# NOAA West Watch

*Reporting Regional Environmental Conditions & Impacts in the West*

**July 24, 2018**

# Call Agenda

- **Project Recap & Updates (Timi Vann)**
- El Niño and Regional Climate brief (Dan McEvoy)
- Guest Speaker: (Sarah Kapnick: Snowpack Prediction)
- IOOS Nearshore Conditions brief (Jan Newton, Henry Ruhl, Megan Hepner)
- Discussion - Environmental conditions and impacts reporting (All)

# Project Recap and Updates

- NOAA West Watch bi-monthly webinars are a project of the NOAA Western Regional Collaboration Team (NOAA West)

- Project Goal: Document and share information on regional environmental conditions and impacts on human systems at the regional scale to elevate awareness and foster improved communication and coordination across NOAA and our partner network in the region.

- Next webinar: September 25th, 1-2PM PDT/ 2-3PM MDT. ***NOTE:*** This is our last scheduled webinar.

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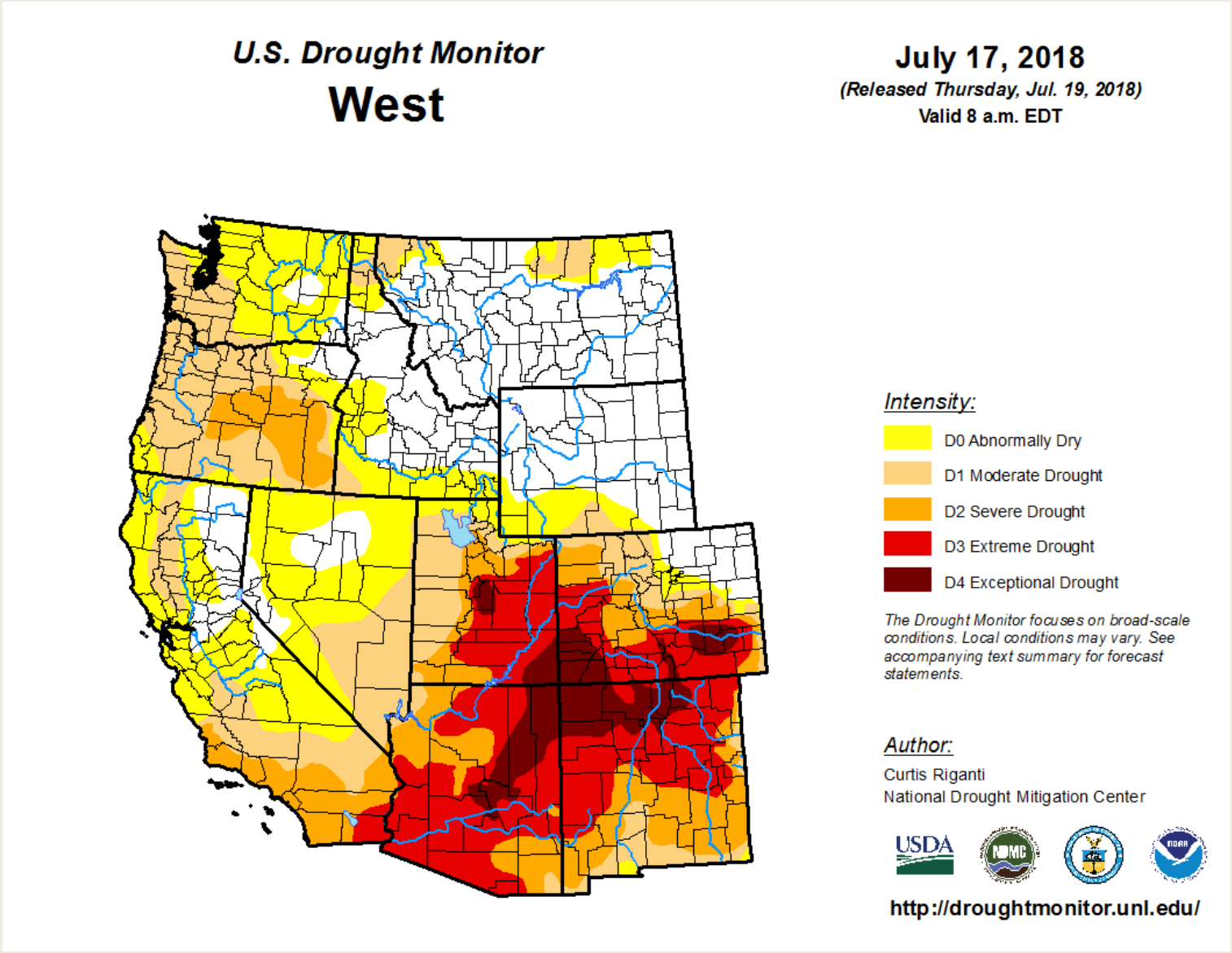
# Current Drought Conditions



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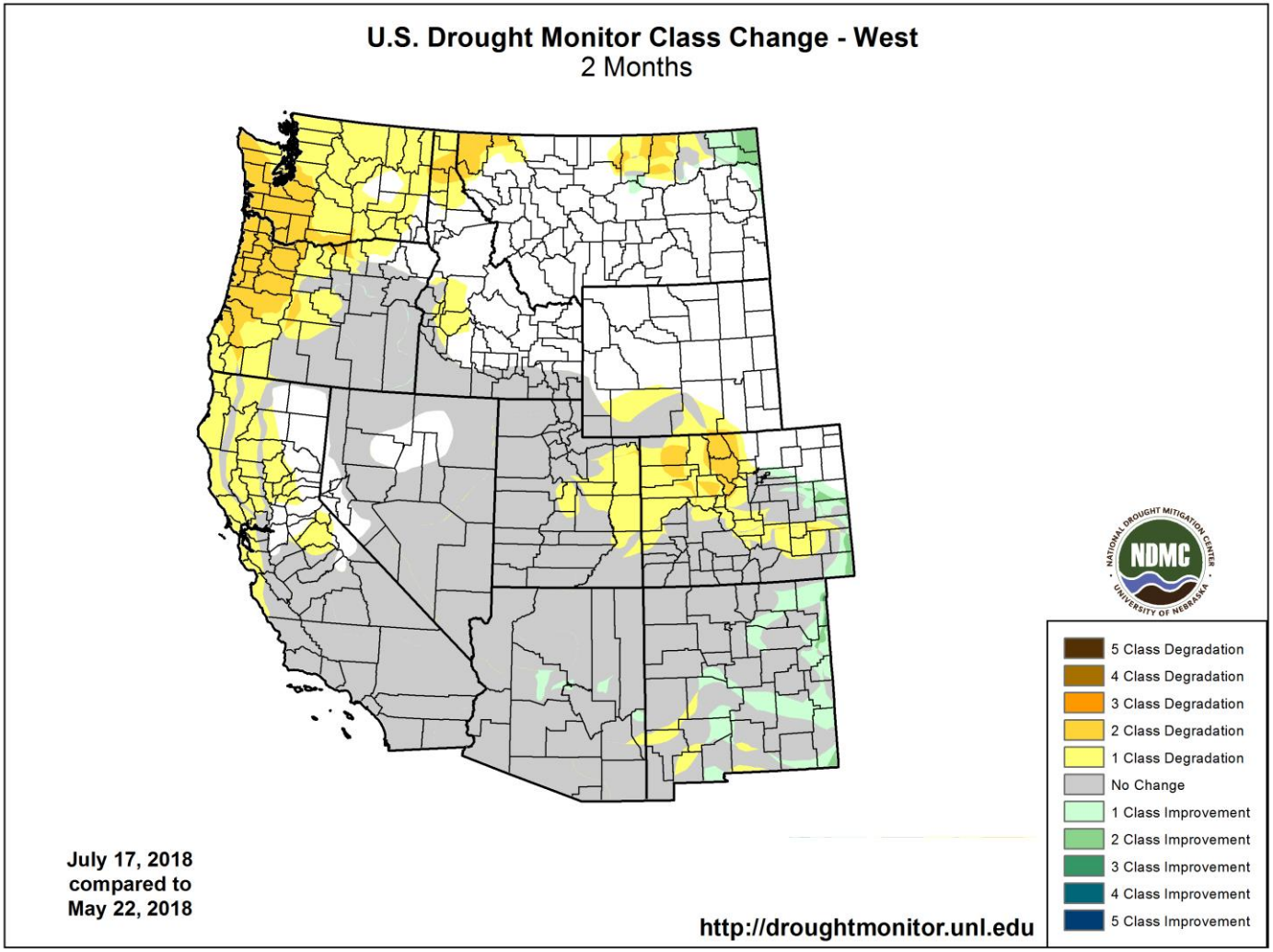
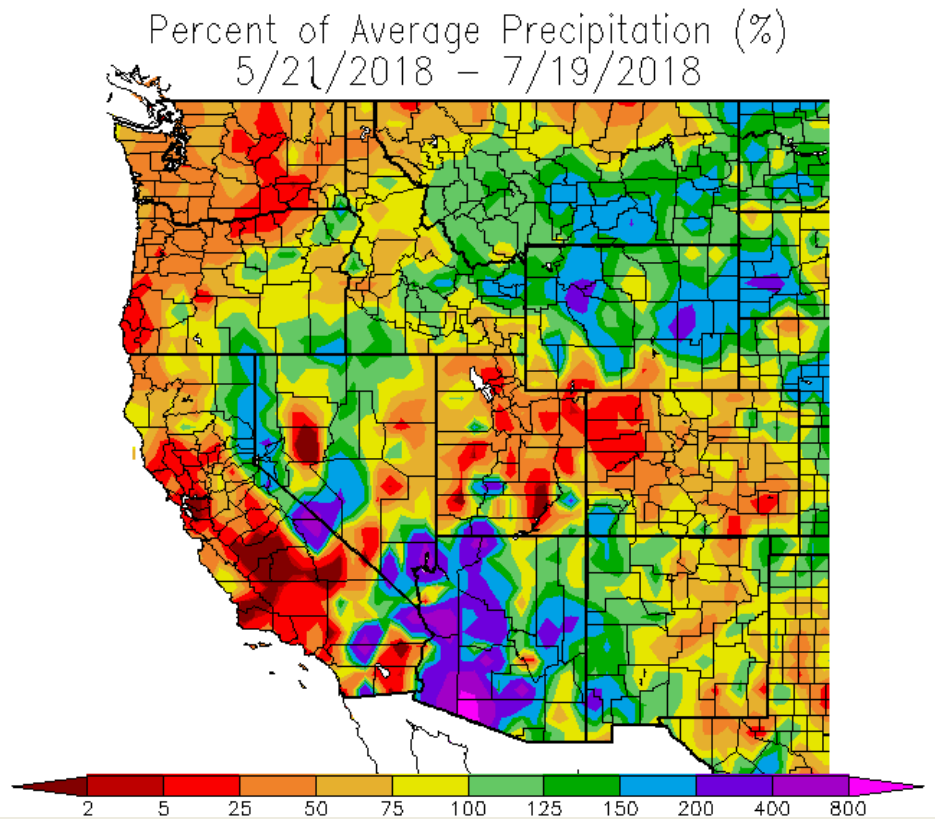
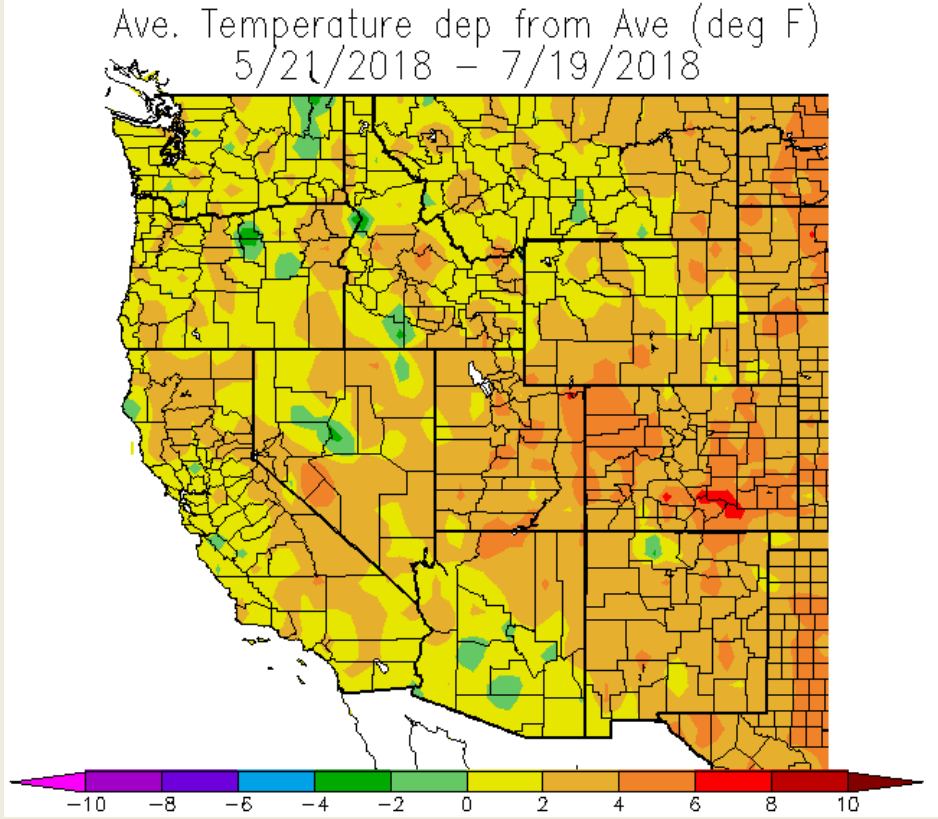


