# Safer NOAA Diving through GIS Applications

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Esri User Conference July 2021

# Acknowledgements

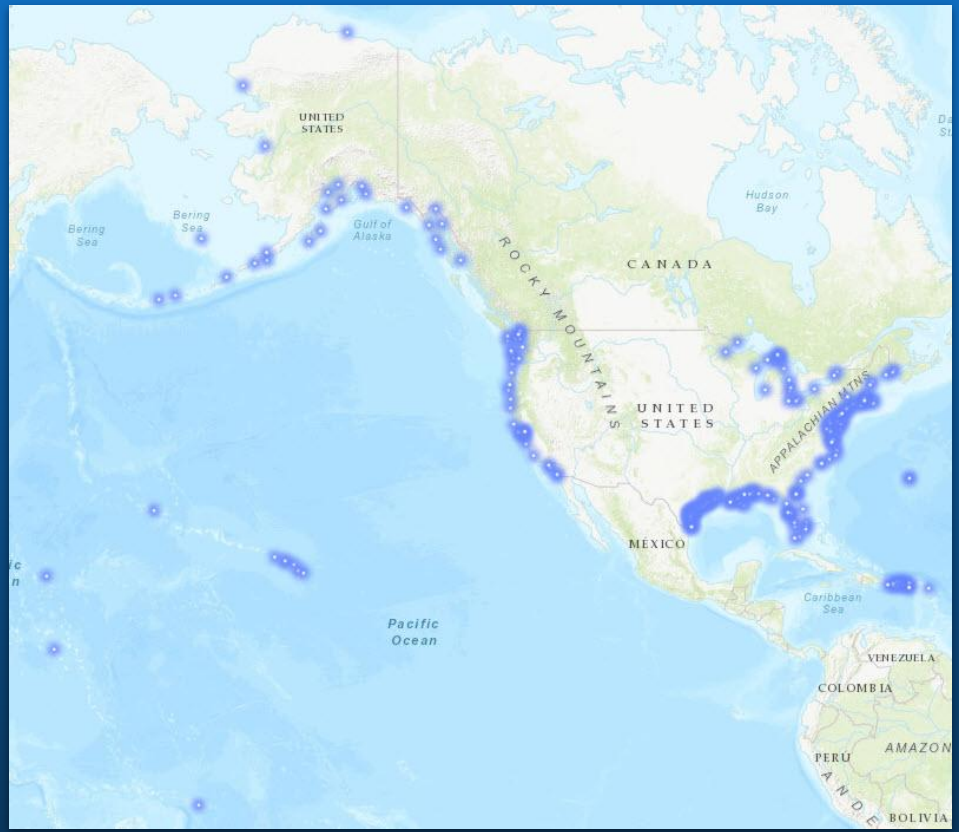
**LTJG Josh Fredrick**, Executive Officer, NOAA Small Boat Program

**CO-OPS Field Operations Division**

**CO-OPS GIS Team**

# NOAA's Center for Operational Oceanographic Products & Services

- CO-OPS is the Nation's authoritative source for tide predictions, water levels, currents & other coastal oceanographic information.
- We maintain the National Water Level Observation Network (NWLON) with more than 200 stations across the U.S. & Territories.
- Routine maintenance requires diving at many locations.



# The Problem - Diving Expectations Can Differ From Reality


- Diving can be dangerous.
- Potential hazards for CO-OPS divers:
  - Low visibility
  - Vessel traffic
  - Contaminated water

