NOAA West Watch: Reporting Regional Environmental Conditions & Impacts in the West

April 26, 2022

Desert Research Institute

Western Regional Climate Center

National Oceanic and Atmospheric Administration · U.S. Department of Commerce

IOOS | Integrated Ocean Observing System

Call Agenda

- Project Background (Dan McEvoy)
- Guest speaker: Dr. Joe Casola, ***NOAA West Watch, Past, Present, and Future***
- Regional Climate and ENSO brief (Dan McEvoy)
- IOOS Nearshore Conditions brief (Jan Newton, Henry Ruhl, Clarissa Anderson)
- Discussion - Environmental conditions and impacts reporting (All)
  - Additional impacts to share?

Project Background

- Run by the Western Regional Climate Center, in partnership with the NOAA Western Regional Collaboration Team (NOAA West)
- Standing contributions from the three Integrated Ocean Observing System Regional Associations.

- Project Goals:
  - Serve as forum for bringing together NOAA staff and partners from across the agency and region to share information about regional scale environmental observations and impacts on human systems.
  - Help facilitate interdisciplinary connections and the exchange of information among agency staff and partners on regional climatic and oceanic conditions, particularly departures from normal.

These webinars are not formal public releases of data.

NOAA West Watch

Past, Present, and Future

Joe Casola

Western Regional Climate Services Director

NOAA/National Centers for Environmental Information

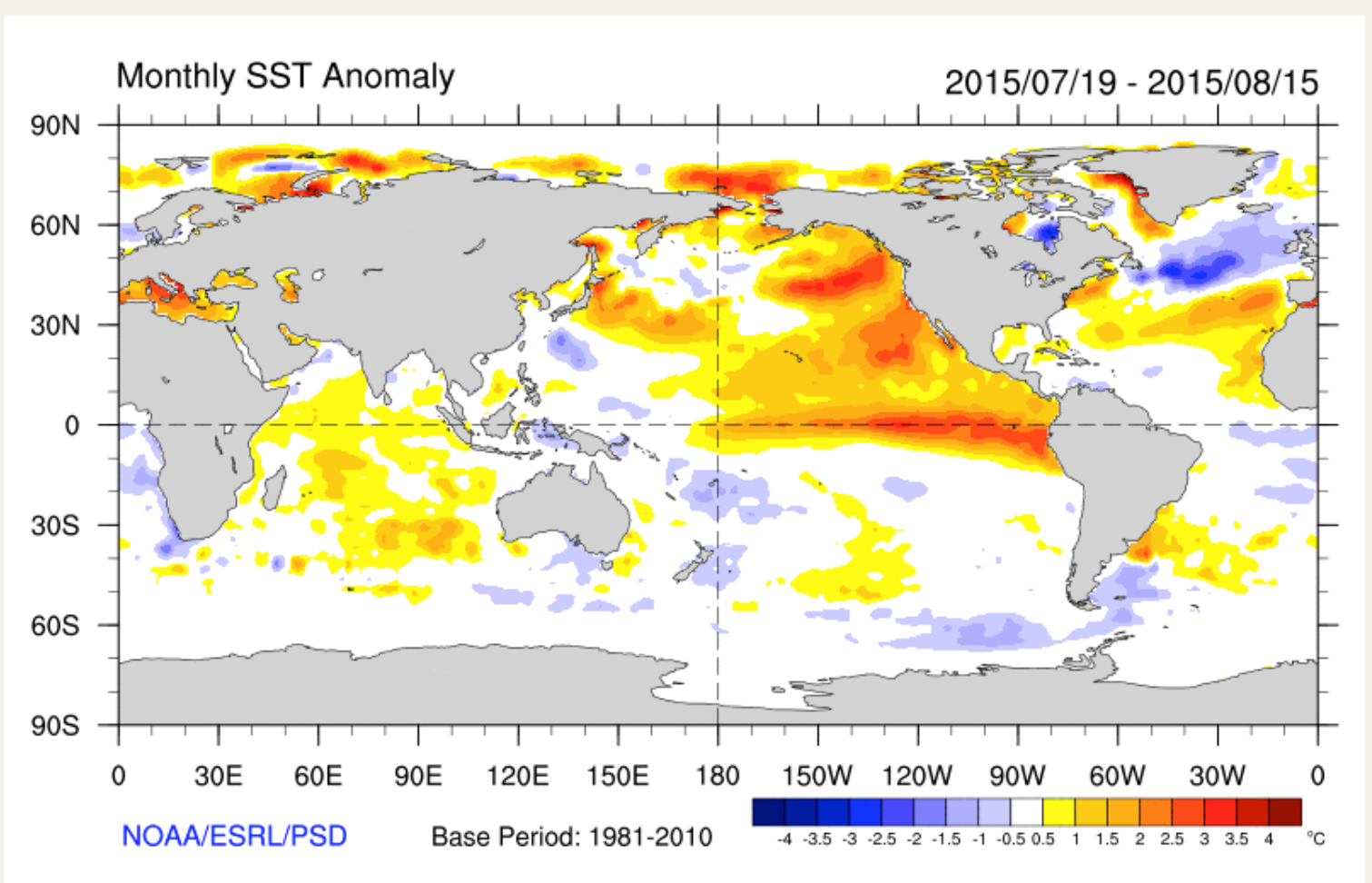
National Oceanic and Atmospheric Administration

April 26, 2022

My Background

- Began as Western Regional Climate Services Director, Jan 2022
- Based at NOAA's Boulder, CO Campus
- Background as a climatologist
- Interests in snow hydrology, water resources, and climate adaptation

West Watch inspiration: 2015/2016 El Niño



Source: NOAA/ESRL

West Watch Goals: August 2015

Regional Coordination Proposal Goals

Changing Climate Conditions & Regional Impacts Coordination Goals:

1. Share and document anomalous environmental information and their impacts on human systems.

2. Improve internal awareness of unusual environmental observations across NOAA mission lines

3. Improve communication and coordination between NOAA in the region (e.g. NMFS science centers and region, NWS region, NOS OCM and OCS, NESDIS NCEI, and OAR PMEL and ESRL) and NOAA funded regionally based partner entities involved in monitoring and communicating about changing climate conditions and impacts (e.g., IOOS, Sea Grant, RISA, State Climatologists, Western Regional Climate Center, etc)

4. Improve external communication of changing climate conditions, including but not limited to El Niño

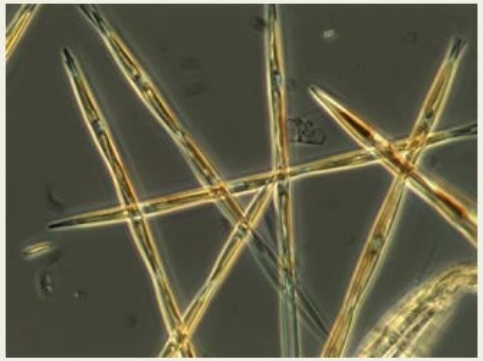
Widespread impacts across the West

Sockeye salmon veered off course to the Little White Salmon River to escape the heat of the Columbia River, but many died like the one in the foreground. In the background is a sockeye with large patches of white fungus. (Steve Ringman/The Seattle Times)

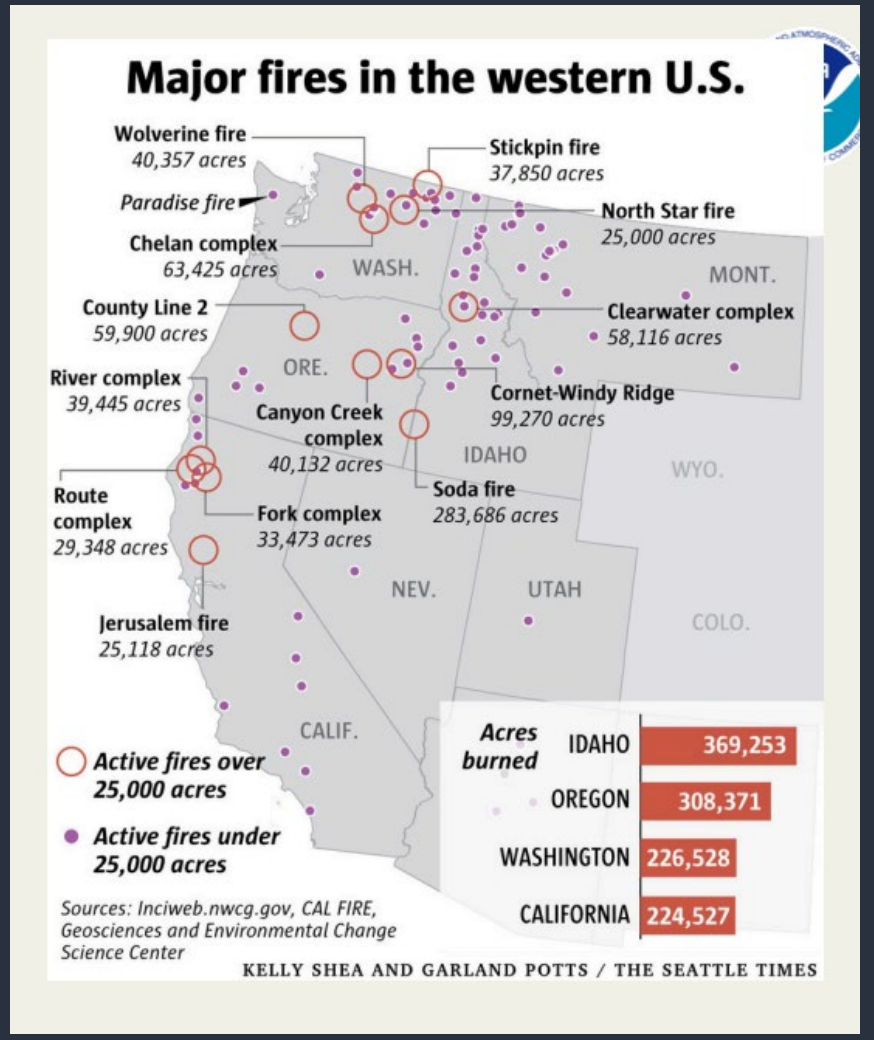
Steve Pribyl, of the Deschutes River Alliance, holds a sockeye salmon in the Deschutes River. Pribyl found hundreds of the migratory fish dying of a bacterial infection that spreads in warm waters. (Photo courtesy of Steve Pribyl)

Monitoring suggests warm conditions are having negative consequences on the Puget Sound marine environment with increasing harmful algae blooms, increasing and early shellfish closures, lower dissolved oxygen levels, and unfavorable conditions for salmon and other cold-loving marine species. WA Dept. of Ecology http://ecologywa.blogspot.com/2015/07

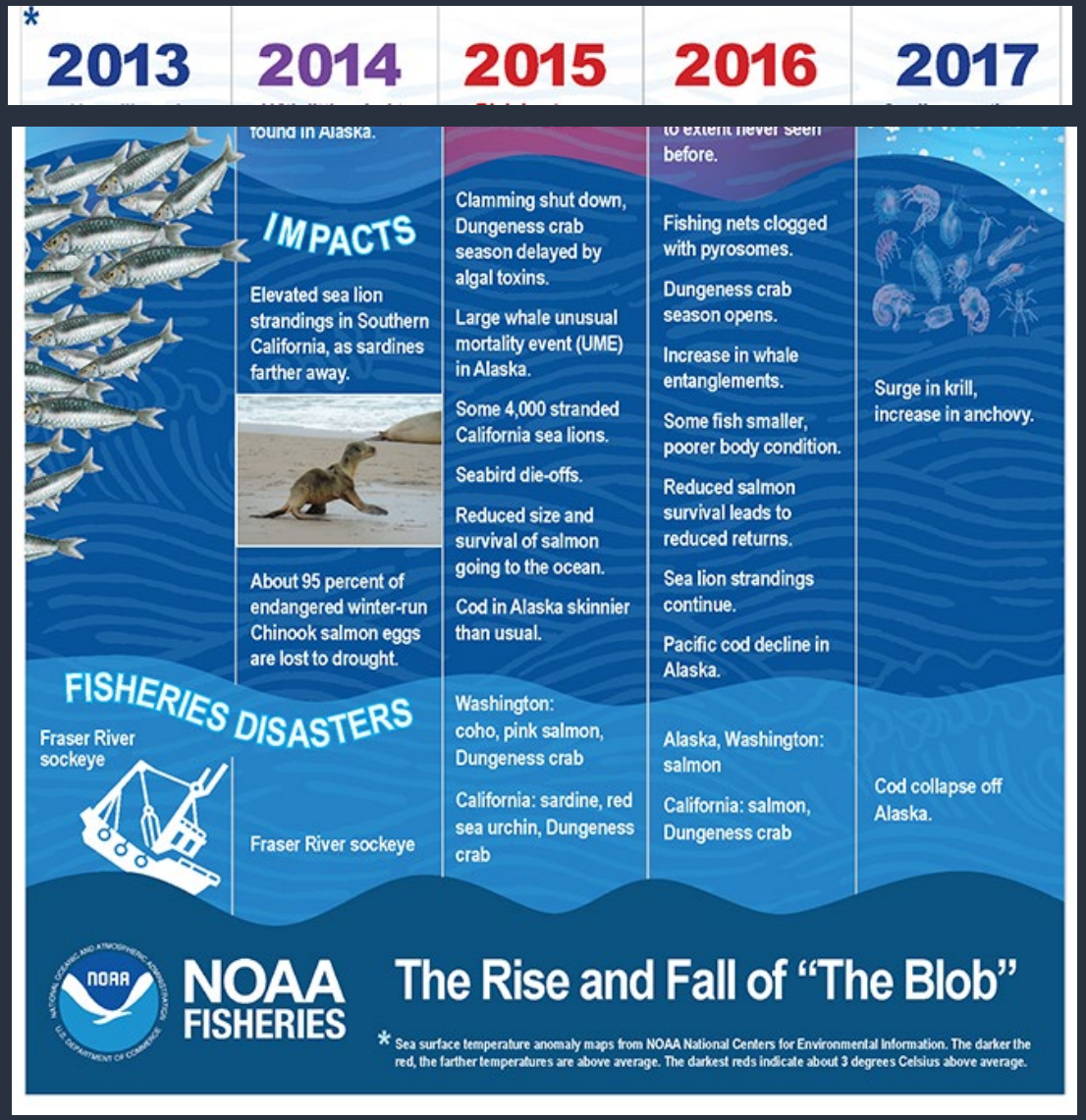
This is a California sea lion on Long Beach, Washington, apparently experiencing seizures from domoic acid poisoning in May 2015. Dan Ayres/Washington Department of Fish and Wildlife

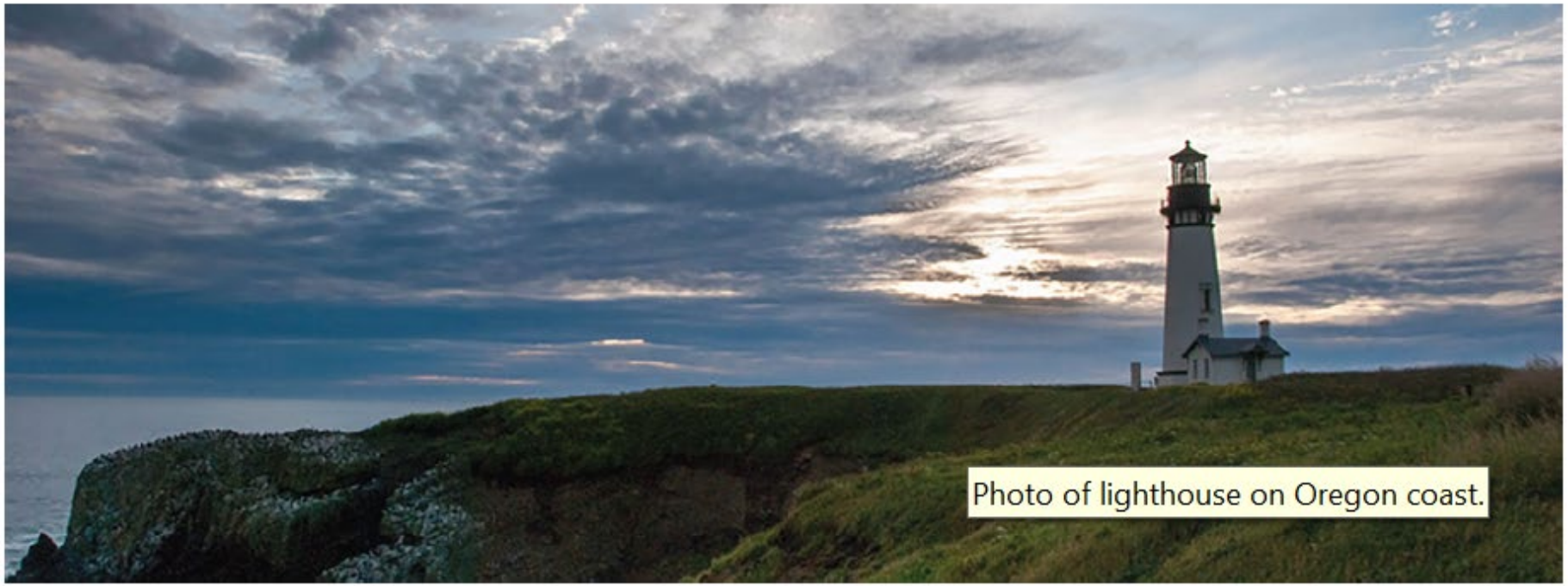


The algae pseudo-nitzchia, which produces the toxic domoic acid, is seen from an algae bloom sample collected this summer on the West Coast. One of the largest toxic algae blooms recorded off the West Coast is much denser, more widespread and may go extend deeper than initially thought, say scientists who surveyed the event. (NOAA Fisheries via AP)




Alaska
Canada
United States
*
2013
Upwelling of cool water near the coast keeps temperature lower.
2014
With little wind to cool ocean, blob develops in winter. Very low snowpack in 2014 / 2015.
2015
Blob heat wave envelops West Coast.
Elevated temperatures ashore.
El Niño develops.
2016
West Coast waters cool but Gulf of Alaska remains warm.
2017
Cooling continues, ocean trends back.
Arctic remains warm.
OCEAN CONDITIONS
ECOLOGICAL CHANGES
Krill plentiful off West Coast.
Salmon migration routes shift.
Sardine spawning farther offshore.
Species shifting north to cooler waters.
Warmer water species such as skipjack tuna found in Alaska.
Krill and forage fish decline.
Harmful algal bloom spreads in shellfish from SE Alaska to Southern California.
Fish species move northward hundreds of miles.
Juvenile salmon going to ocean find poorer quality food.
Pyrosomes appear farther north than ever recorded before.
Lacking krill, humpback whales feed on anchovy closer to shore, where crab traps are.
Shift in food web from crustaceans to gelatinous organisms with less value to fish.
Pyrosomes multiply to extent never seen before.
Return to cooler conditions.
Snowpack increases.


*
2013
2014
2015
2016
2017
found in Alaska.
to extent never seen before.
IMPACTS
Elevated sea lion strandings in Southern California, as sardines farther away.
About 95 percent of endangered winter-run Chinook salmon eggs are lost to drought.
Clamming shut down, Dungeness crab season delayed by algal toxins.
Large whale unusual mortality event (UME) in Alaska.
Some 4,000 stranded California sea lions.
Seabird die-offs.
Reduced size and survival of salmon going to the ocean.
Cod in Alaska skinnier than usual.
Fishing nets clogged with pyrosomes.
Dungeness crab season opens.
Increase in whale entanglements.
Some fish smaller, poorer body condition.
Reduced salmon survival leads to reduced returns.
Sea lion strandings continue.
Pacific cod decline in Alaska.
Surge in krill, increase in anchovy.
FISHERIES DISASTERS
Fraser River sockeye
Fraser River sockeye
Washington: coho, pink salmon, Dungeness crab
California: sardine, red sea urchin, Dungeness crab
Alaska, Washington: salmon
California: salmon, Dungeness crab
Cod collapse off Alaska.
NOAA FISHERIES
The Rise and Fall of "The Blob"
* Sea surface temperature anomaly maps from NOAA National Centers for Environmental Information. The darker the red, the farther temperatures are above average. The darkest reds indicate about 3 degrees Celsius above average.



NOAA West Watch Evaluation

A Report of Findings to NOAA's Western Regional Collaboration Team

https://wrcc.dri.edu/Climate/WestWatch/

Findings of Evaluation

- As a one-way communication tool, NOAA West Watch has an effective process for communicating technical environmental content to its intended audience.
- There is consensus that this information can be presented more effectively.
- NOAA West Watch is not an effective two-way communication tool in its current capacity and format. All groups appear to want more engagement but are discouraged by the lack of dedicated time and unclear method for discussion

Recommendations from Evaluation

- Bolster two-way communication
- Clarify goals, outcomes, and metrics for success
- Standardize time and format of presentations
- Improve accessibility of technical information
- Improve archive
  - Webinar recordings
  - Website organization/access
- Improve attendee feedback options
- Advertise and grow audience(s)

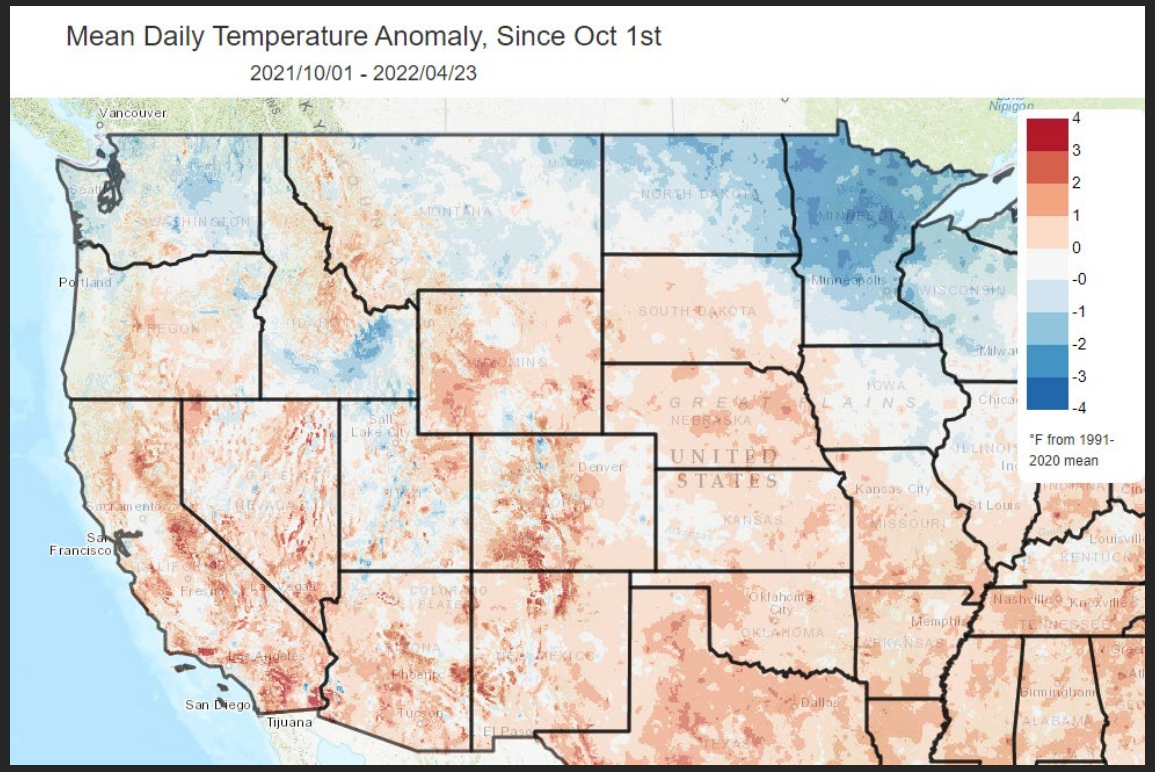
Ideas for improvement

- Who are the key audiences?
- Going back to monthly format, but alternating between monitoring discussion and project highlight
- “Open Mic” time at the beginning or end of a webinar
- Explicit metrics for success
- Broadening the functionality of the archive

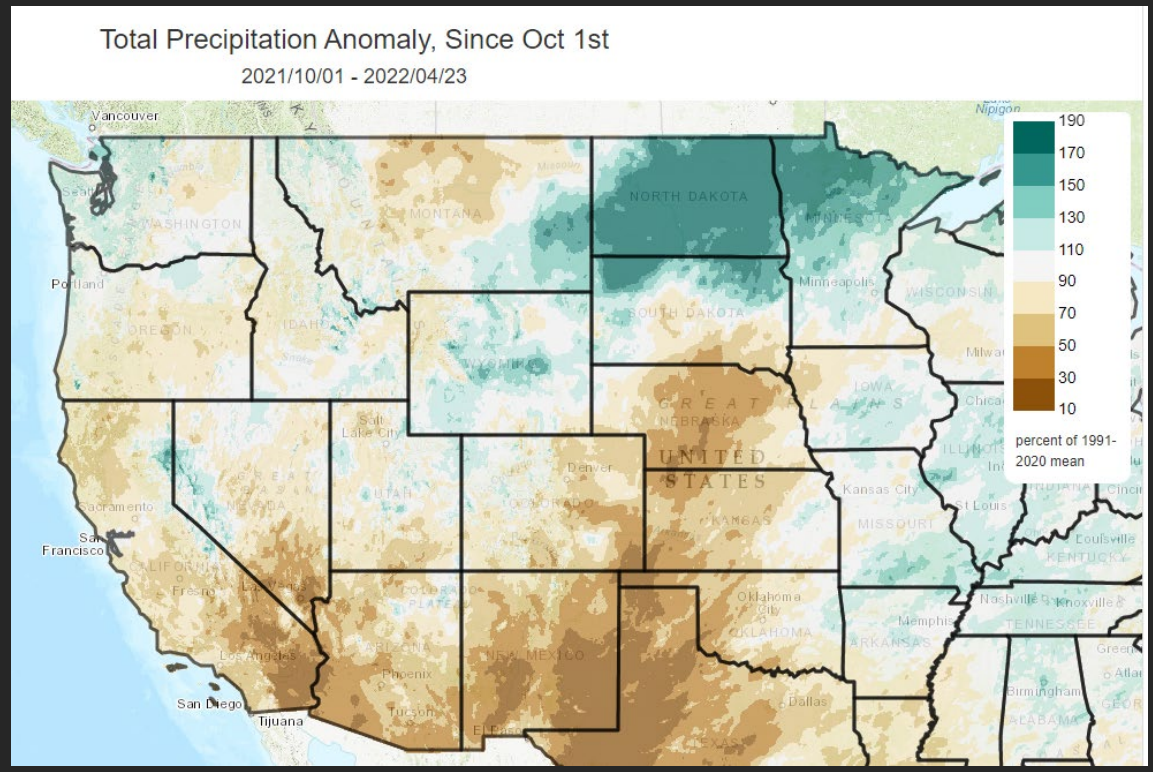
Climate Briefing: Dan McEvoy

Water Year Temperature and Precipitation

October 1-April 23 Temperature Anomaly



October 1-April 23 % of Average Precipitation

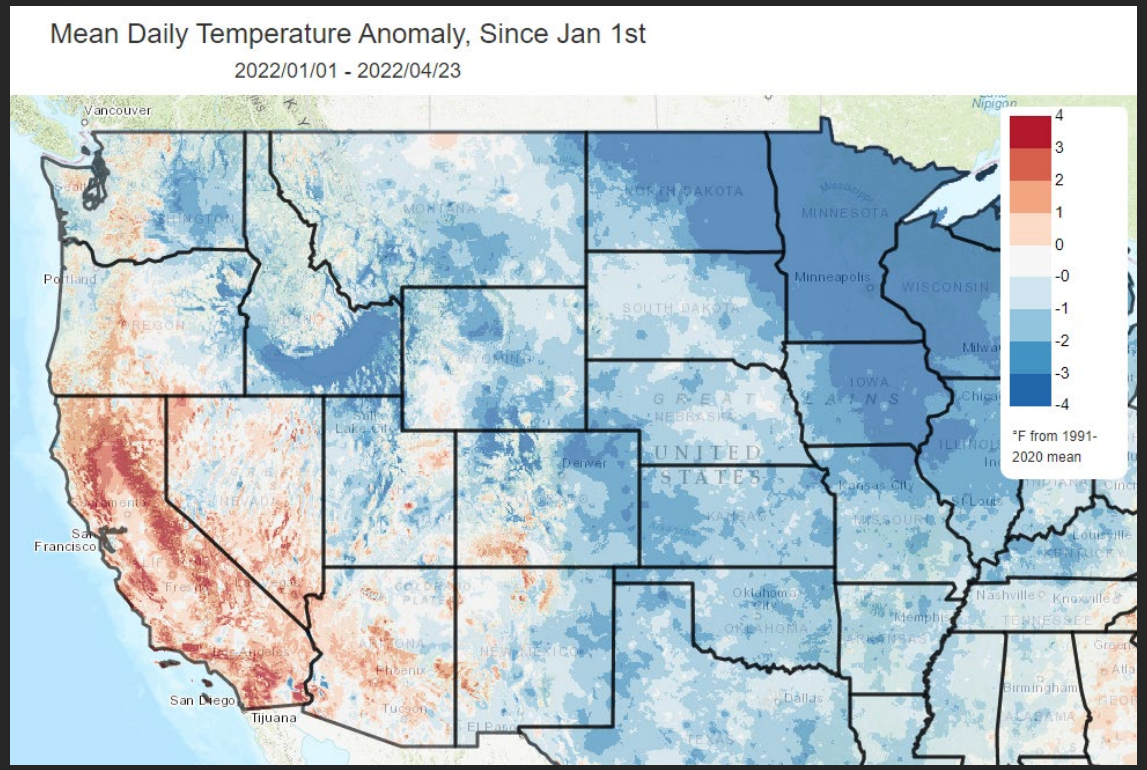


- S. California, Arizona, and New Mexico stand out as warm and extremely dry

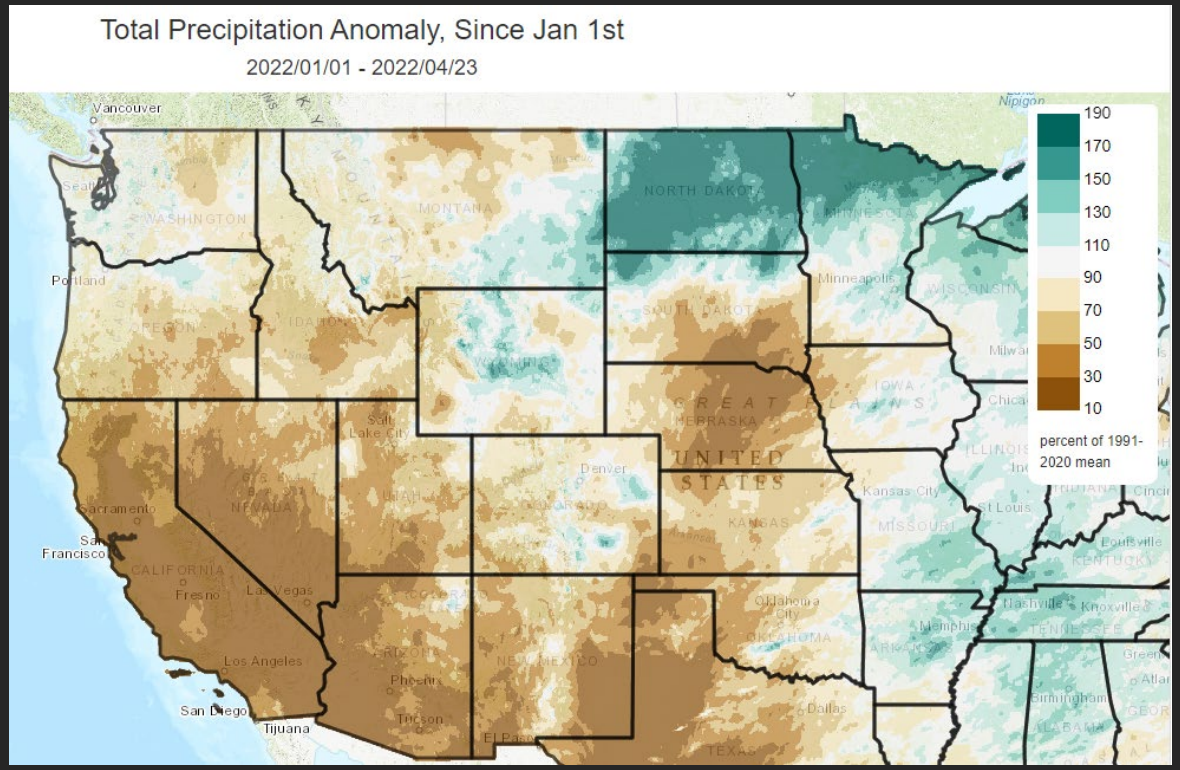
https://climatetoolbox.org/tool/climate-mapper