# Precipitation and Temperature

**May 21-July 19, 2018**
**% of Average Precipitation**

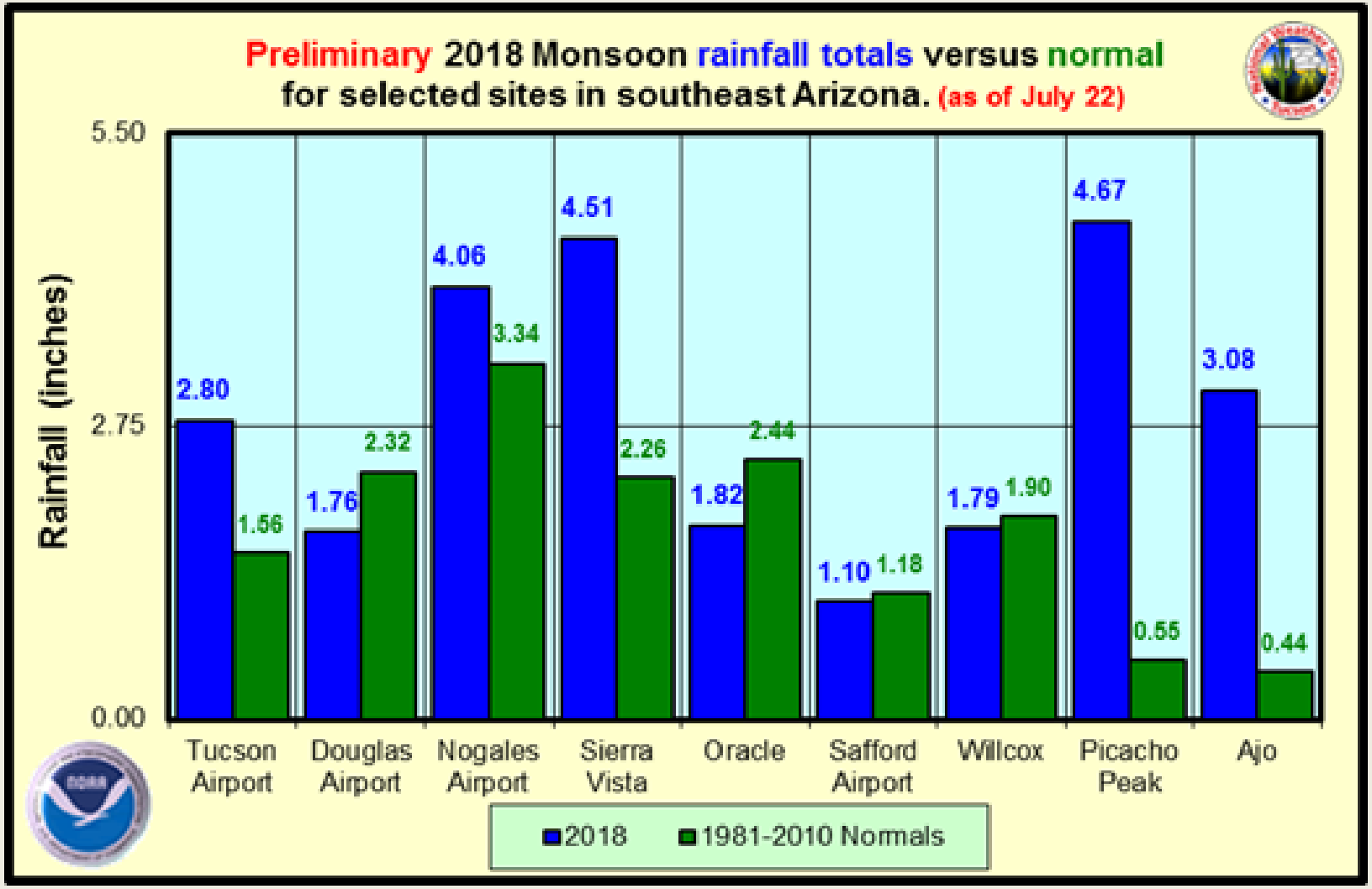



**May 21-July 19, 2018**
**Temperature Anomalies**




https://wrcc.dri.edu/anom/

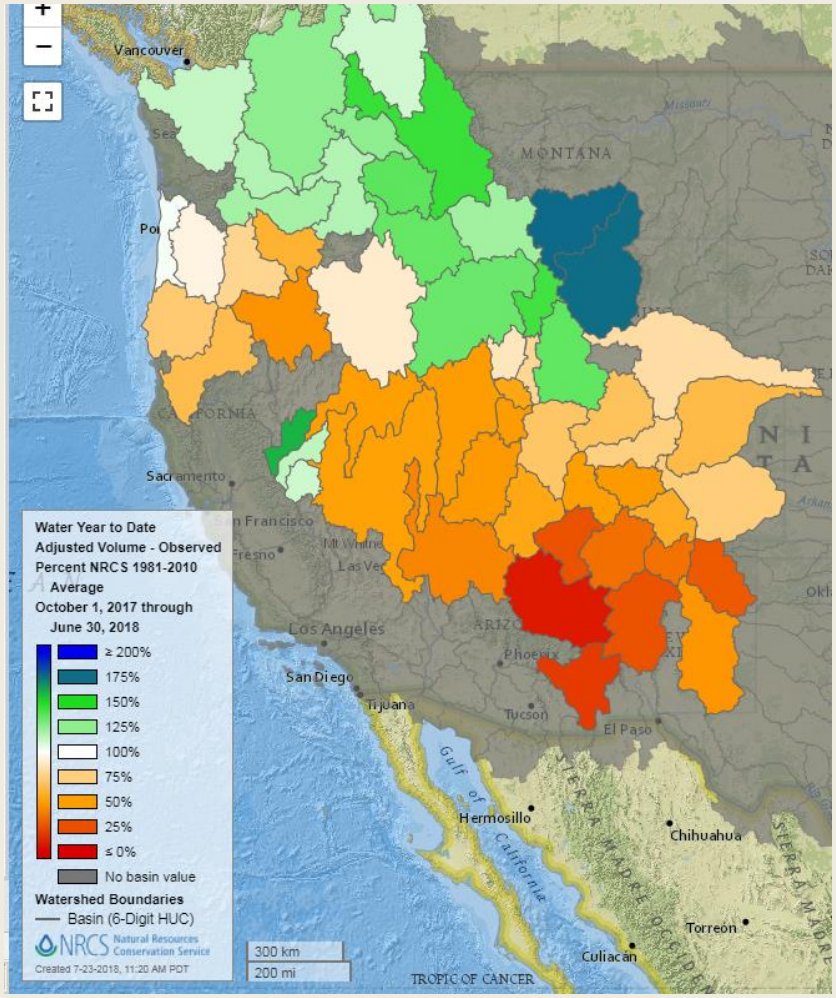
# Southwest Monsoon



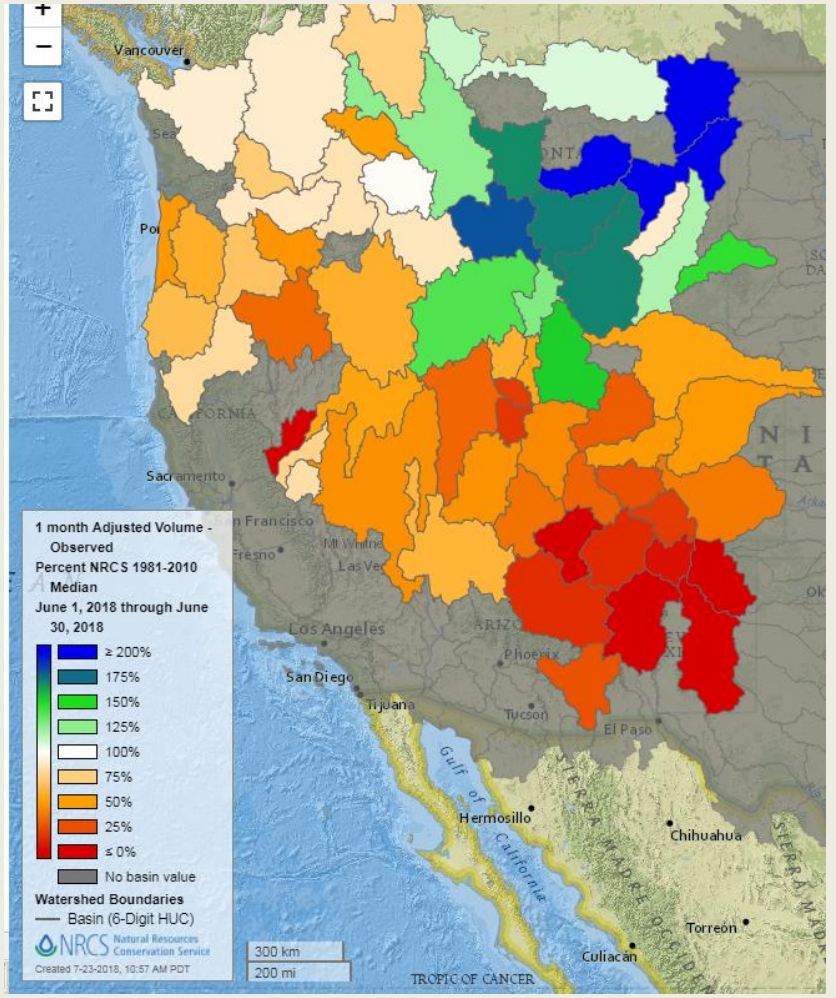

https://www.wrh.noaa.gov/twc/monsoon/rainfall.php

# Streamflow

## October 1-June 30, 2018
## Observed Streamflow % of Average

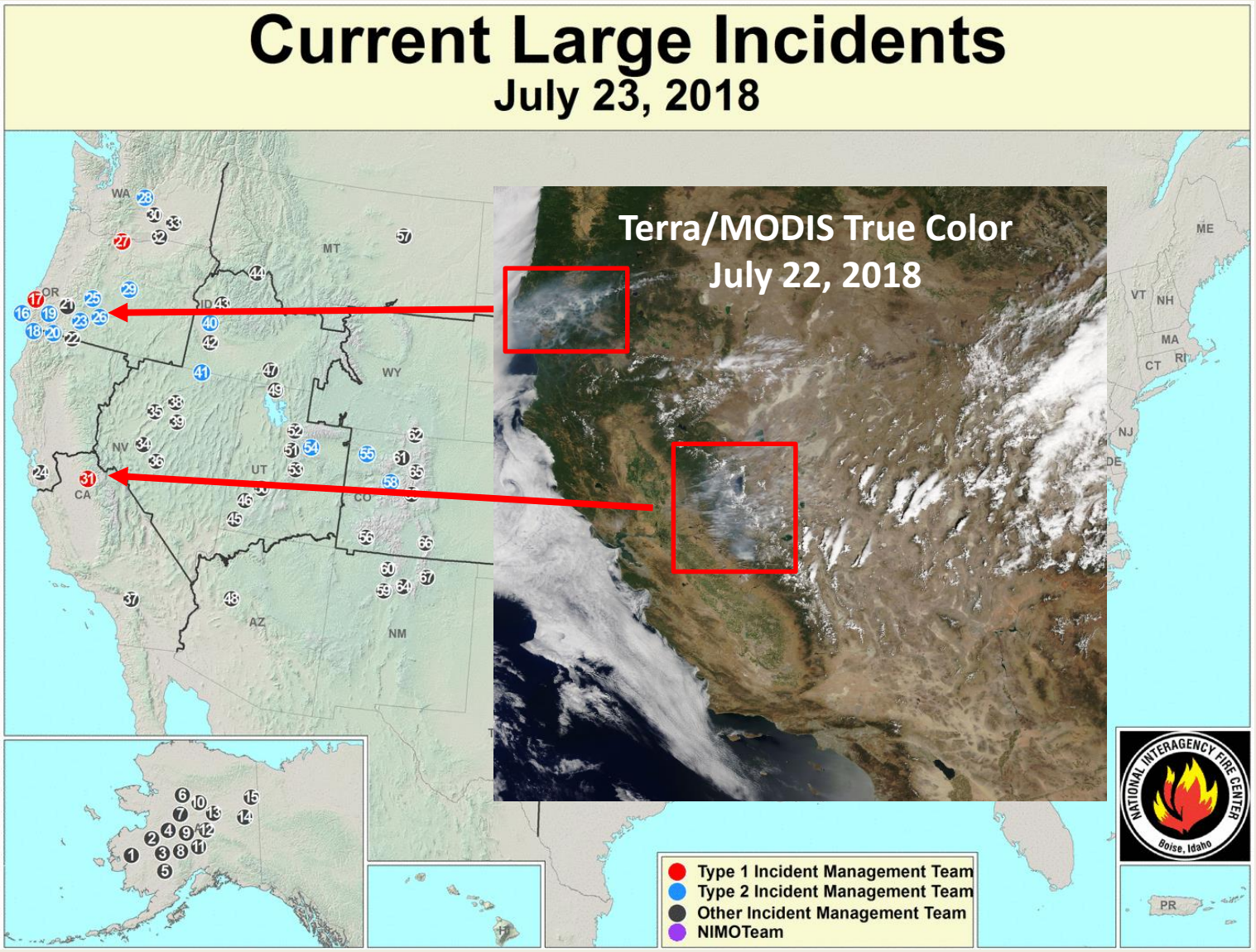



## June 1-June 30, 2018
## Observed Streamflow % of Median



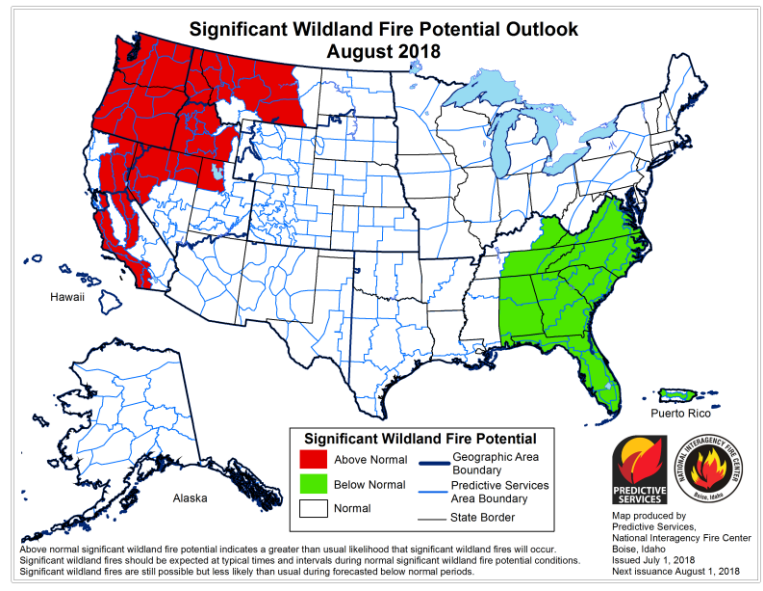

https://www.wcc.nrcs.usda.gov/wsf/wsf-strmflow-data.html

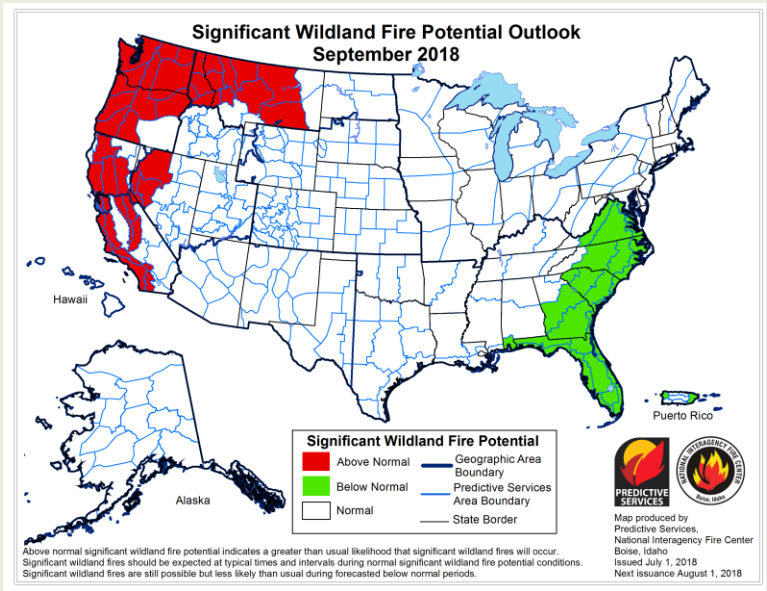
# Wildfires and Smoke

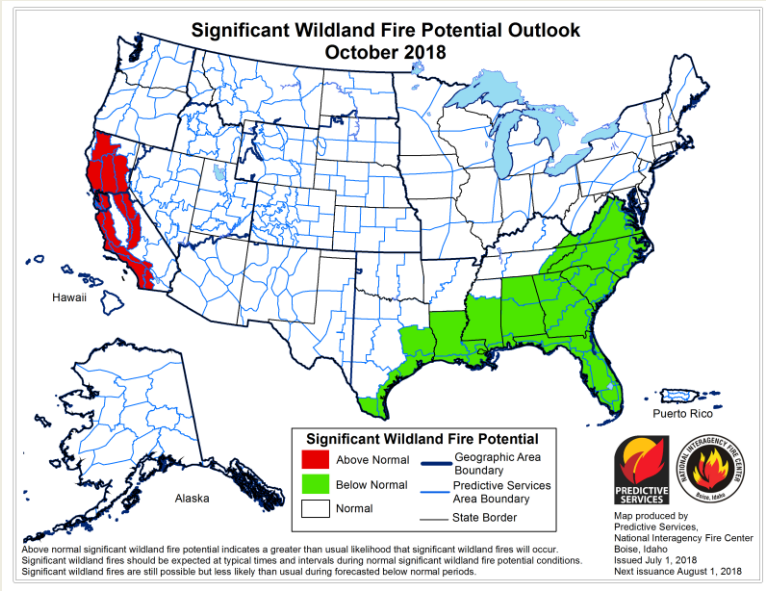



https://fsapps.nwcg.gov/afm/index.php

# Significant Wildland Fire Potential Outlook




https://www.predictiveservices.nifc.gov/outlooks/outlooks.htm

# ENSO Status

- ENSO Alert System Status: **El Niño Watch**
- ENSO-neutral conditions are present. *
- Equatorial sea surface temperatures (SSTs) are near-to-above average across most of the Pacific Ocean.
- ENSO-neutral is favored through Northern Hemisphere summer 2018, with the chance for El Niño increasing to about 65% during fall, and to about 70% during winter 2018-19.