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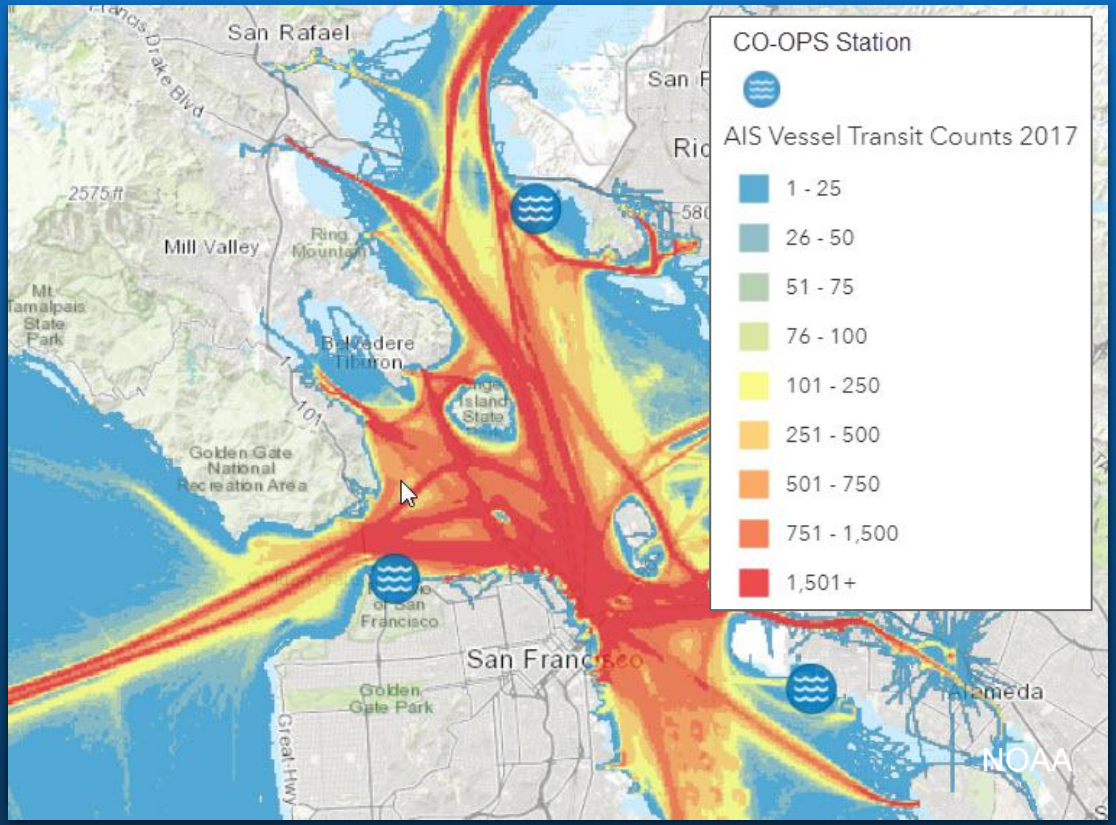


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  - Low visibility
  - Vessel traffic
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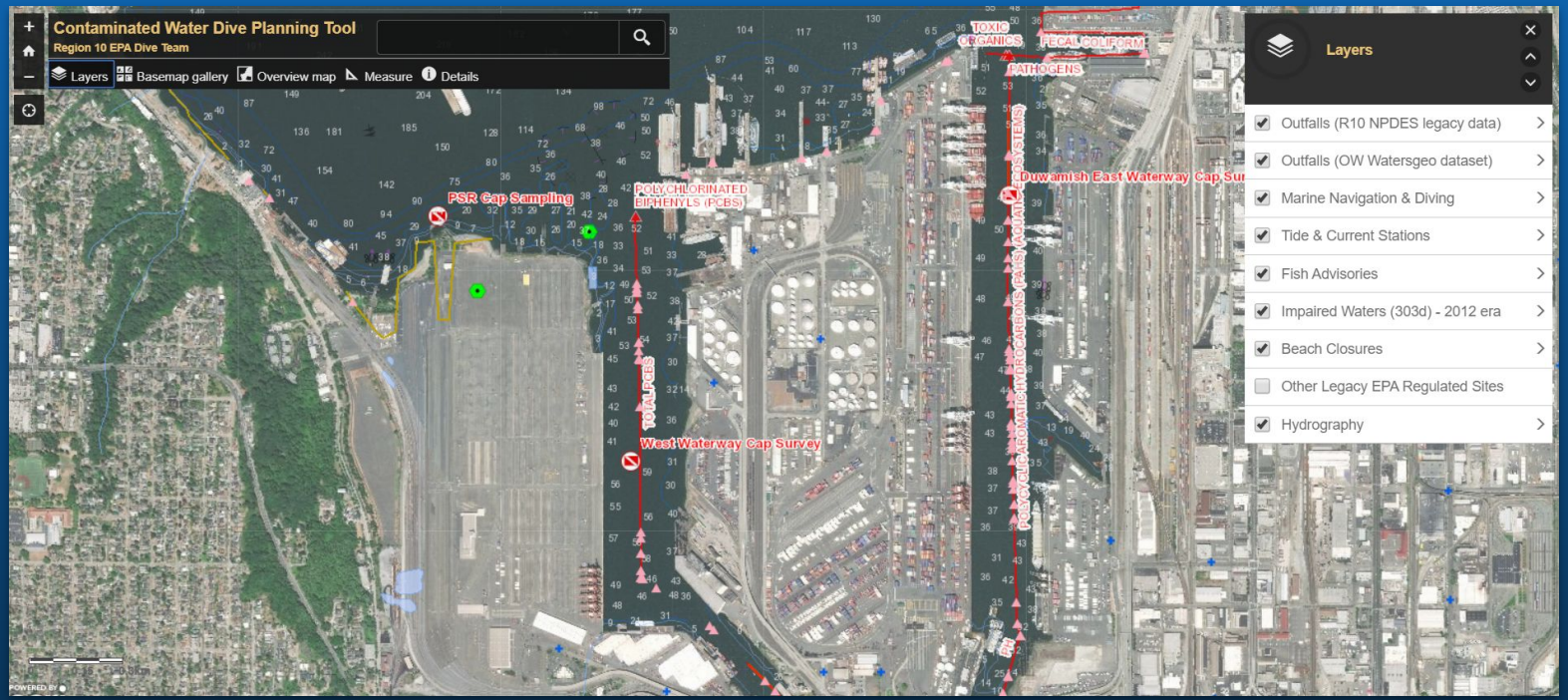
# Contaminated Water