Calendar Year Temperature and Precipitation

January 1-April 23 Temperature Anomaly



January 1-April 23 % of Average Precipitation

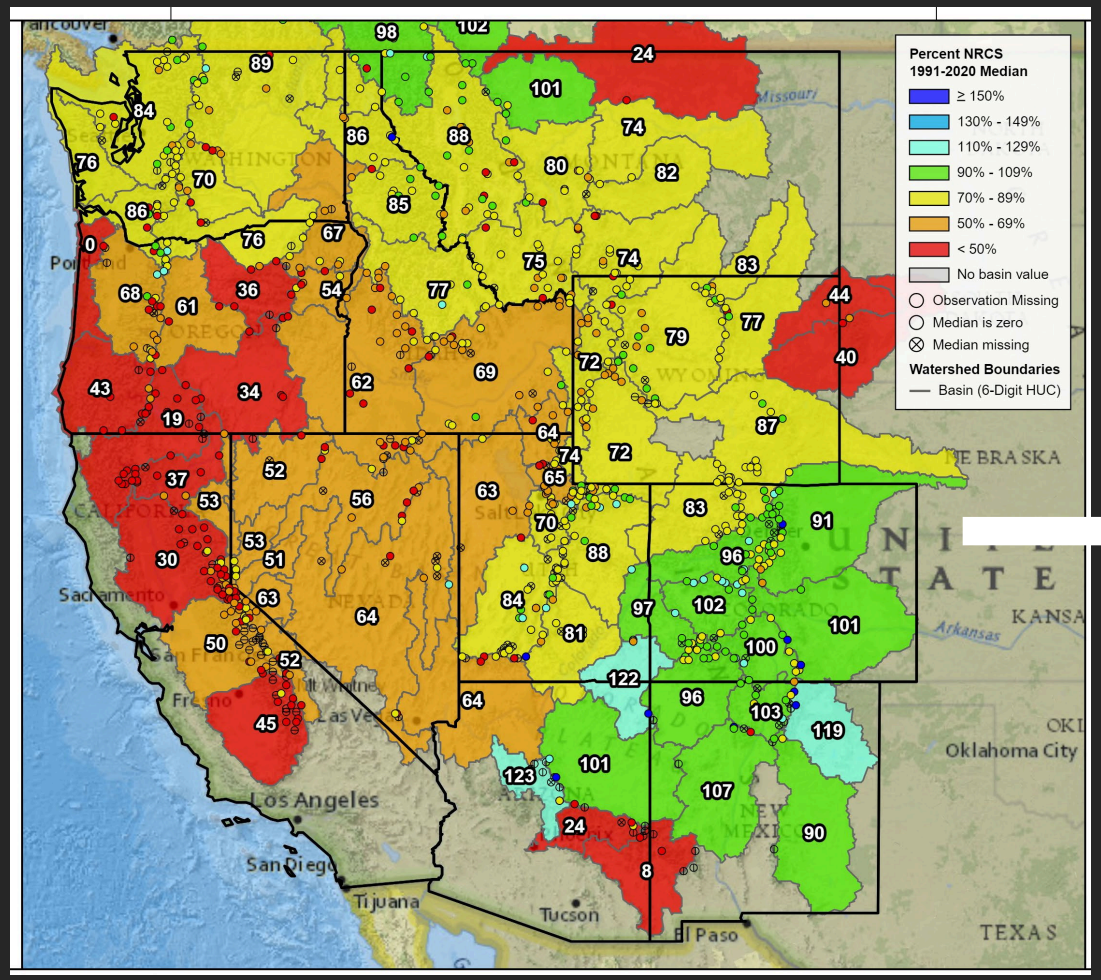


- California mountains stand out as warm and whole Southwest extremely dry

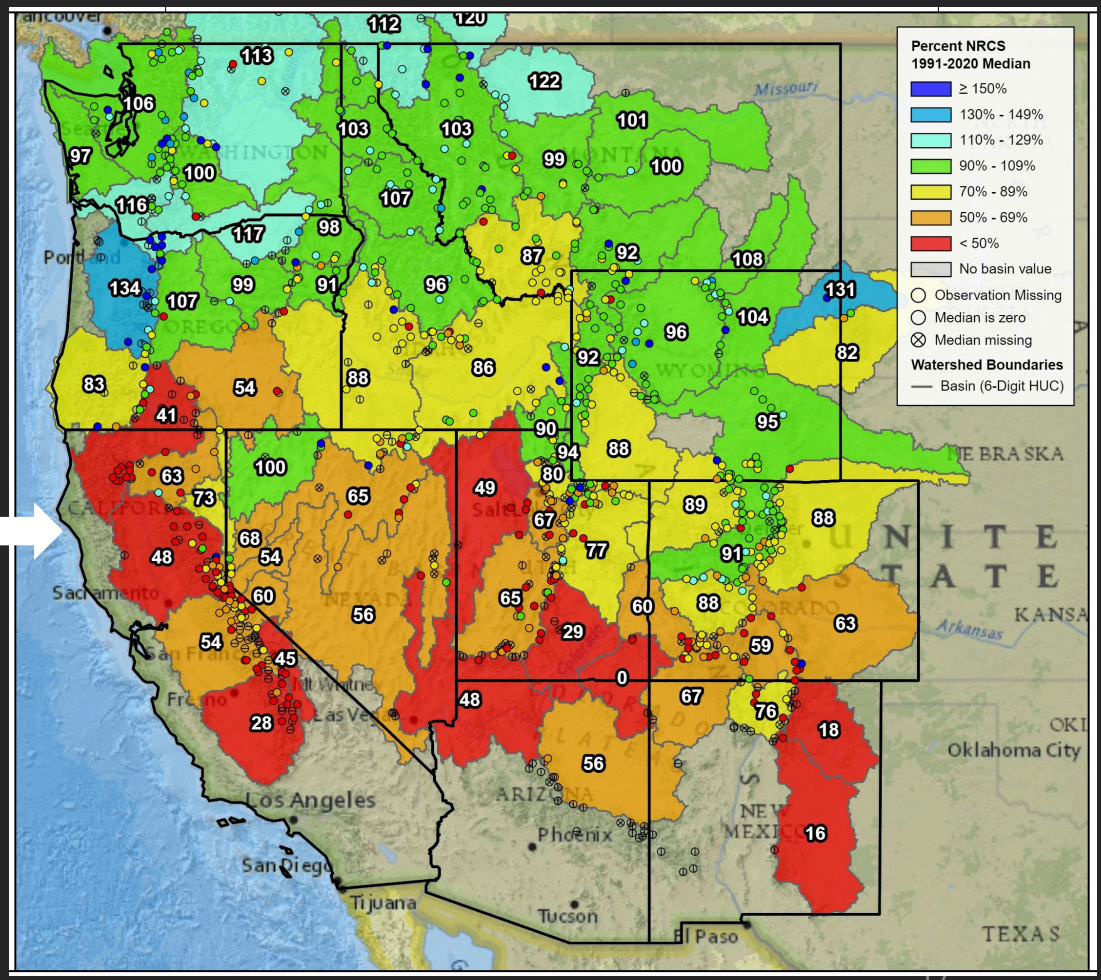
https://climatetoolbox.org/tool/climate-mapper

Mountain Snowpack

April 1, 2022, Snow Water Equivalent

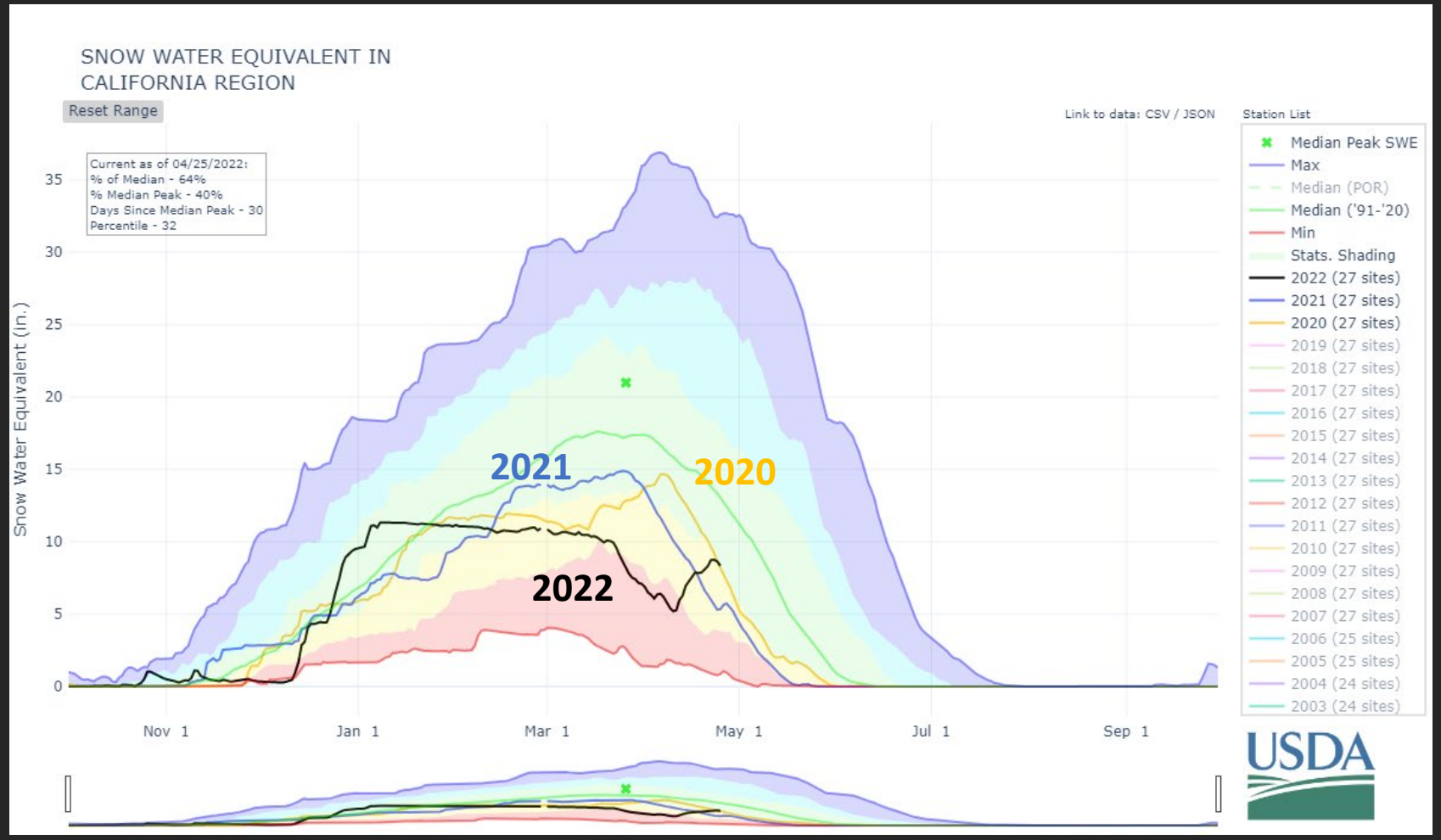


April 23, 2022, Snow Water Equivalent



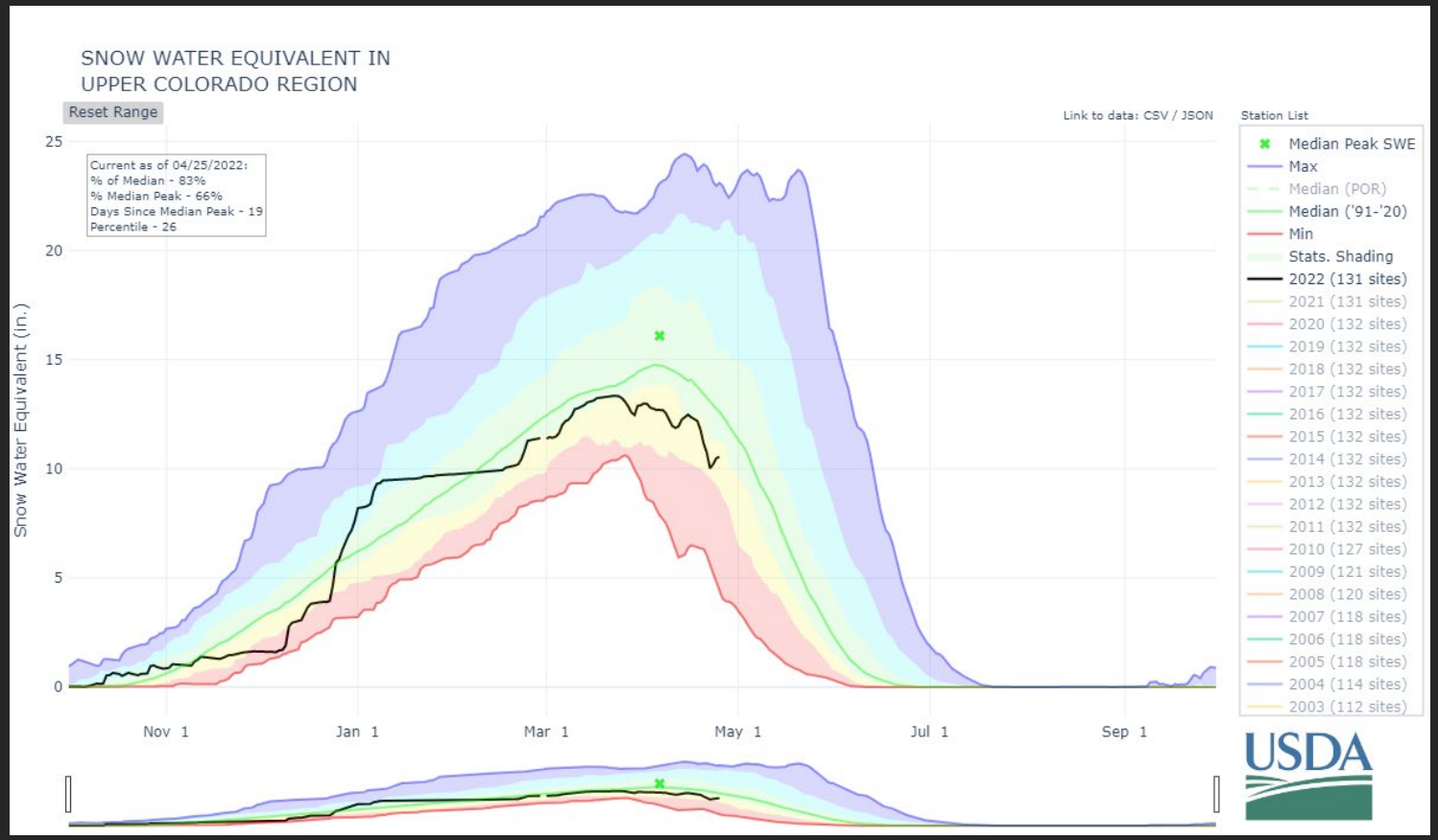
https://www.nrcs.usda.gov/wps/portal/wcc/home/

Mountain Snowpack—California

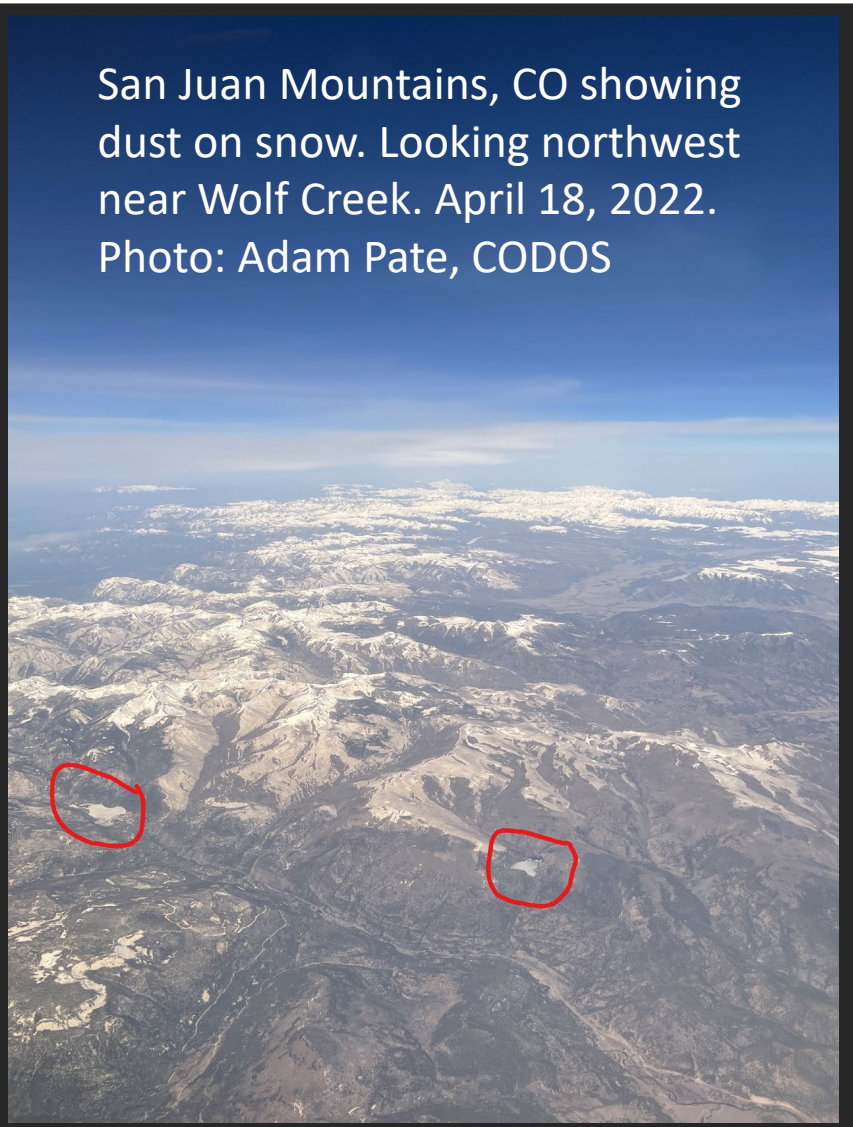


- Record snowfall in December followed by record January-March dryness
- Third year in a row with low snowpack and (likely) early melt
- April snow beneficial but not a drought buster

Mountain Snowpack—Upper Colorado



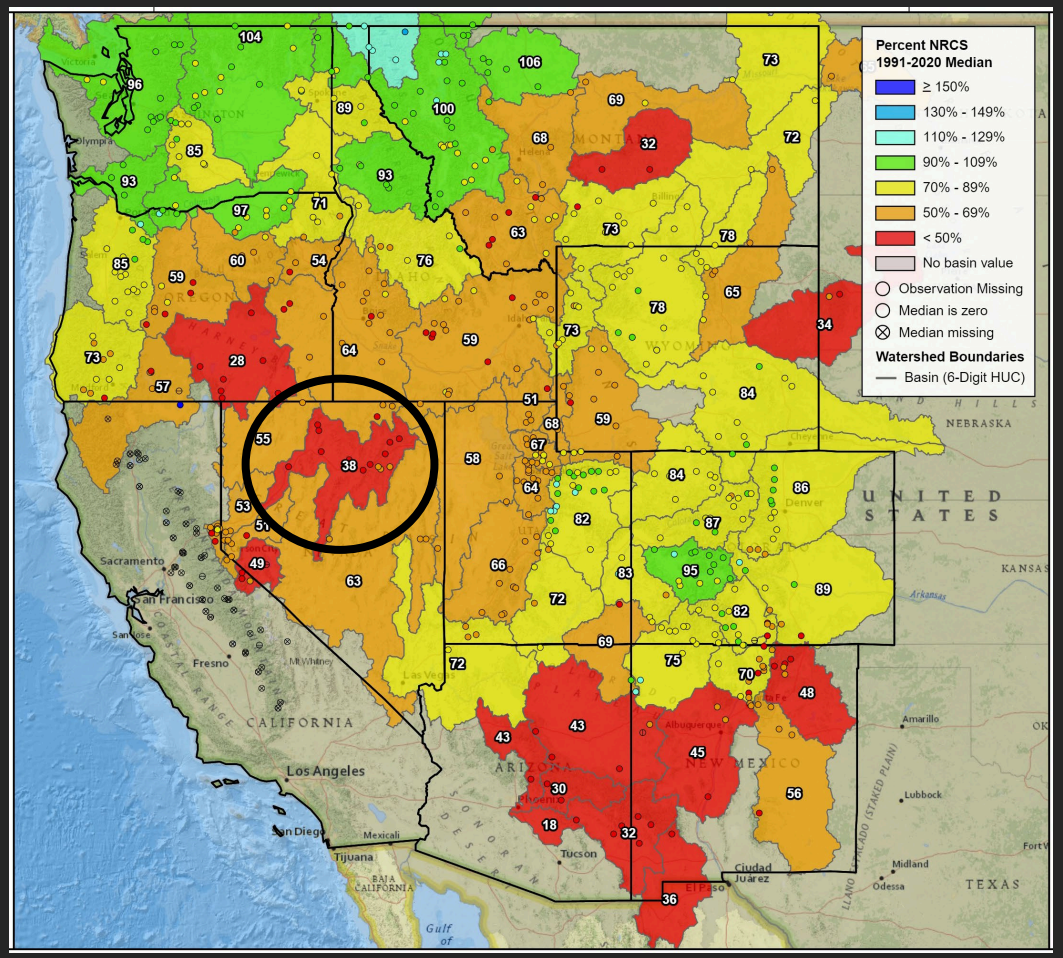
- Melting early; less SWE gains from April storms
- Dust-on-snow events can accelerate melt

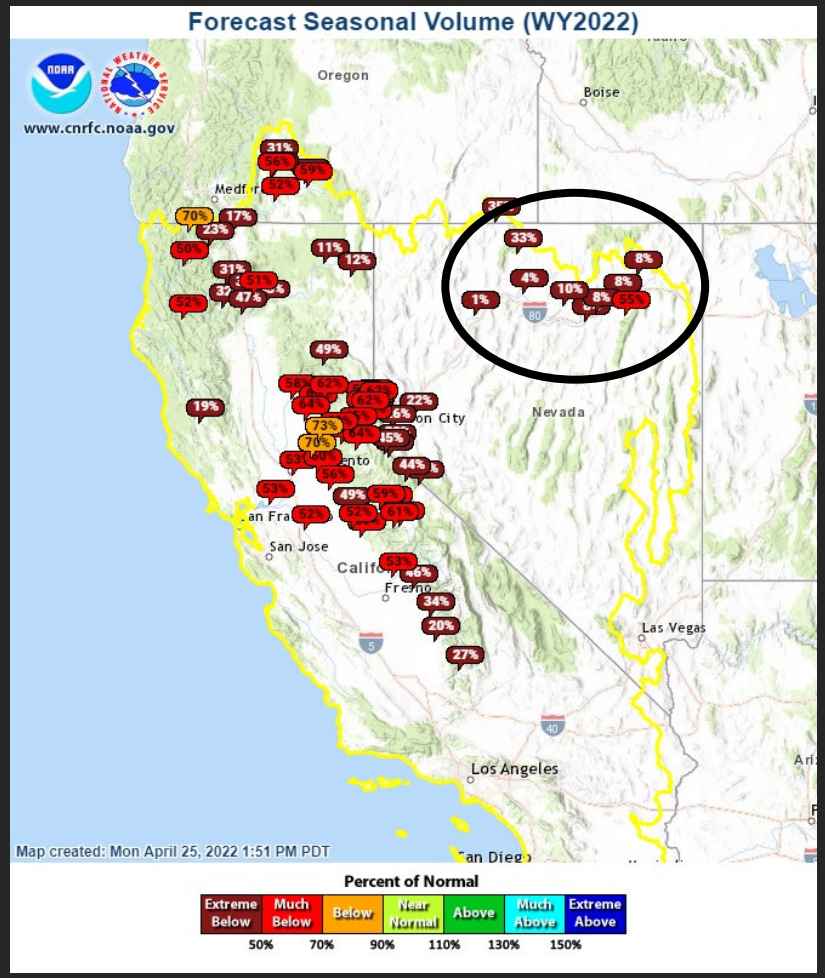


San Juan Mountains, CO showing dust on snow. Looking northwest near Wolf Creek. April 18, 2022. Photo: Adam Pate, CODOS

Runoff Forecasts

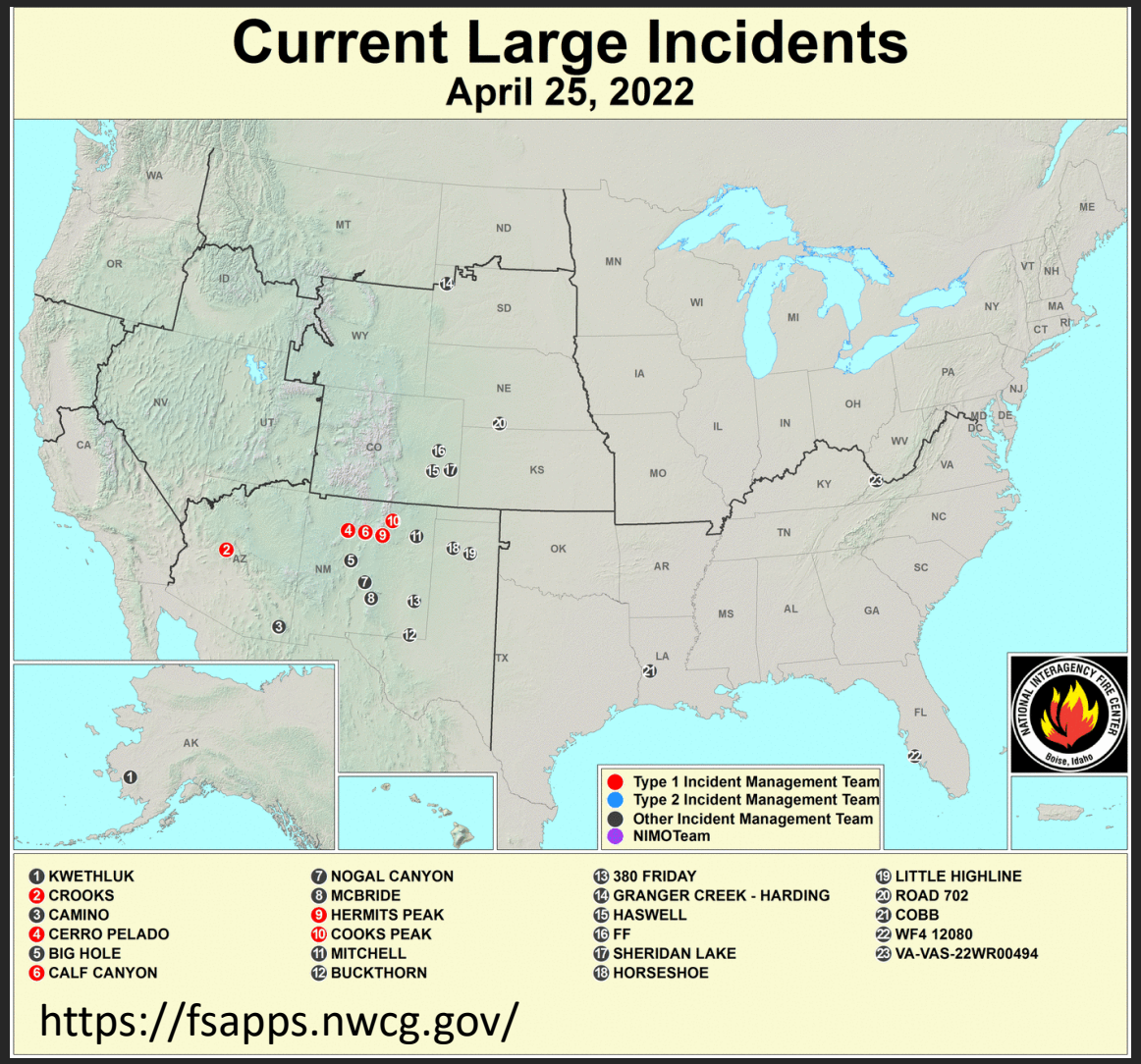
April-July, 2022 % of Median Runoff Forecast