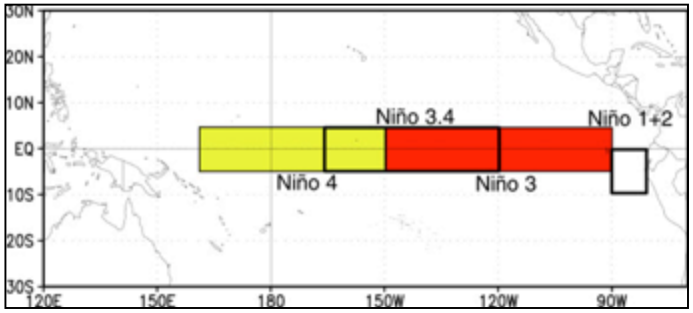
Credit: CPC

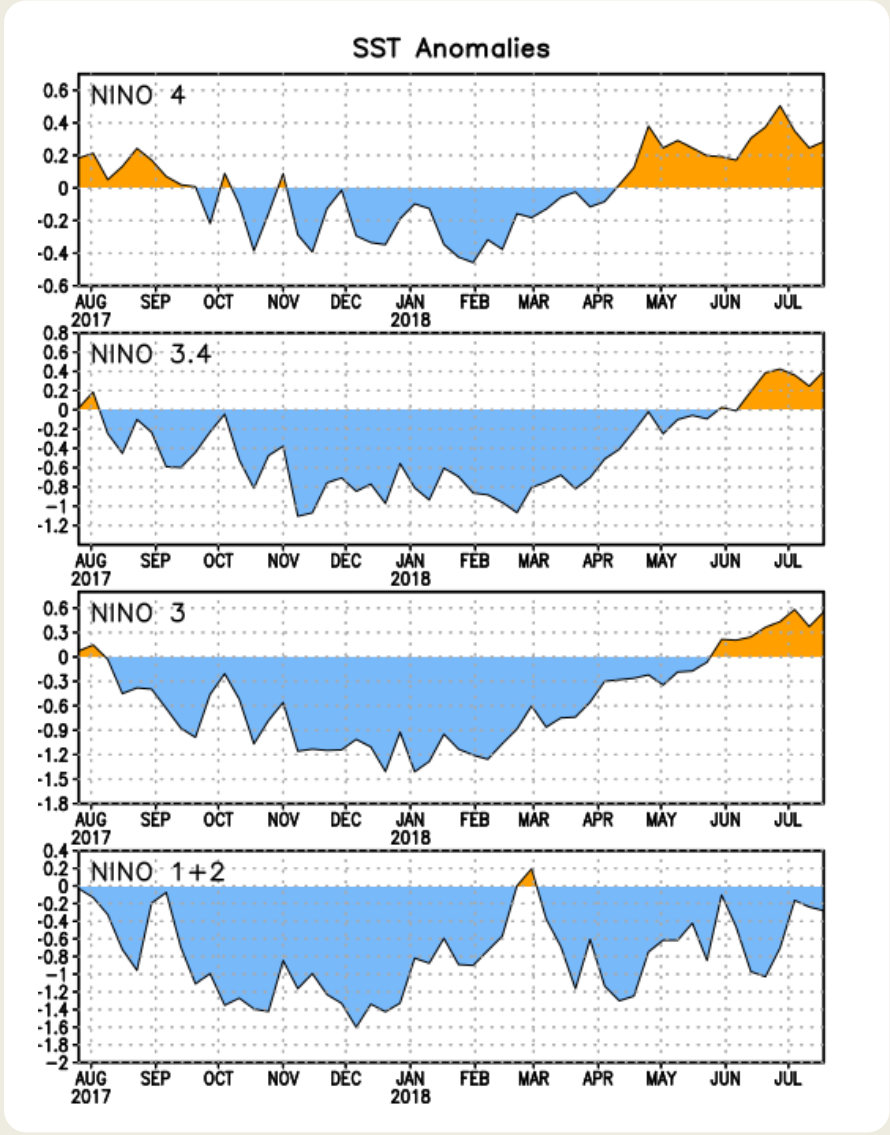
* Note: These statements are updated once a month (2nd Thursday) in association with the ENSO Diagnostics Discussion, which can be found here: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/.

# Niño Region SST Departures (ºC) Recent Evolution

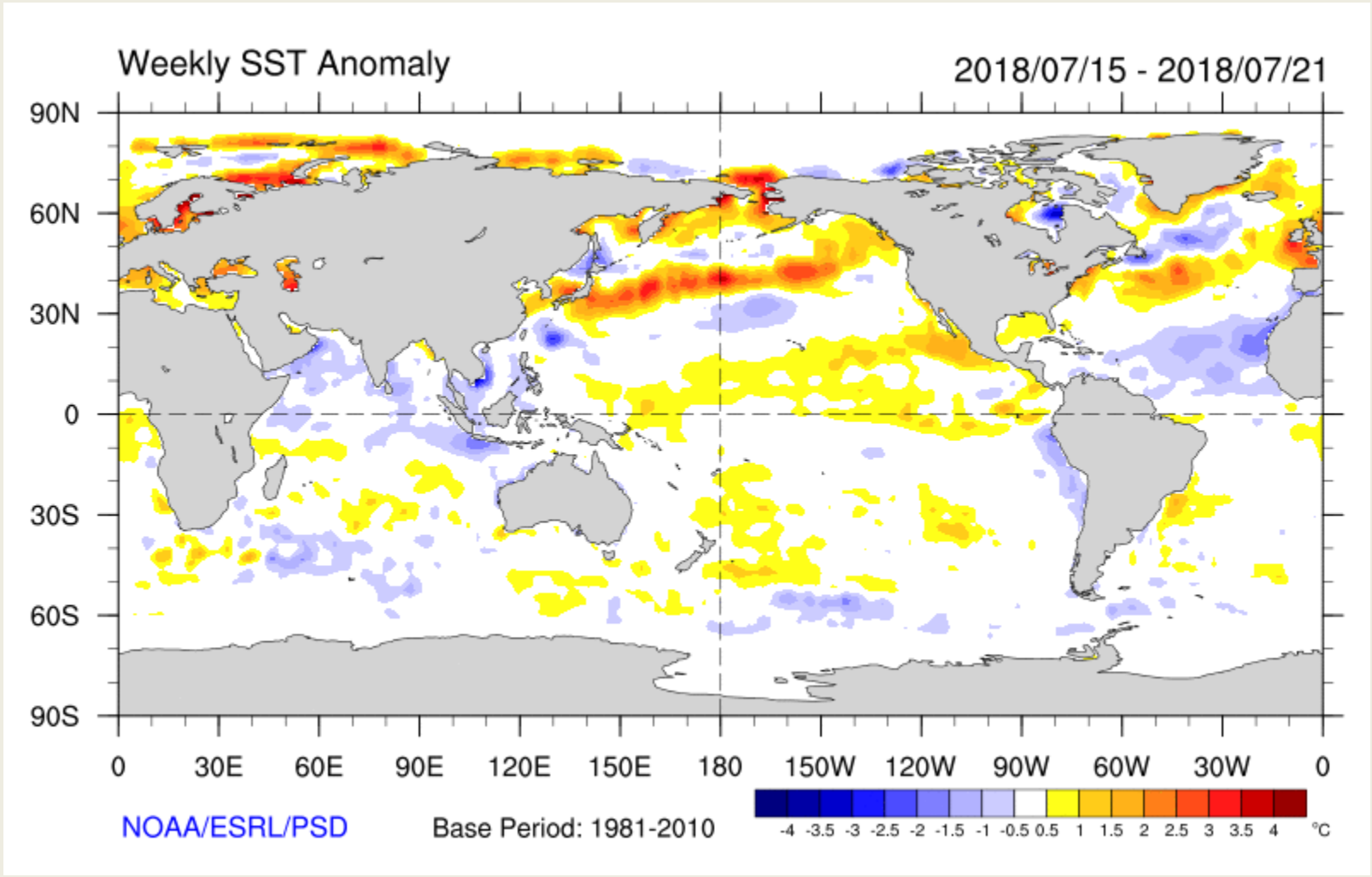
**The latest weekly SST departures are:**

| | |
|---|---|
| **Niño 4** | **0.3ºC** |
| **Niño 3.4** | **0.4ºC** |
| **Niño 3** | **0.6ºC** |
| **Niño 1+2** | **-0.3ºC** |

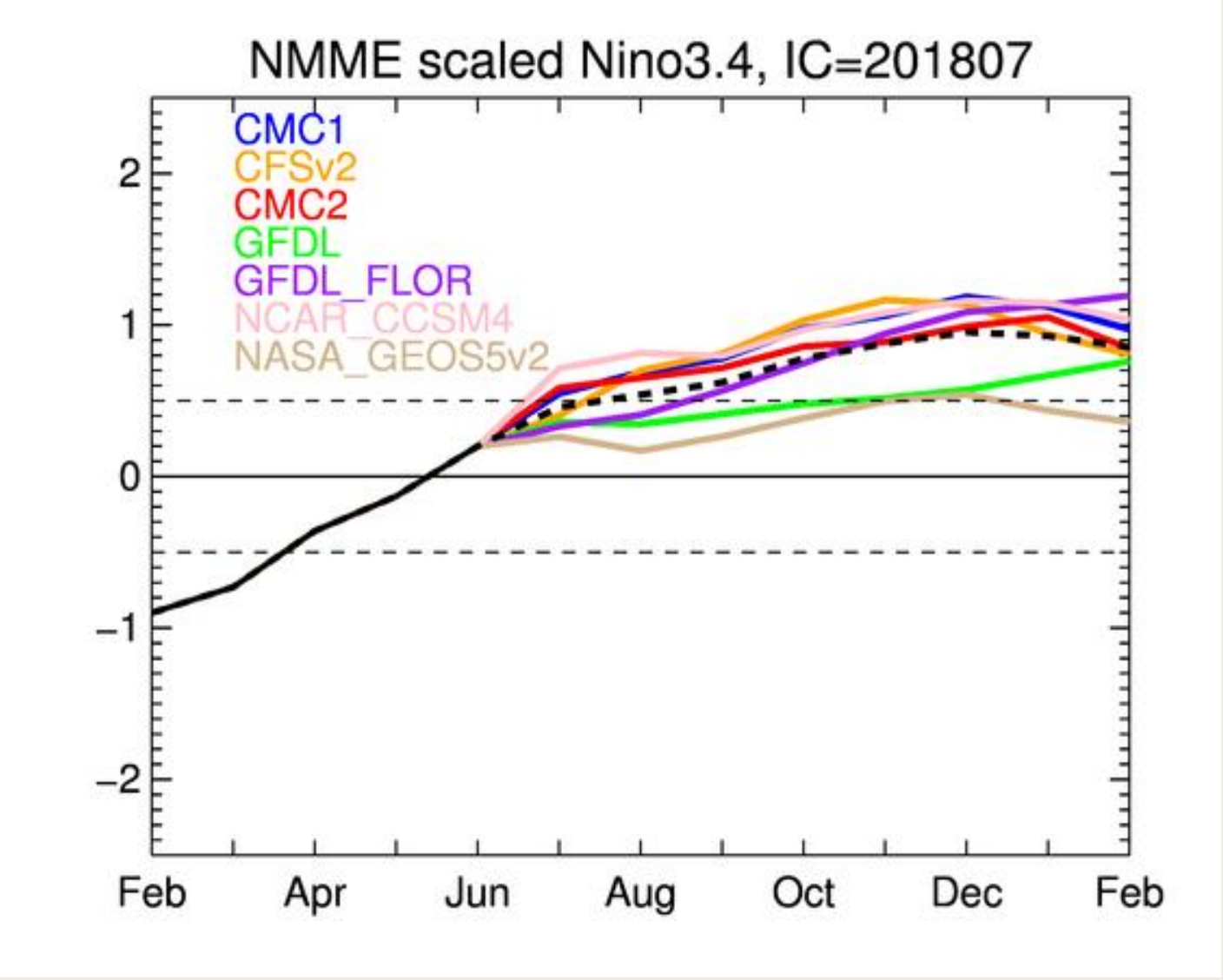


# Current Sea Surface Temperatures



# ENSO Forecasts




Source: NOAA/CPC

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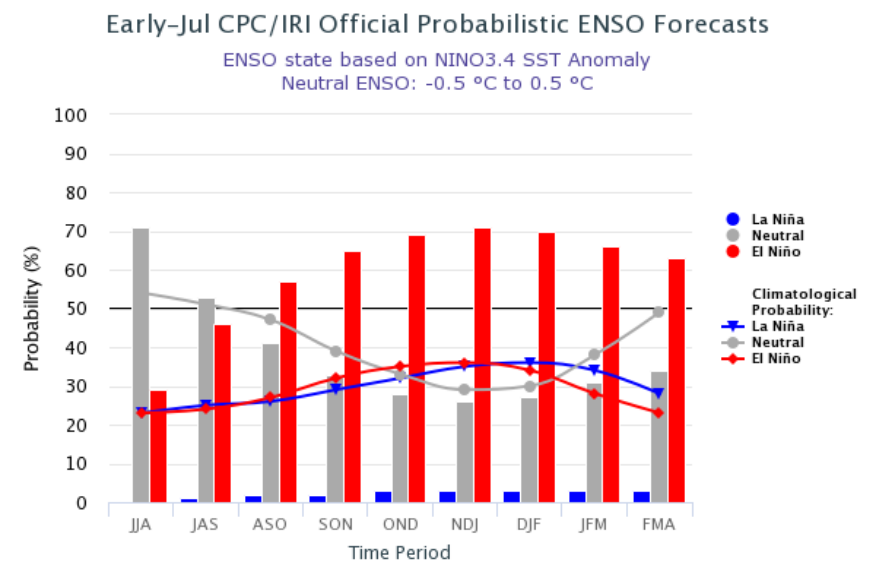
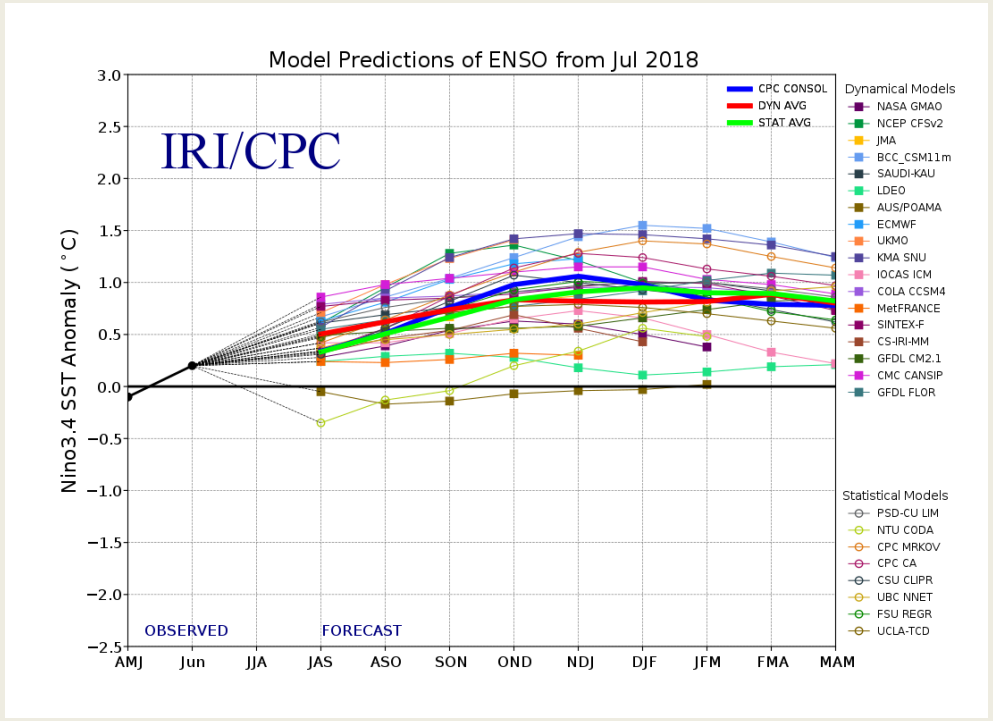