- Contaminated water = anything that may sicken the diver (immediately or in the future).
- NOAA doesn't authorize staff to dive in contaminated water...
- Problem:
  - Not all pollutants are visible
  - Some pollutants stick around for decades in sediment - repeat dives increase exposure.
  - Water column concentrations can change rapidly.
  - No rapid tests for all the potential contaminants.



# GIS to the Rescue!

- U.S. EPA Region 10 has an internal tool for dive planning in Seattle, WA.



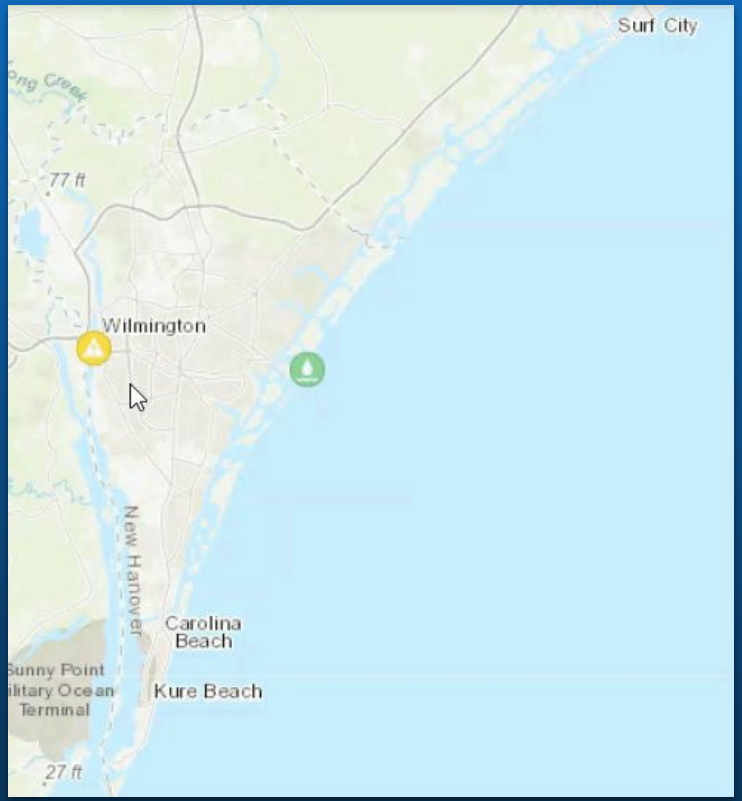
# GIS to the Rescue!

- U.S. EPA Region 10 has an internal tool for dive planning in Seattle, WA.
- Inspired NOAA CO-OPS' tool for planning dives and small boat operations.