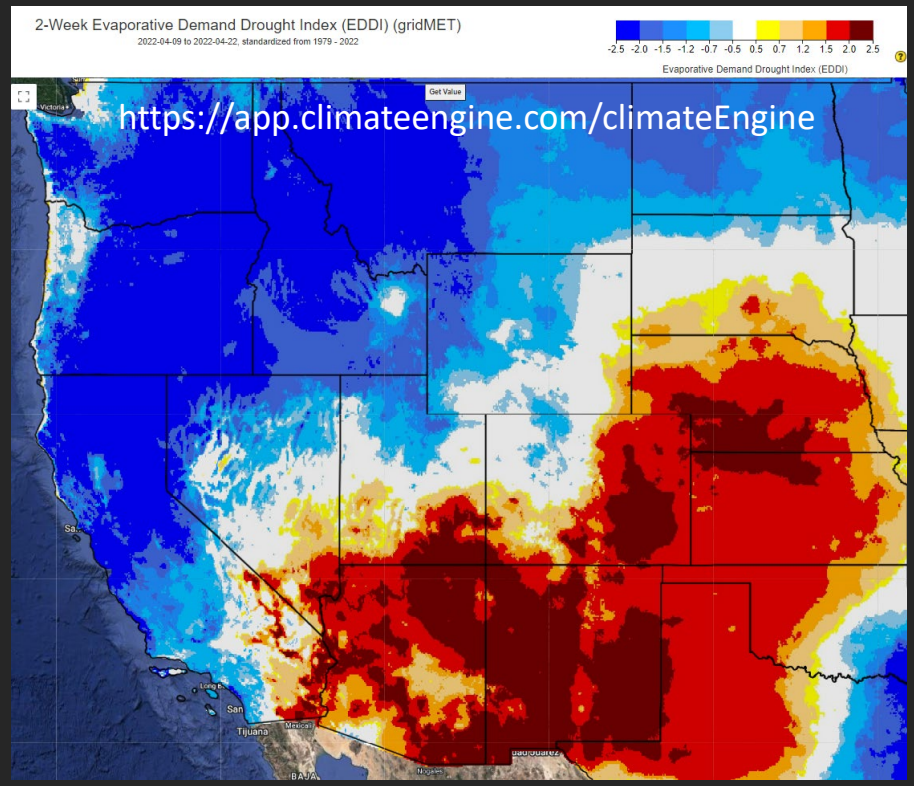


- Below average runoff expected across most of West
- Critically low volumes forecast for some basins like the Humboldt River, Nevada
- Colorado River flows will be below average again

Active Start to Wildfire Season for Arizona and New Mexico

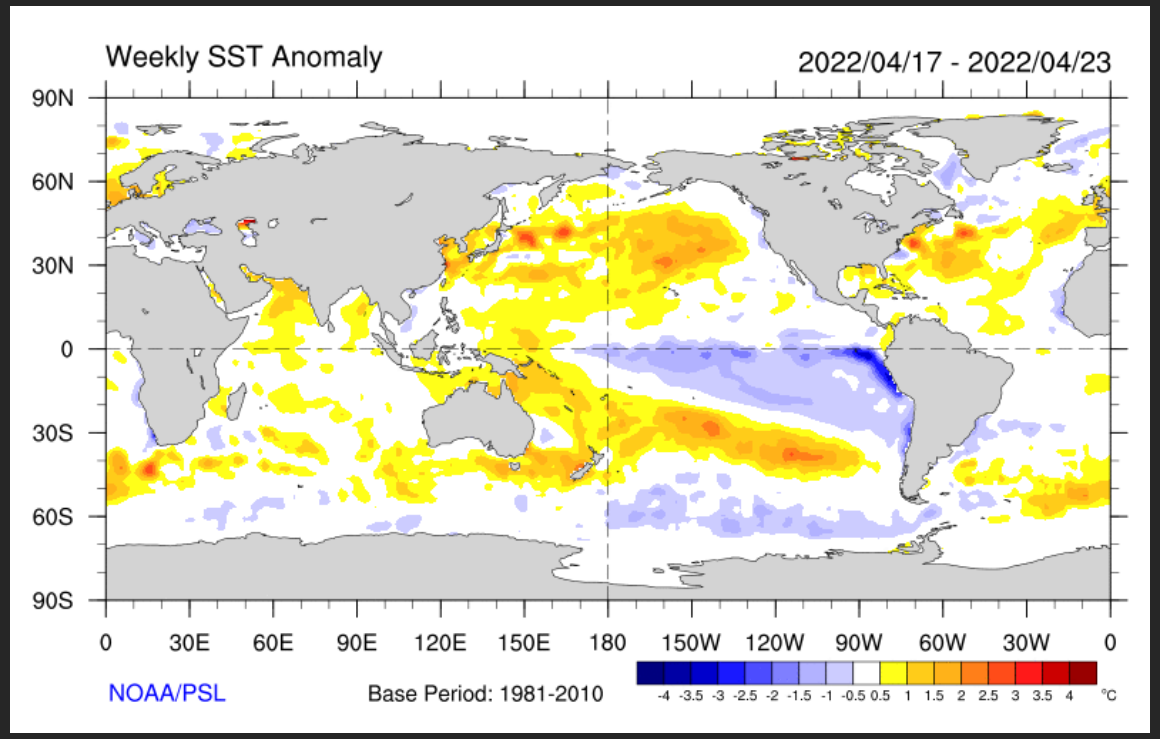


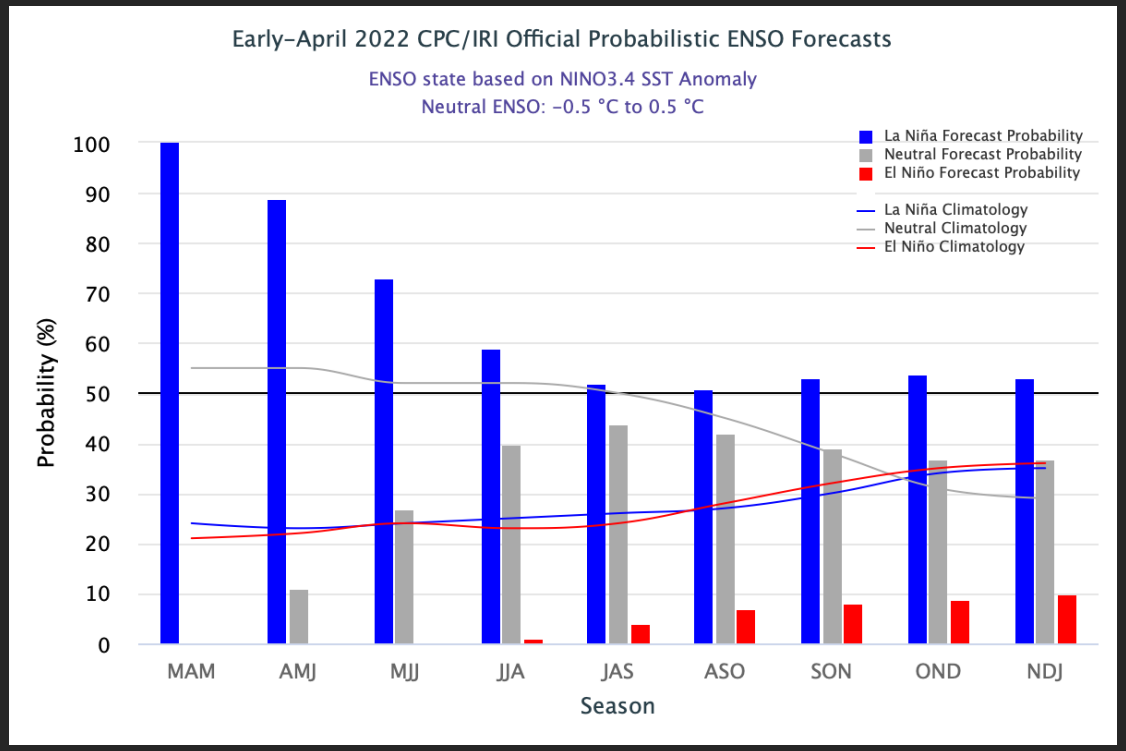
2-week Evaporative Demand Drought Index ending April 22, 2022



- High evaporative demand will draw moisture out of dead and live fuels leading to more flammable conditions

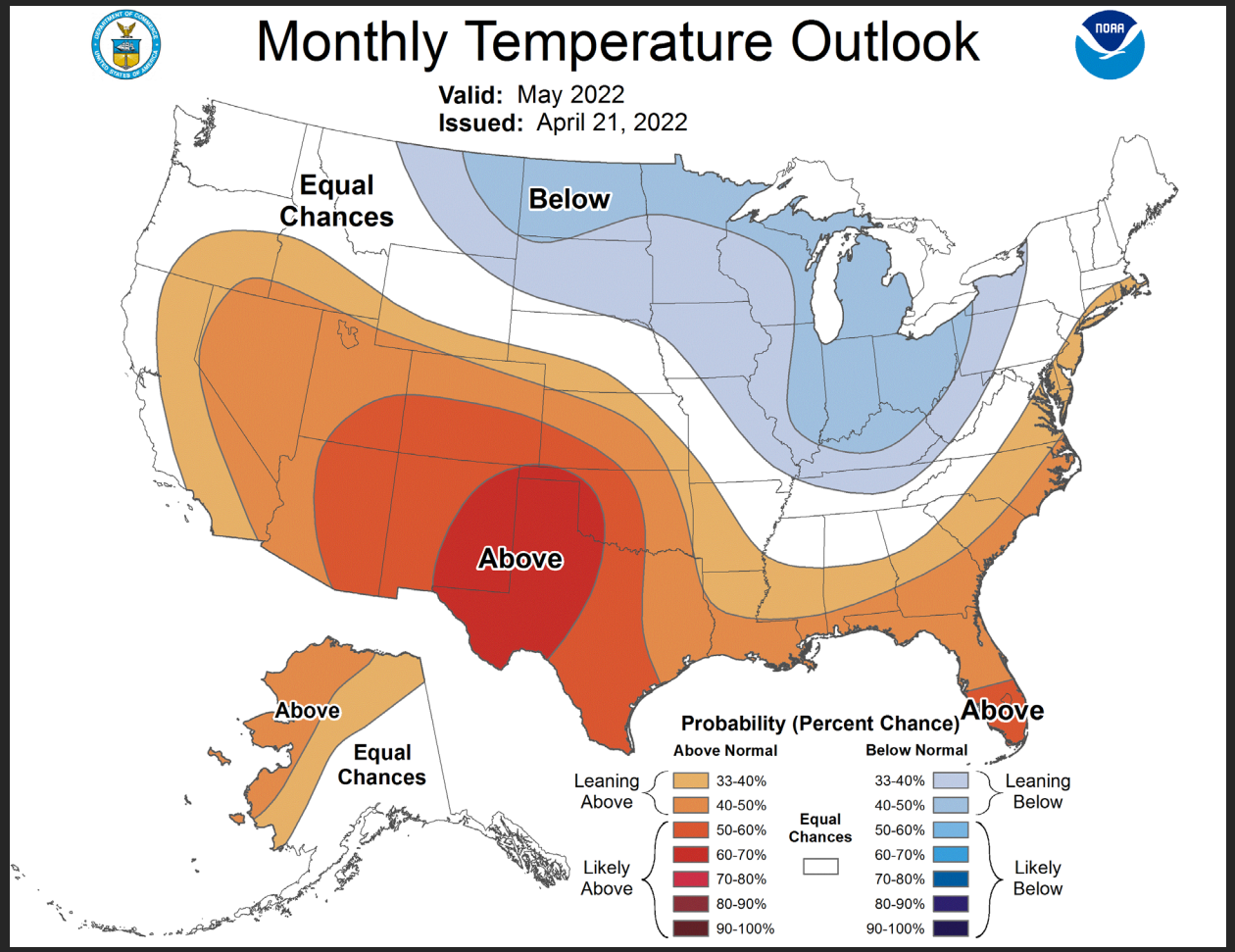
ENSO—La Niña Conditions Persist

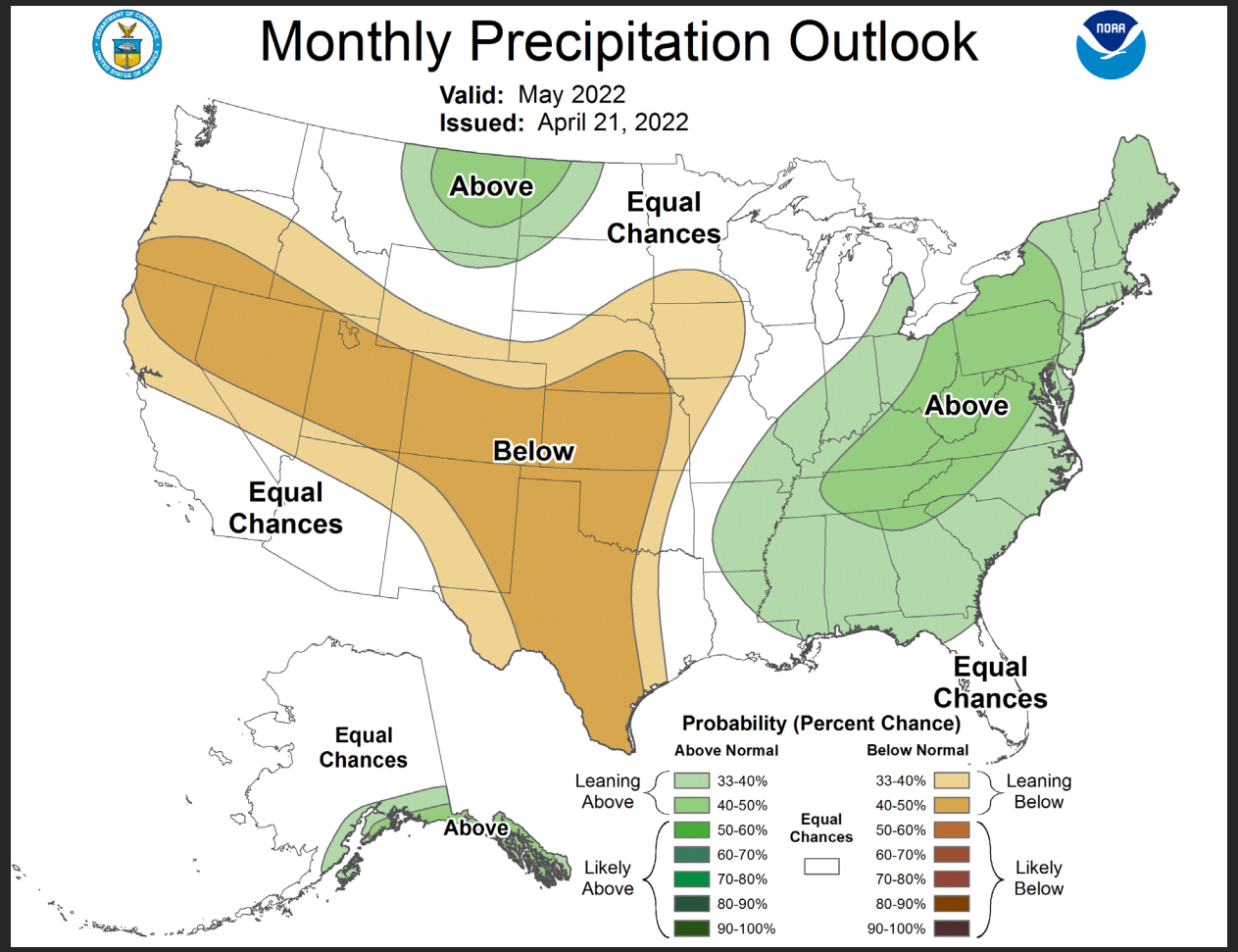




- La Niña conditions still present with below average SSTs in the eastern equatorial Pacific
- La Niña likely to continue into summer and possibly autumn

May Temperature and Precipitation Outlook





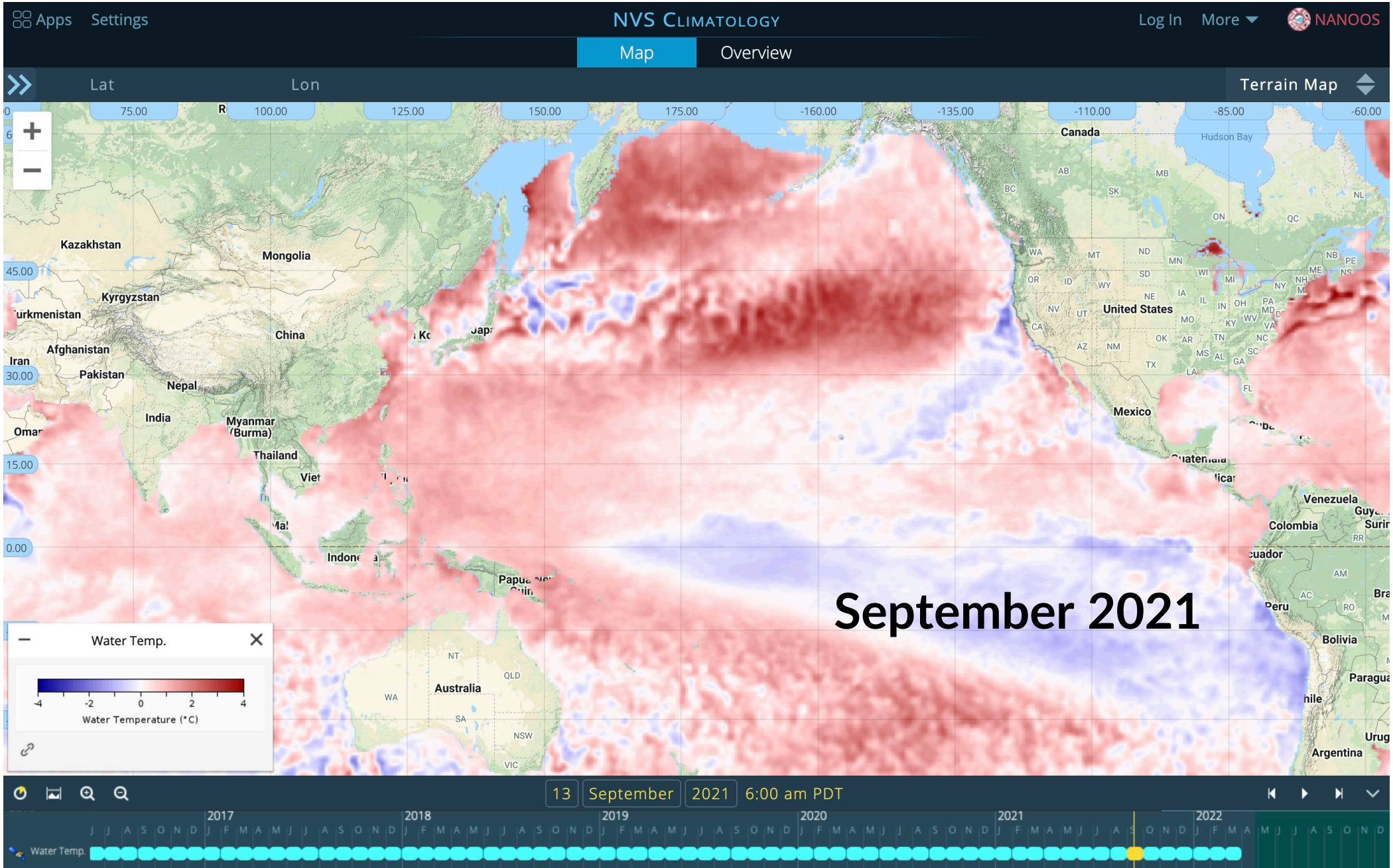
NOAA West Watch Update 26 April 2022

Jan Newton, NANOOS Executive Director
Roxanne Carini, NANOOS Research Associate
Anna Boyar, NANOOS Staff

www.nanoos.org

NANOOS: www.nanoos.org Climatology app

Sea Surface Temperature Anomaly
NCDC Optimum Interpolation SST



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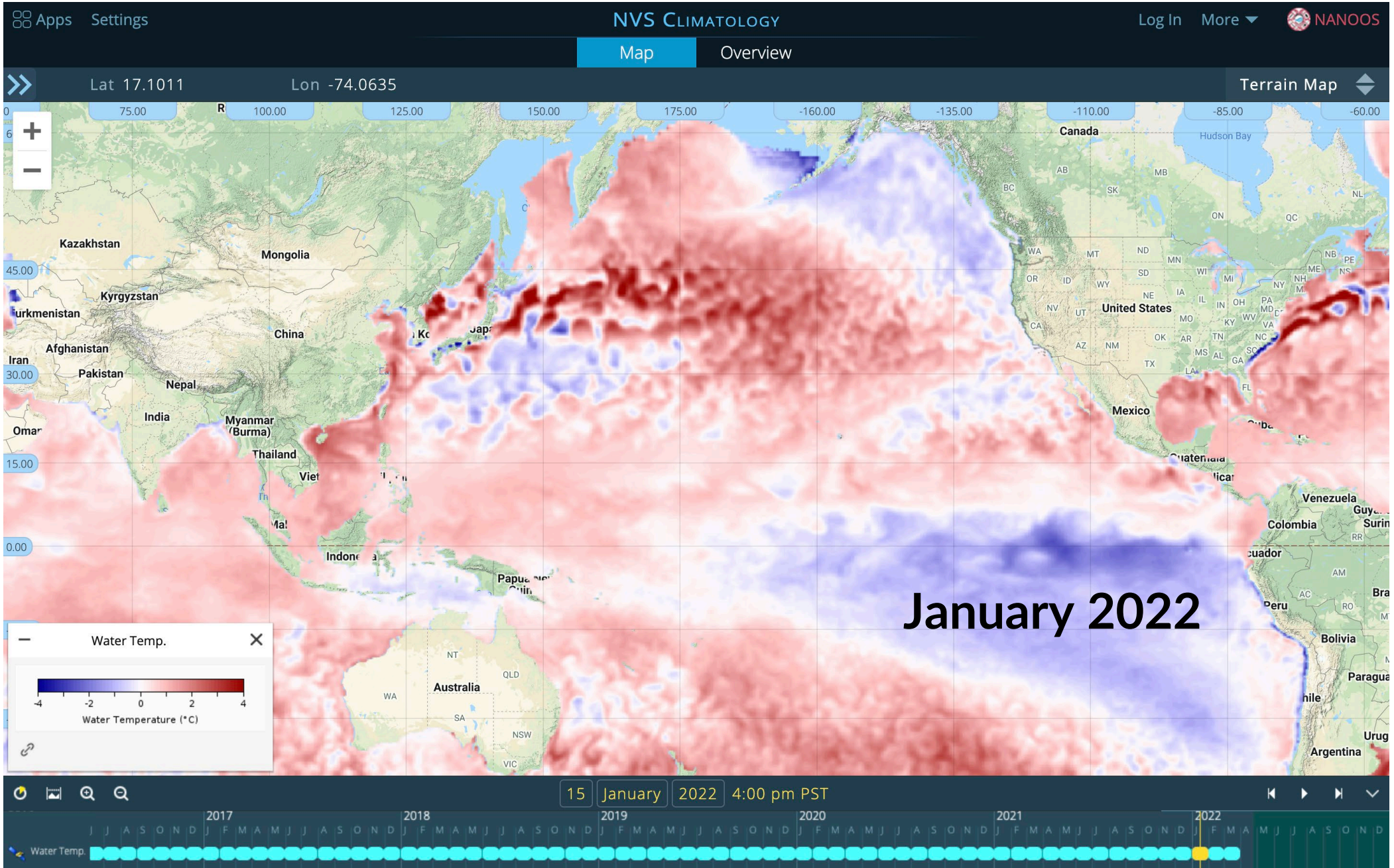
Sea Surface Temperature Anomaly
NCDC Optimum Interpolation SST



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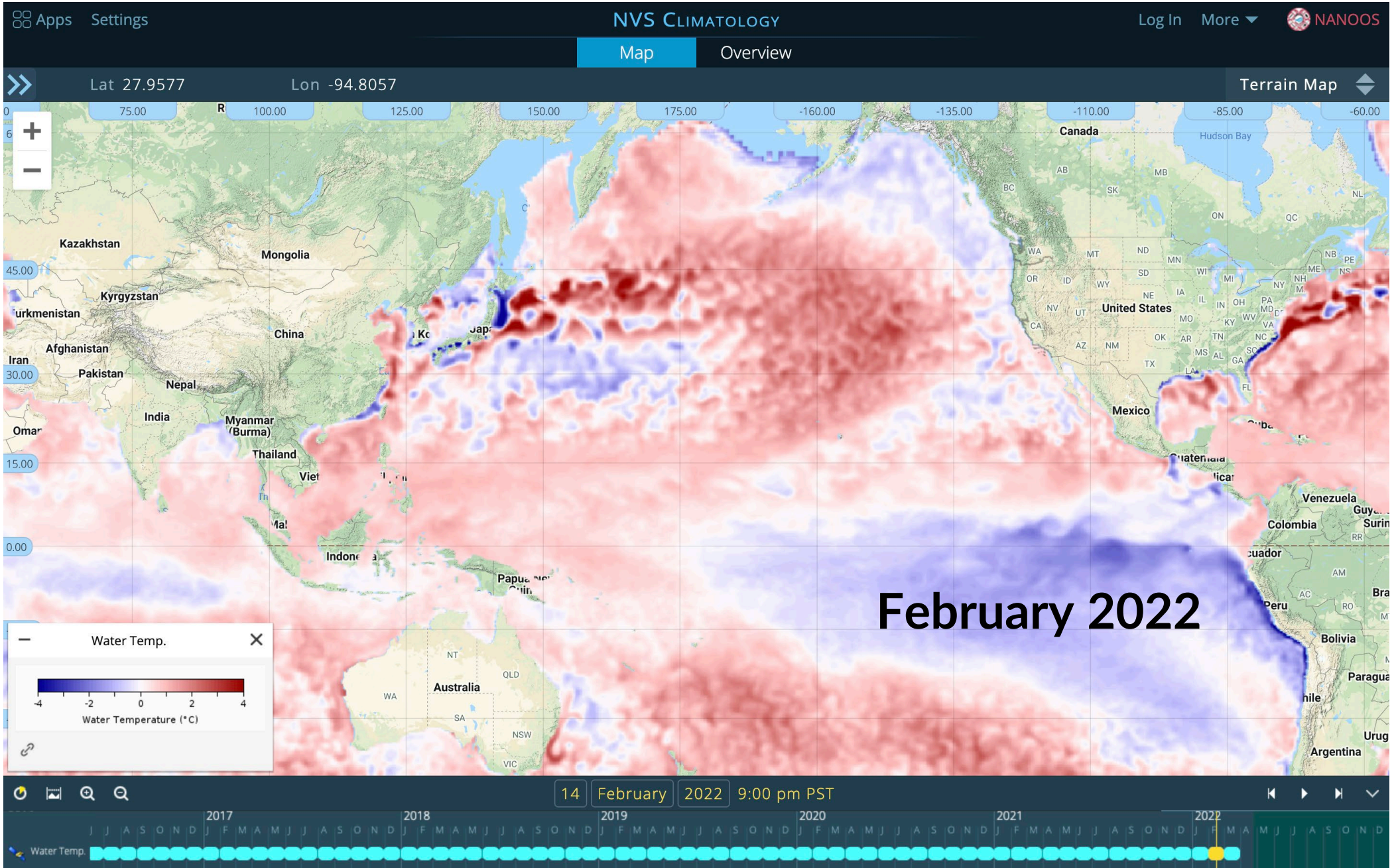

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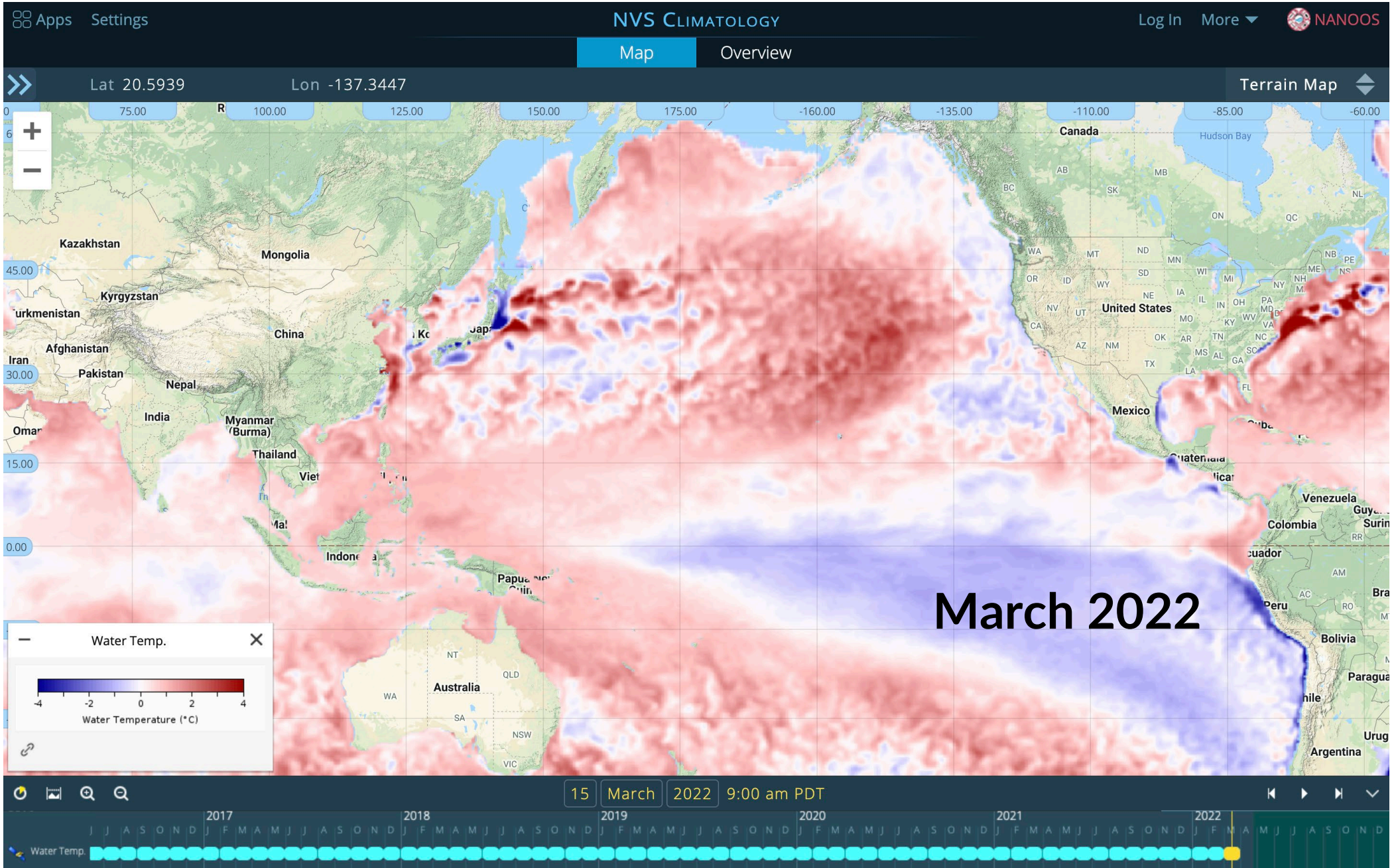
Sea Surface Temperature Anomaly
NCDC Optimum Interpolation SST