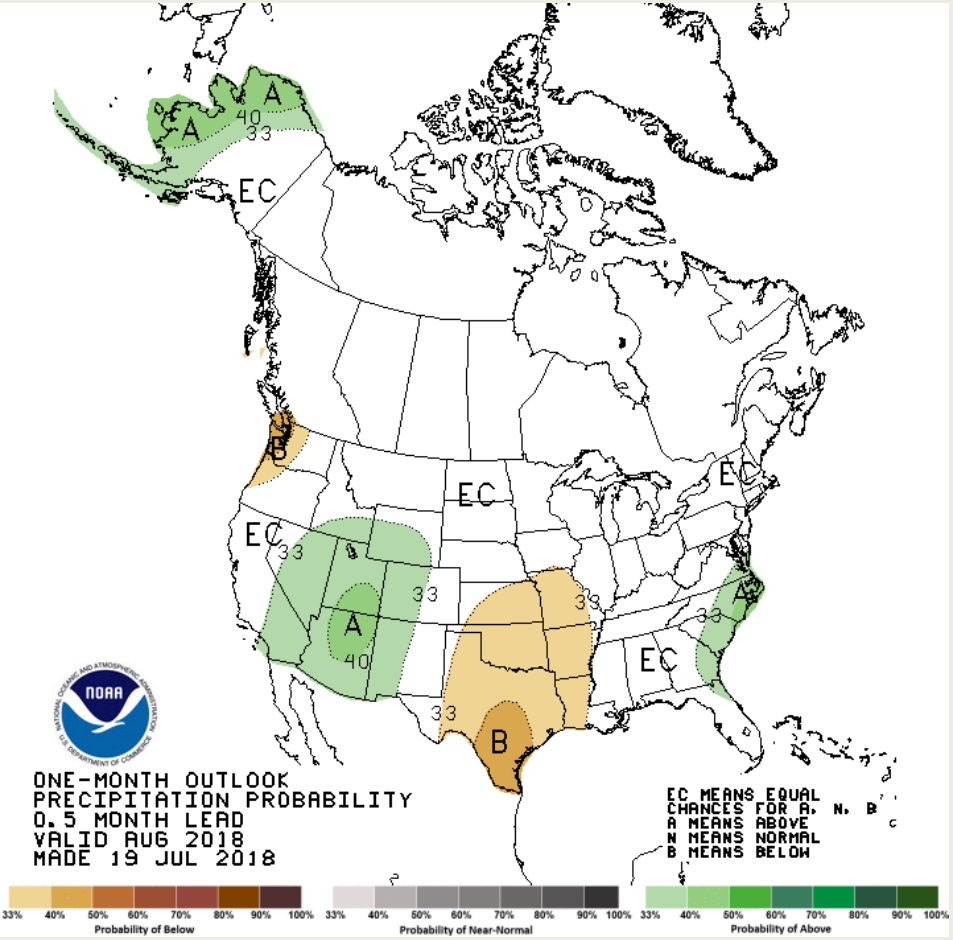



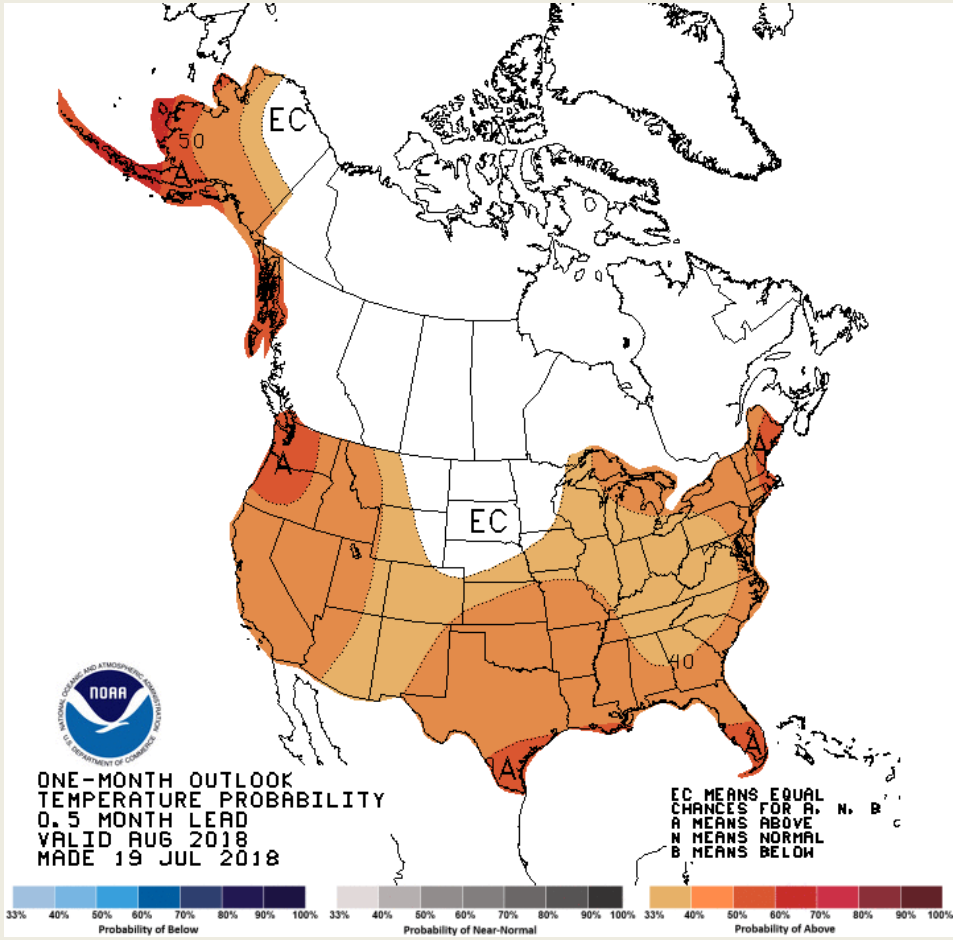

CPC/IRI El Nino forecast:

