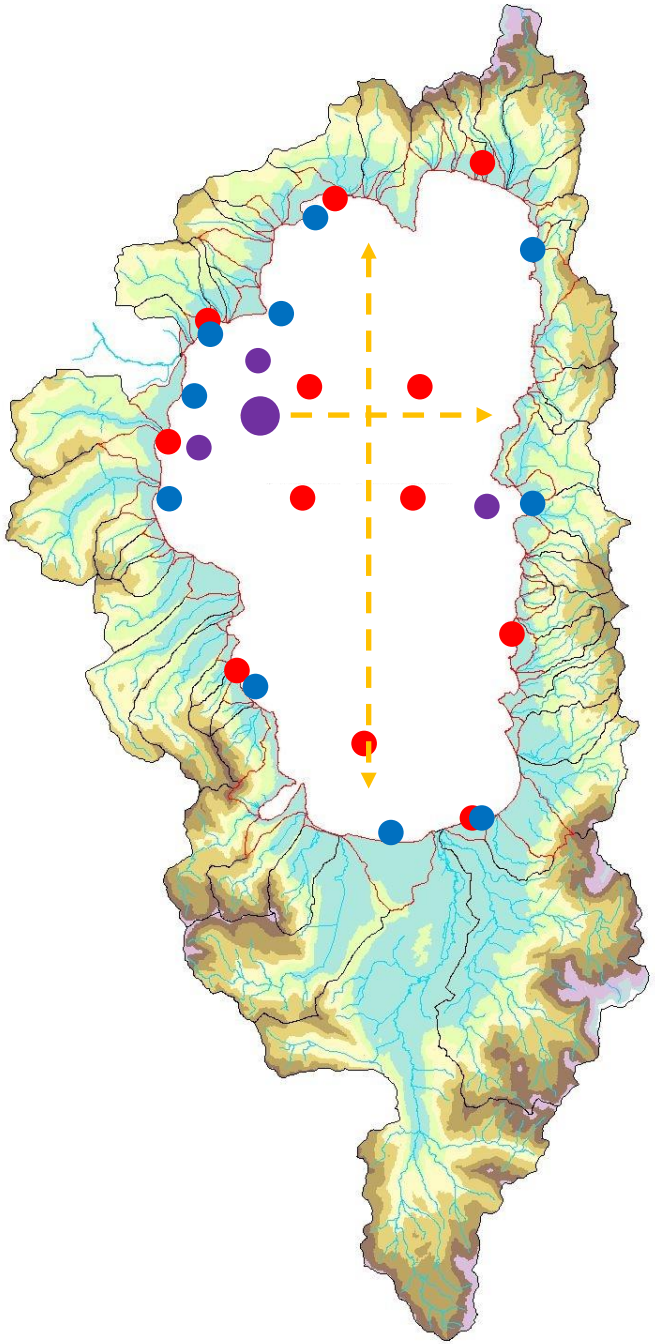


Real-time Lake Moorings



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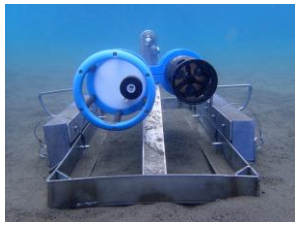

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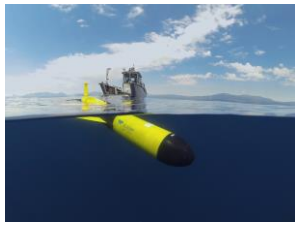