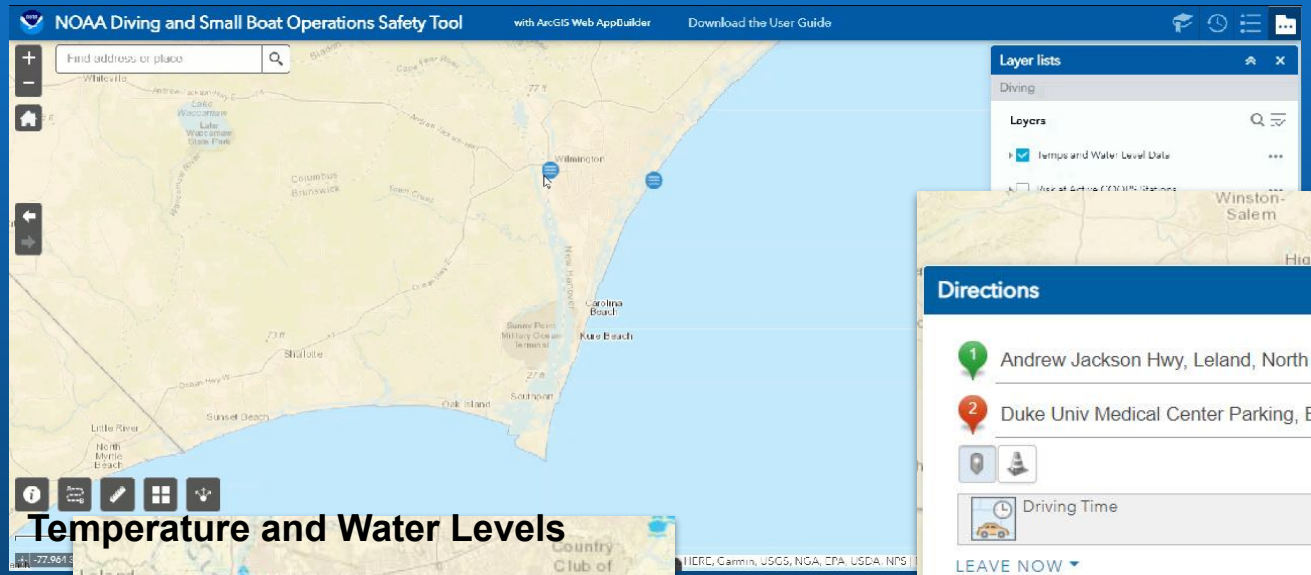

Currently for internal NOAA use: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=72e16b7109bd41dfbf79b69b1eaf1b08

# Dive Planning

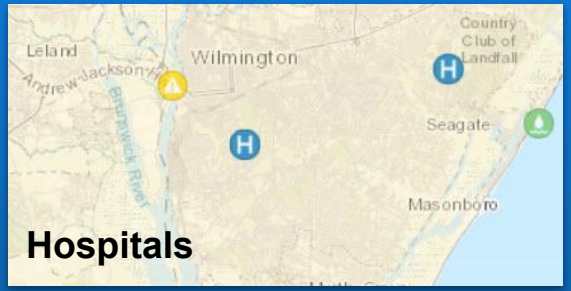
- Divers are required to prepare pre-dive plans with safety information specific to each site.
- CO-OPS station layer includes a link to:
  - Water temperature & tides
  - Estimated contaminated water risk
  - Recommended gear
  - Nearest hyperbaric chamber & hospital