NMME models + other dynamical models + statistical models

Source: CPC/IRI

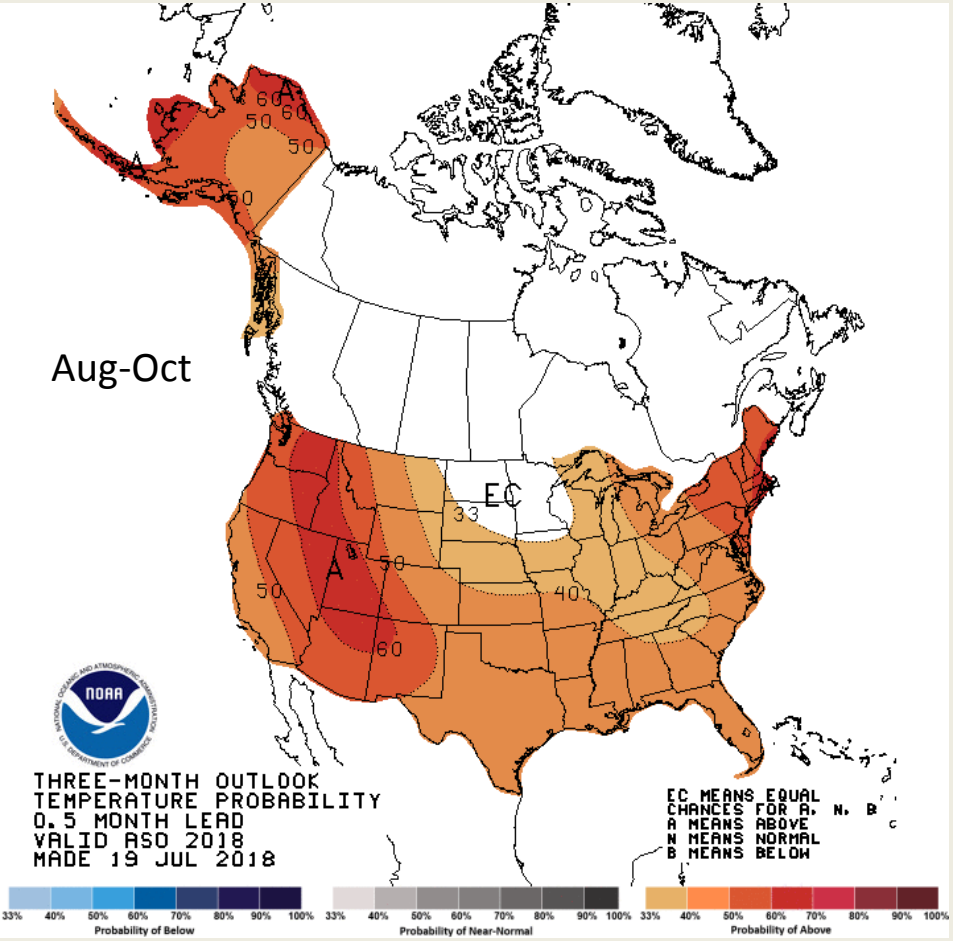
# August U.S. Forecasts

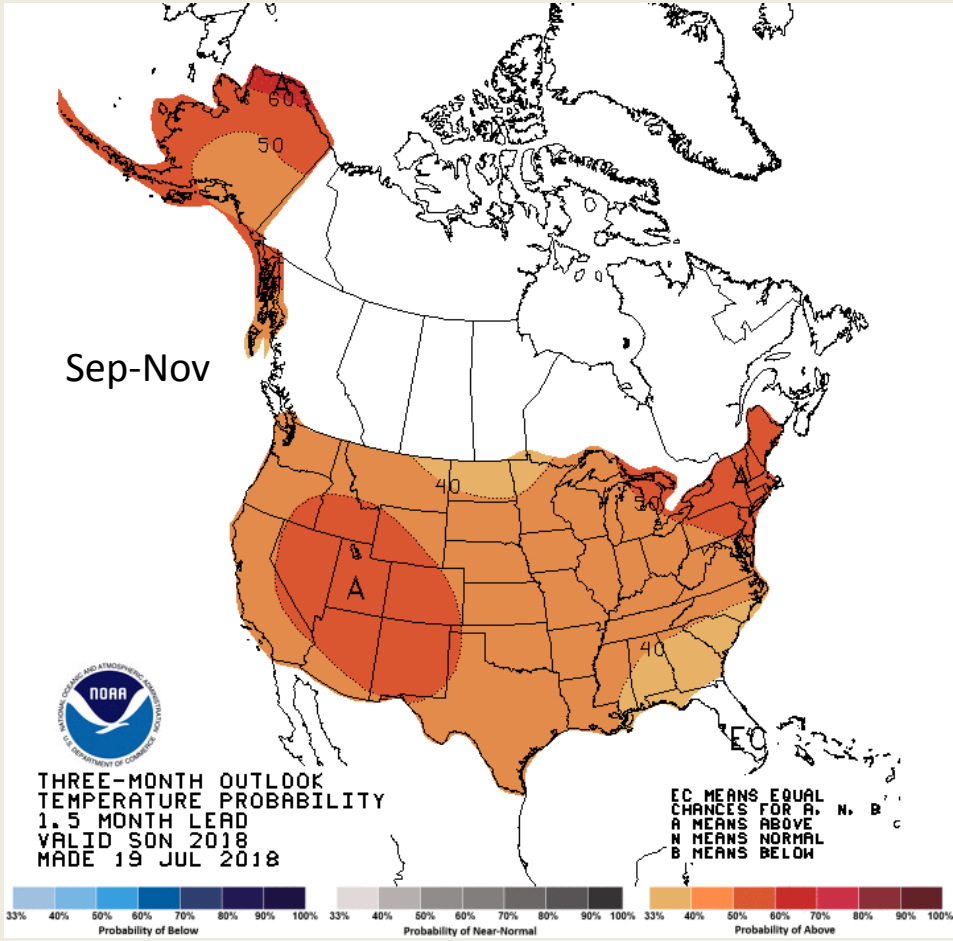



Source: NOAA/CPC

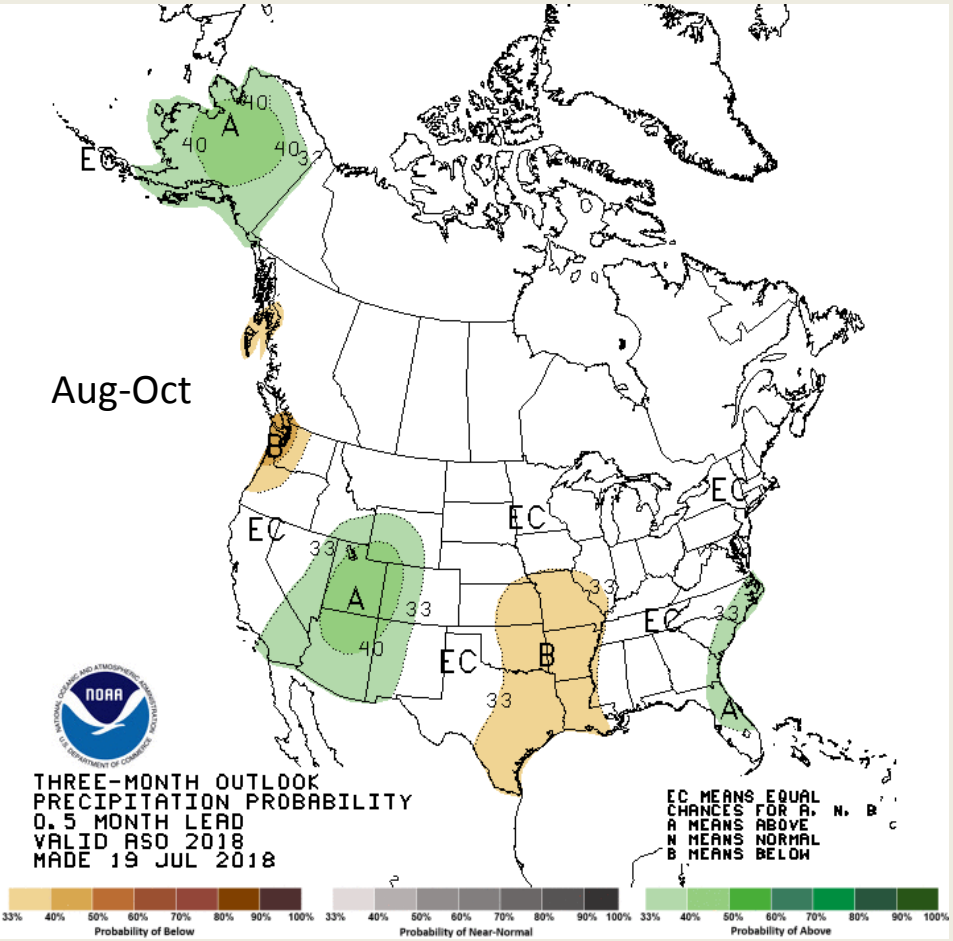
# U.S. Seasonal Temperature Forecasts

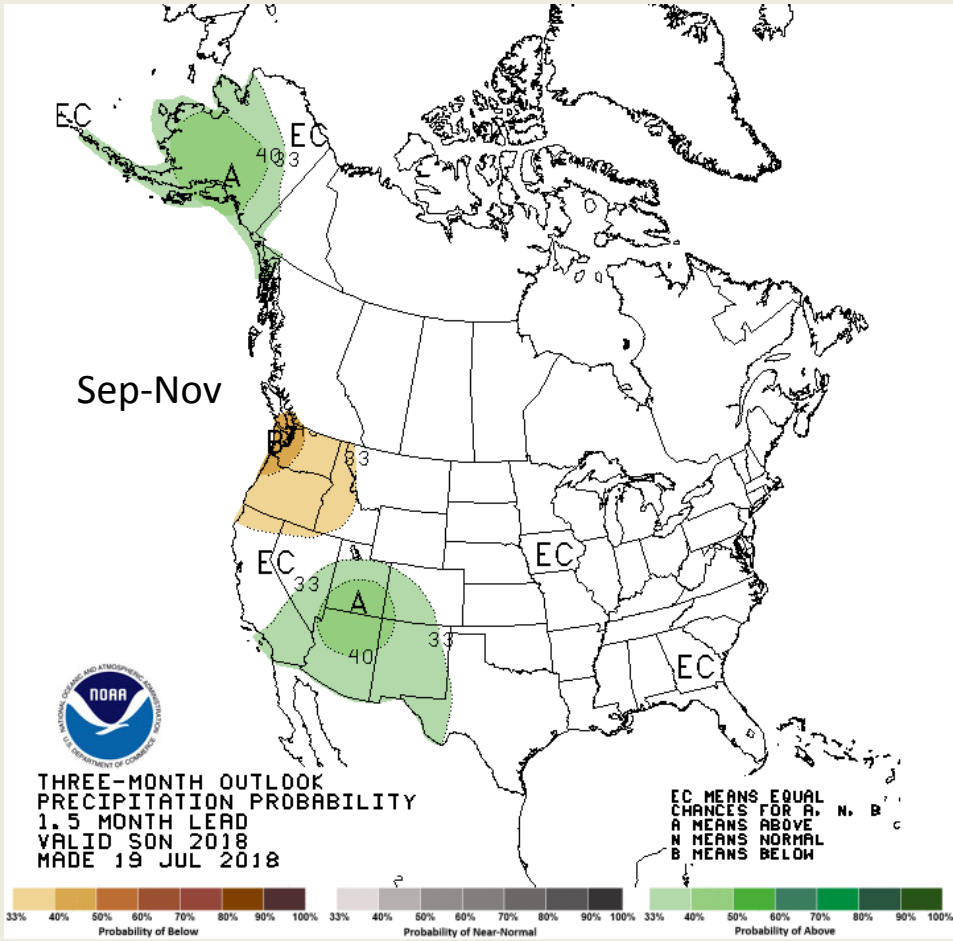



Source: NOAA/CPC

# U.S. Seasonal Precipitation Forecasts




Source: NOAA/CPC

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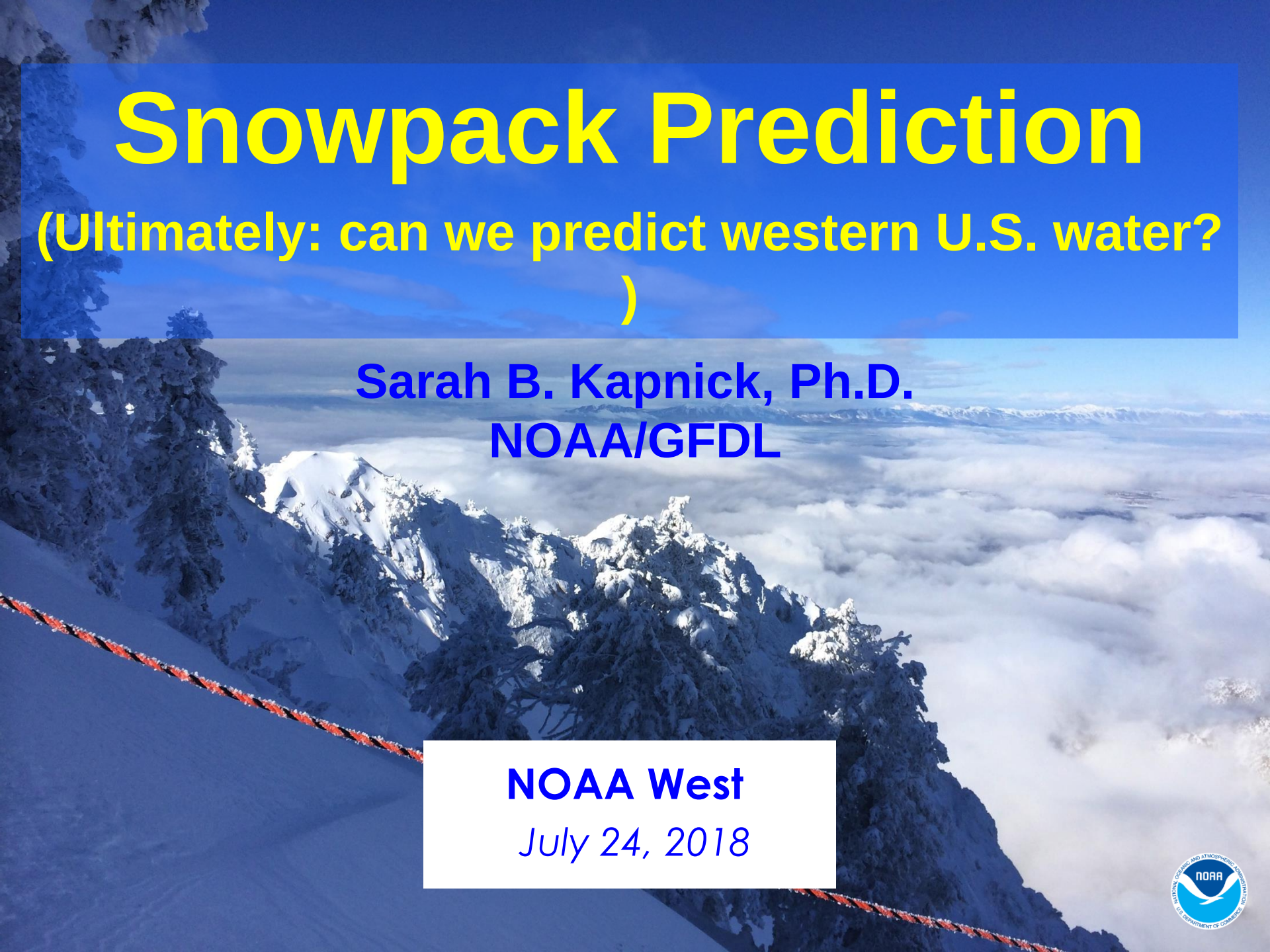


# Snowpack Prediction

## (Ultimately: can we predict western U.S. water? )

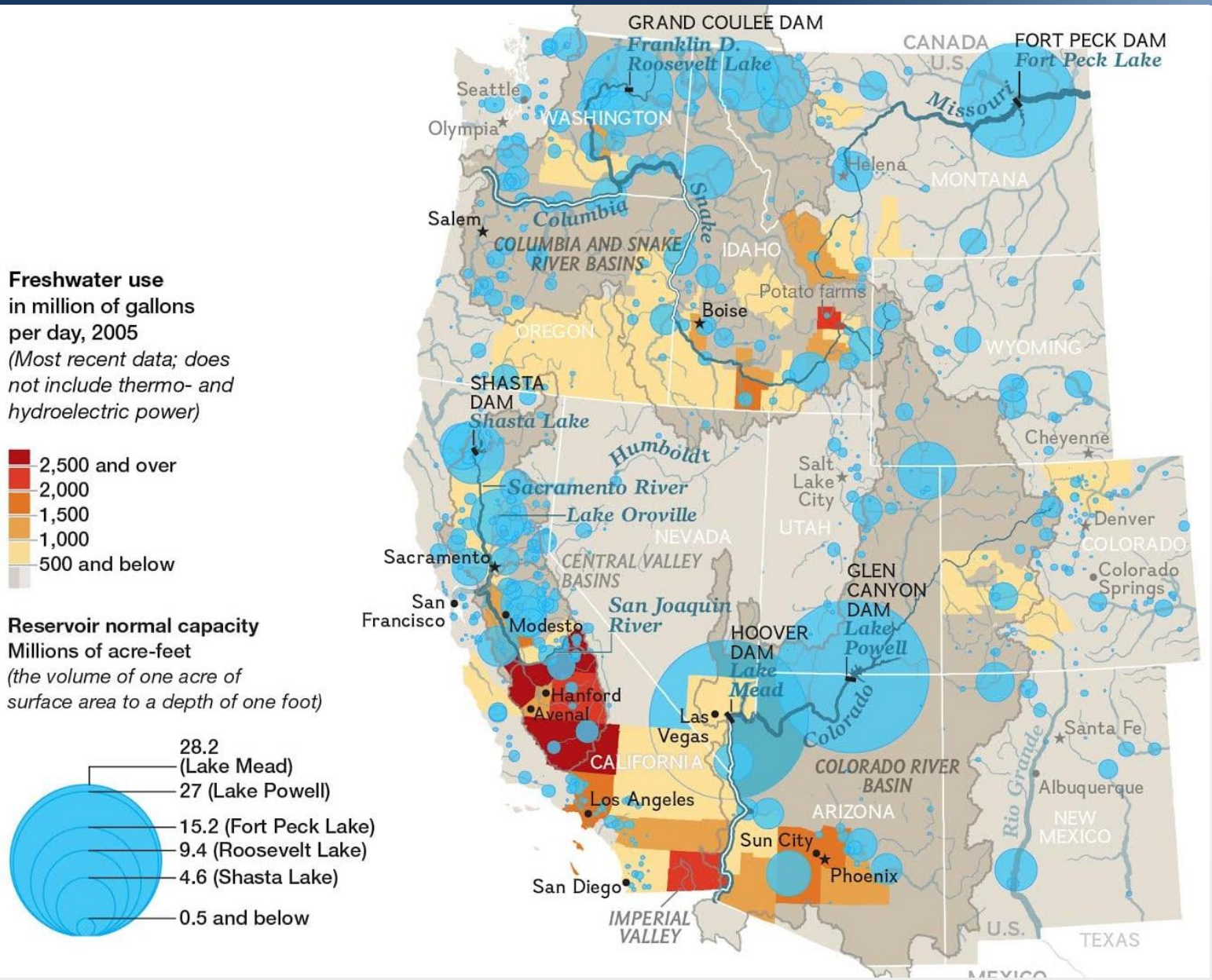
**Sarah B. Kapnick, Ph.D.**
**NOAA/GFDL**

**NOAA West**

*July 24, 2018*

# Characteristics of western U.S. mountain climate

## Remote mountain precipitation (& snowmelt) delivers water supply



# Developing a western U.S. prediction system

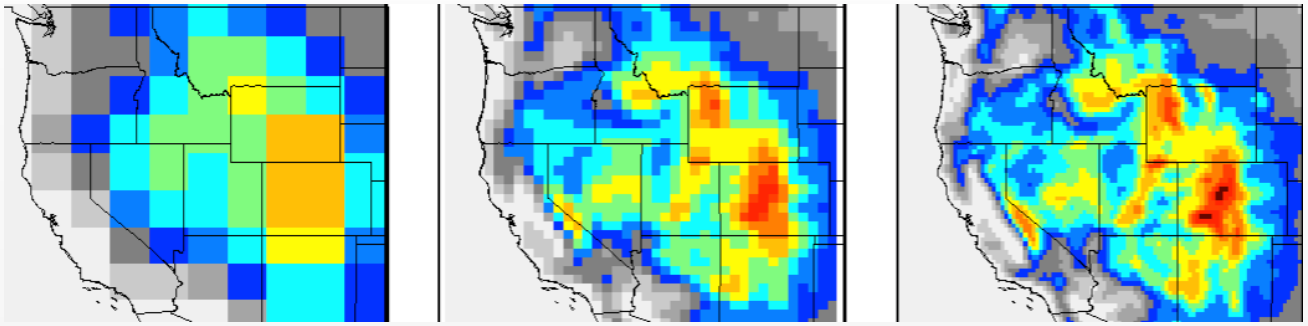
## Scientific questions to ask

- *Why do we have mountain precipitation / snow?*
- *How does it vary?*
- *Can we predict it?*
- *What else are we missing?*
- *Are we asking the right prediction questions? (For science? For stakeholders?)*

# WESTERN U.S. SNOWPACK PREDICTION

# Current Research: GFDL seasonal prediction models

## **Global** coupled models for regional applications



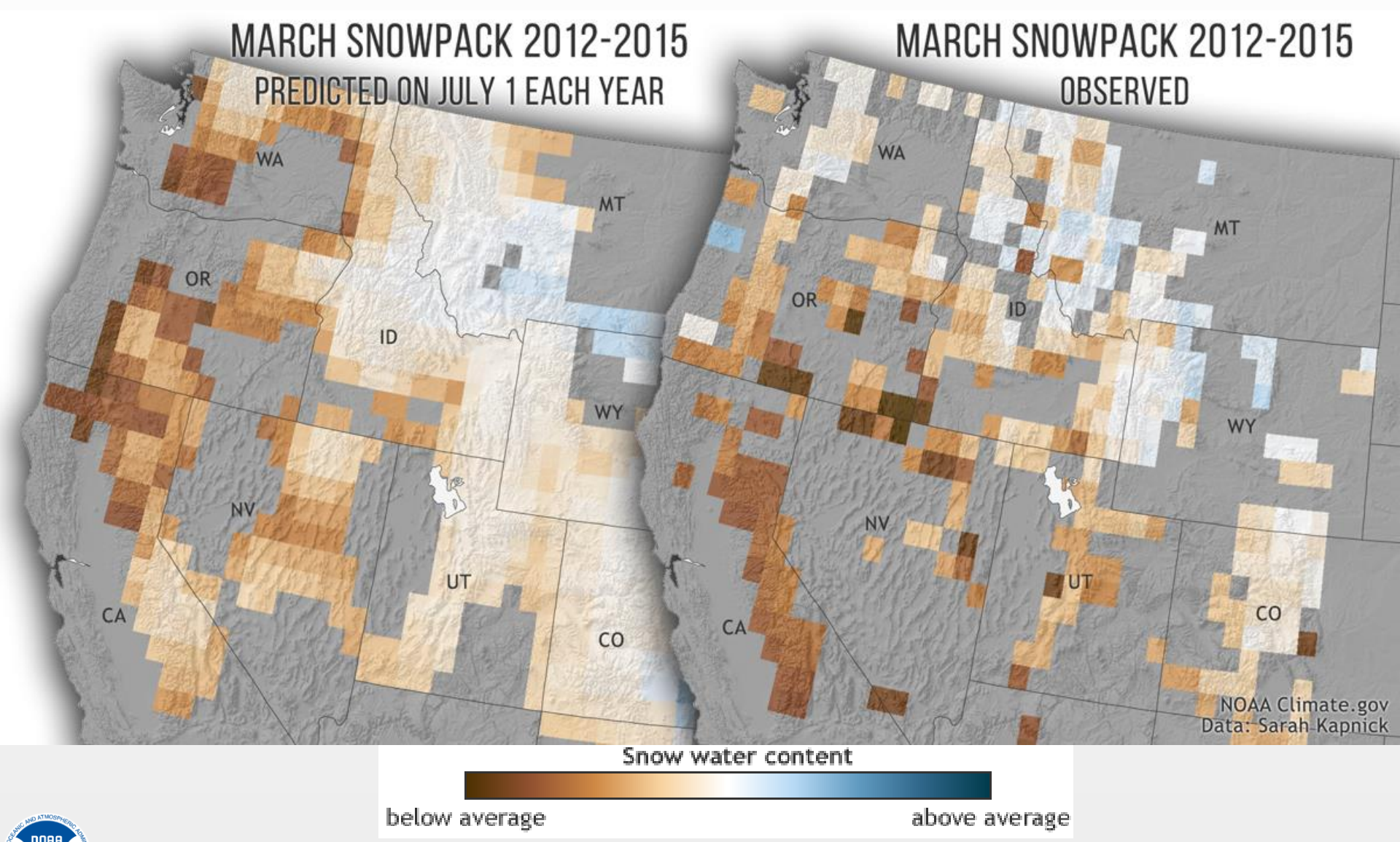
| | | | |
|---|---|---|---|
| **Atmospheric/Land Grid Size** | ***200 km*** | ***50 km*** | ***25 km*** |
| **Ensemble members** | *10* | *12* | *12* |