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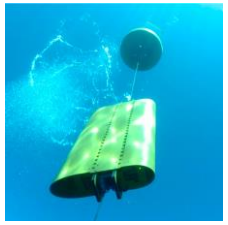
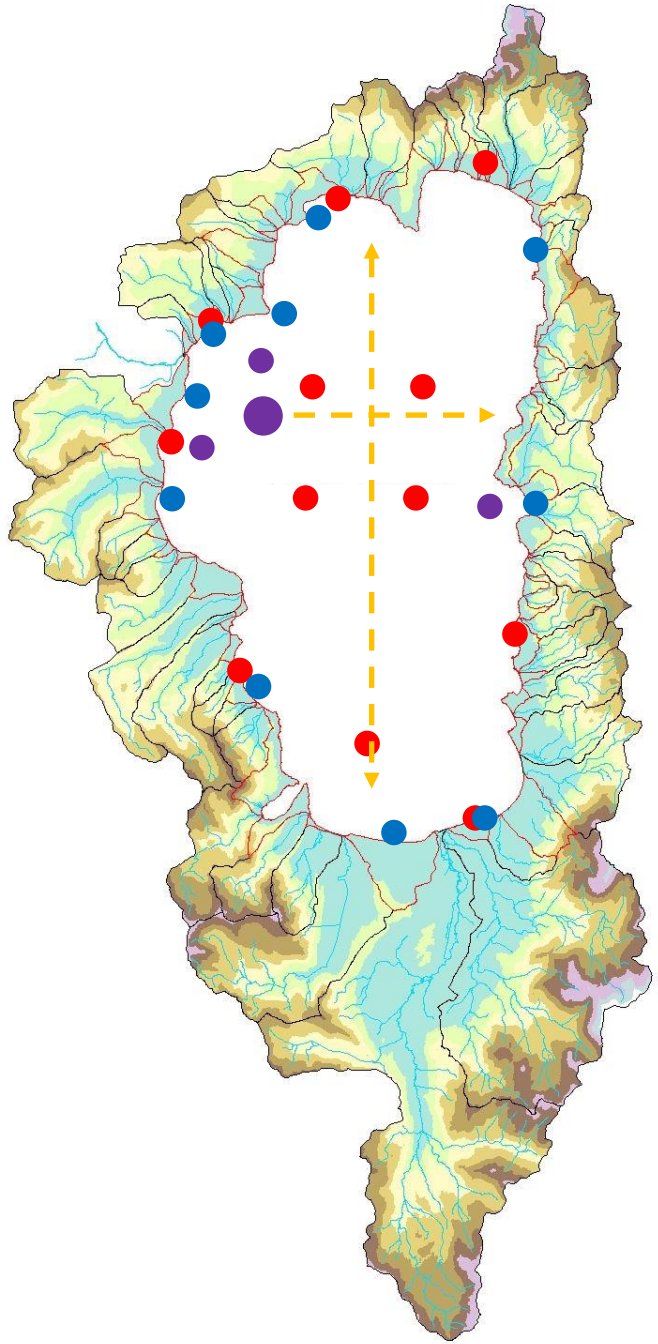


Coming March 2024



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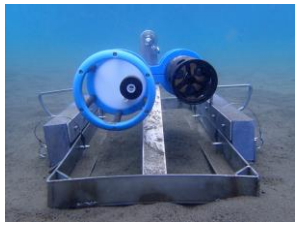

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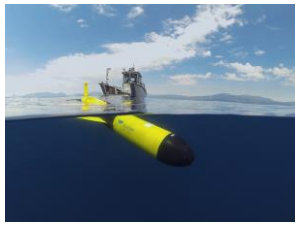