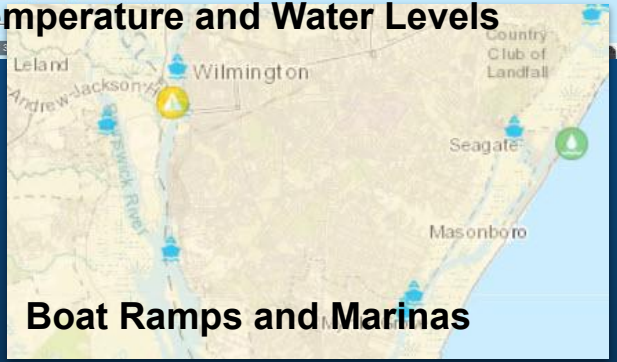
# Dive Planning



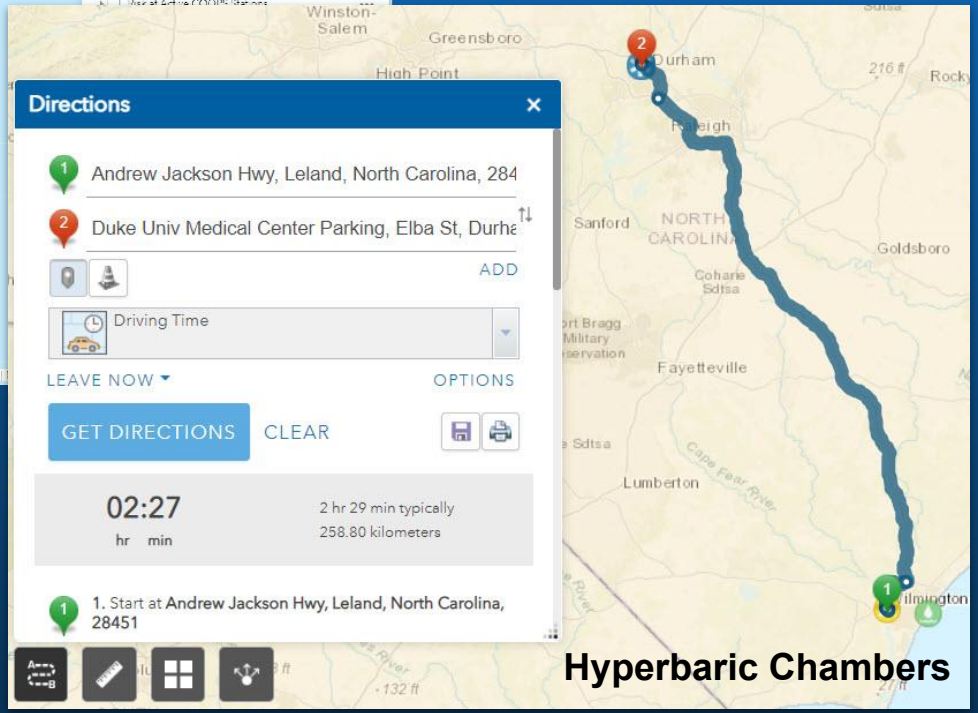

Temperature and Water Levels




Hospitals



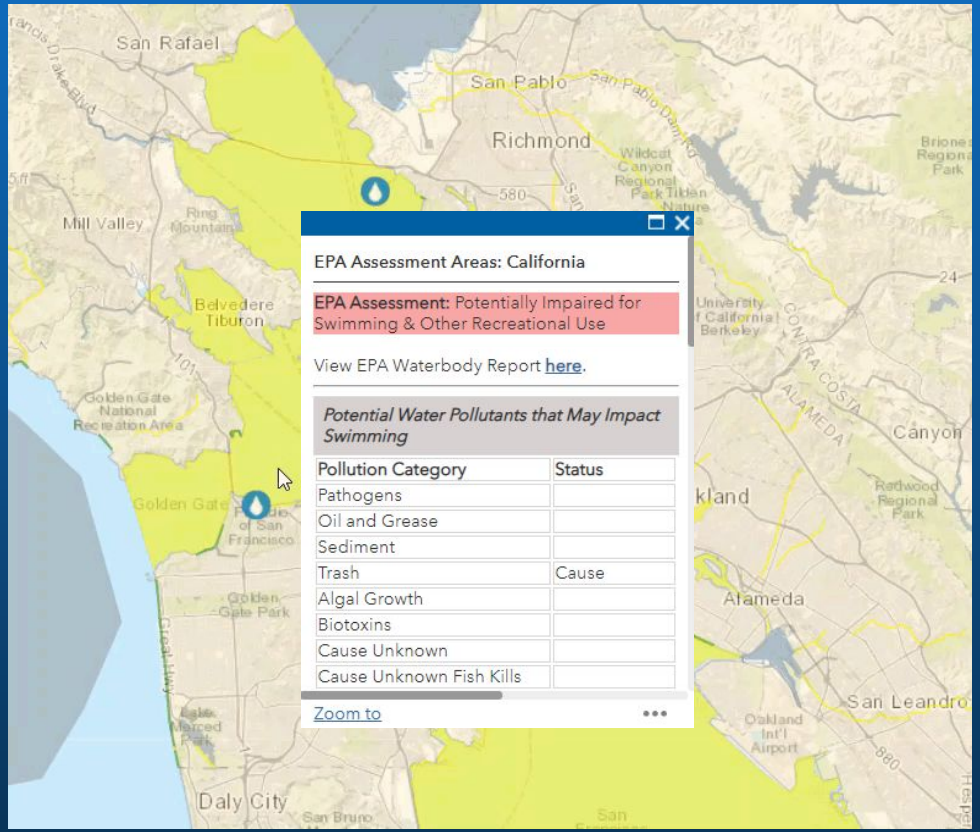

Boat Ramps and Marinas




Hyperbaric Chambers

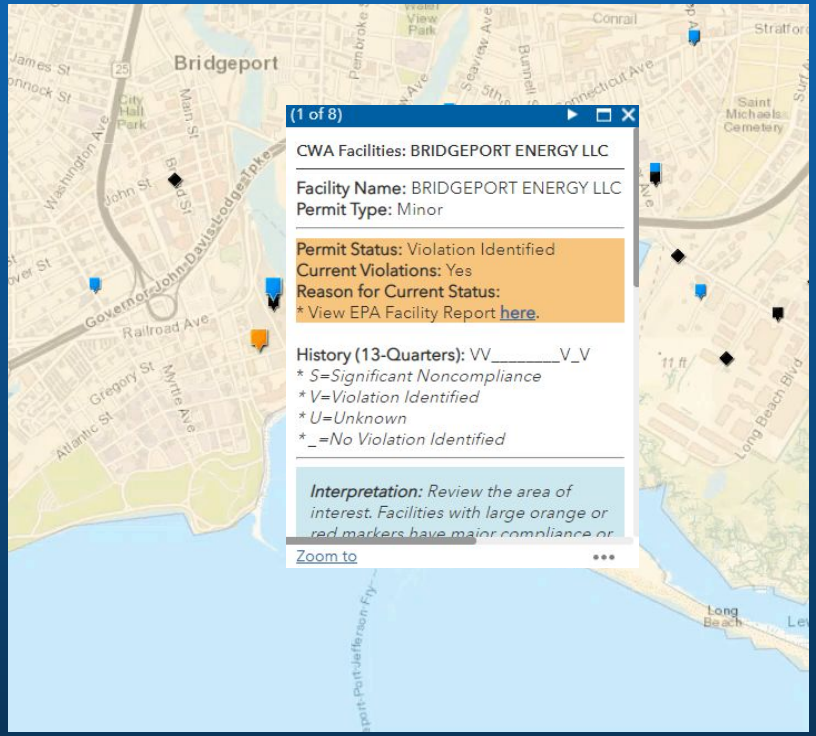
# EPA Impaired Waters for Recreational Use

- Displays the EPA rating for recreational water bodies.
- Separated into pollutants in the water column vs. those in sediments.
- Risk for short-term vs. chronic exposure.
- Source: [mywaterway.epa.gov](mywaterway.epa.gov)



# EPA Clean Water Act Compliance Status of Facilities

- Displays quarterly compliance status of facilities with EPA permits to discharge pollutants into the water, including suspended solids and oil (Source: echo.epa.gov)