**"Ensemble members"** provide individual solutions for the future

- Seasonal prediction: initialize on the 1st of the month and left to run for 12 months total to provide a potential future (for 4 seasons)
- Collectively ensembles provide a probabilistic forecast of the future—a likely solution but also a range of potential values and probabilities
- Note: Multi-year & decadal prediction uses same models run for years to decades

# Low March snowpack case study: 2012-15

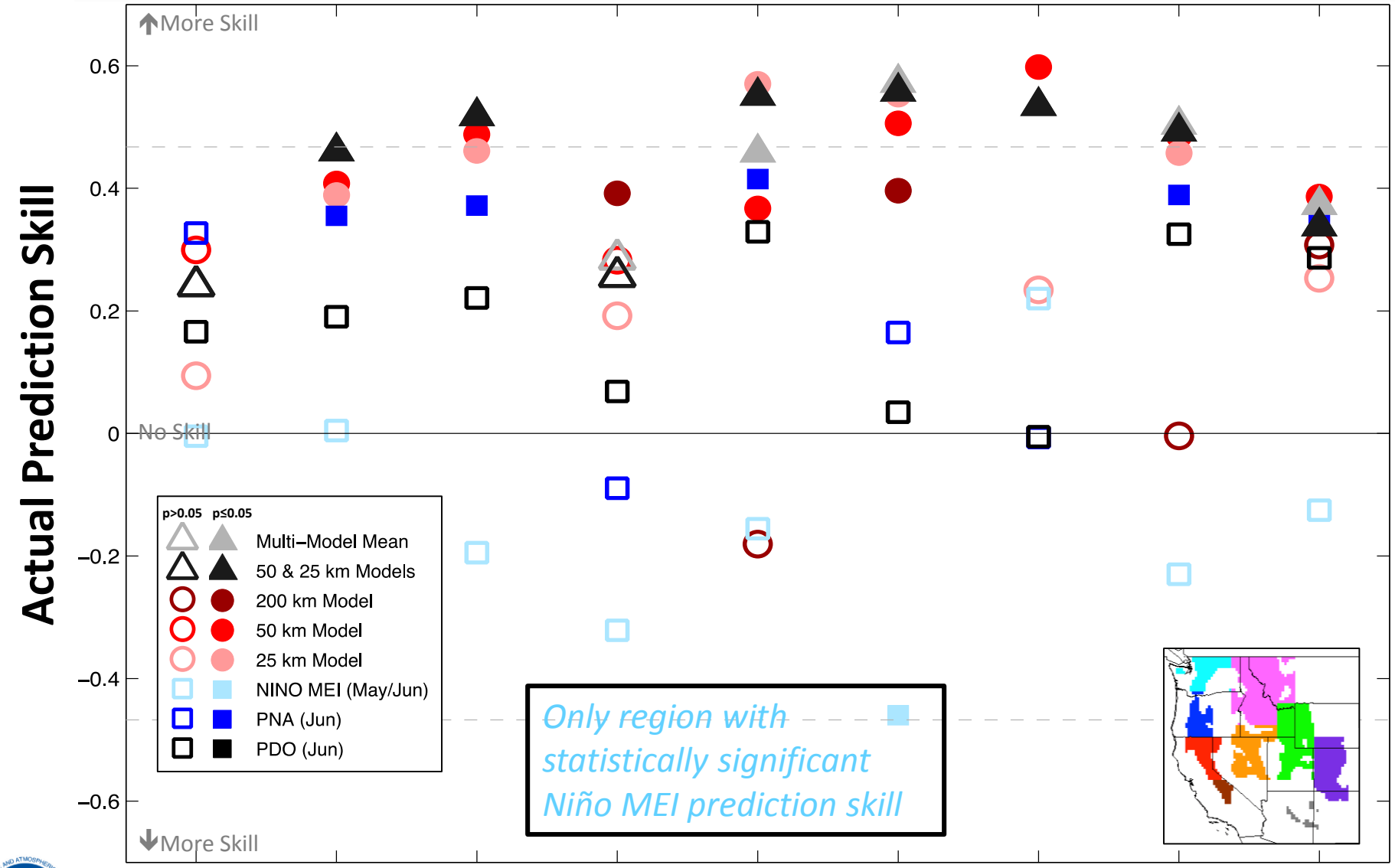
## Yearly predictions made July 1 (50 km model) vs. observed




*Source: Climate.gov image adapted from Kapnick et al., Proc. Natl. Acad. Sci. 2018*

# 1981-2016 March prediction skill 8 months prior

## March snowpack predicted on previous July 1 (Kapnick et al. 2018)



# Why are coastal mnts difficult to predict?

## Majority of western U.S. water reservoirs (outside CO)

1) **Trends:** Do trends in climate variables affect results?
2) **Size of mountains:** Did we chose narrow ranges that scale to be significantly smaller than storms?
3) **Frequency of storms:** Do coastal ranges tend to have fewer storms than the interior?
4) **Fundamental modeling issue:** Is there a model bias in specific regions? Perhaps a fundamental dynamical issue? Narrow mountains?
5) **Elevation/resolution:** Do we need even higher resolution for elongated maritime mountains?

***Short answer: YES!*** *These points have been researched and are used to feed back on R&D. Ultimately, we can work to improve various aspects of a prediction system. We are also engaged with stakeholders to understand where the goal posts should be placed.*

# BROADER ENGAGEMENT FEEDING BACK ON DEVELOPMENT & KEY TAKEAWAYS

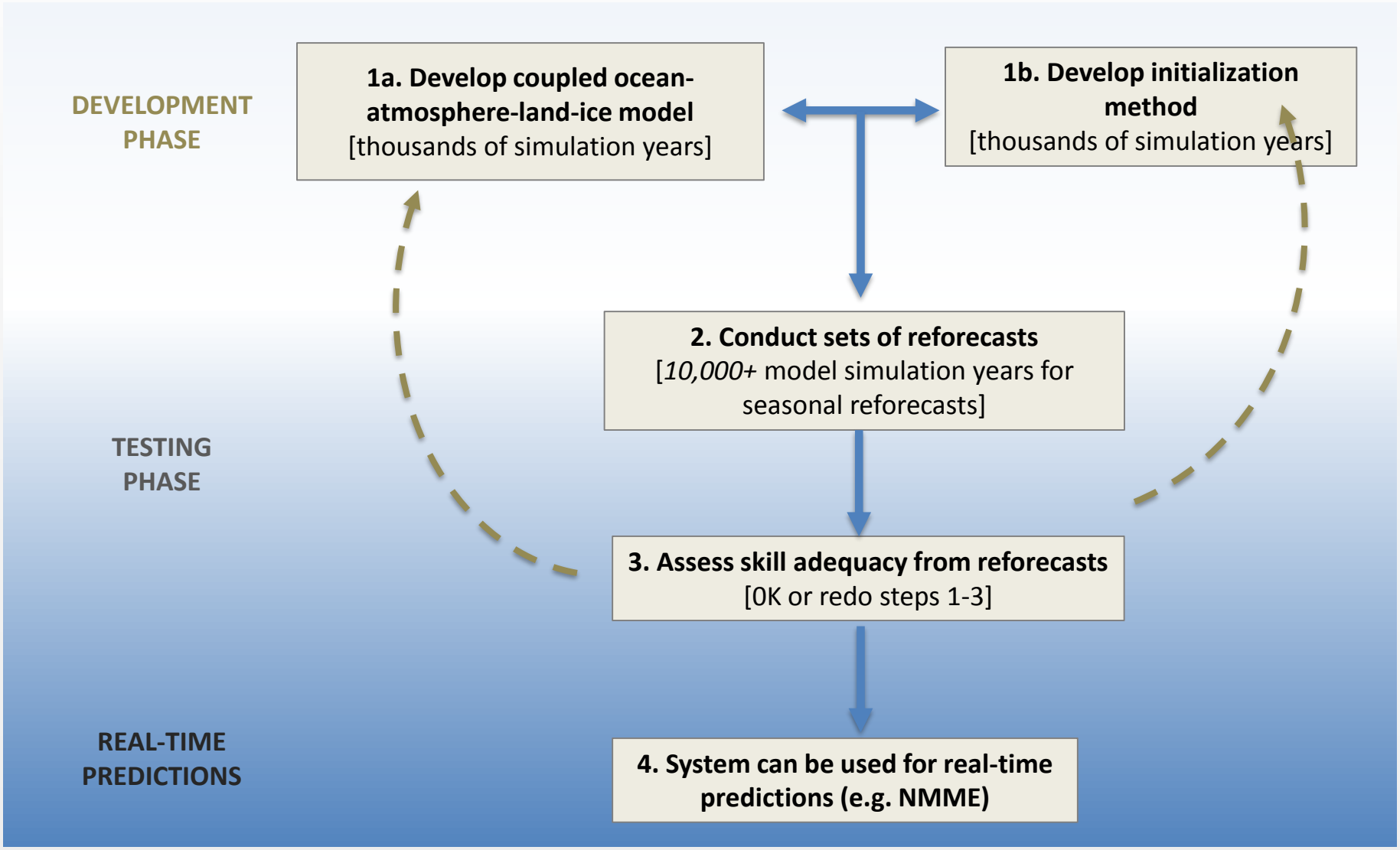
# Understanding extremes: asking what matters to society

## Stakeholders

- As a result of research publications & general outreach, we have spent time with stakeholders discussing our research and hearing about their concerns:
  - Western States Water Council
  - Water managers (e.g. CA DWR, Oregon, Texas Colorado River, NV, NYC)
  - Federal Government: Other NOAA labs/divisions and Agencies
  - Industry
- Points raised:
  - What about predictions November 15, Jan 15 for snowpack?
  - Spring runoff predictions for supply?
  - Tie prediction timing to management planning
  - Flood inducing extreme rainfall predictions?
  - Advanced drought warnings months to yrs
  - River flow/ temperatures for aquatic ecosystems?
  - Temperatures for natural gas / energy in winter?
  - Snowpack for tourism / ski industry?

*Given questions / constraints, can we build a new prediction system designed for user needs?*

# Building a seasonal prediction system



# Key takeaways

- **Snowpack prediction skill exists 8 months in advance** in a dynamic coupled modeling system
  - Prediction in this system comes from the ocean state on July 1 (initialization) & dynamic coupled evolution of weather/climate (prediction from the global coupled model simulating the ocean, atmosphere, and land as it evolves in time)
- **Climate indices lack (or have lesser) prediction skill at 8 months**
  - Dynamic coupled models outperform their climate index counterparts & may be necessary at longer time scales
- **California remains elusive** with lowest skill in coastal mountains, but we have pathways to improve prediction. We can reframe our questions for stakeholder needs / to solvable problems
- **The new frontier:** At the GFDL we are developing a next-generation prediction system (SPEAR) to tackle these problems. We are trying to better engage with stakeholders and regional experts

# THANK YOU!

sarah.kapnick@noaa.gov

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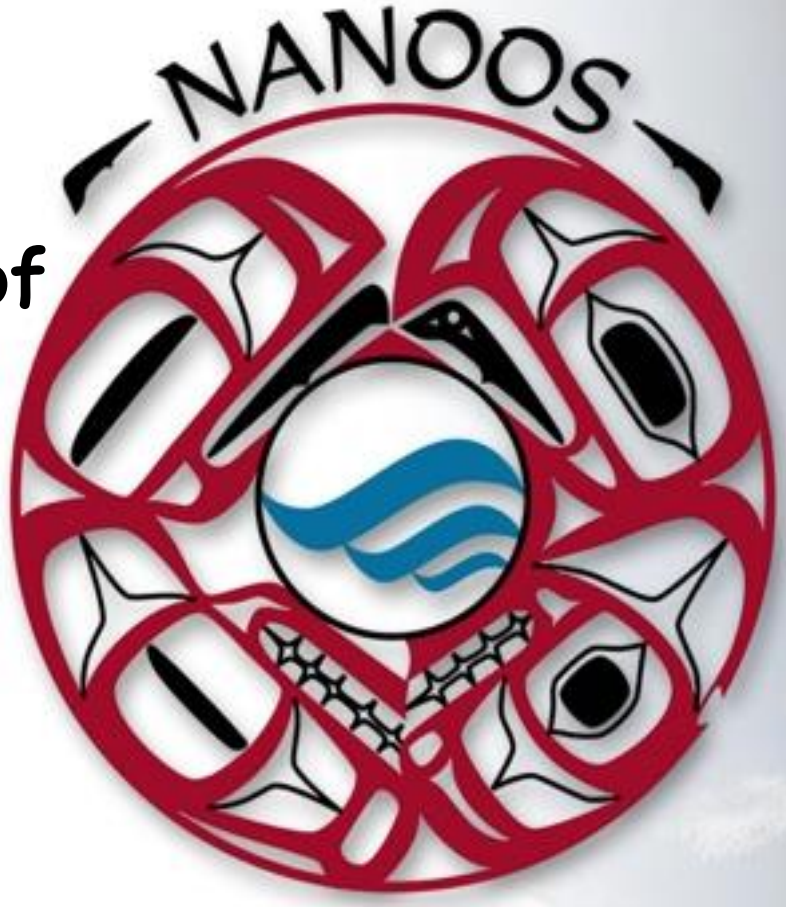
# Northwest Association of Networked Ocean Observing Systems