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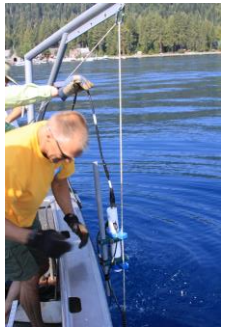
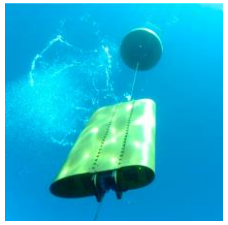
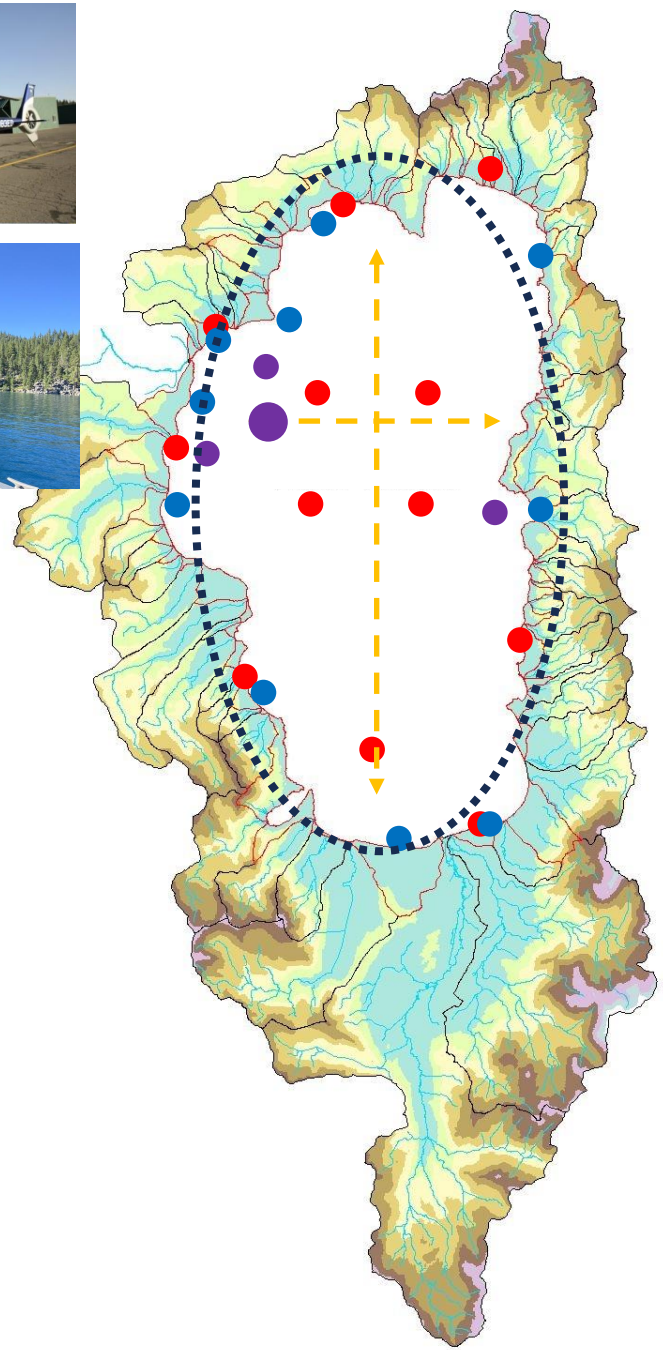


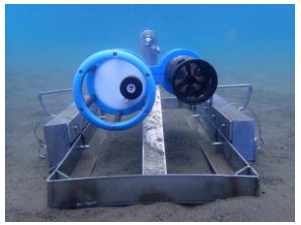


Aerial and spaceborne shoreline surveys + machine learning



Real-time Meteorological Network

Real-time Nearshore Network



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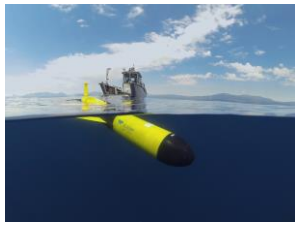