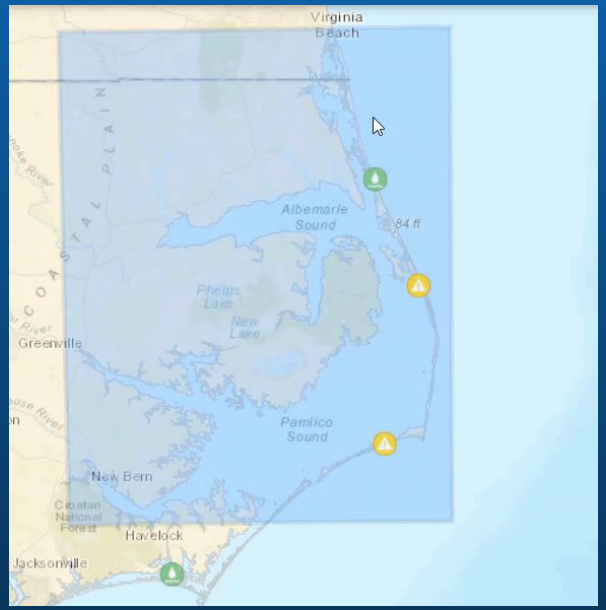



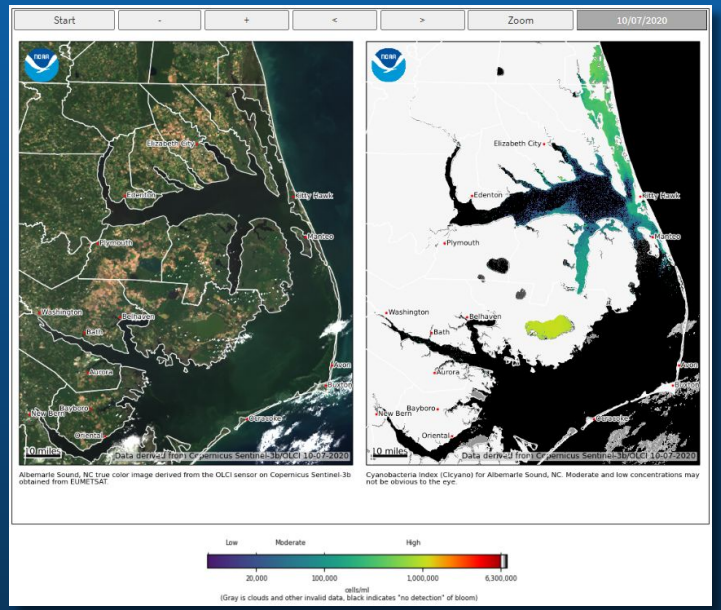
# NOAA Office of Response & Restoration Incident News

- Recent oil spills and other events reported to NOAA
- Source: https://incidentnews.noaa.gov/ RSS feed

# Cyanobacteria and Harmful Algal Bloom Monitoring

- Some cyanobacteria and algal blooms produce toxins that are harmful to humans
- Layer links to available NOAA monitoring data

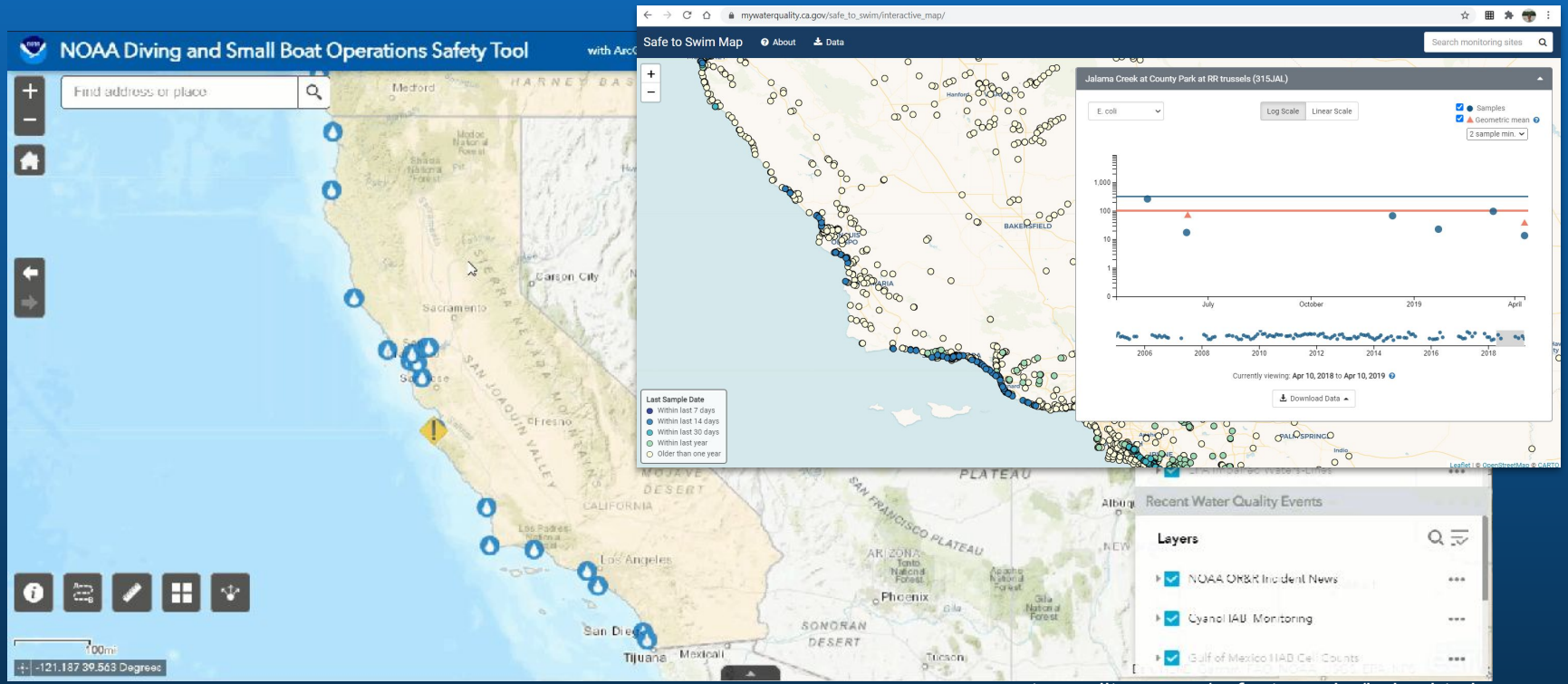



coastalscience.noaa.gov/research/stressor-impacts-mitigation/hab-monitoring-system