## NOAA West Watch Update 24 July 2018: Washington / Oregon Observations

*Jan Newton, NANOOS Executive Director*

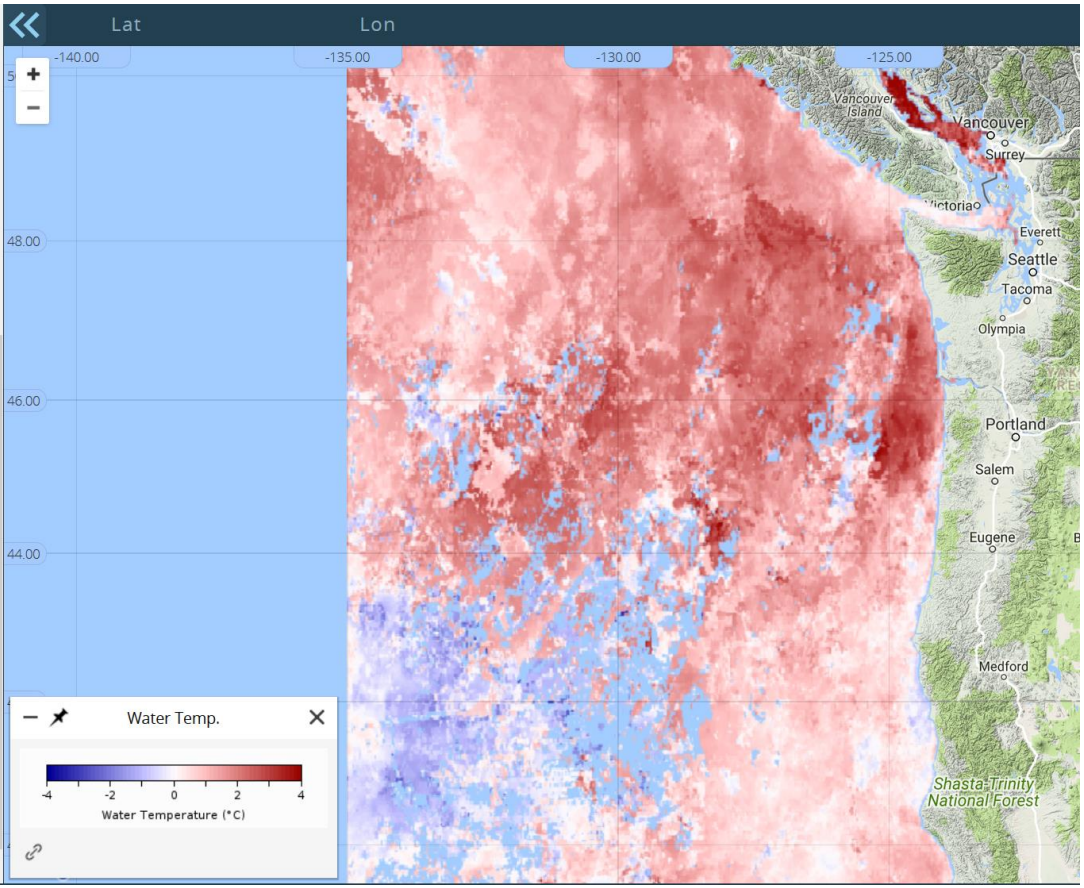
www.nanoos.org

IOOS Integrated Ocean Observing System

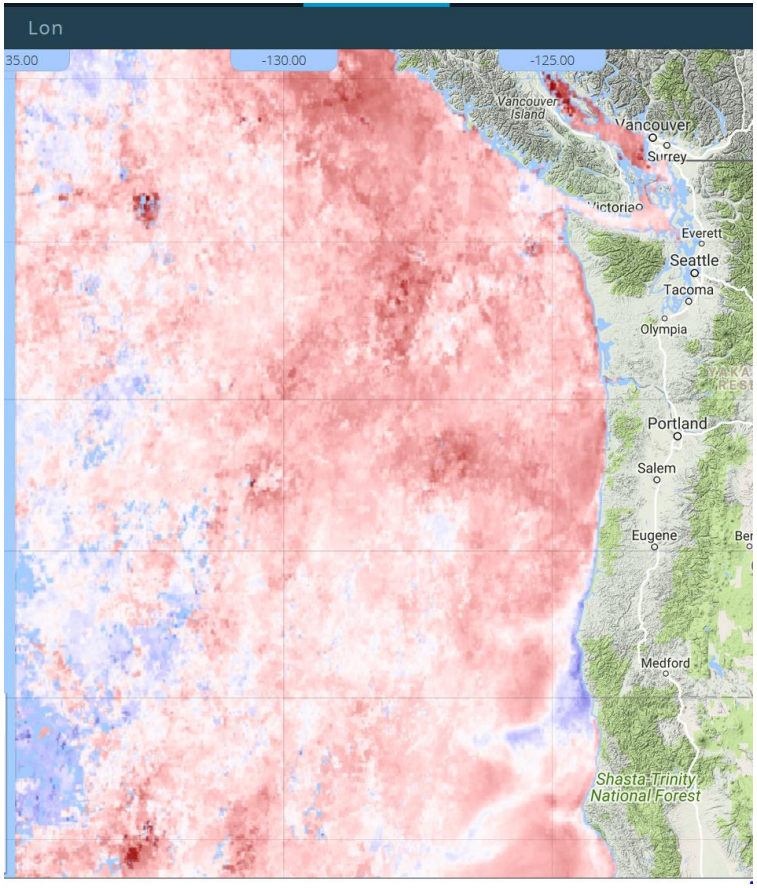
*NANOOS: [www.nanoos.org](http://www.nanoos.org) Climatology app*

**Sea Surface Temperature Anomaly**

May 2018




June 2018



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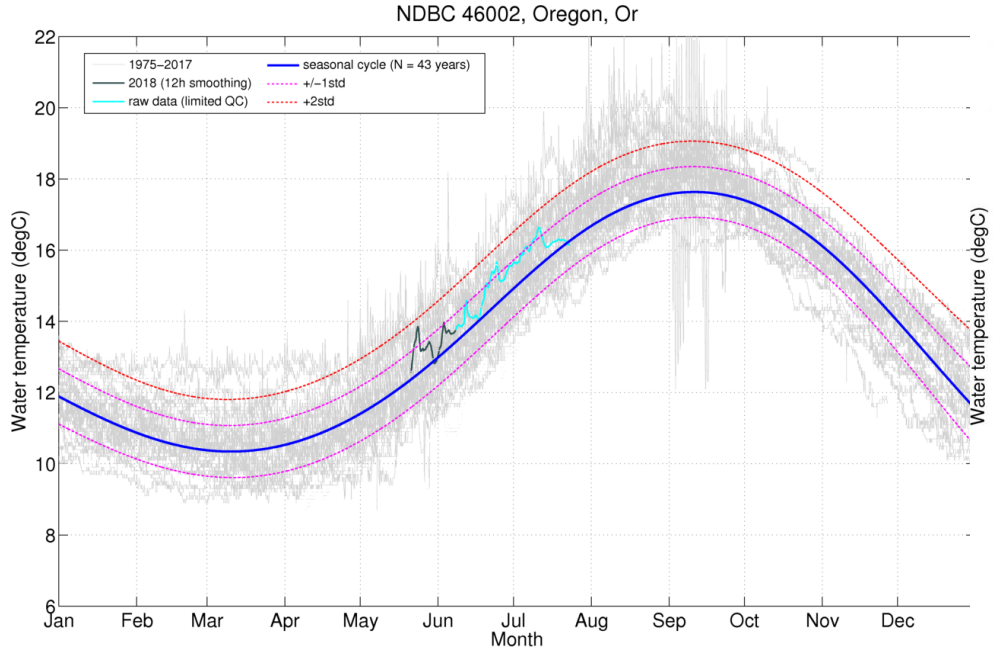
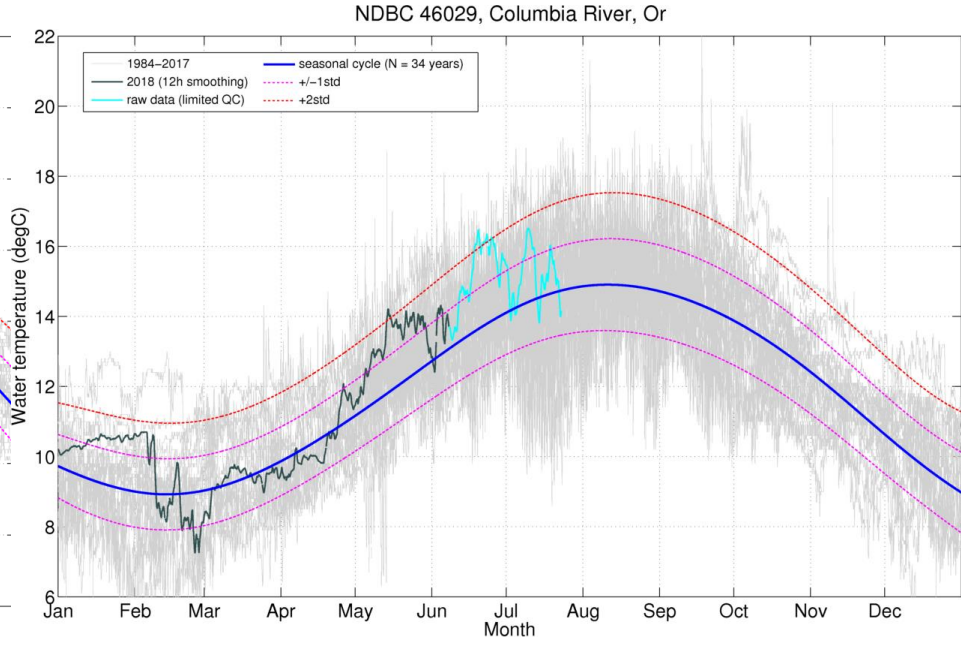
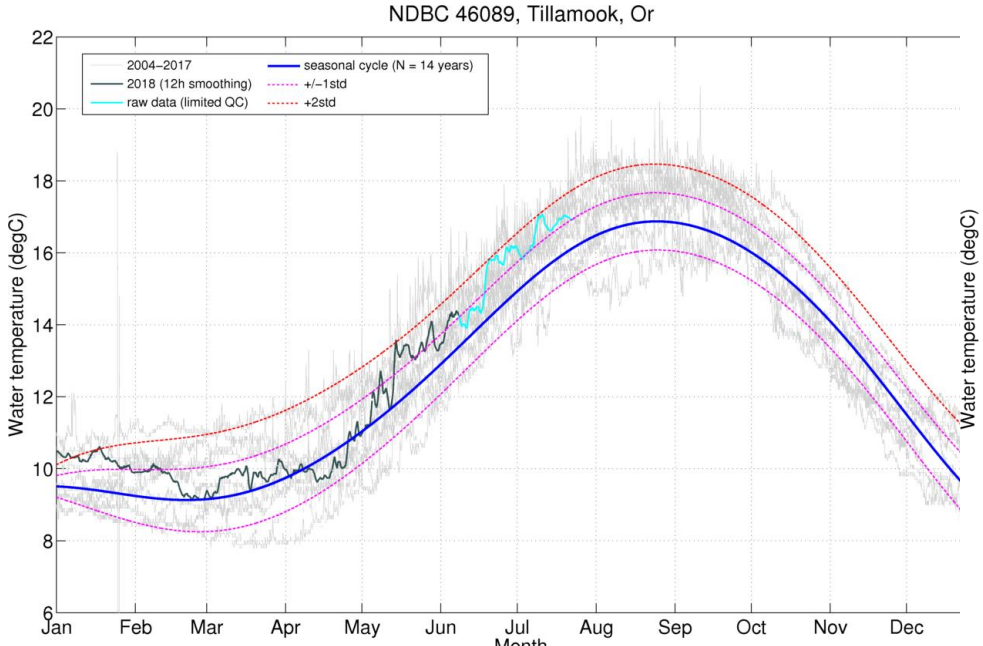
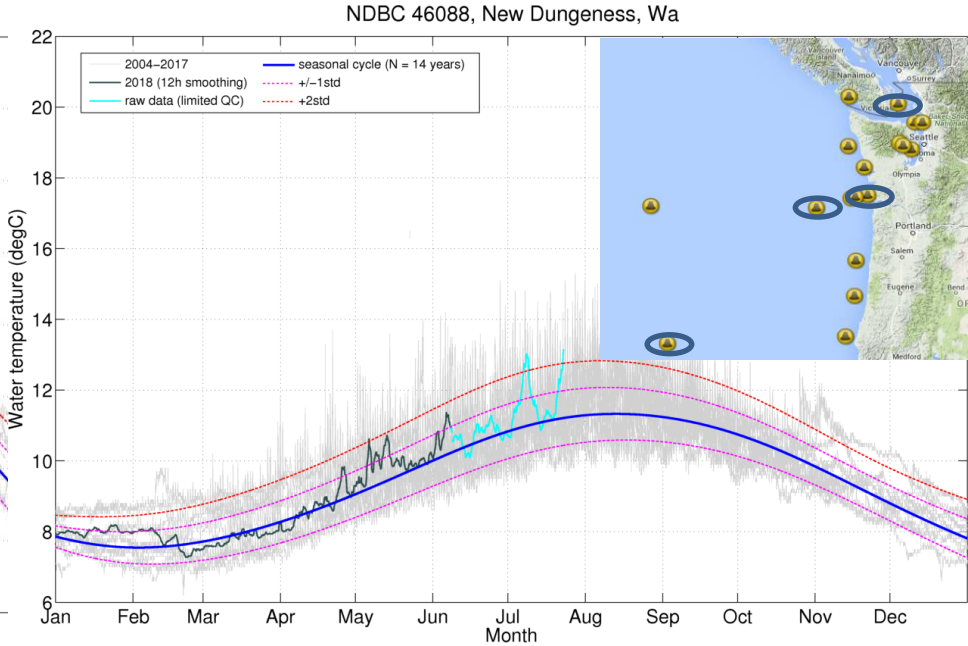
# Sea Surface Temp