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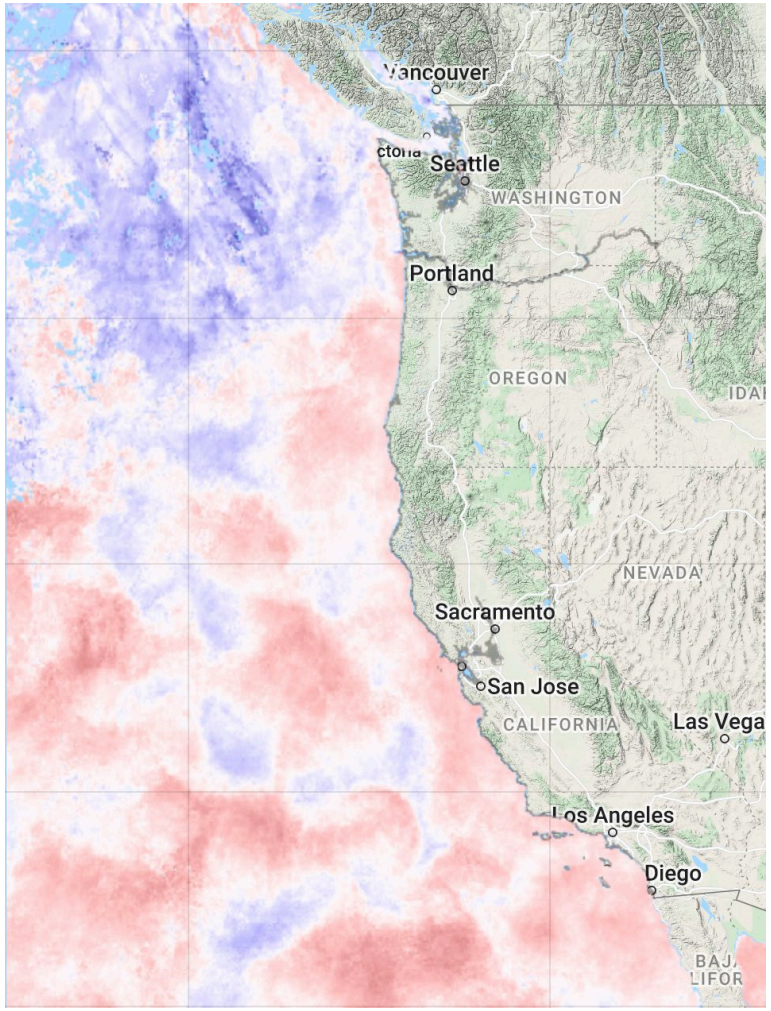
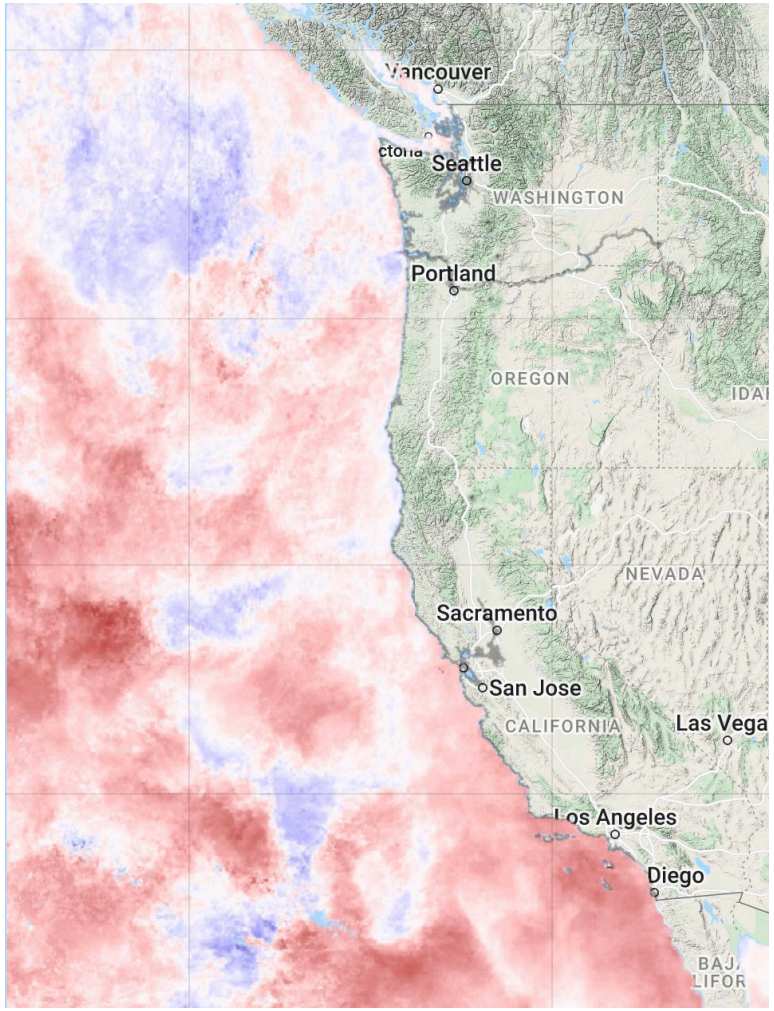
Sea Surface Temperature Anomaly
OSU Modis

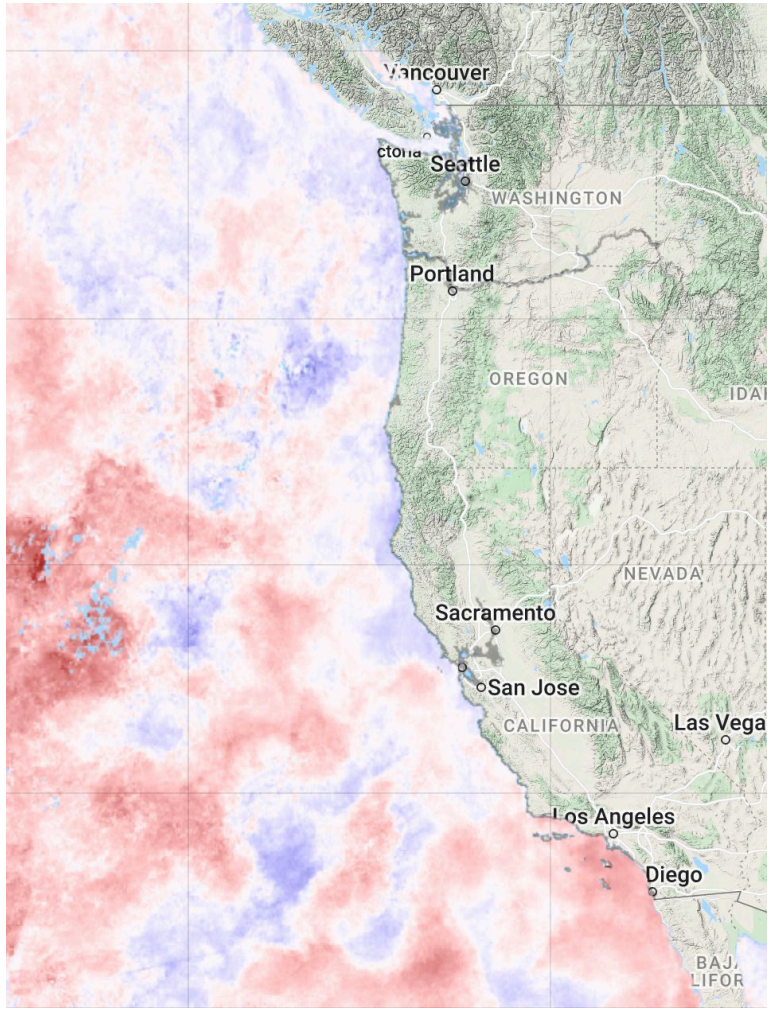
January 2022

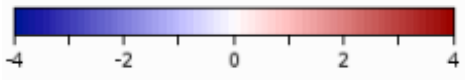


February 2022



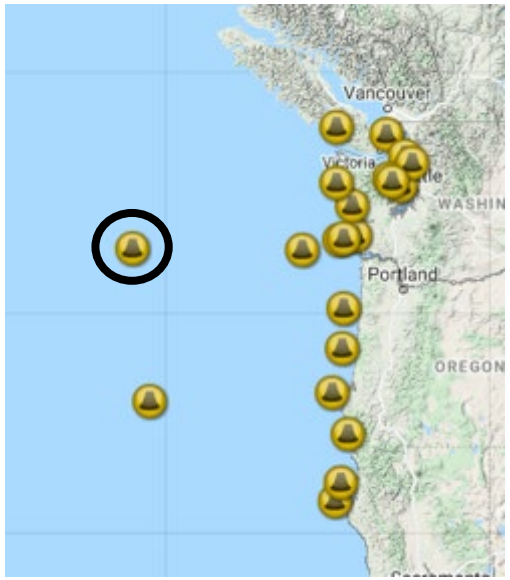
March 2022



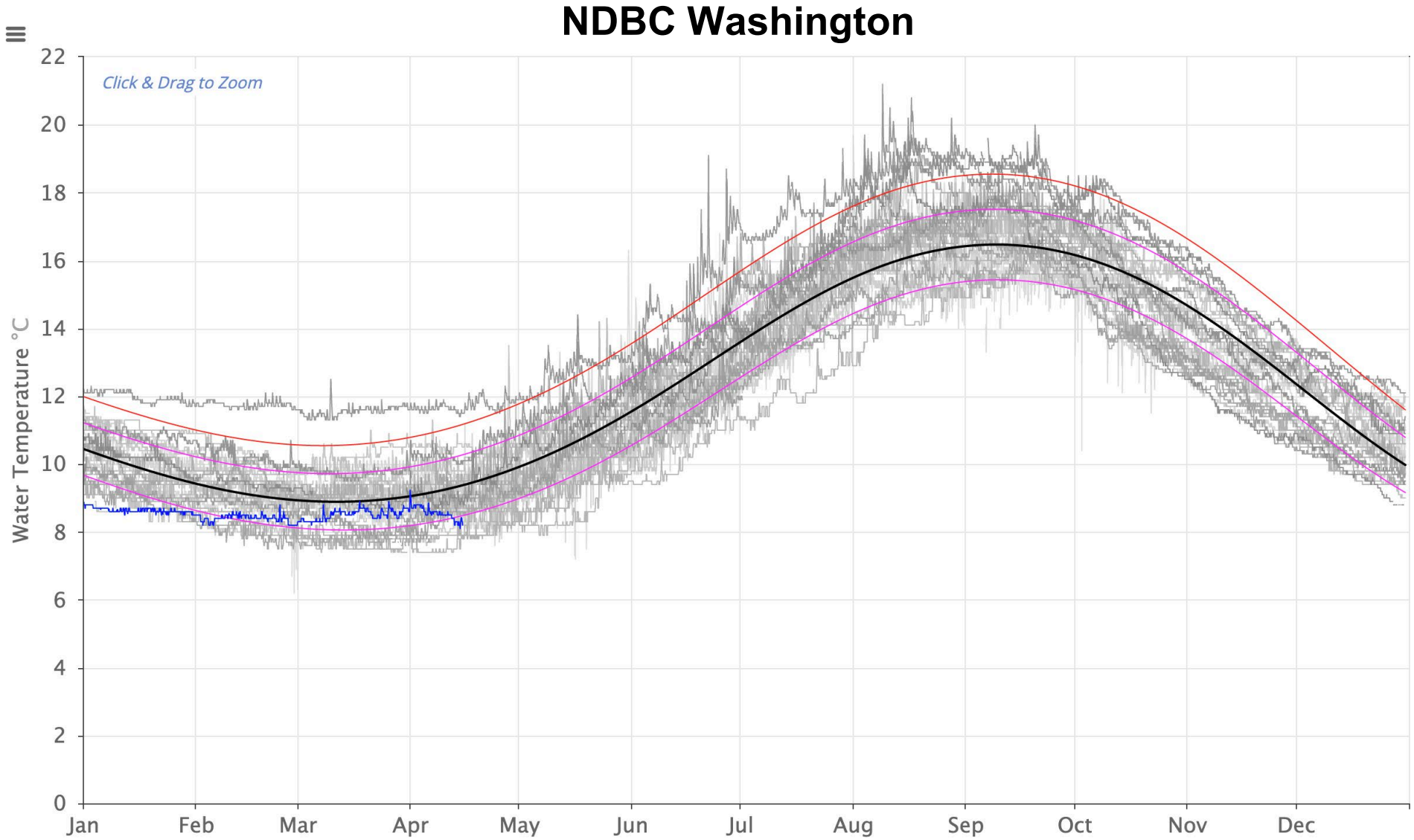
Water Temperature Anomaly  (°C)

NANOOS: www.nanoos.org Climatology app

Sea Surface Temperature



Seasonal Cycle
n=45 Yrs
-1 STD
+1 STD
+2 STD
2022



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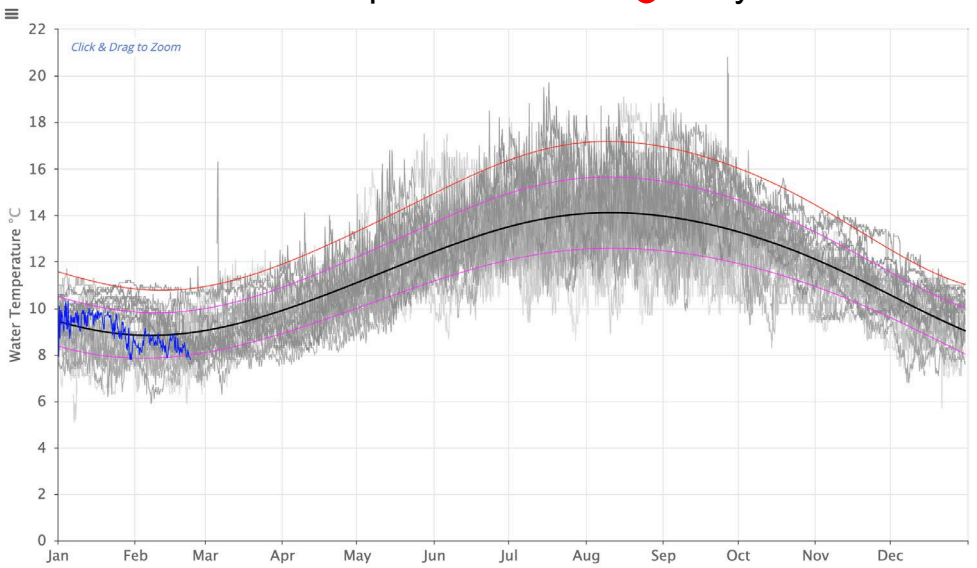
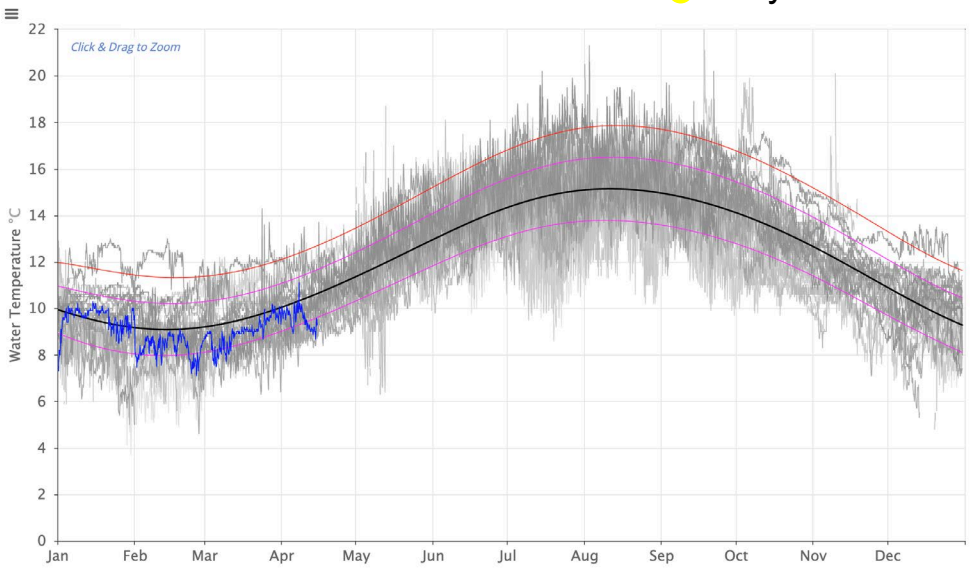
Sea Surface Temperature

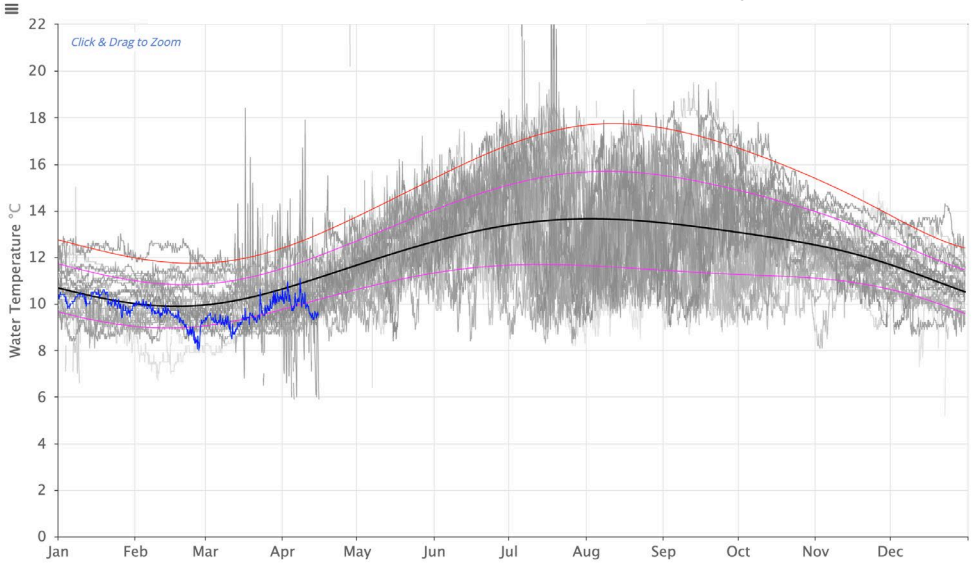
NDBC Cape Elizabeth ● 34 yrs



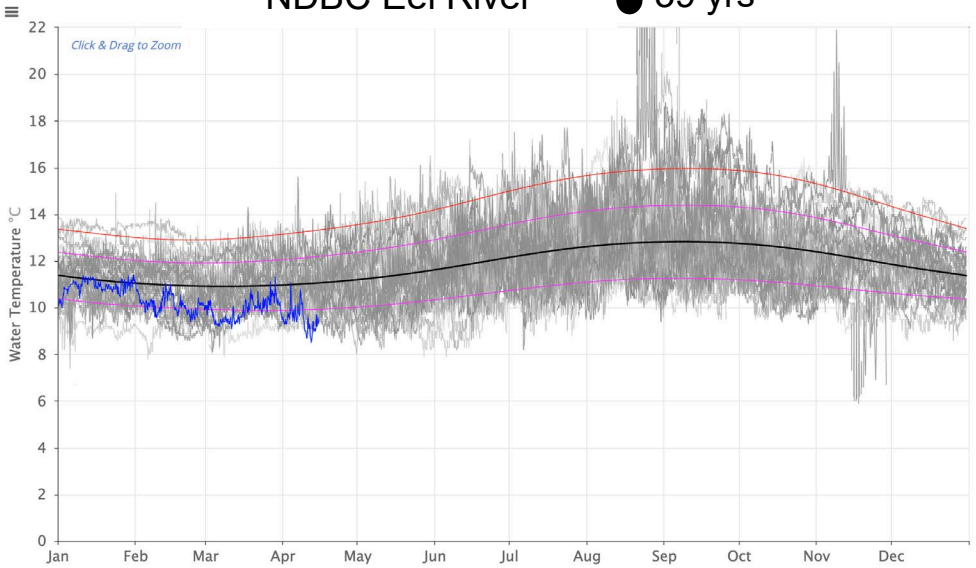
NDBC Columbia River Bar ● 37 yrs



NDBC Stonewall Bank ● 34 yrs



NDBC Eel River ● 39 yrs



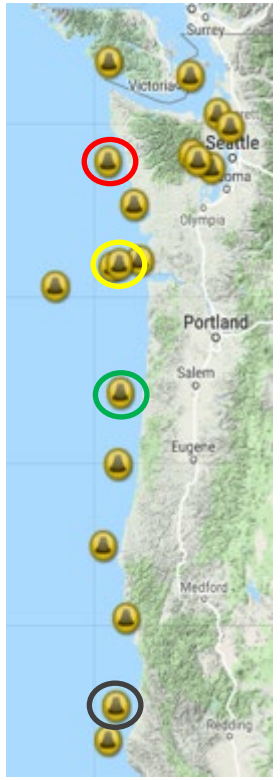
Seasonal Cycle

-1 STD

+1 STD

+2 STD

2022

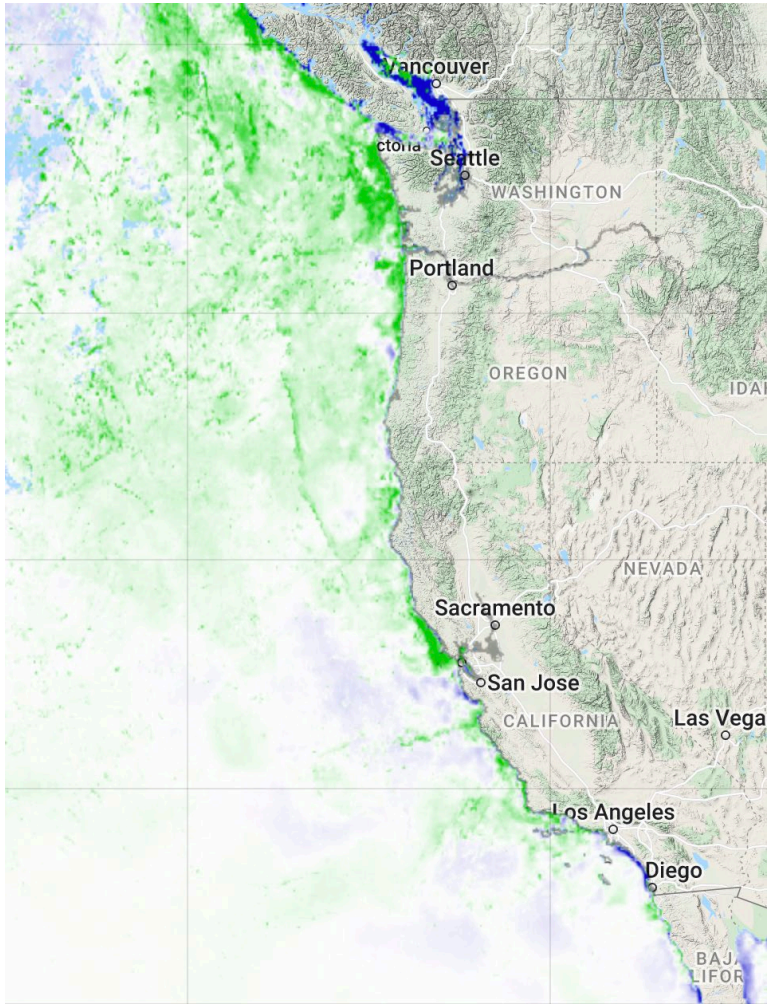


IOOS

NANOOS: www.nanoos.org Climatology app

Sea Surface Chlorophyll Anomaly
OSU Modis

January 2022



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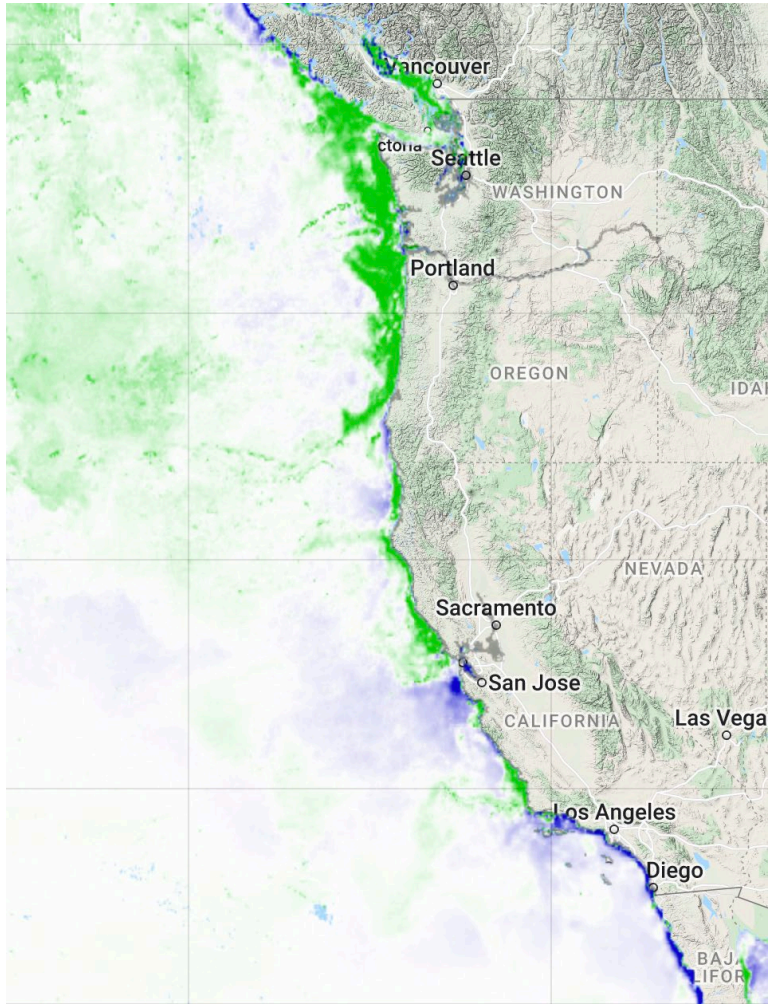
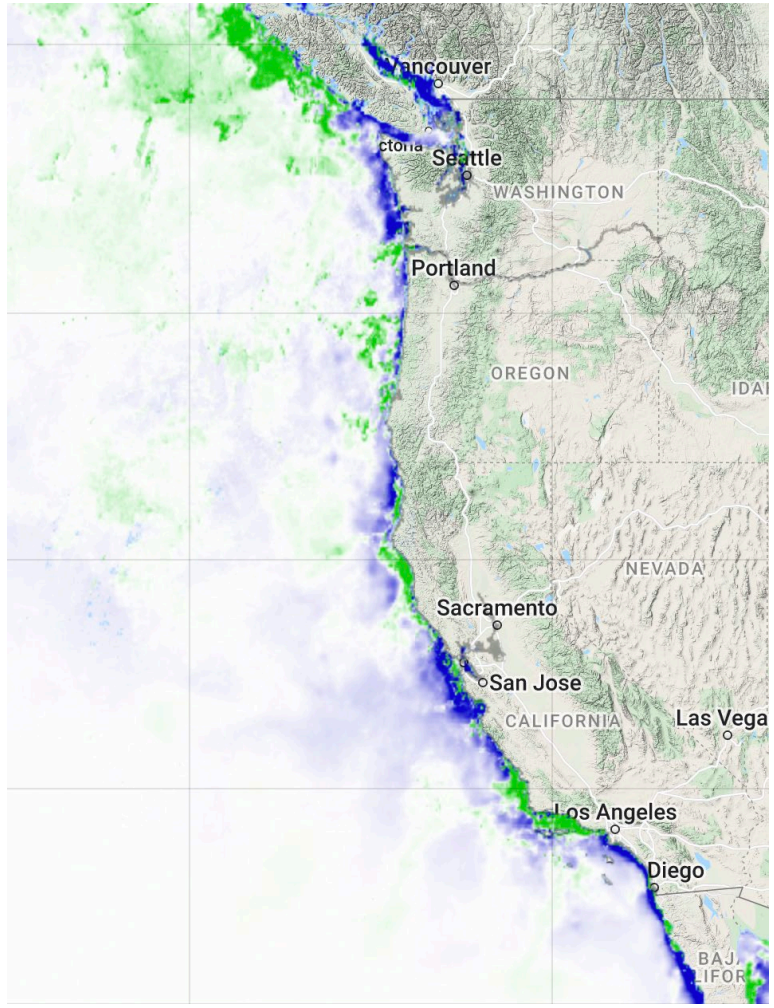
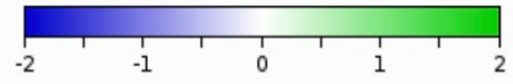


March 2022



Chlorophyll *a* Anomaly  (mg/m^3)

To summarize:

Temperature

- Satellite – Pacific Basin:
  - La Nina conditions continue
  - Heat in Gulf of AK abated starting in Oct
  - Warm anomaly shifts to western Pacific
  - Warm anomaly in NE Pacific decreased and became more diffuse Jan-Feb-Mar
- Satellite – Coastal WA & OR:
  - Oct-Jan: Predominantly cool anomalies offshore, warm anomalies onshore
  - Feb-Mar: Weaker and more mixed (warm/cool) anomalies
- Buoys – Coastal:
  - NDBC Washington: Cooler than average
  - Closer to shore NDBC: Depending on location, some slightly warmer than average in Jan, though most of 2022 average to cooler than average