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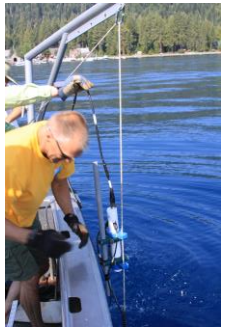
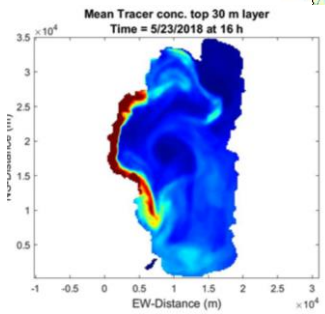
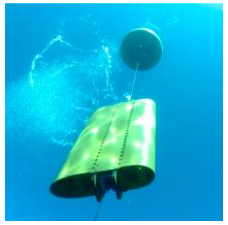
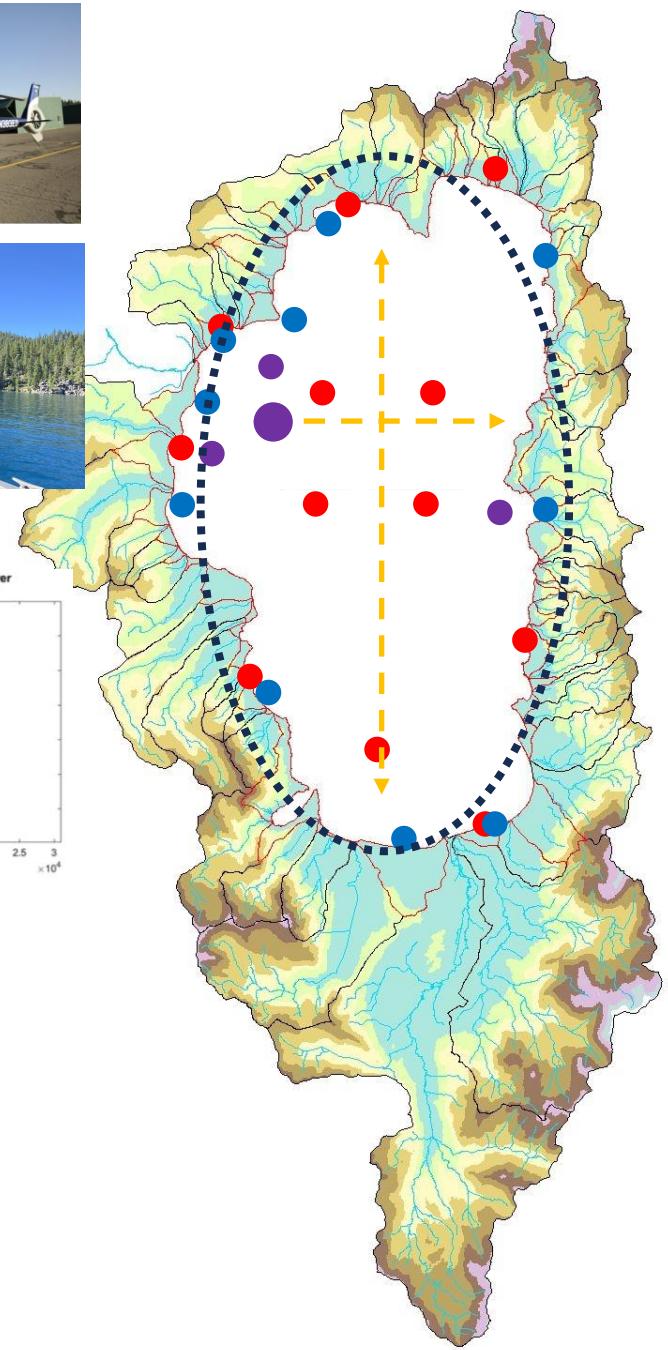


Aerial and spaceborne shoreline surveys + machine learning

3-D Lake Model

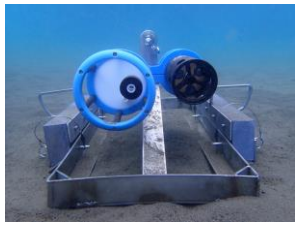






Real-time Meteorological Network

Real-time Nearshore Network



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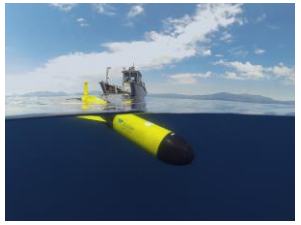