# State Beach Monitoring

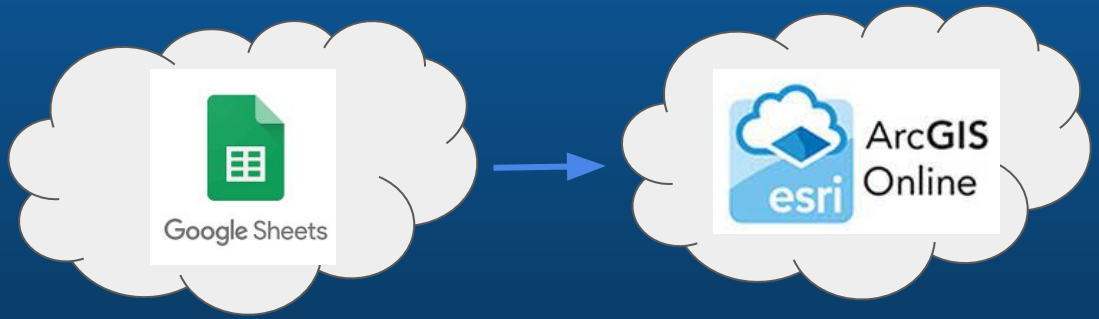
- States provide up-to-date water quality information




www.mywaterquality.ca.gov/safe_to_swim/index.html

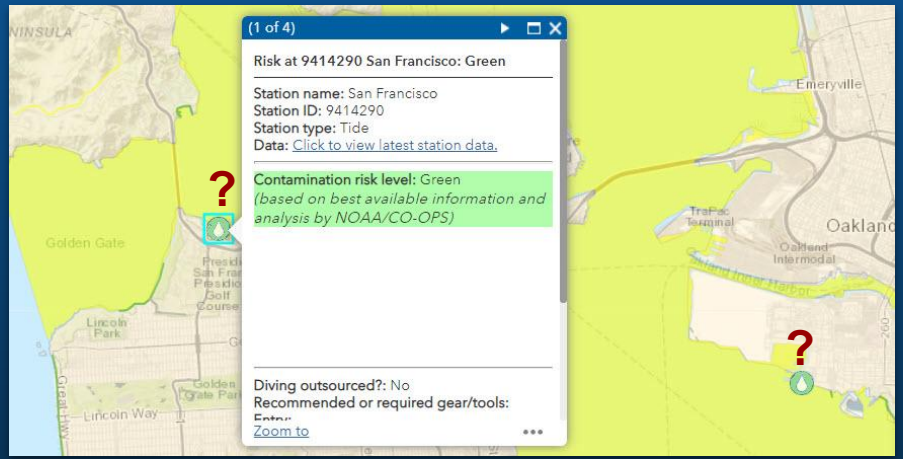
# Behind the scenes

- Cross-agency collaboration:
  - Web application hosted on NOAA's GeoPlatform
  - CO-OPS station layers are updated directly from Google Sheets
- Efficiency: Python script copies EPA data layers and updates weekly

# Benefits

- Saves people
  - Helps divers avoid high risk areas, especially where contamination is unexpected
  - Record of contamination can aid medical data/treatment of divers for chronic exposure
- Saves time: 20 minutes in planning time per dive location
- Saves money: $1000s for each trip that is averted to avoid a recent contamination event (i.e. post-hurricane or oil spill)



# Next steps

- Spring/Summer 2021-Expand beyond CO-OPS to other NOAA programs:
  - All dive units (330+ divers)
  - Small boat fleet (430+ small boats, 100+ units, 700+ operators)
  - 14 research ships
- Fall 2021-Optimize the tool: Use a GIS model for the CO-OPS risk layer instead of manual process
- 2022-Use the data to update safety procedures:
  - Update criteria for exposure to contaminated water (e.g. acceptable risk)
  - Identify specific sites that are “potentially” contaminated and collect samples for analysis
  - Establish medical testing guidelines for divers based on chronic exposure

**Questions?**

**Email nos.co-ops.gisteam@noaa.gov**