Chlorophyll

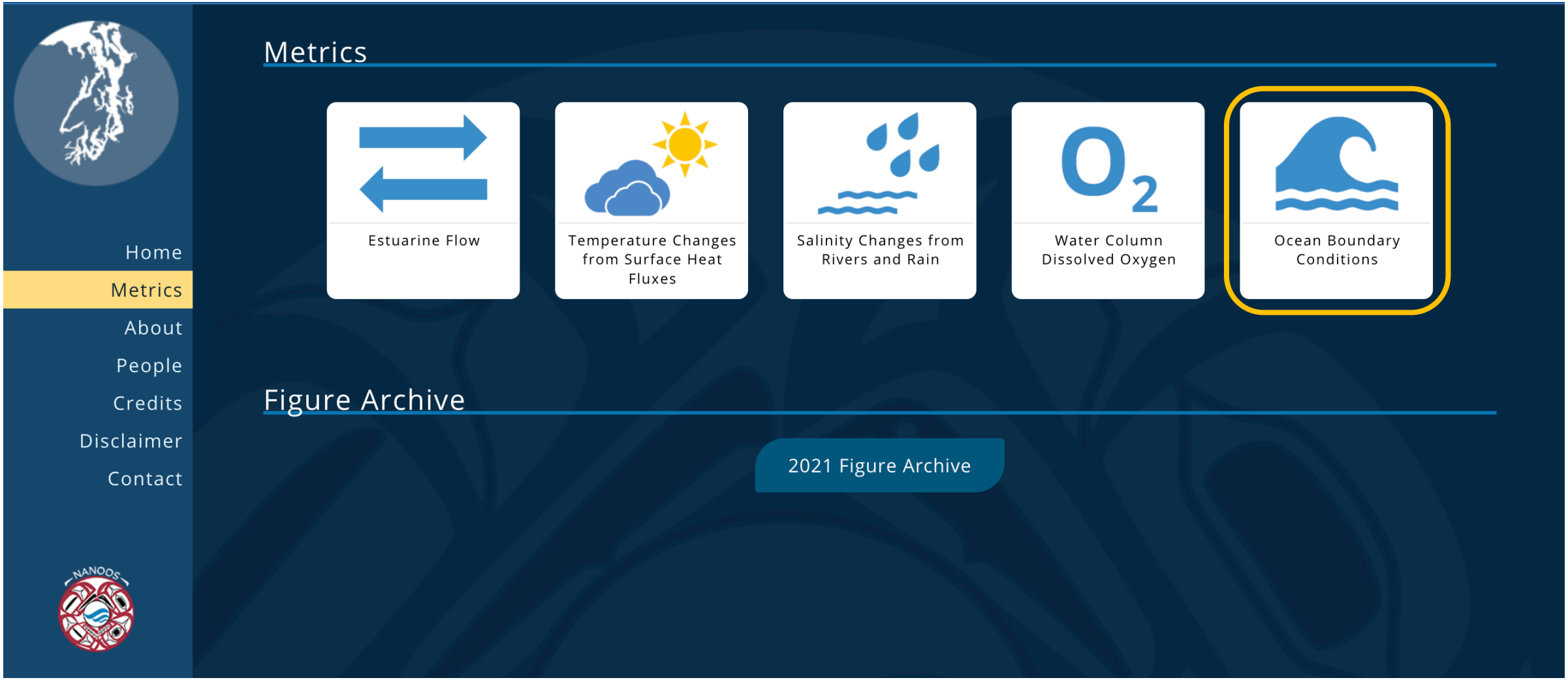
- Satellite – Coastal WA & OR:
  - Jan-Feb: ocean color indicates highest biomass at the coast
  - Mar: ocean color indicates less than average biomass at the coast

Tracking Salish Sea Environmental Changes in Real-time

J. Mickett, J. Newton, N. Bond, B. Curry

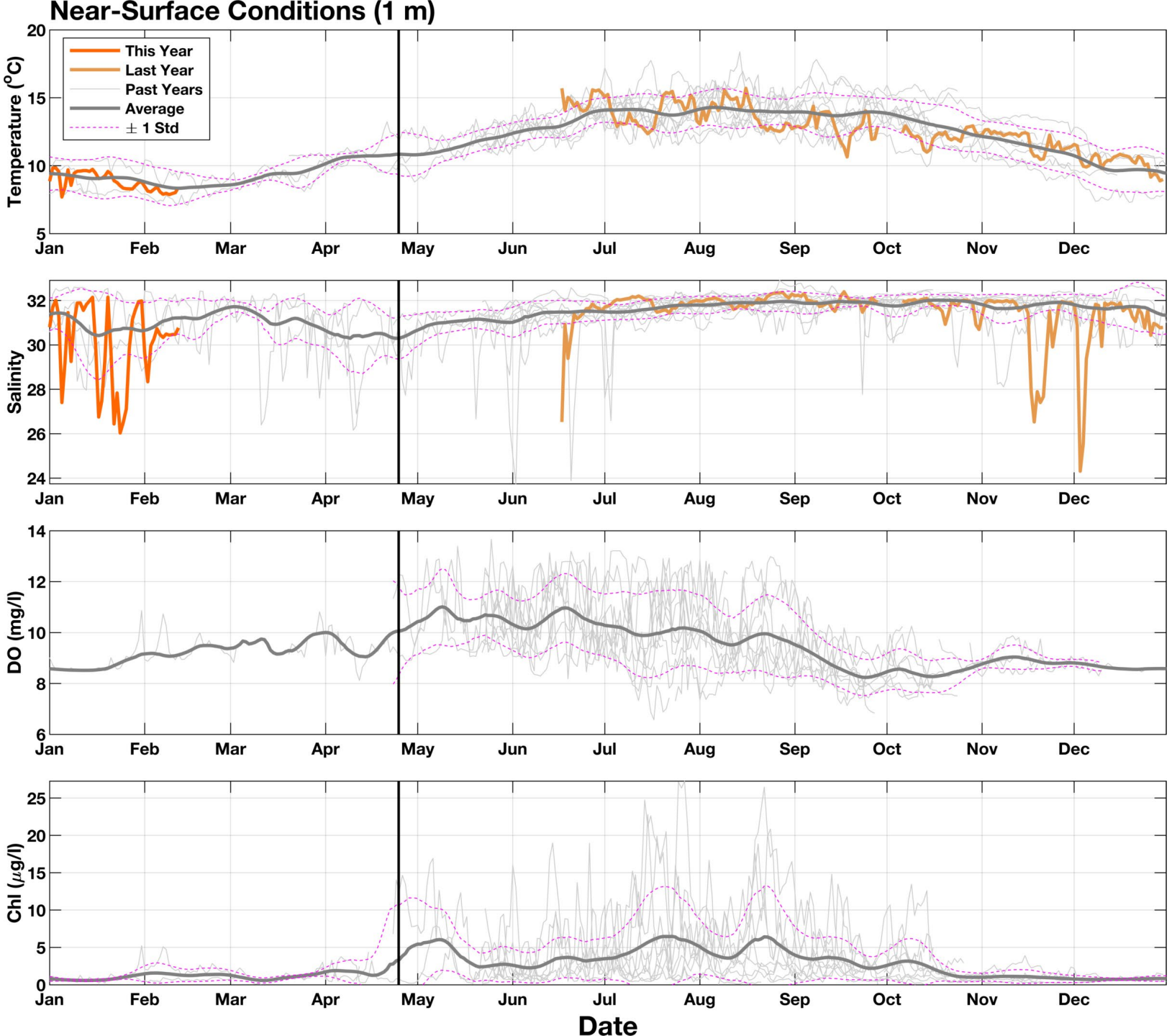
NANOOS Environmental Metrics Website

www.nanoos.org/products/ps_metrics/home.php



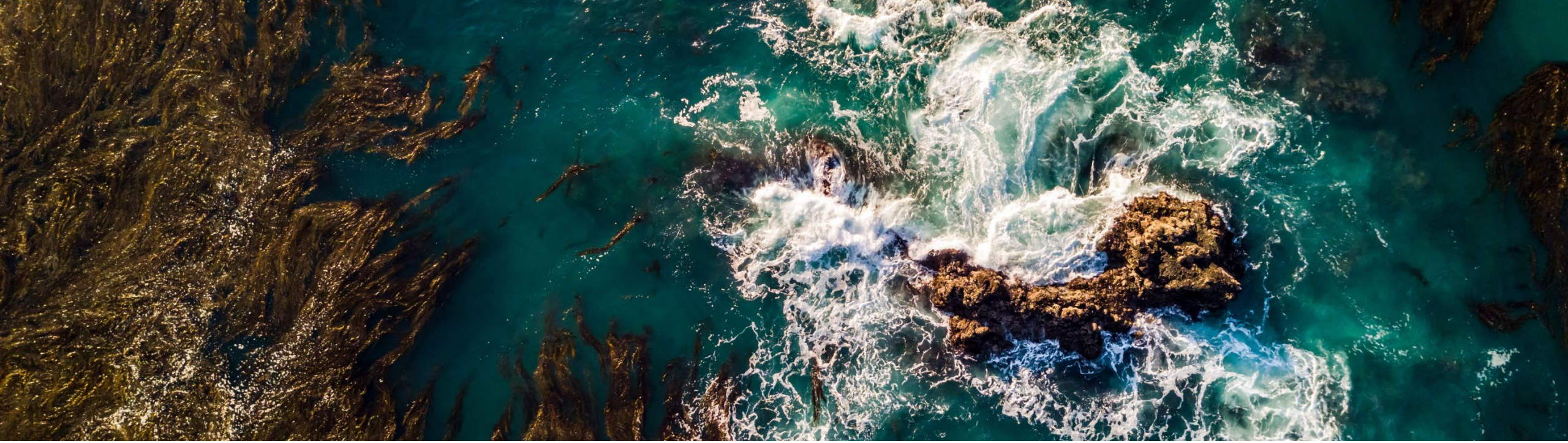
Ocean Boundary Conditions

- Cha'ba near surface
- Significant shelf changes that are correlated with and precede similar changes in Puget Sound are a potential indicator that source water changes are driving Puget Sound variability.



www.nanoos.org

rjcarini@uw.edu
janewton@uw.edu



The Central and Northern California Ocean Observing System:

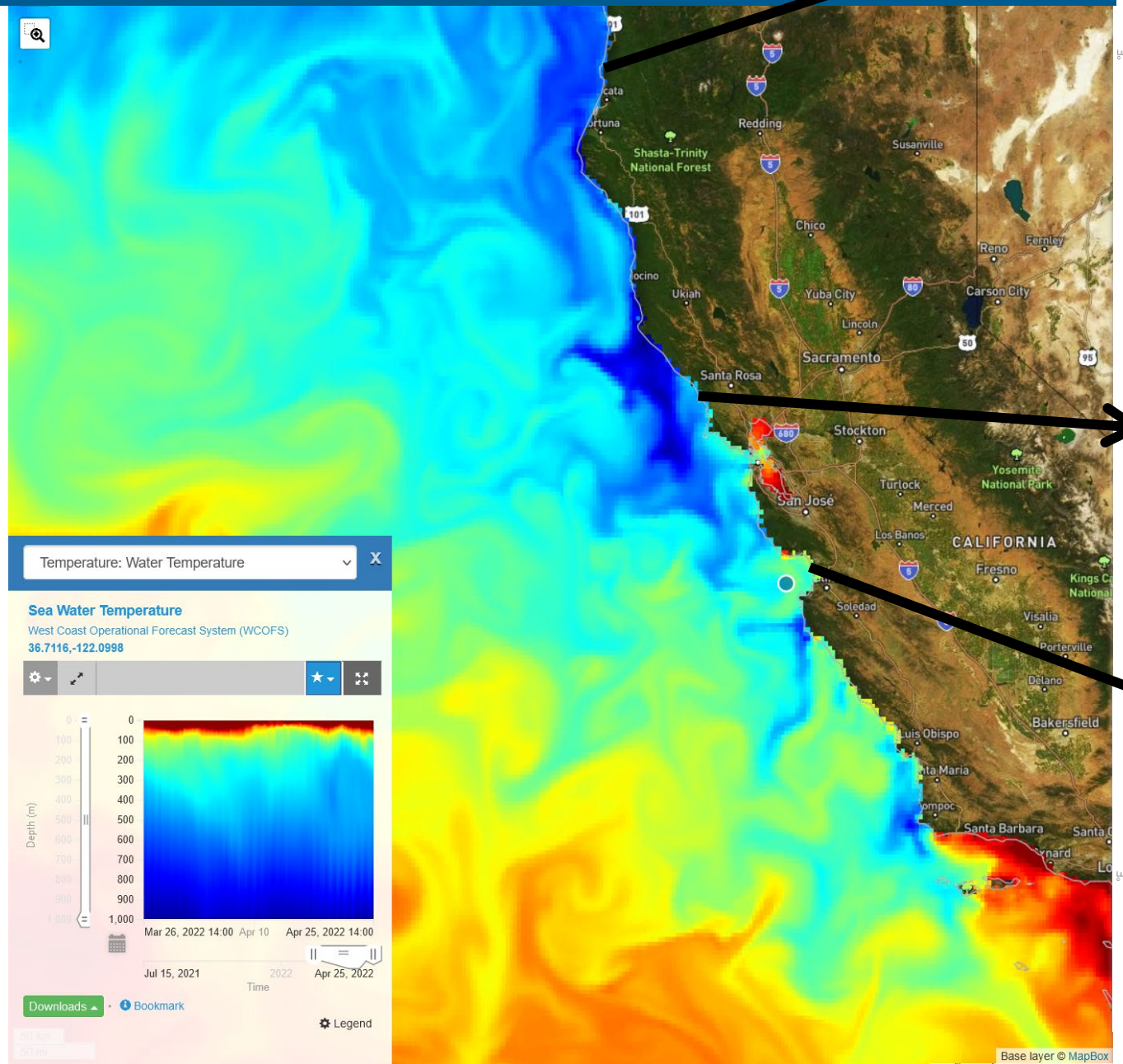
West Watch Update

IOOS Integrated Ocean Observing System

CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

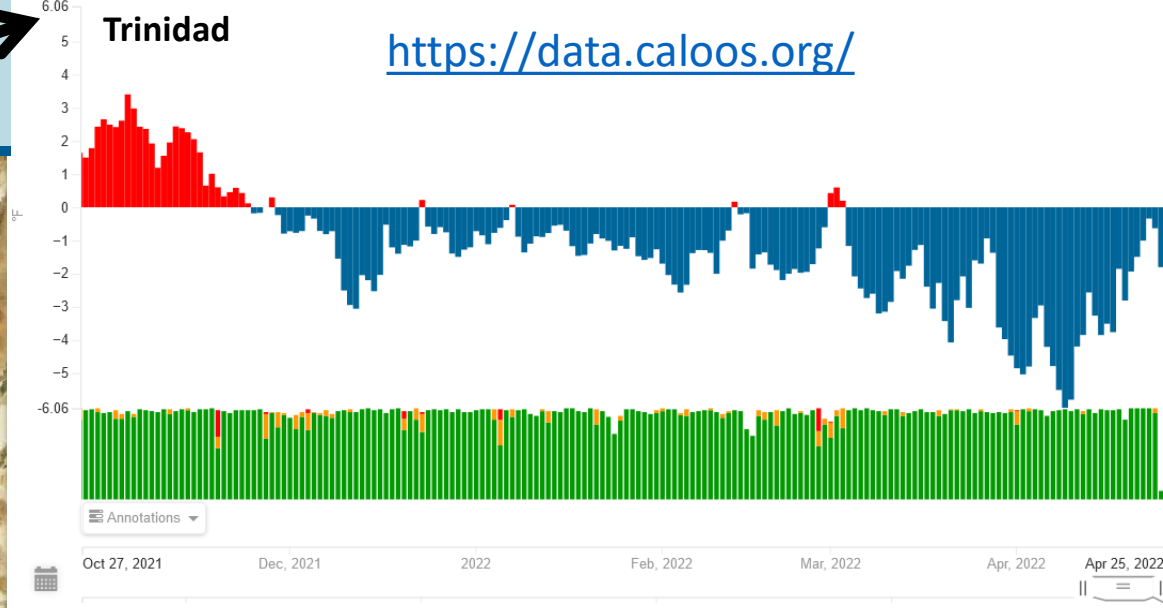
CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

Shore Sta.

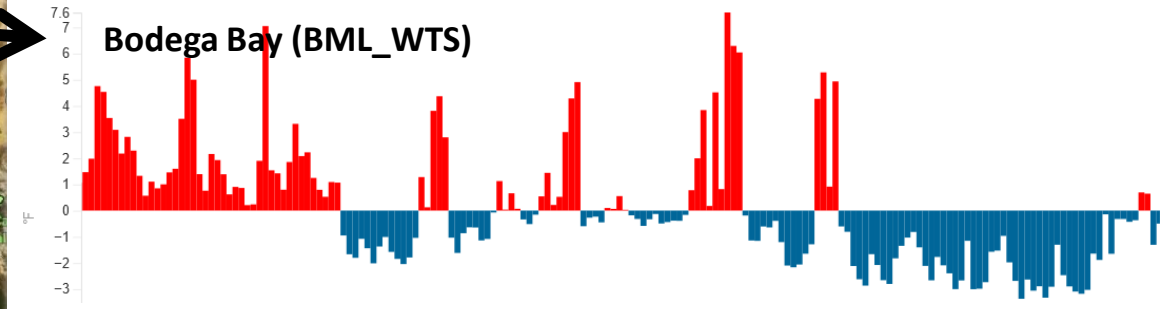


Trinidad

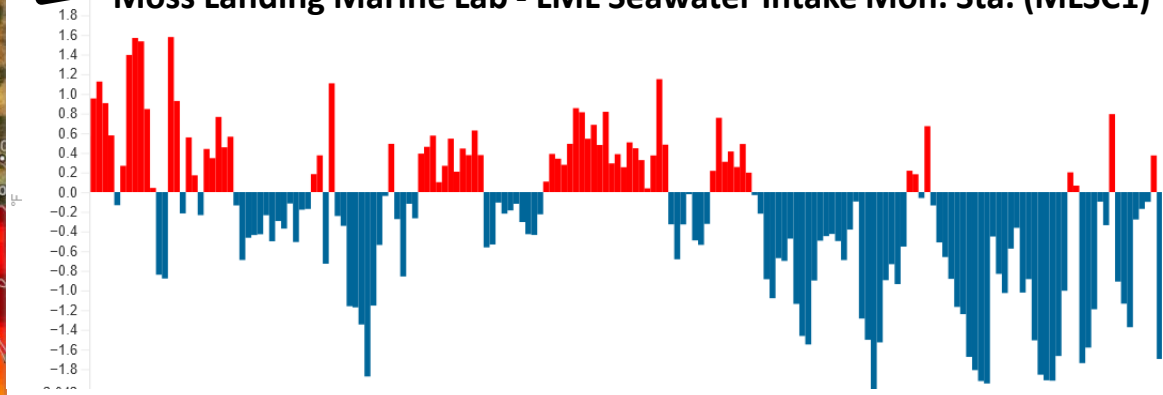
https://data.caloos.org/



Bodega Bay (BML_WTS)

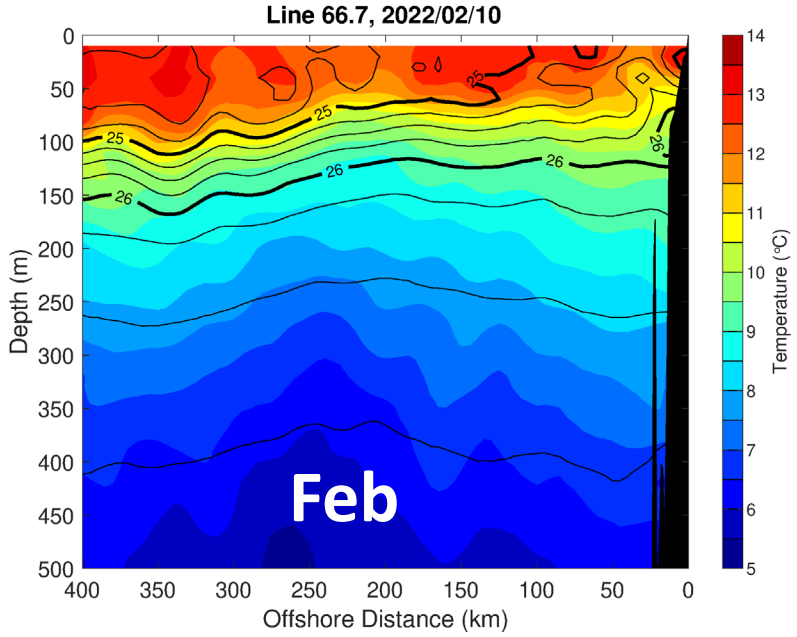


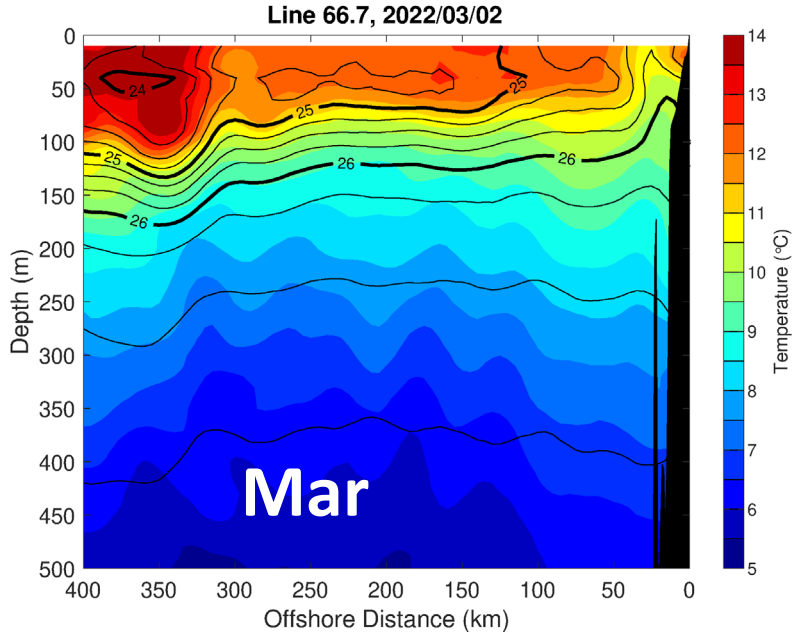
Moss Landing Marine Lab - LML Seawater Intake Mon. Sta. (MLSC1)

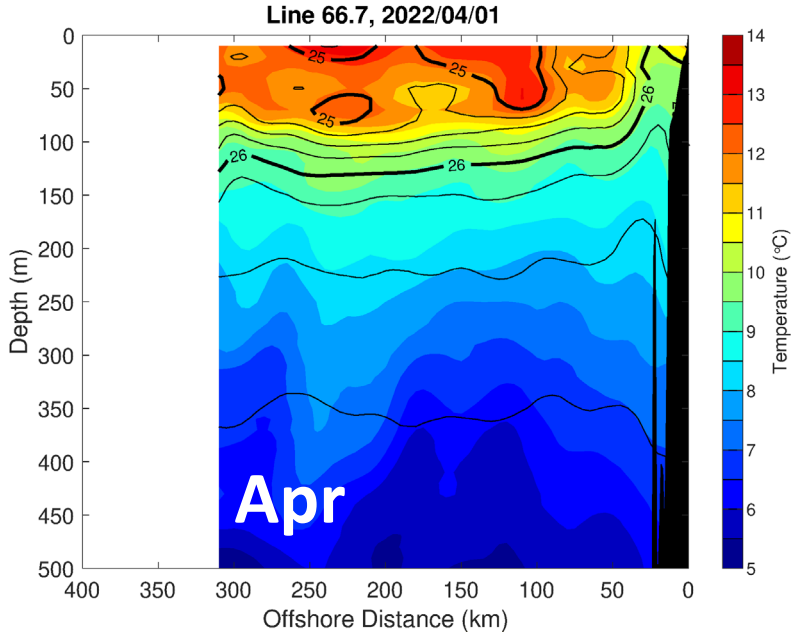


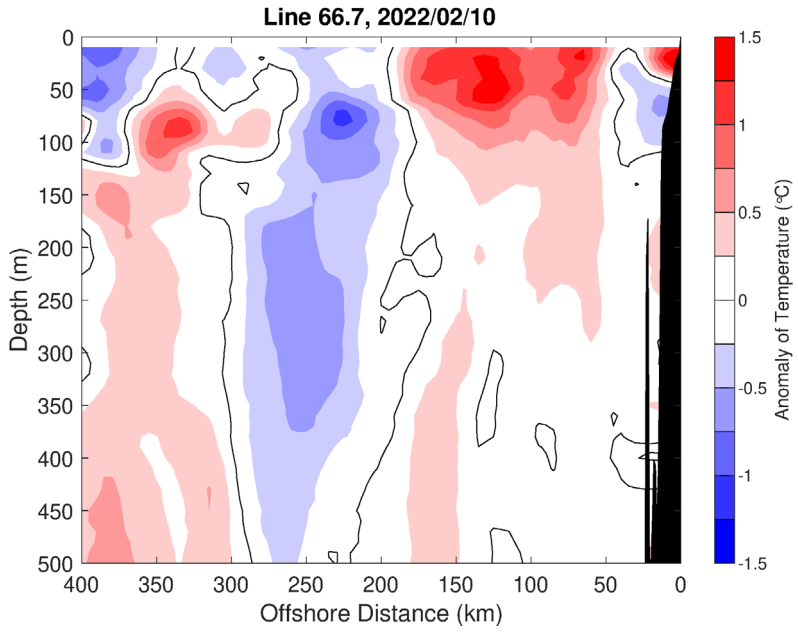
CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