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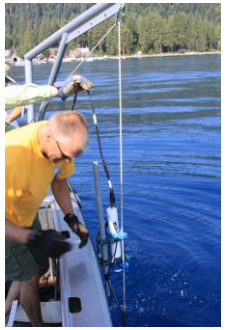
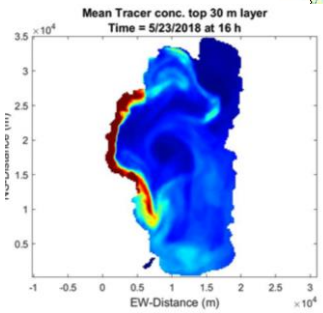
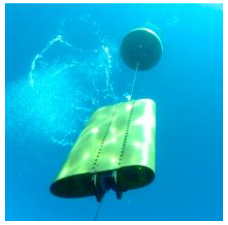
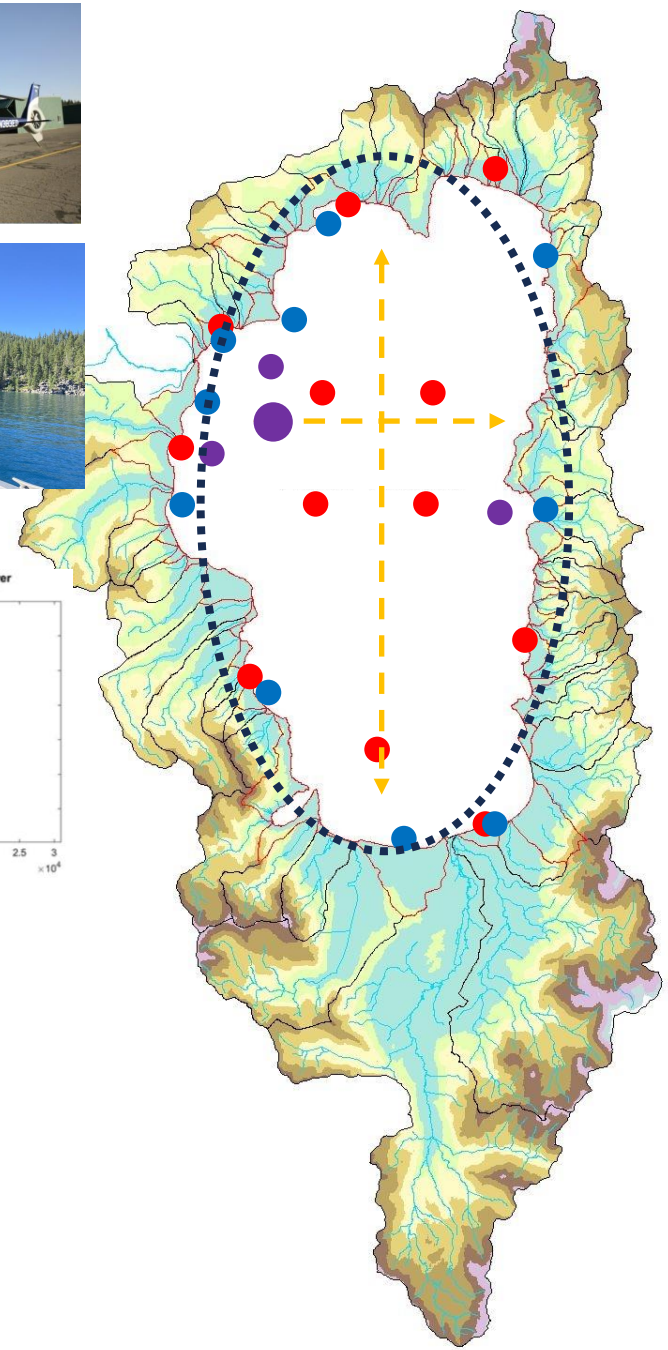


Aerial and spaceborne shoreline surveys + machine learning

3-D Lake Model







Lake Tahoe: The Smartest Lake in the World

Thank You