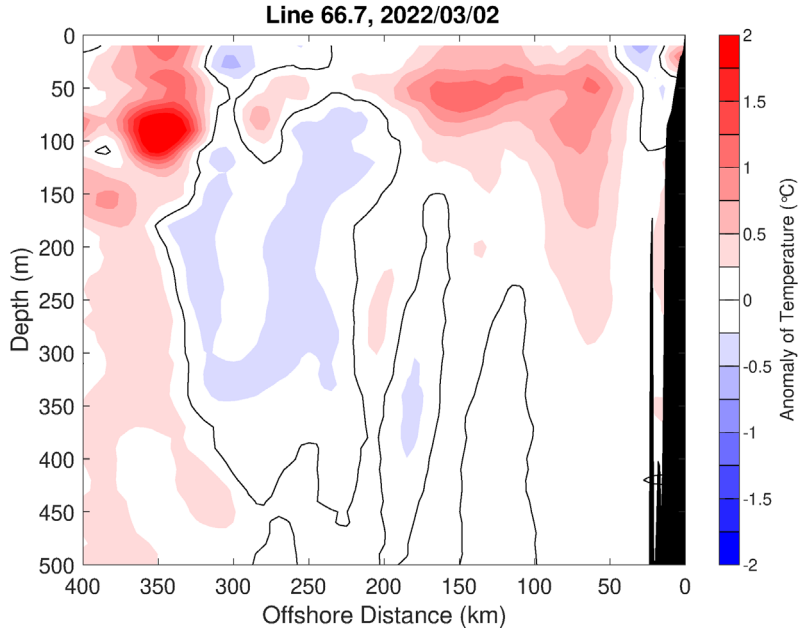
Gliders – Monterey Bay

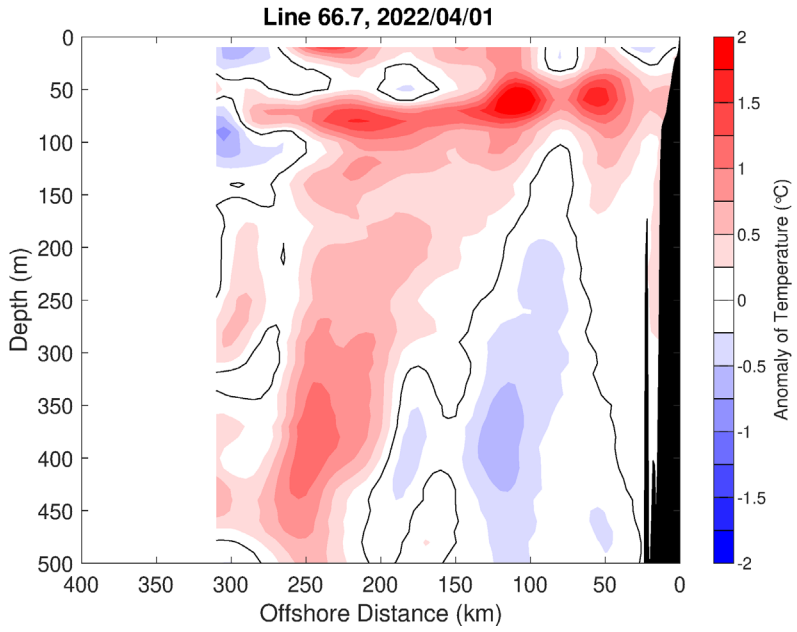








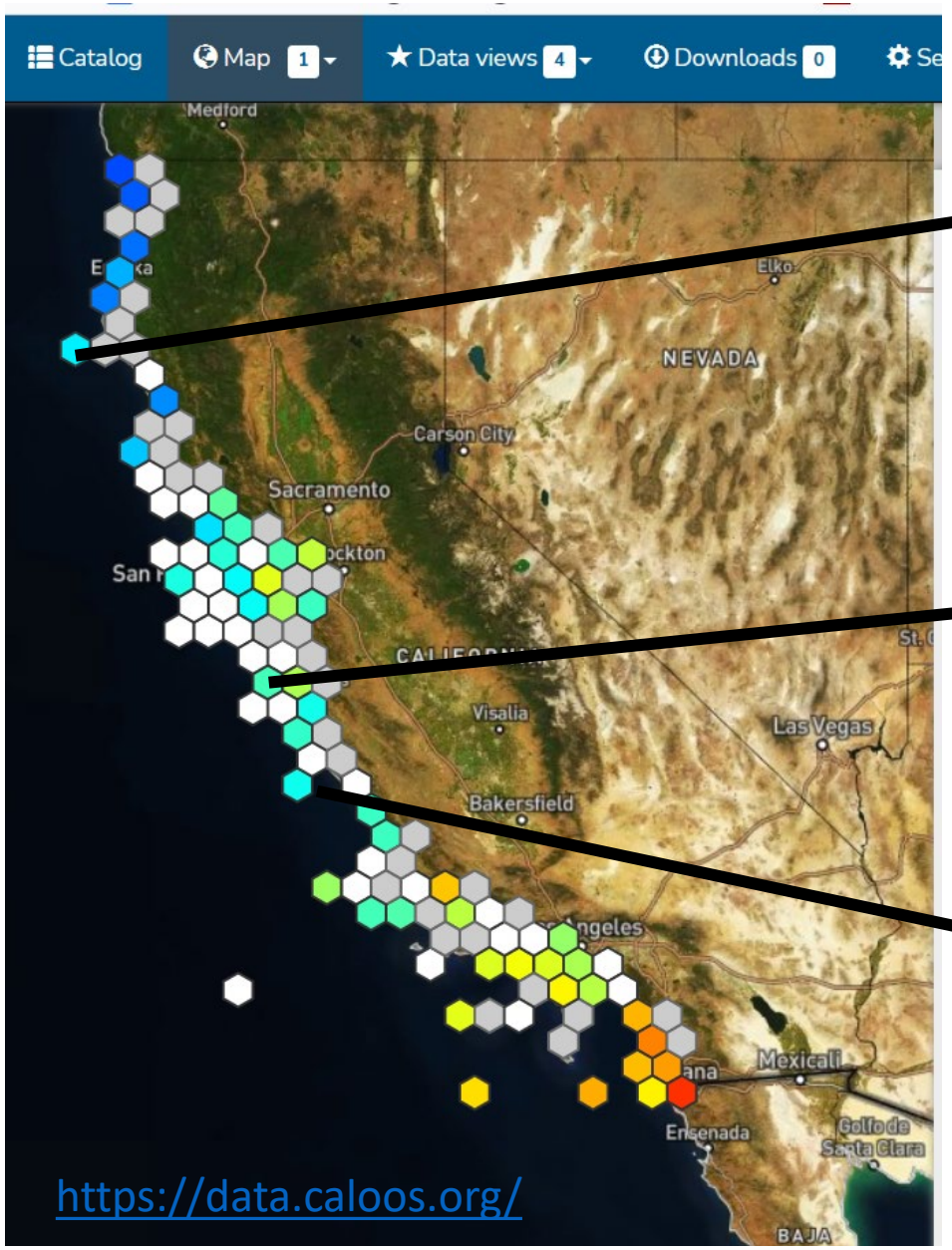


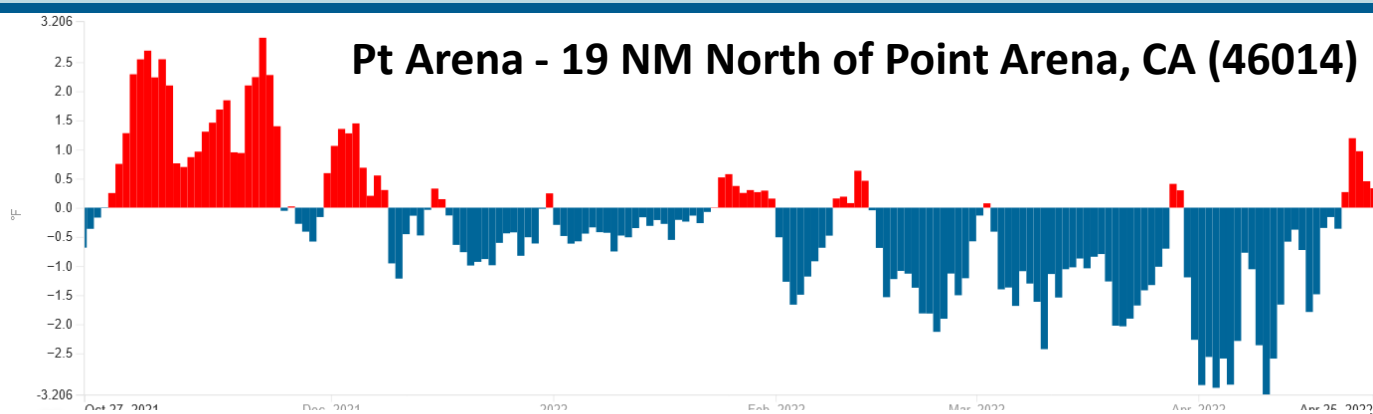


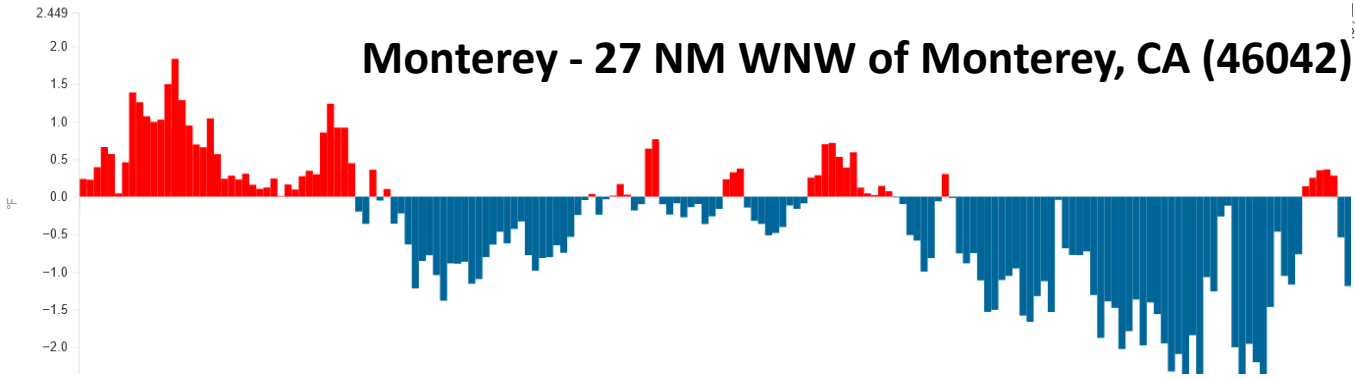
https://spraydata.ucsd.edu

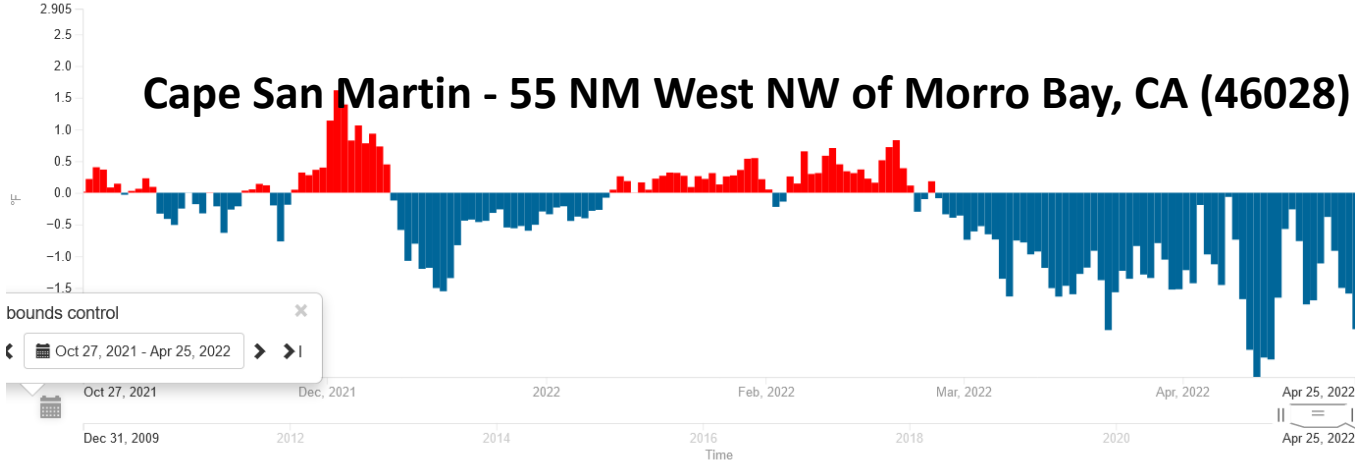
CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

NDBC





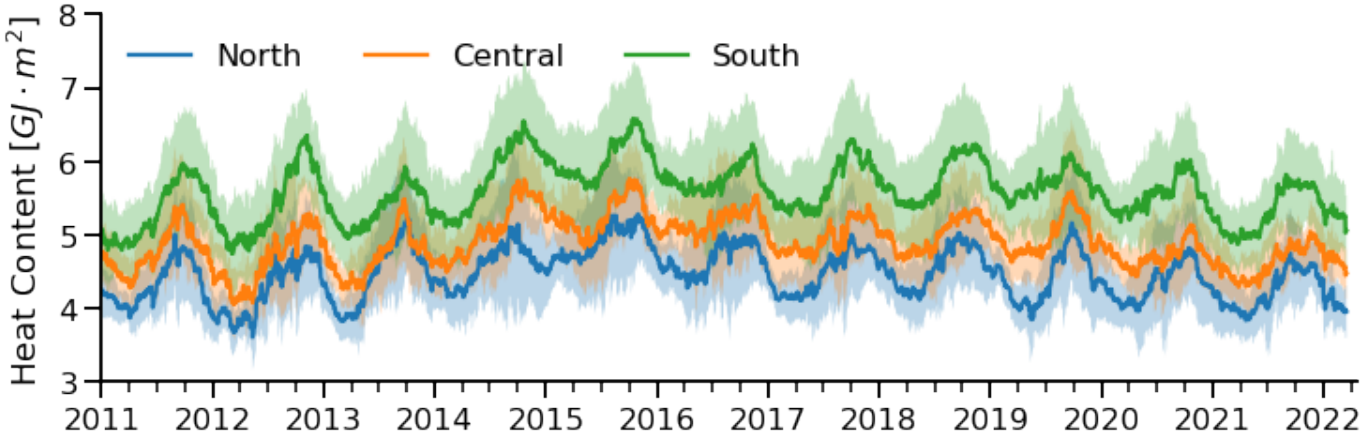


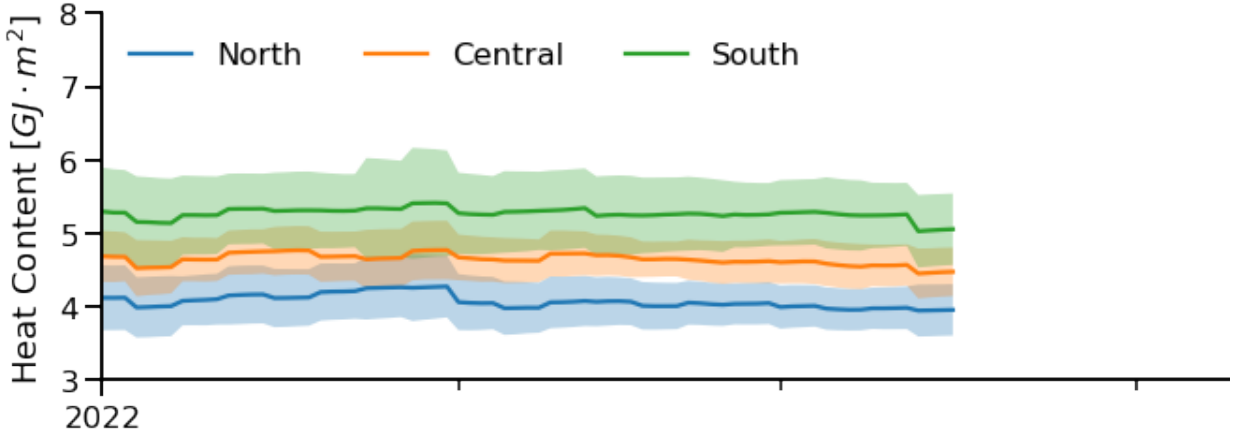


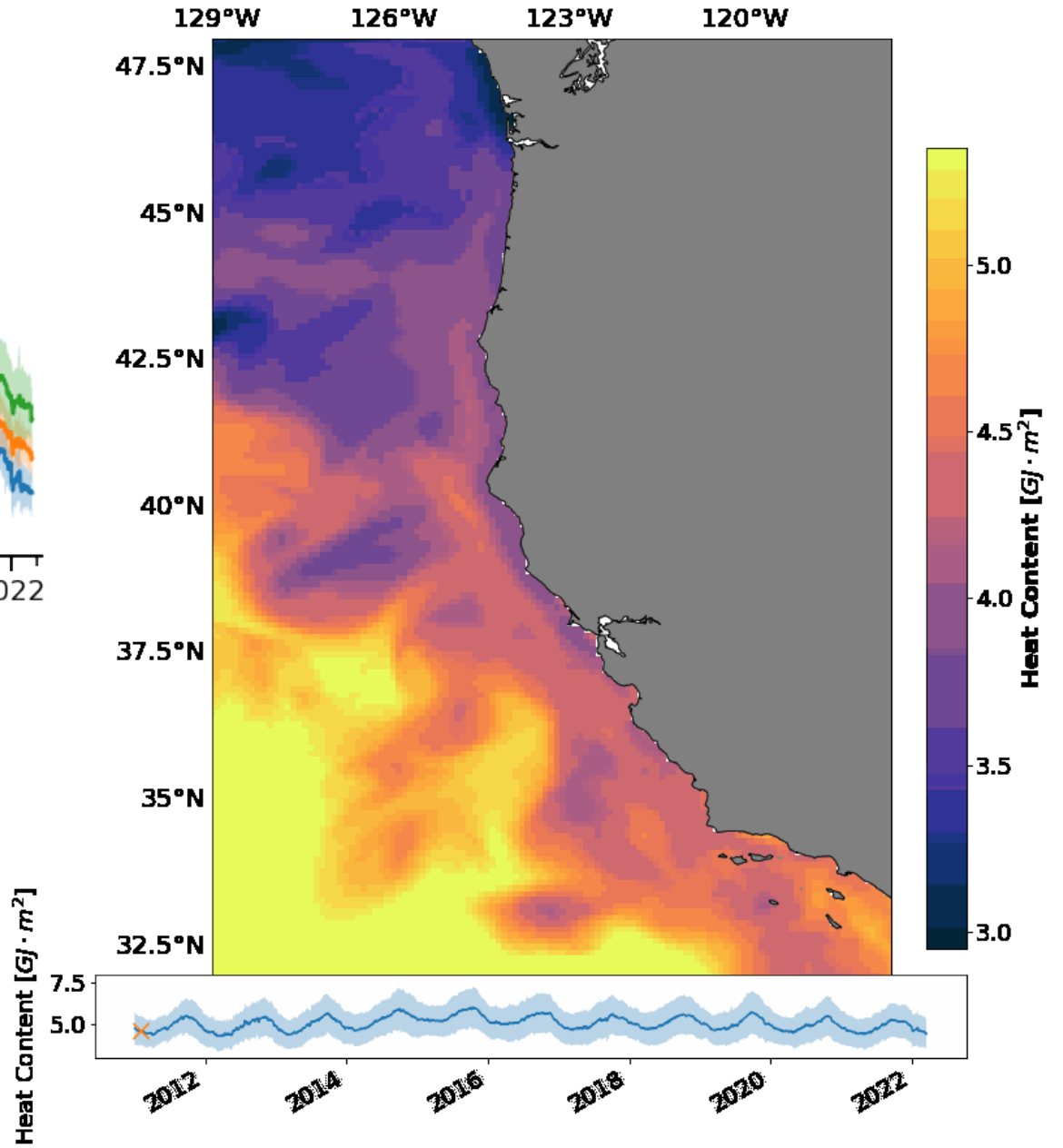
CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

Heat Content – Upper 100 m

- Uses West Coast ROMS 10 km now/hindcast
- Has NEMURO NPZ/BGC run associated with it

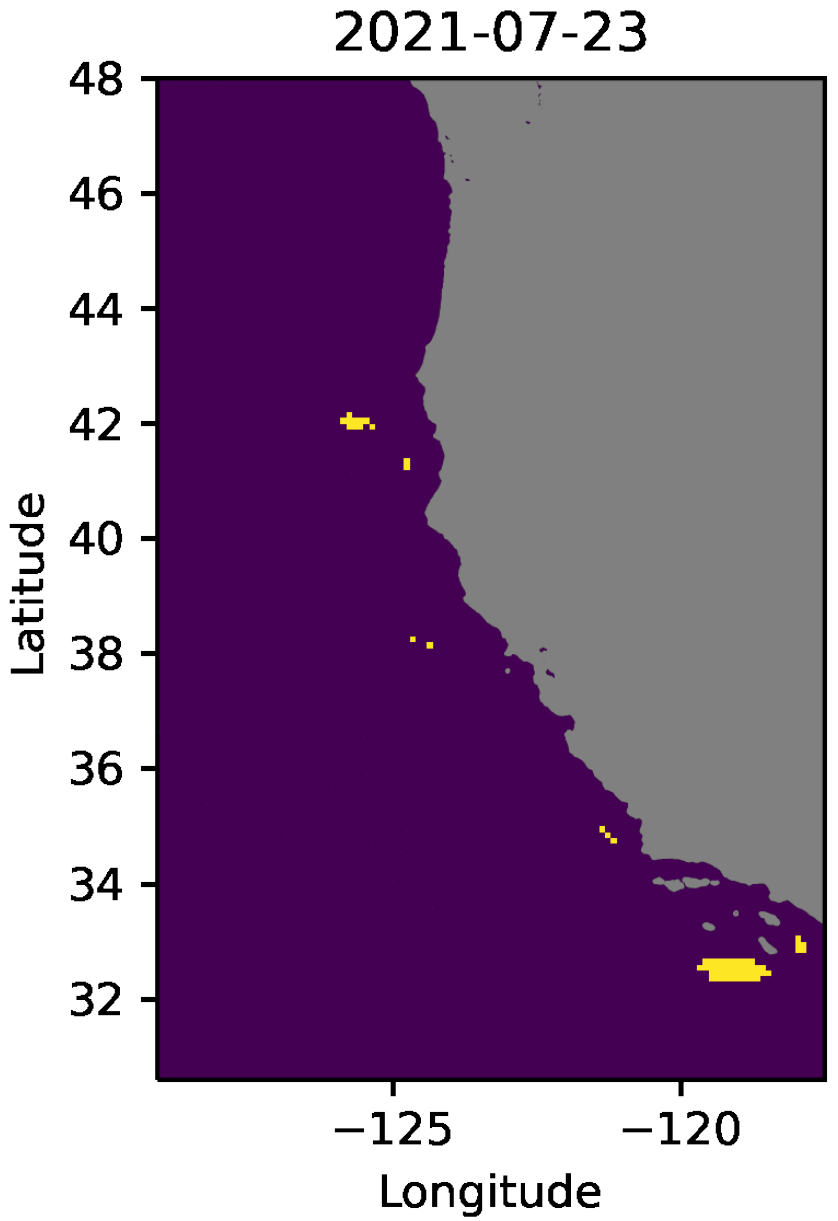






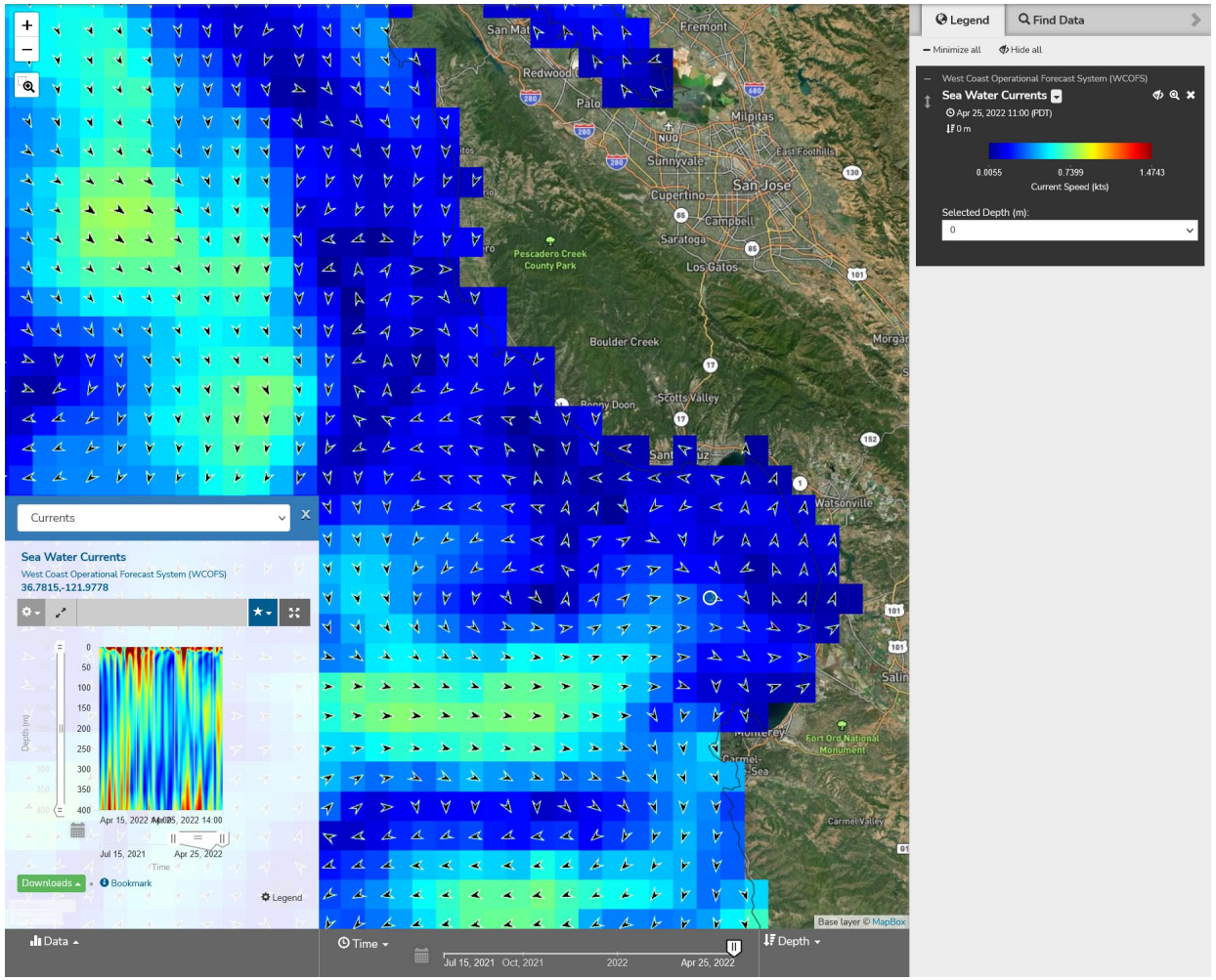
Heatwave Classification

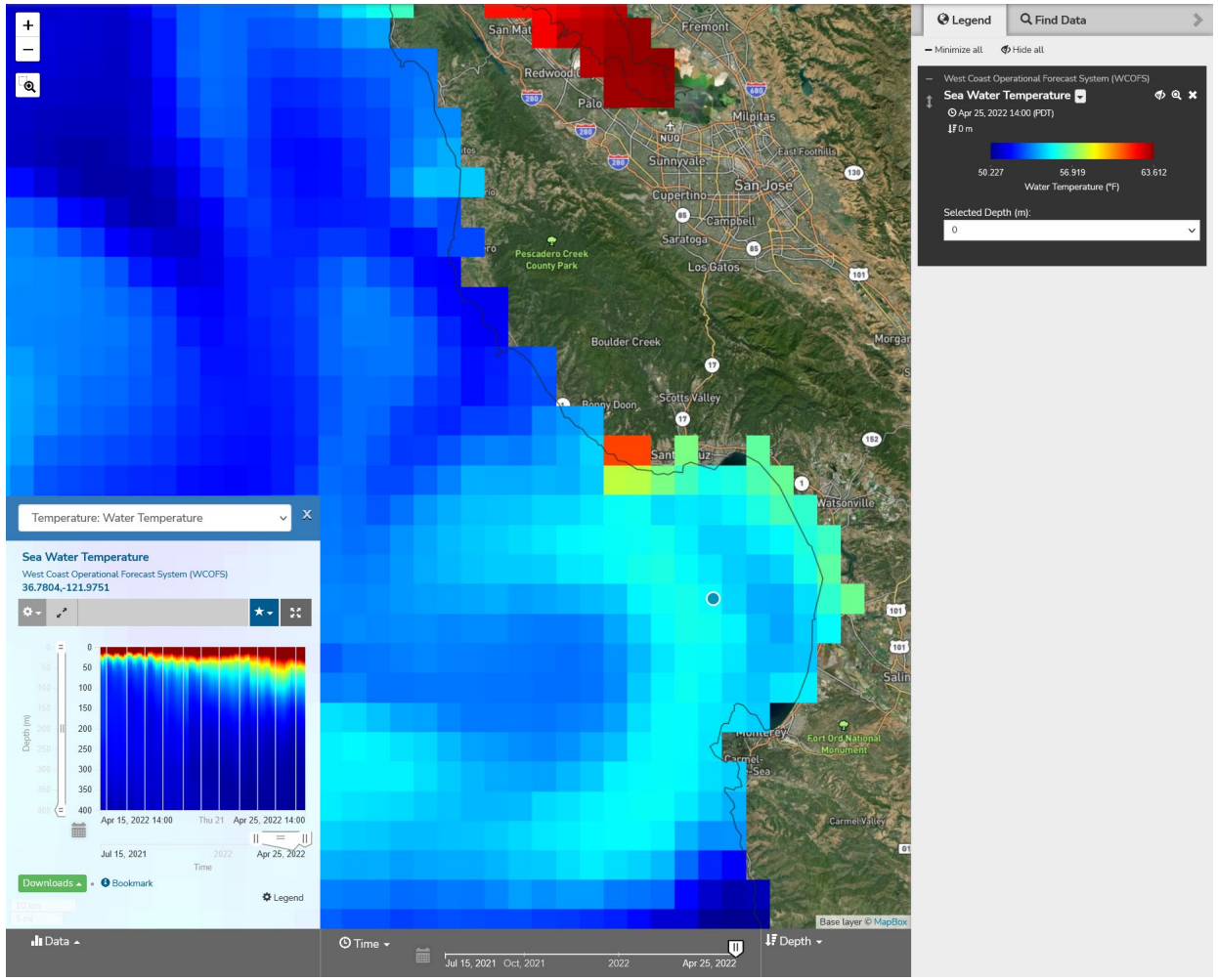
- Adaptation of Hobday et al.
- "…we consider an anomalously warm event to be a MHW if it lasts for five or more days, with [**Heat Index**] warmer than the 90th percentile based on a [**11-year**] historical baseline period. "
- Hobday, A.J. et al. (2016), A hierarchical approach to defining marine heatwaves, Progress in Oceanography, 141, pp. 227-238, doi: 10.1016/j.pocean.2015.12.014



CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

WCOFS

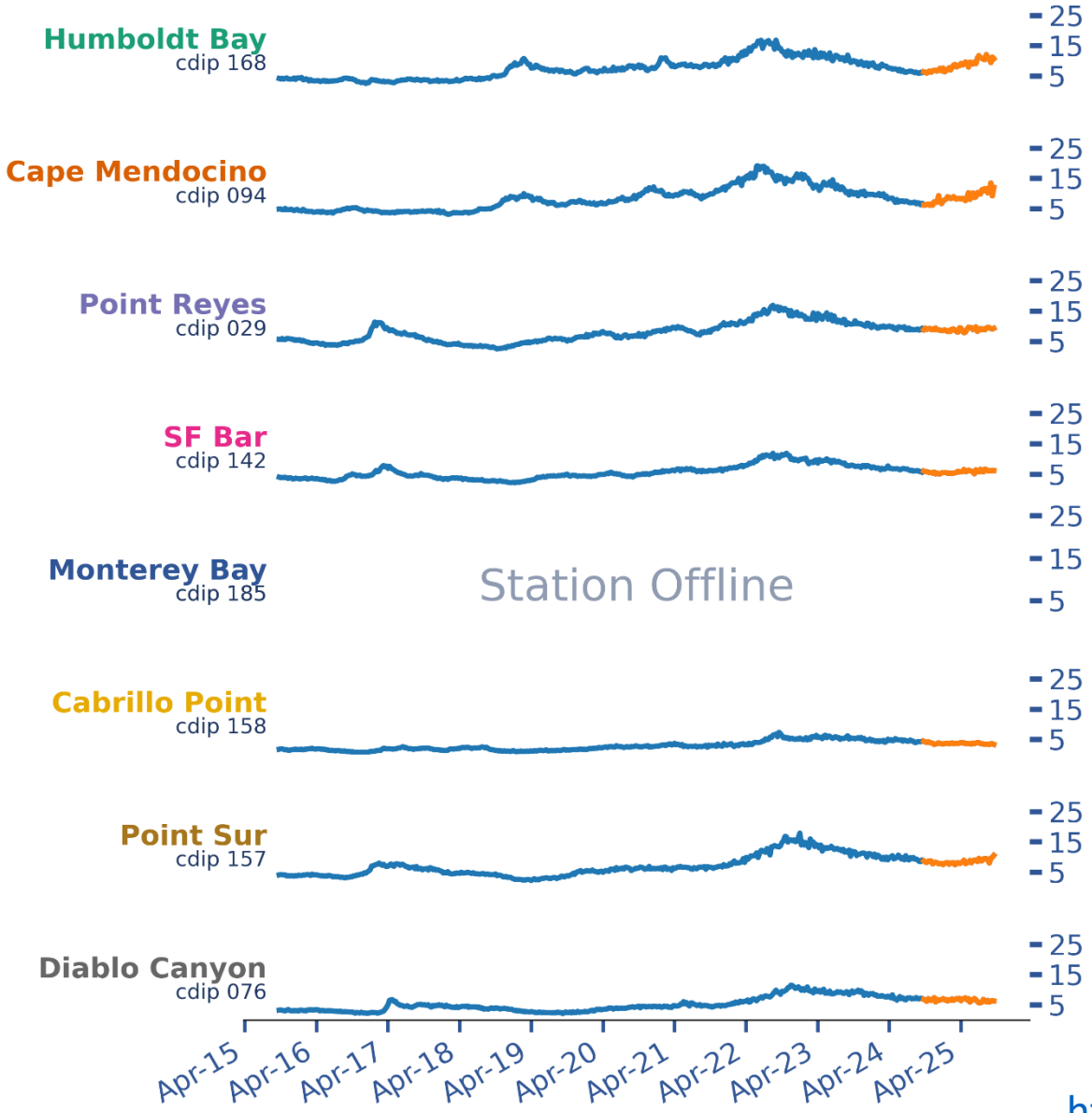


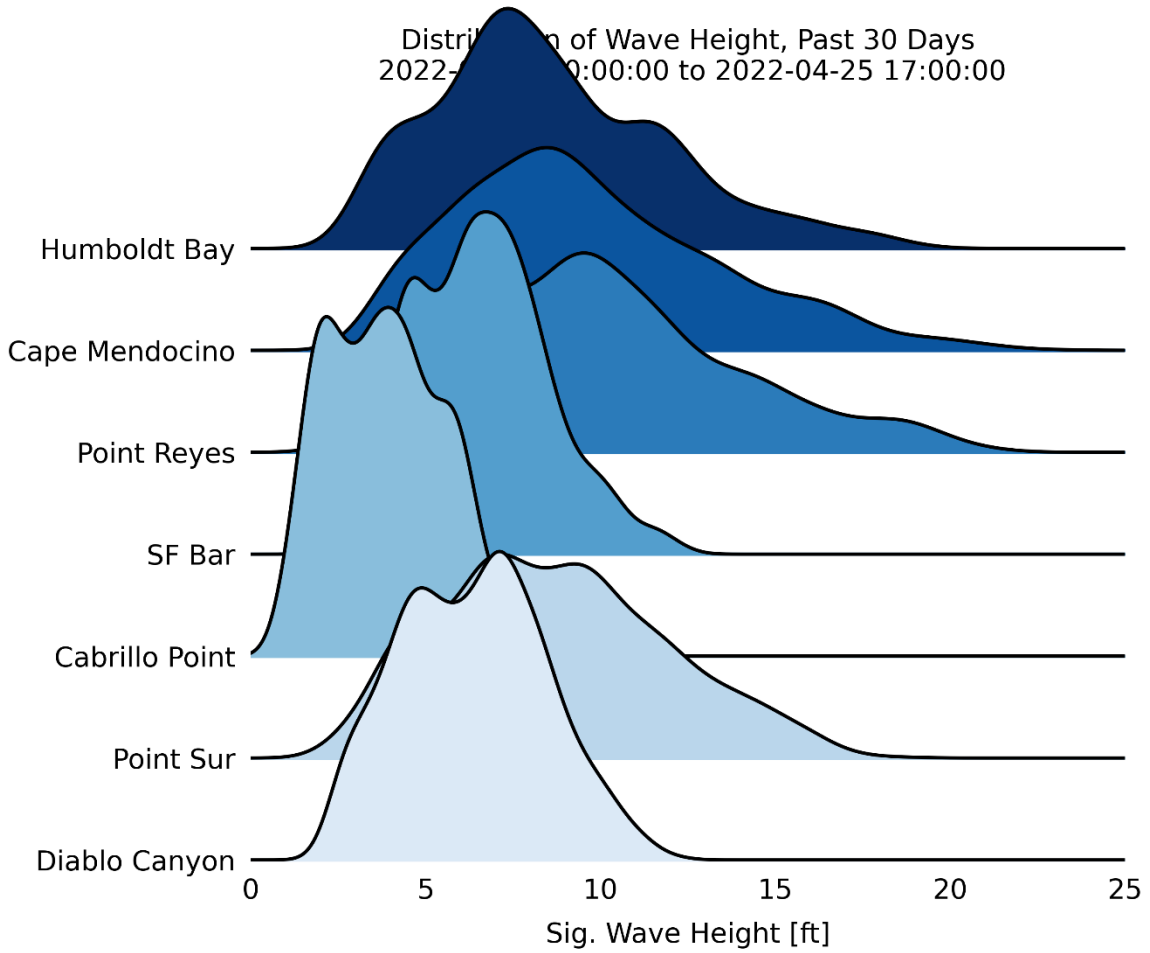


https://data.caloos.org/#module-metadata/08776889-ee89-4d15-9b49-e0779ec1b0fb

CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

Wave Tracker





US Army Corps of Engineers

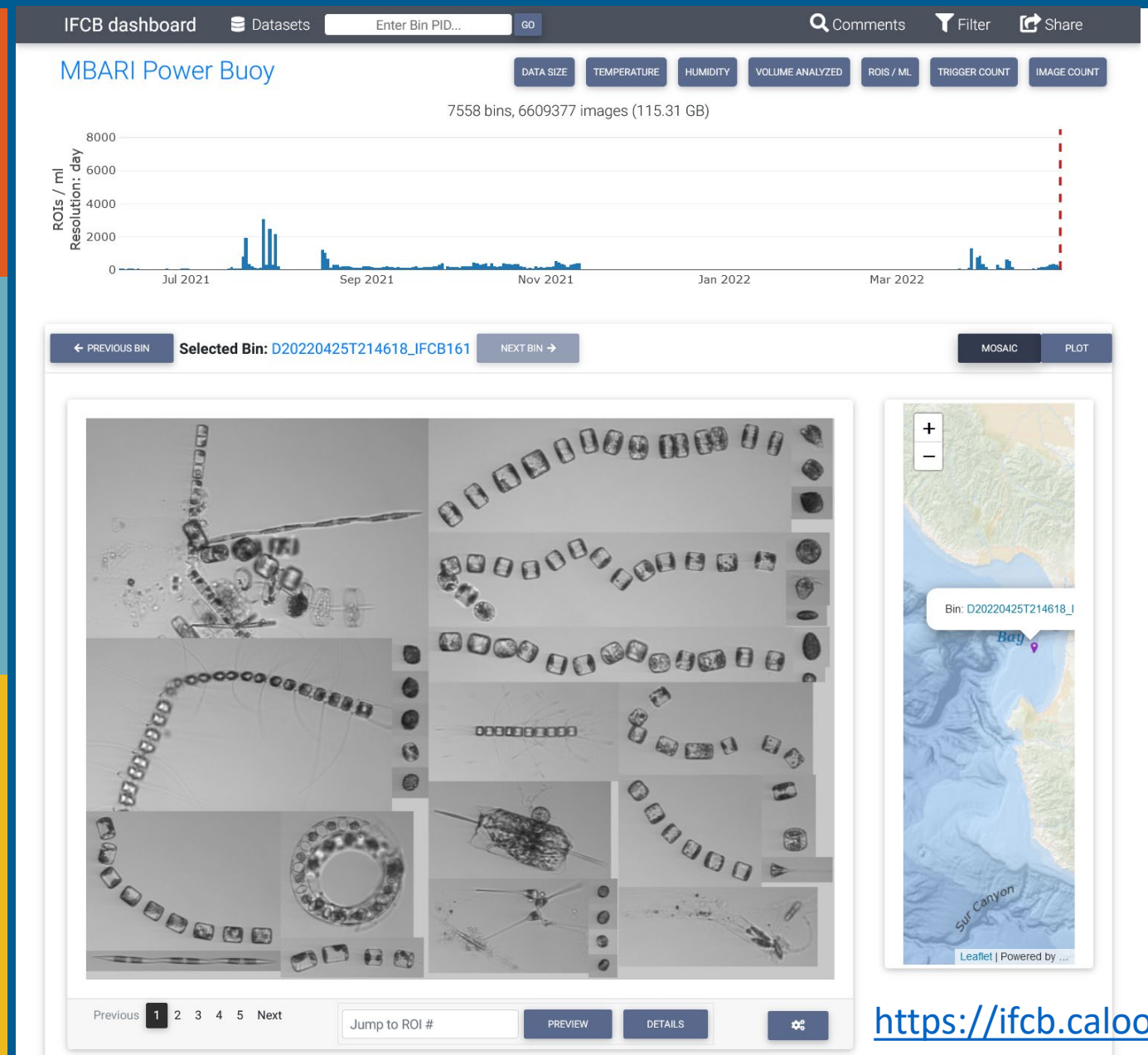
CDIP

Scripps Institution of Oceanography UCSD

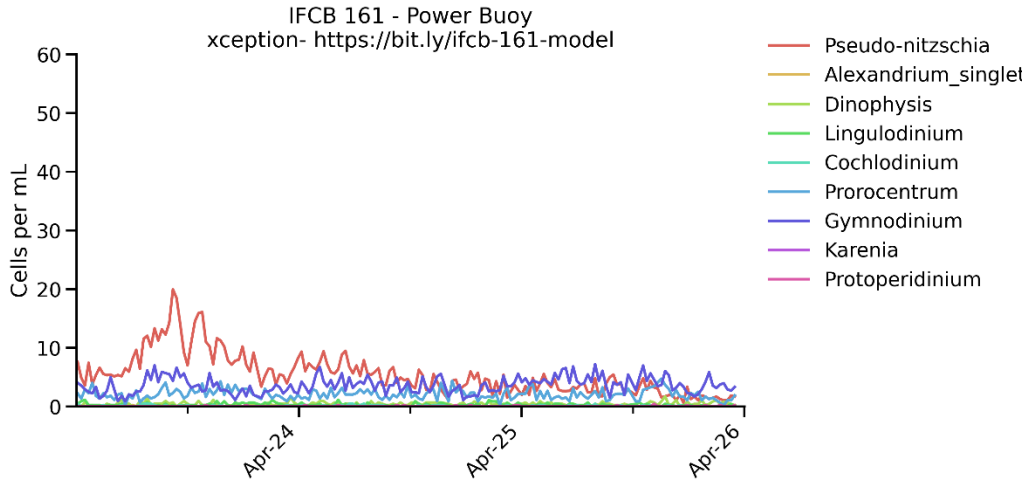
https://www.cencoos.org/information-solutions/recent-waves/

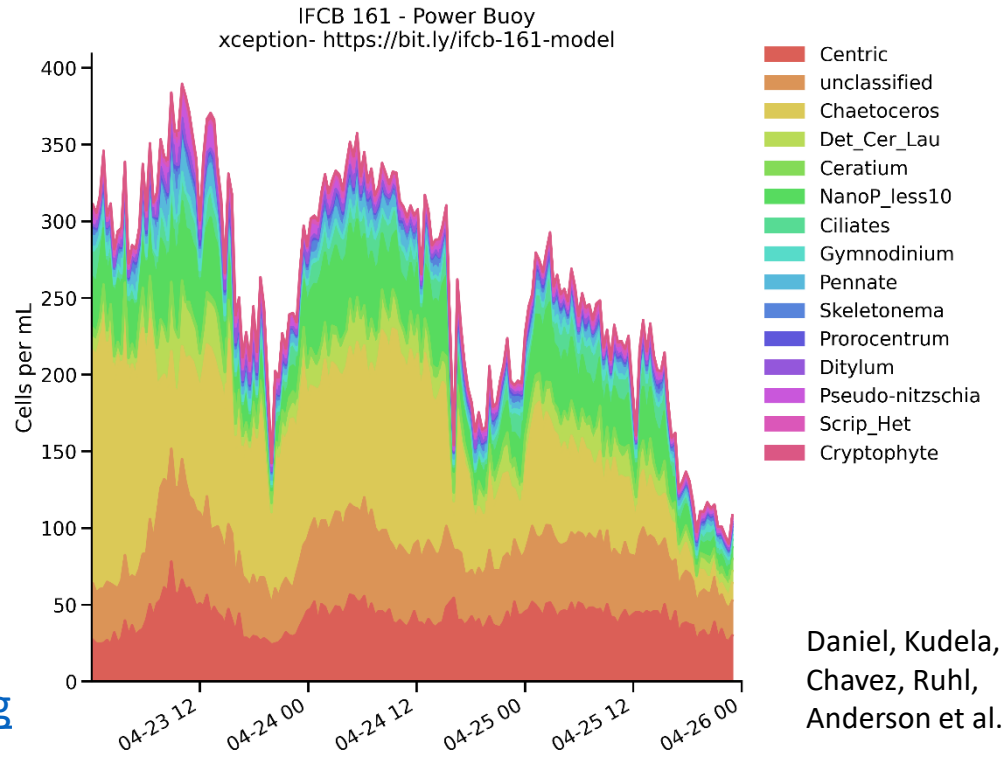
CA IFCB Network – MBARI Power Buoy

CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM



https://ifcb.caloos.org

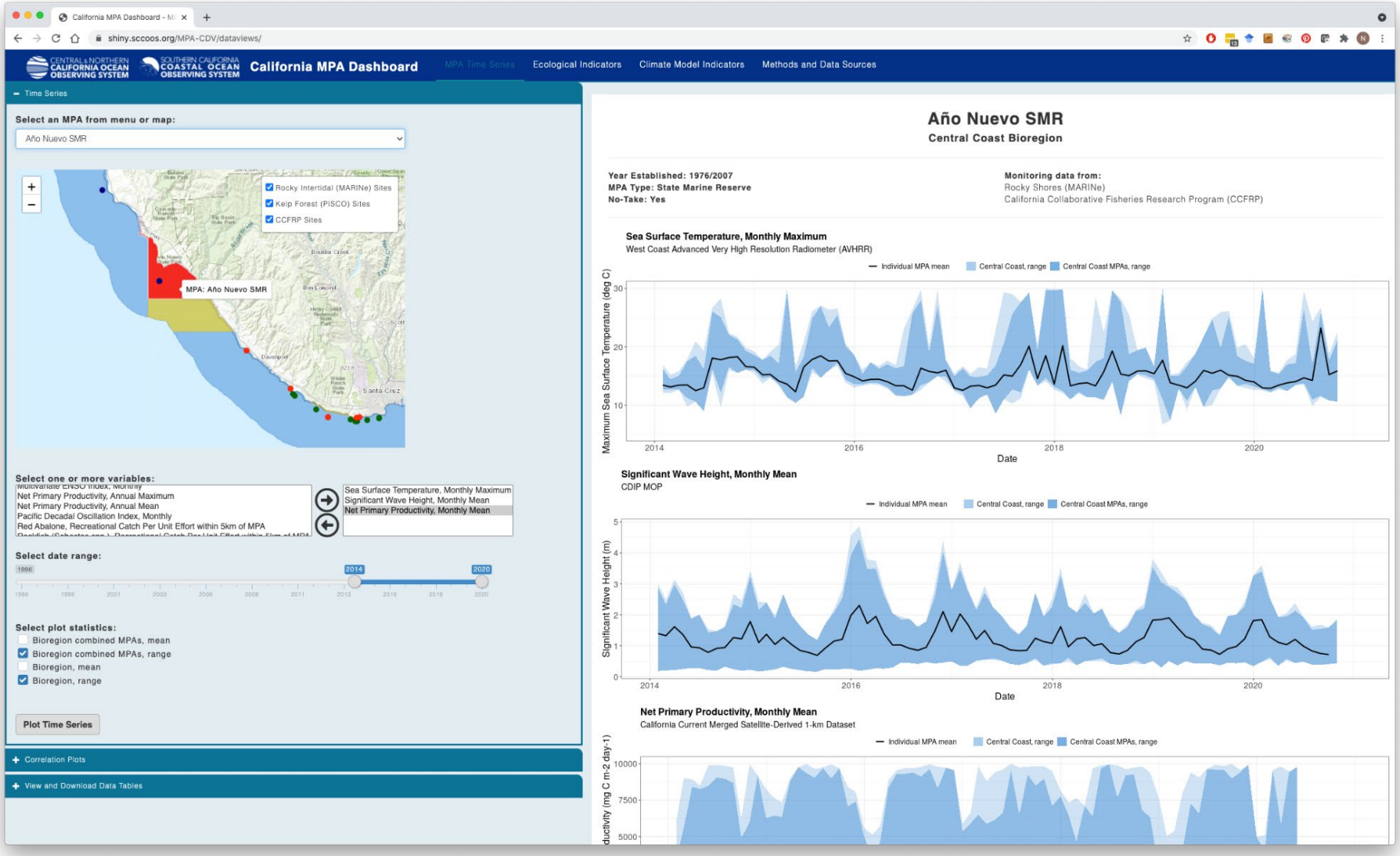




Daniel, Kudela, Chavez, Ruhl, Anderson et al.

CA IOOS MPA Project & Data Products

- 122+ MPAs
- Climate variation
- Satellite data
- Model data
- C-HARM
- Seascapes
- EcoCast
- MPA monitoring
  - MARINe
  - PISCO
  - CCFRP
  - Reef Check
  - Ecotrust
  - …

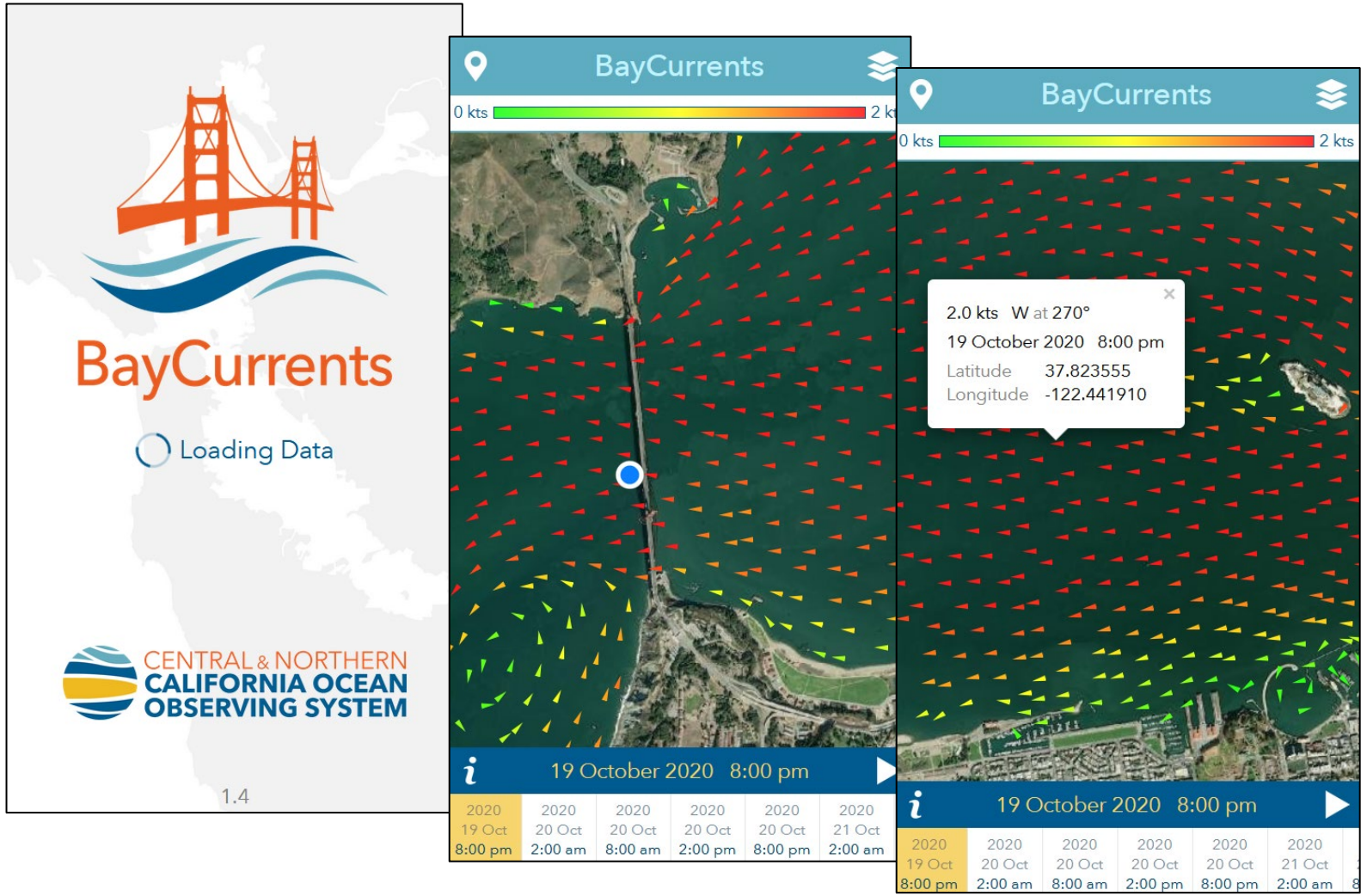


N. Low, F. Le Valle, LaScala-Gruenewald, Anderson, Ruhl, Edwards, et al.

https://mpa-dashboard.caloos.org

BayCurrents Mobile App

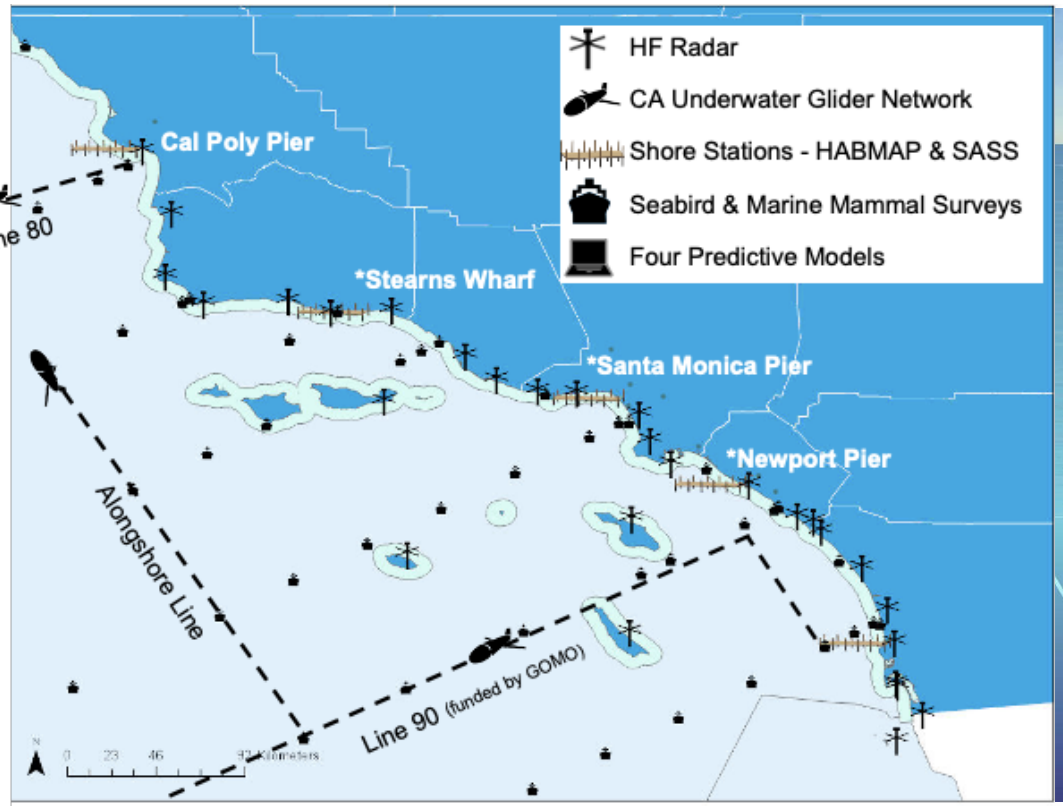
- Refresh of app in use several years ago
- Multiplatform web app
- Leverages PORTS/SFBOFS
- Other layers under consideration including navigation charts
- Available now
- Launch communications immanent

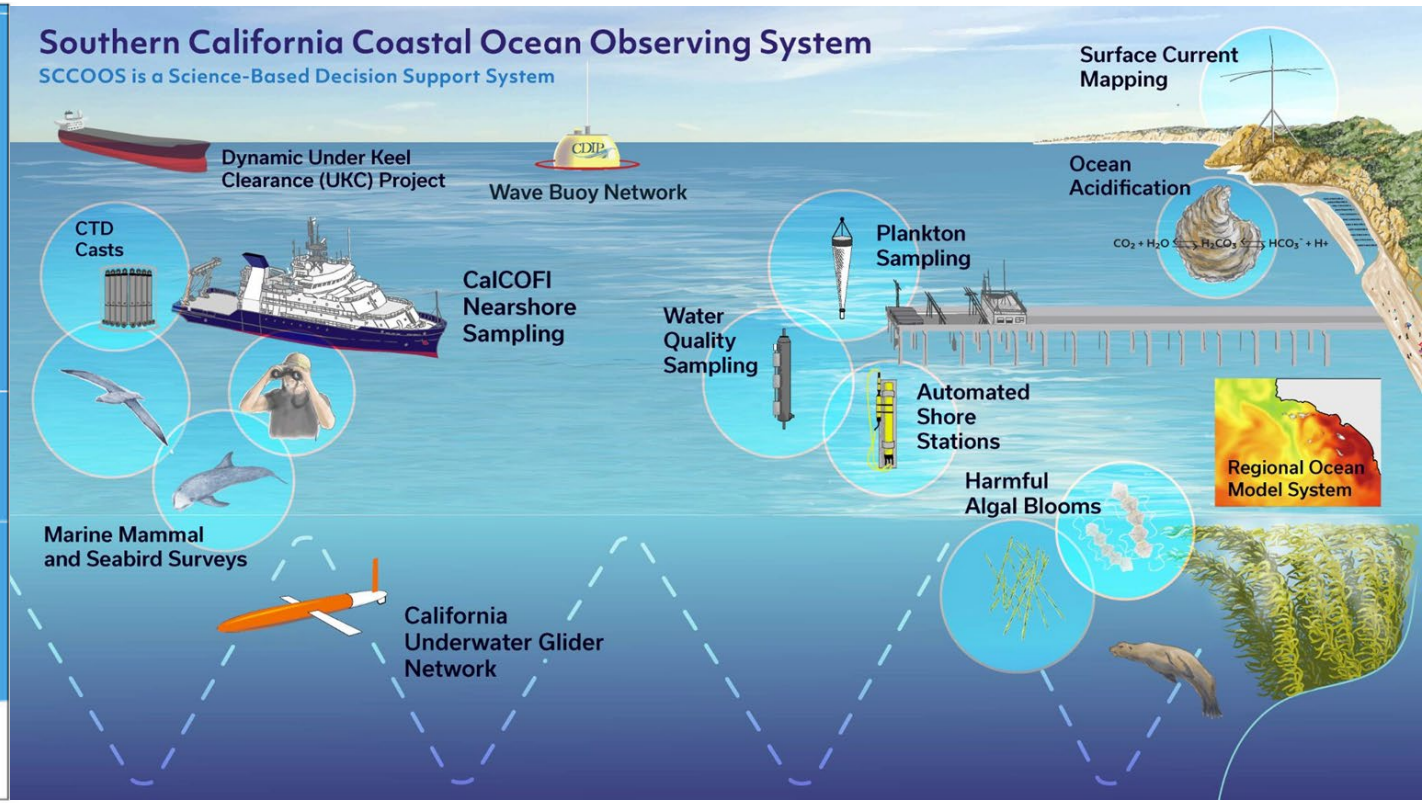


https://apps.apple.com/us/app/baycurrents/id1591997070

https://play.google.com/store/apps/details?id=org.cenoos.baycurrentsandroid&hl=en_US&gl=US

SOUTHERN CALIFORNIA
COASTAL OCEAN
OBSERVING SYSTEM





NOAA West Watch Webinar: Southern California

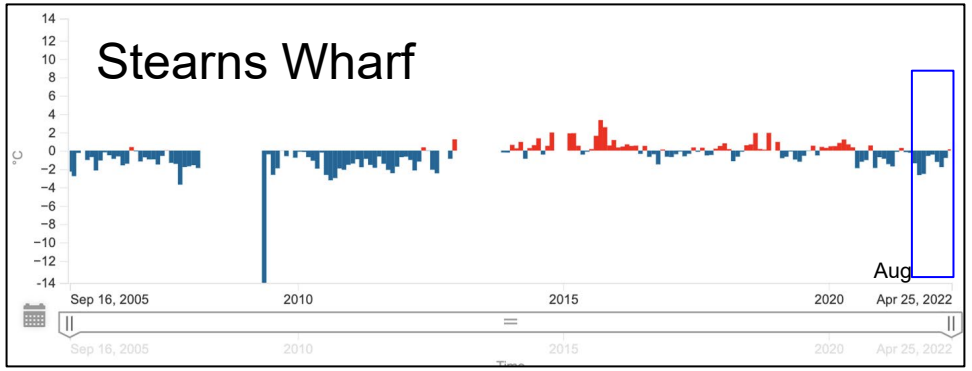
Clarissa Anderson, SCCOOS Executive Director

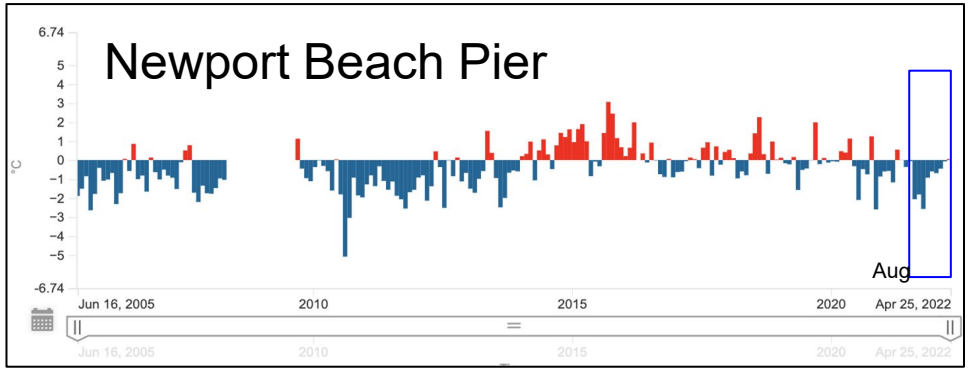
26-Apr 2022

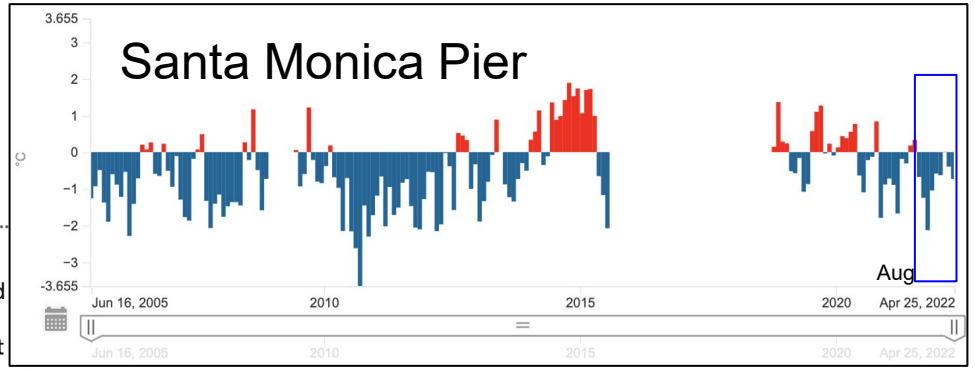
SCCOOS Automated Shore Stations

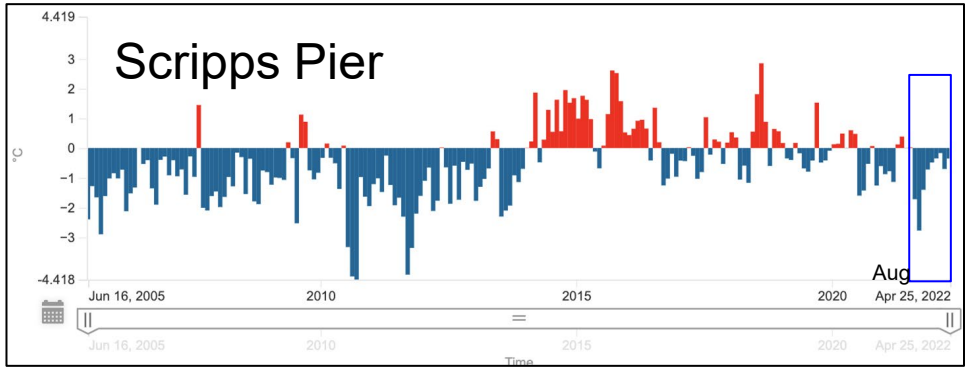
Sea Surface Temperature Anomalies

- SCCOOS shore stations ~ 17 years of data
- Ocean temps have been cooler for ~8 months
- Now trending near normal, except in areas affected by upwelling









NWS San Diego ✓
@NWSSanDiego

That 53° water temperature at Mission Beach reported at 10 AM (24 Apr 2022) was the lowest water temperature at Mission Beach since at least 2003, not just for April but any month of the year (other than a few errors!). Strong upwelling has made the local water quite cold lately!

9:15 PM · Apr 24, 2022 · Twitter Web App

34 Retweets **4** Quote Tweets **195** Likes

https://data.caloos.org/

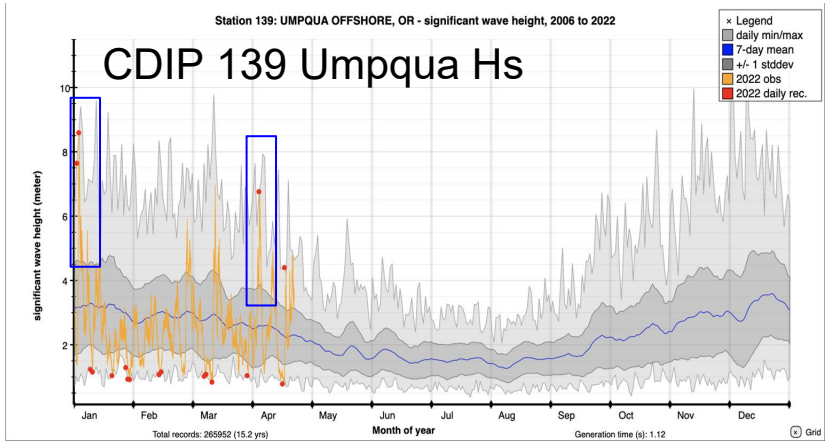
Coastal Data Information Program (CDIP)

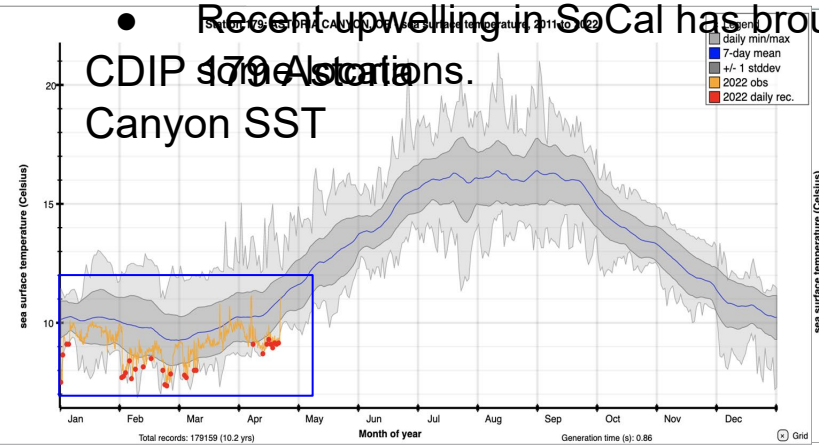
West Coast wave activity in 2022 has been following the long term climate trend.

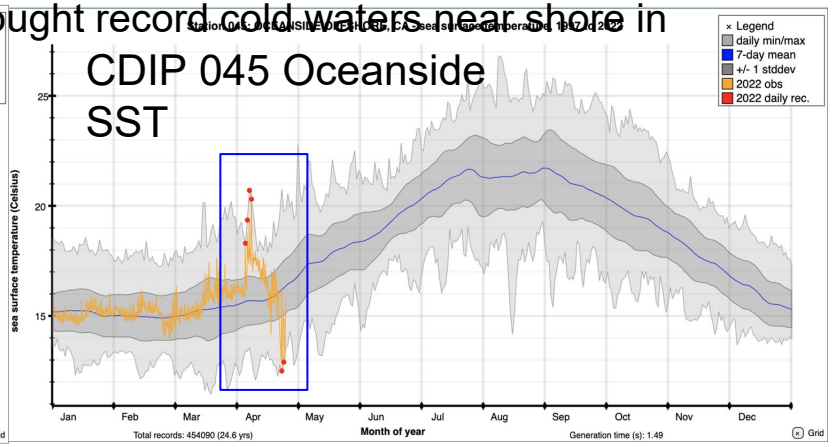
- Notable swell events in early January and early April for PNW.
- Publishing wave bulletins based on CDIP observations.

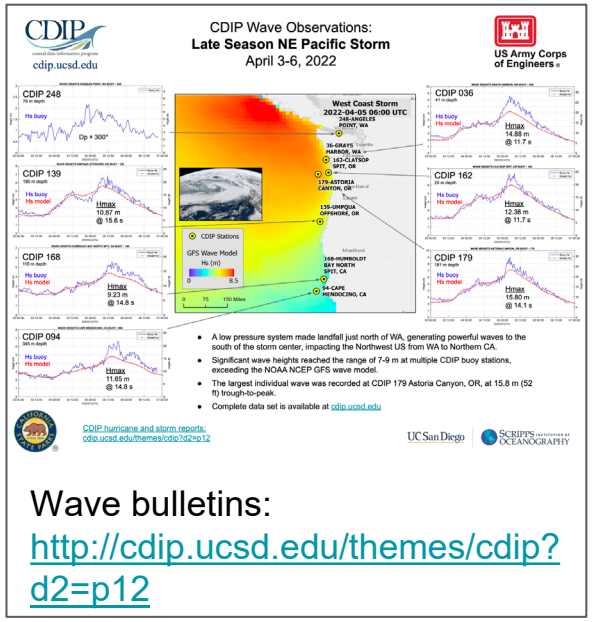
West Coast sea surface temperatures (SST) also following the climate trend.

- Some stations north of Pt. Conception were cooler than average but trending near normal now.
- Warming in N. SD and LA in early April but trending near normal now overall
- Recent upwelling in SoCal has brought record cold waters near shore in some locations.

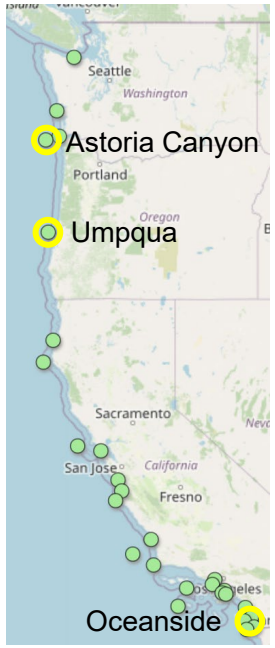








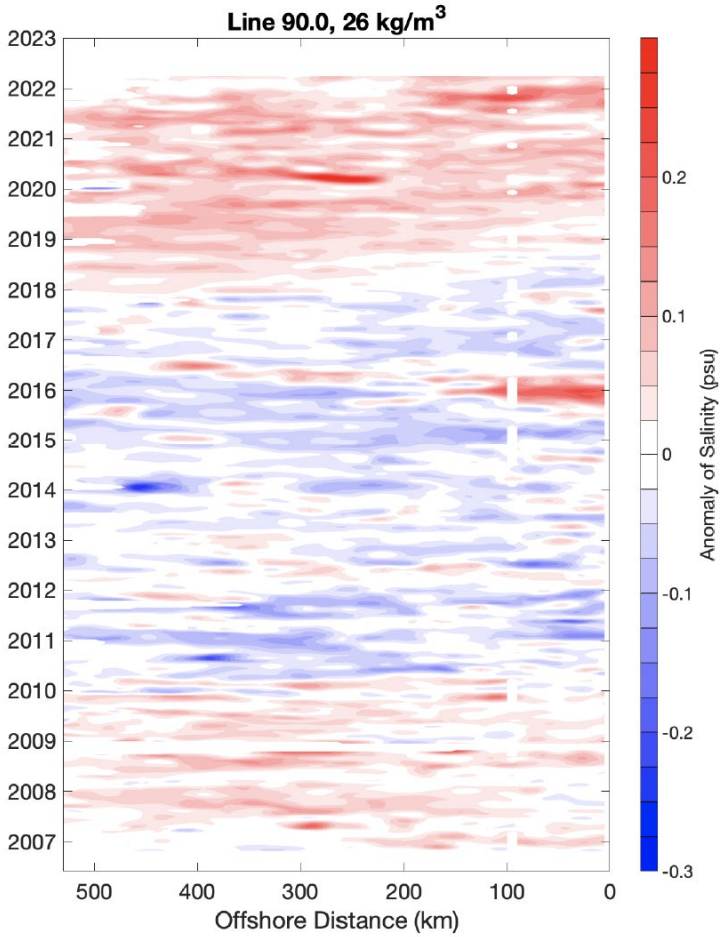
Wave bulletins: http://cdip.ucsd.edu/themes/cdip?d2=p12

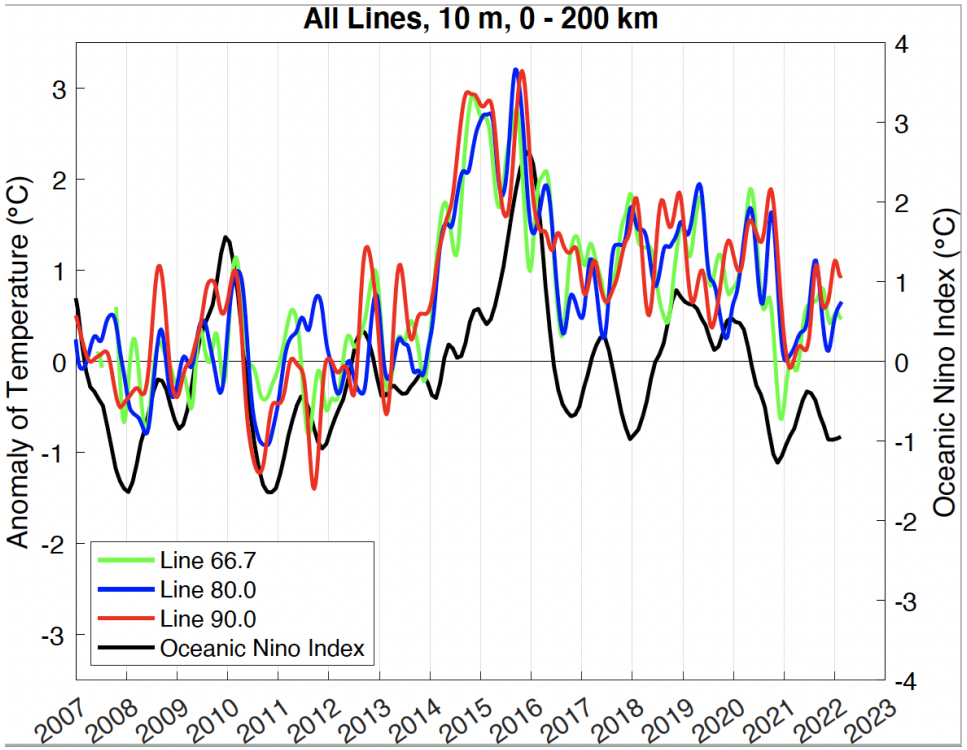


J. Behrens, SIO

California Underwater Glider Network

- Decadal scale changes in salinity
- Recent salty period starting in 2018 offshore- suggests initial influx came southward in the CA current
- Inshore 2015-2016 salty blob indicates strong El Niño with northward flow of salty water in the CA undercurrent





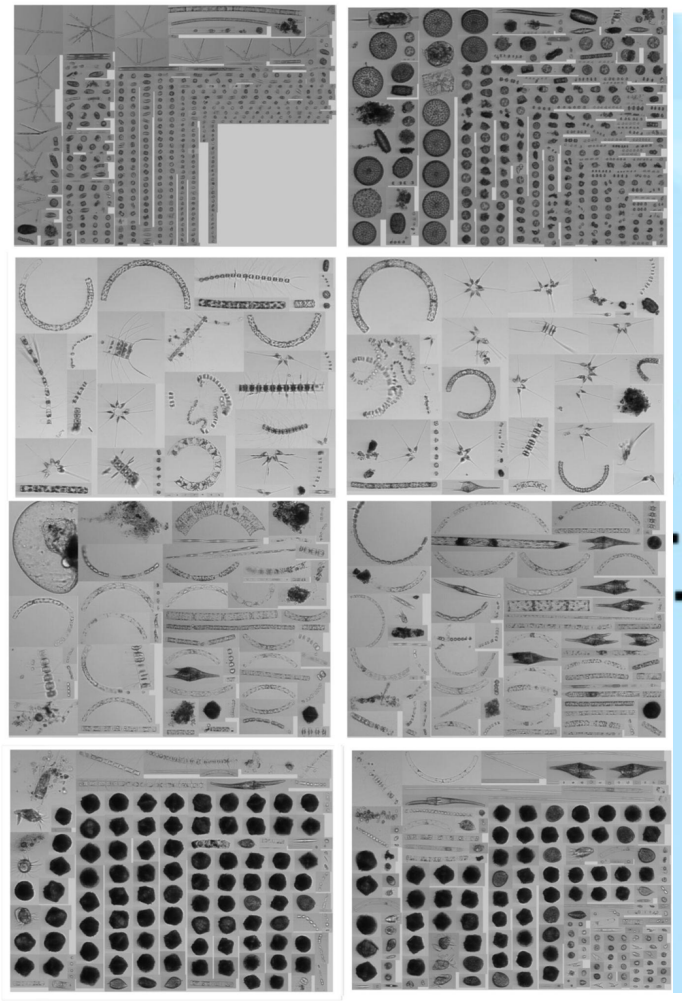
CA IFCB Network - progress update

Roll out of stations:

- San Francisco Pier 17
- Santa Cruz Wharf
- MBARI Power Buoy
- Stearns Wharf
- Newport Beach Pier
- Del Mar Mooring
- Scripps Pier

Mosaic from March 16 illustrates the latitudinal and environmental variation in species

https://ifcb.caloos.org/dashboard

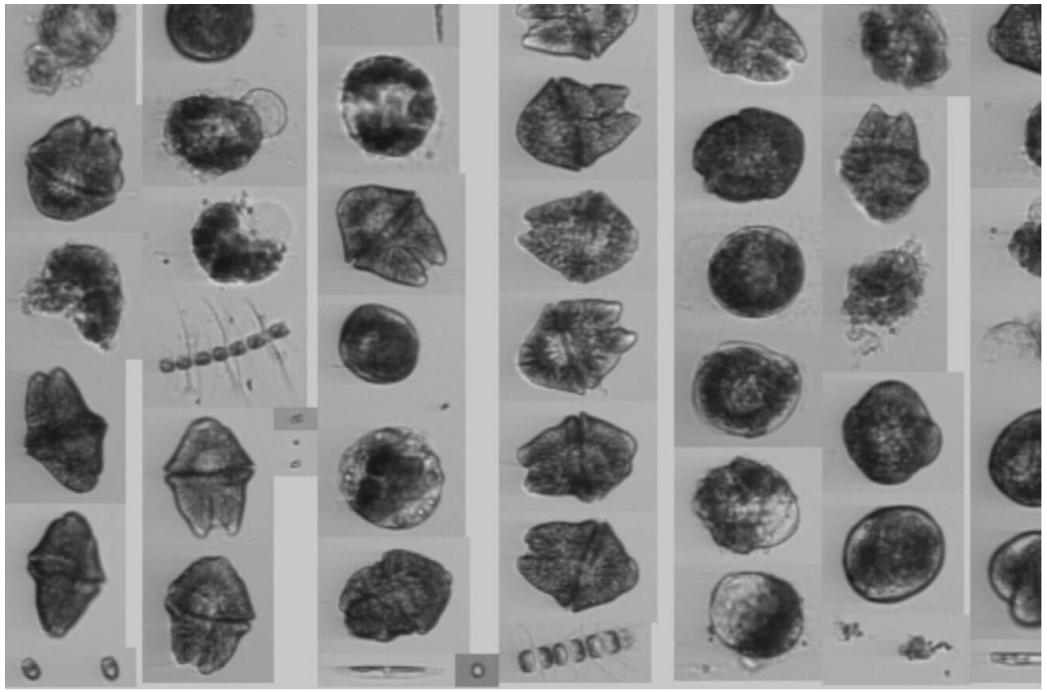


NCCOS IOOS Integrated Ocean Observing System OCEAN PROTECTION COUNCIL

CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM

CA IFCB Network - progress update



Akashiwo sanguinea boom currently occurring at Newport Beach Pier

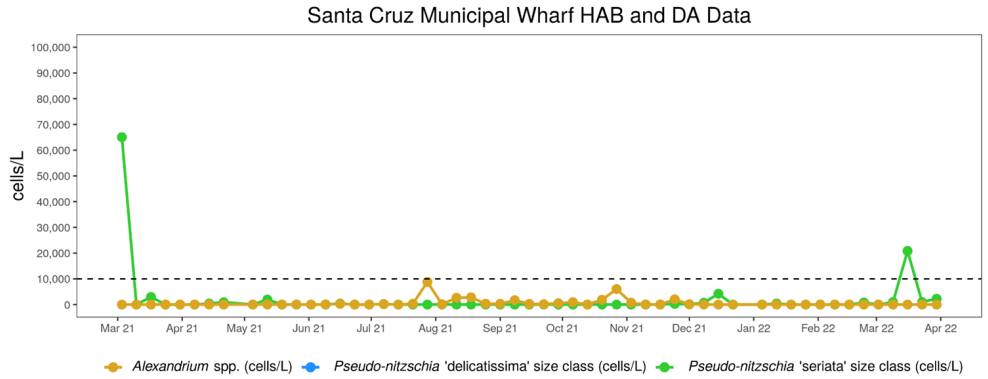
https://ifcb.caloos.org/dashboard

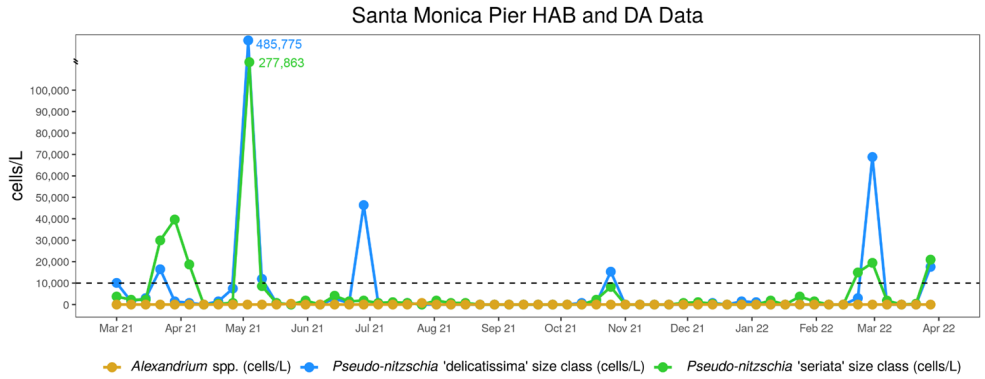
NCCOS IOOS Integrated Ocean Observing System OCEAN PROTECTION COUNCIL

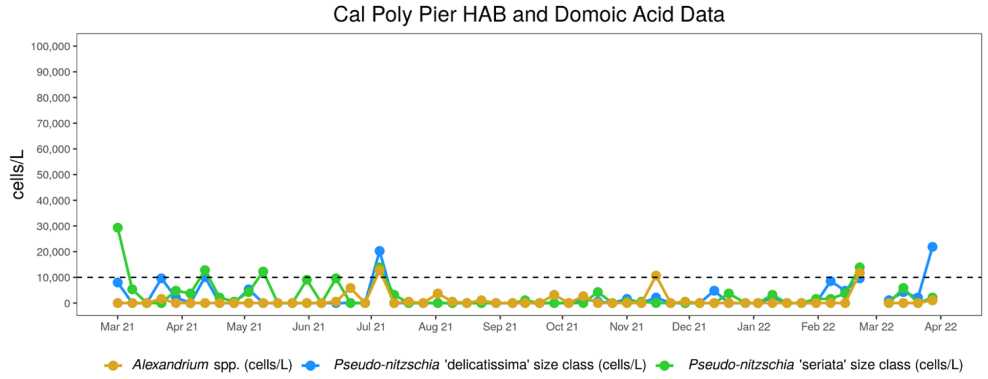
CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

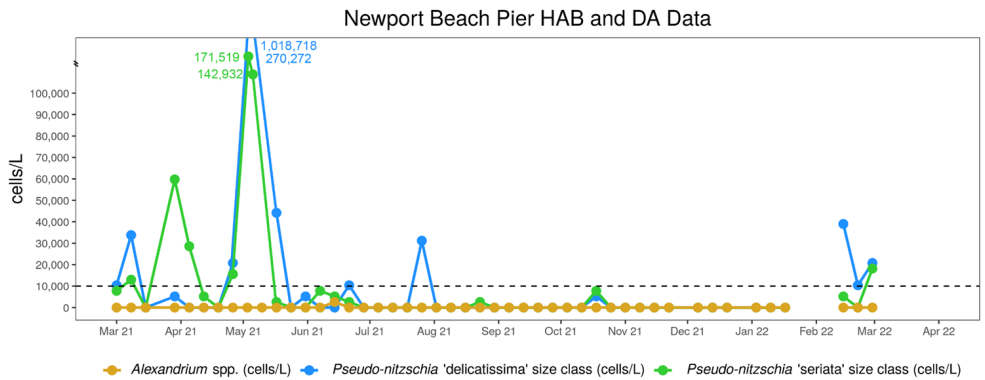
SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM

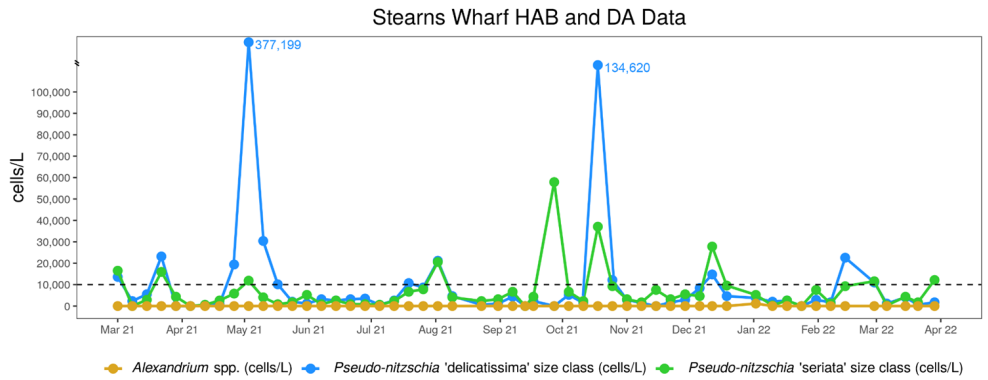
Harmful Algal Bloom Monitoring Alert Program (HABMAP)

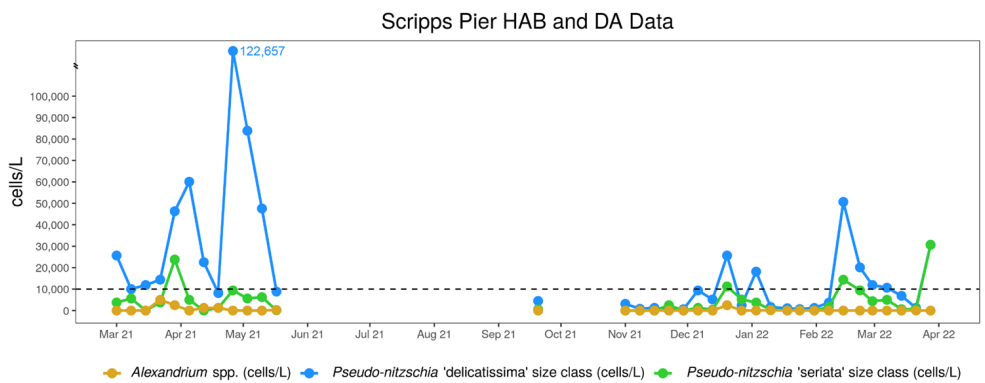










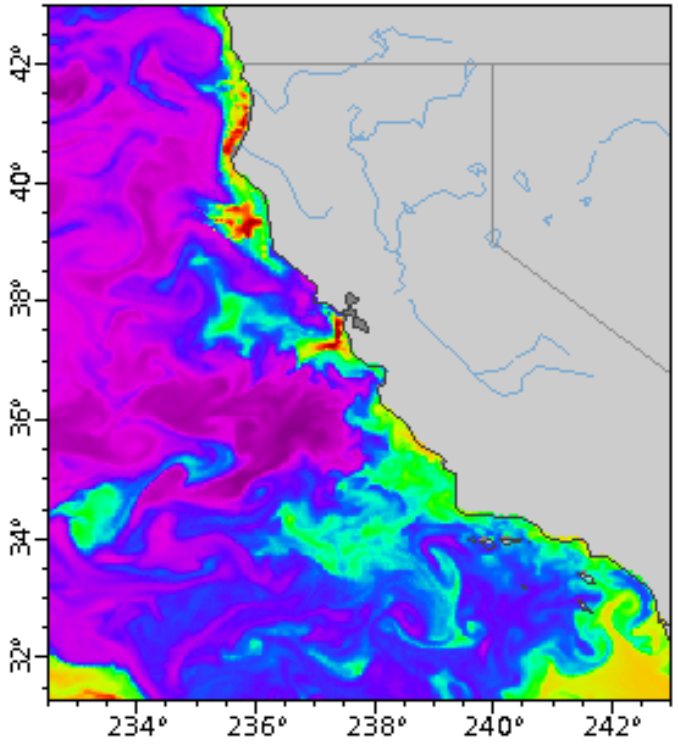


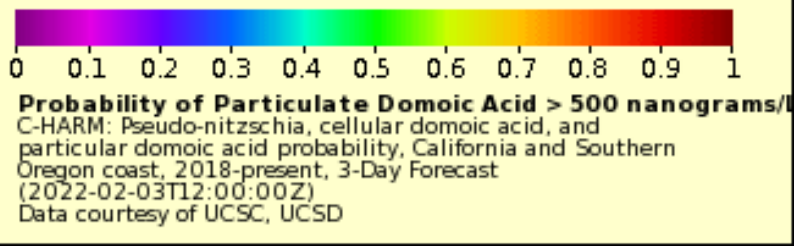
CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM

CA HAB Bulletin

C-HARM Probability of particulate Domoic Acid (pDA) for Feb 1-Apr 24 2022





Mon, Apr 25, 2022 Newsweek LOGIN SUBSCRIBE FOR $1 >

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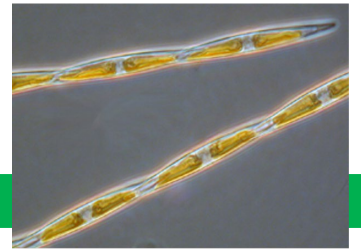
Mystery As Dozens of Sea Lions Wash Up Dead on California Coast

BY ROBYN WHITE ON 4/6/22 AT 7:39 AM EDT

The Pacific Marine Mammal Center (PMMC), in Laguna Beach, recorded a mass sea lion stranding event in February-March.

Domoic acid analysis pending but appears to be caused by an offshore DA event.



Pseudo-nitzschia produces domoic acid

THE ORANGE COUNTY REGISTER

Environment

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21 sea lions found dead on OC coast are a mystery in an otherwise seeming normal year for rescues

https://www.newsweek.com/mystery-dozens-sea-lions-strandings-dead-california-coast-1695448

https://www.ocregister.com/2022/04/05/21-sea-lions-found-dead-on-oc-coast-are-a-mystery-in-an-otherwise-seeming-normal-year-for-rescues/

The Marine Mammal Center | Channel Islands Marine & Wildlife Institute | Marine Animal Rescue Nonprofit • Since 1985 | California Wildlife Center | Marine Mammal Care Center Los Angeles Est 1992 | Pacific Marine Mammal Center | SeaWorld San Diego

sccoos.org/california-hab-bulletin/

SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM

https://data.caloos.org/

California Ocean Observing Systems Science Impact and Stakeholder Engagement Meeting

Hosted by SCCOOS & CeNCOOS

May 23rd - 25th, 2022
Avila Lighthouse Suites
550 Front St, Avila Beach, CA
Point San Luis Conference Room
Register by APRIL 15TH

Meeting Objectives:

1. Provide an update of California's Ocean Observing System's accomplishments, DMAC capabilities, and end-user applications.
2. Improve strategic alignment among Cal OOS contributing partners and share advancements in scientific understanding.
3. Identify knowledge gaps and stakeholder needs

Meeting Organization:

Scientific Presentation

- State of the Science
- Observing Subsystems - Success and Challenges, New Findings
- Data Management
- Highlight Products/Tools

Stakeholder Discussion

- Are there stakeholder needs/gaps that Cal OOS can help fill? What additional information could improve your ability to meet your priorities?
- What do you like about the current data products provided and what would you like improved?
- What opportunities are there for cross-collaboration?
- How to improve DEI and support tribal monitoring efforts?

Questions?

info@sccoos.org

IOOS Integrated Ocean Observing System

Photo: Tahoe Rim Trail, October 7, 2021
Credit: Dan McEvoy

Next NOAA West Watch:

August 2, 2022

Thanks!