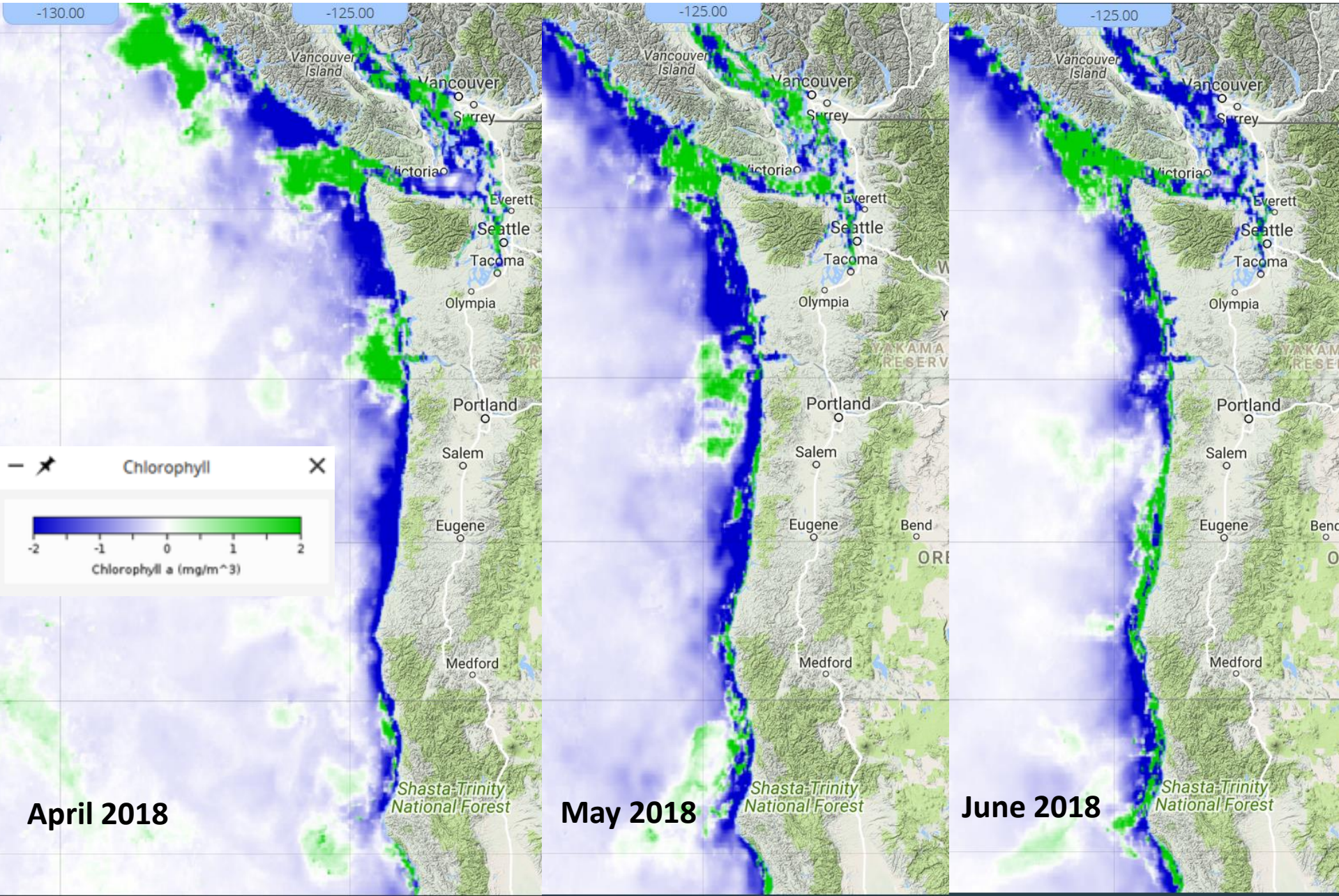



*NANOOS: [www.nanoos.org](http://www.nanoos.org) Climatology app*

**Chlorophyll Anomaly**

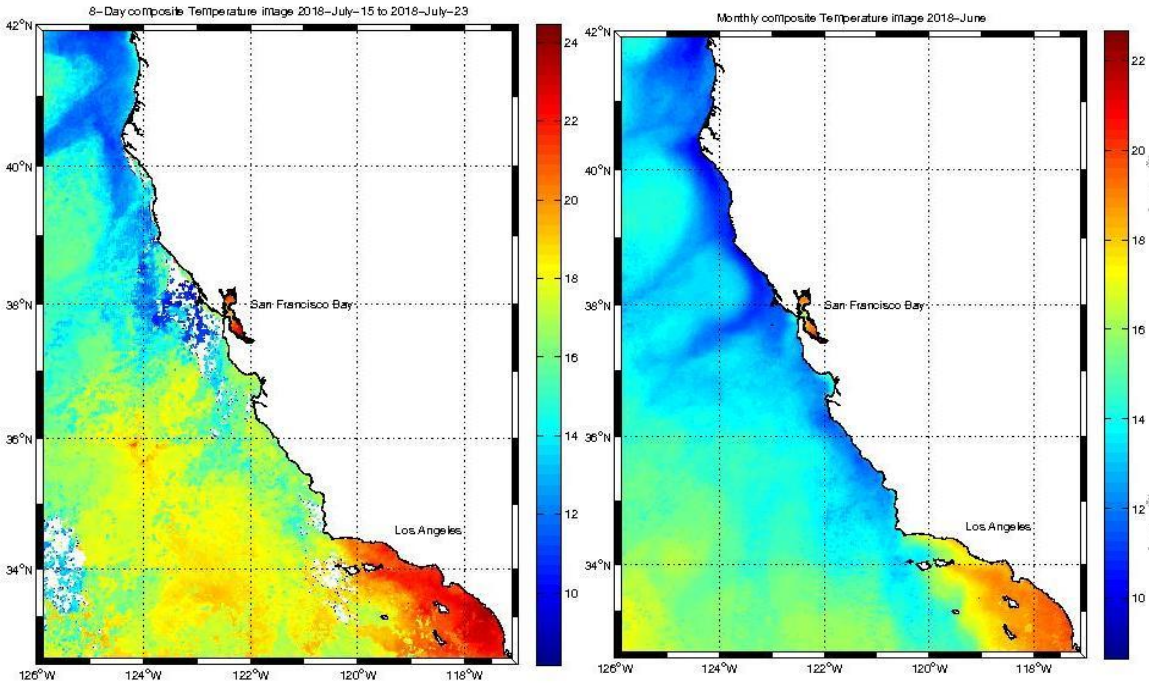


# NOAA West Watch Update: Central & Northern California Update

Presented by: Henry Ruhl, CeNCOOS Director

# CeNCOOS Climatology

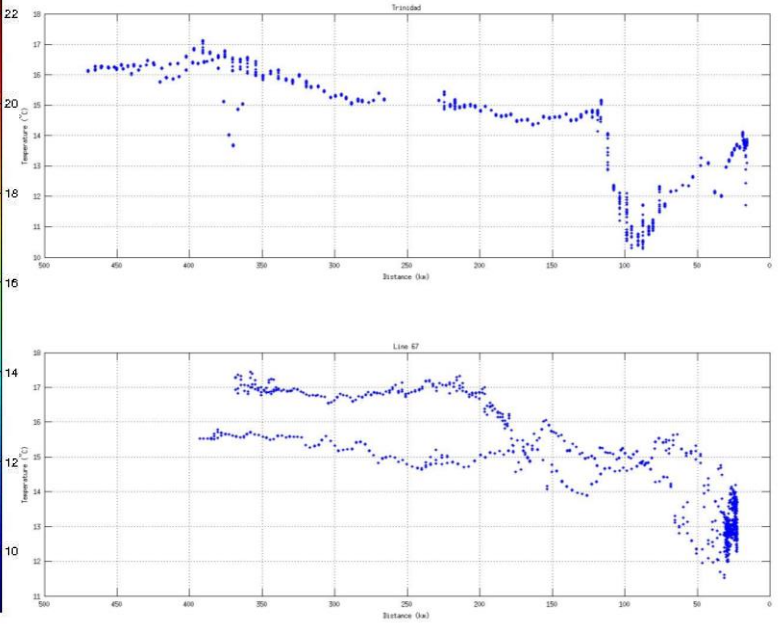
# California Upwelling Update



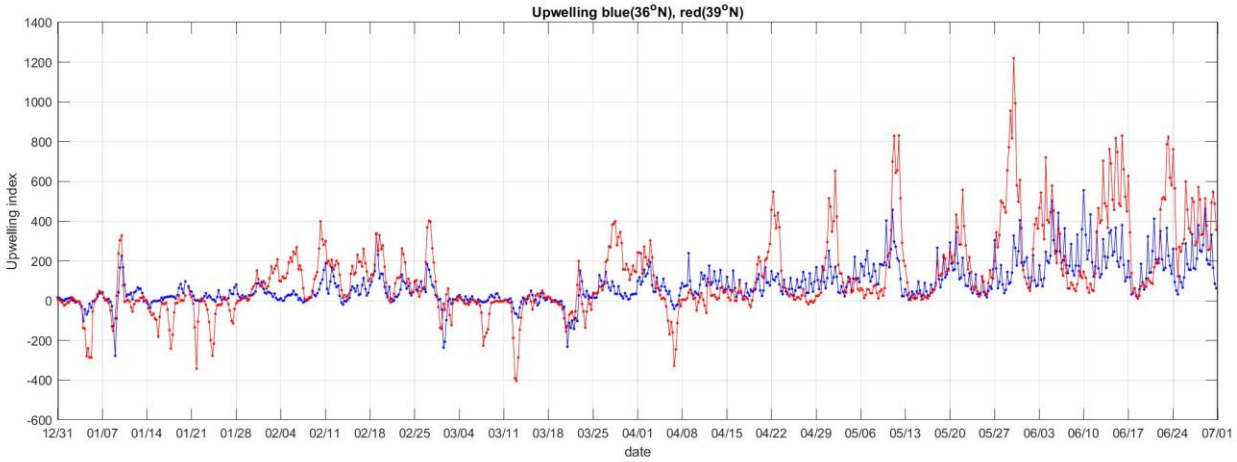




Glider SST Measurements

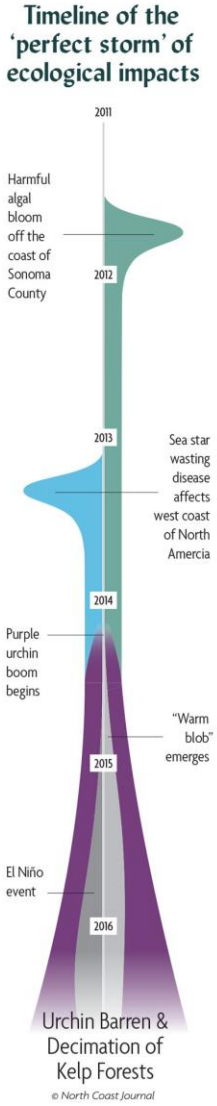


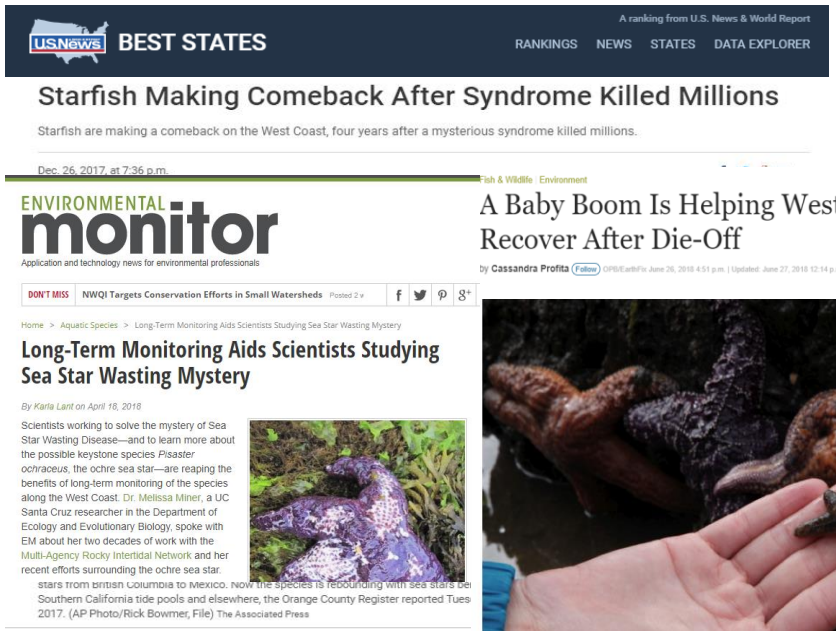

Ekman Upwelling Index (NOAA/SWFSC Environmental Research Division)



# Biology & Ecology Update

## Sea star comeback

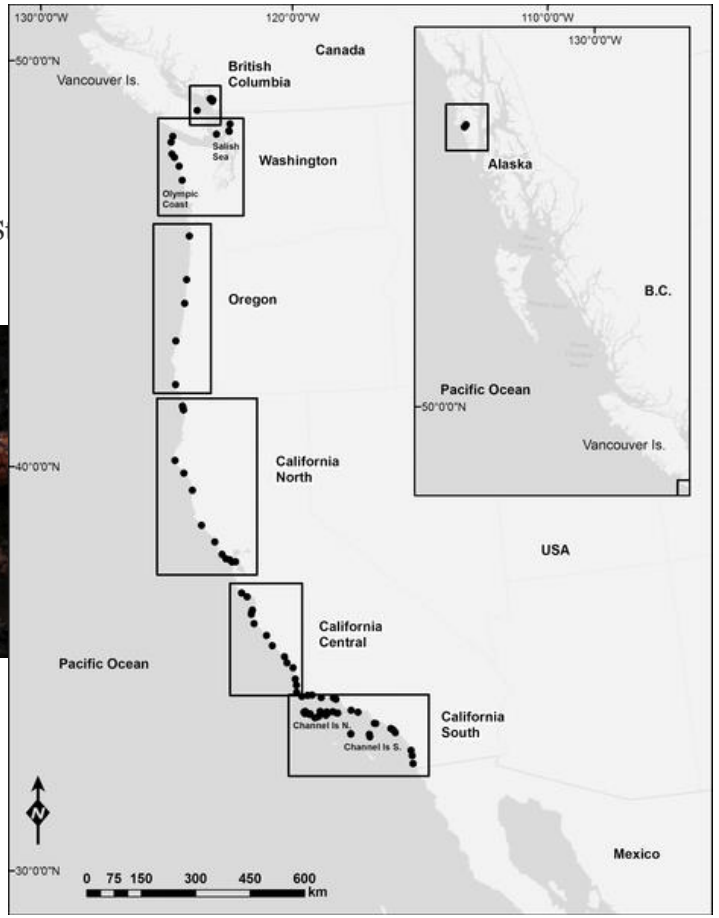


Multi-Agency Rocky Intertidal Network (MARINe)

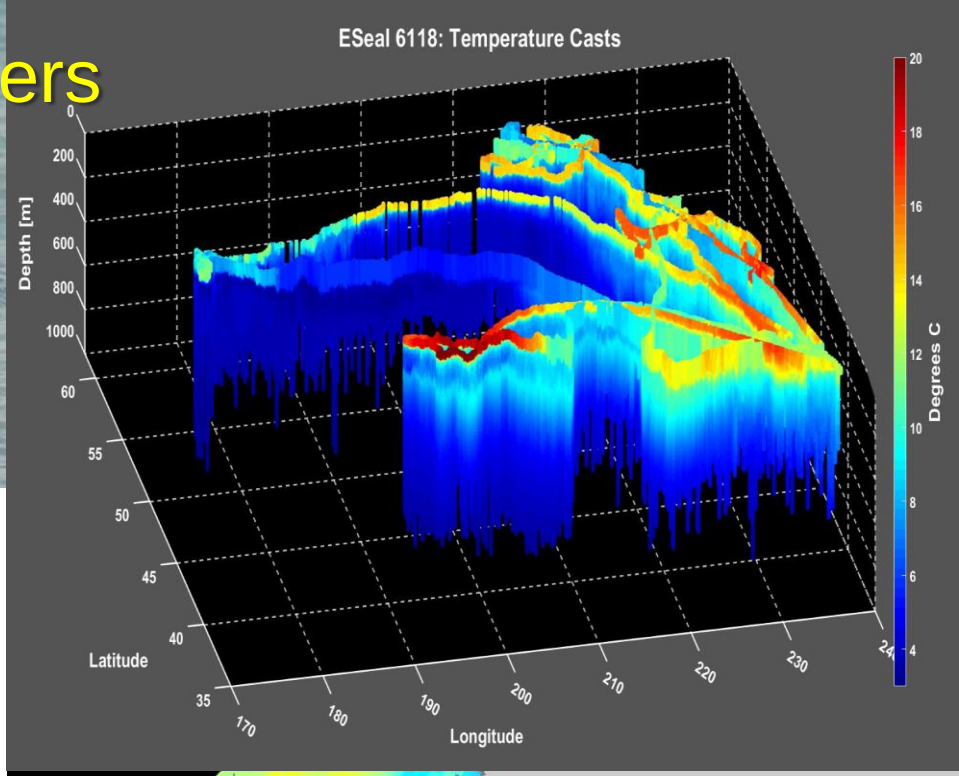
Long-Term Monitoring Surveys use fixed plots to document changes in percent cover, or abundance of targeted species or species assemblages.
https://www.eeb.ucsc.edu/pacificrockyintertidal/index.html

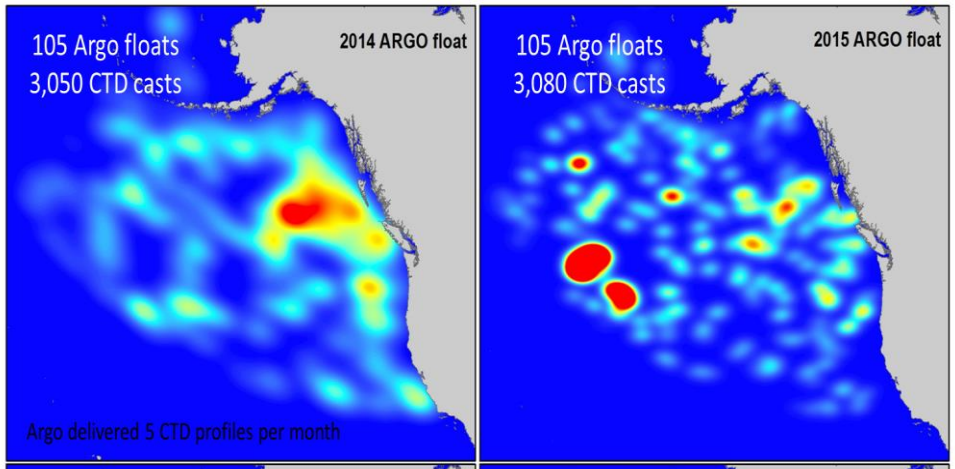
**Fig 1. Map of study sites along the Pacific coast of North America.**




Miner CM et al. (2018) Large-scale impacts of sea star wasting disease (SSWD) on intertidal sea stars and implications for recovery. PLOS ONE http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0192870

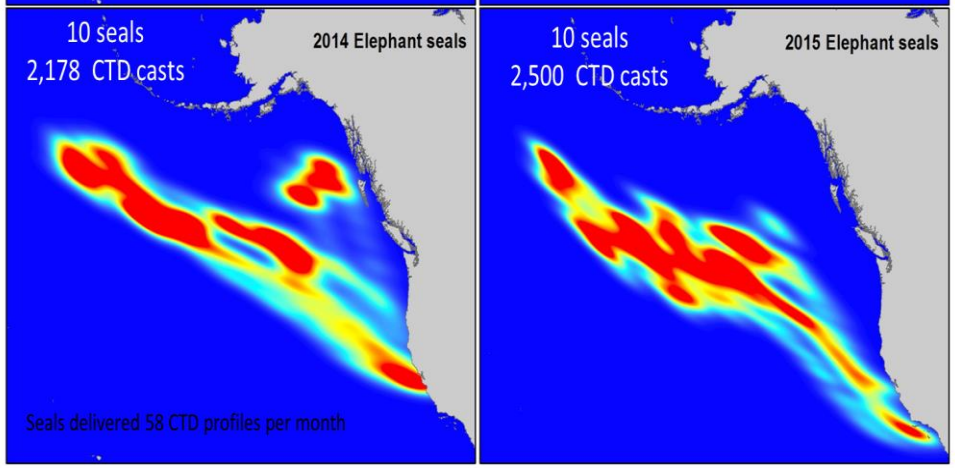
# Elephant seal Oceanographers



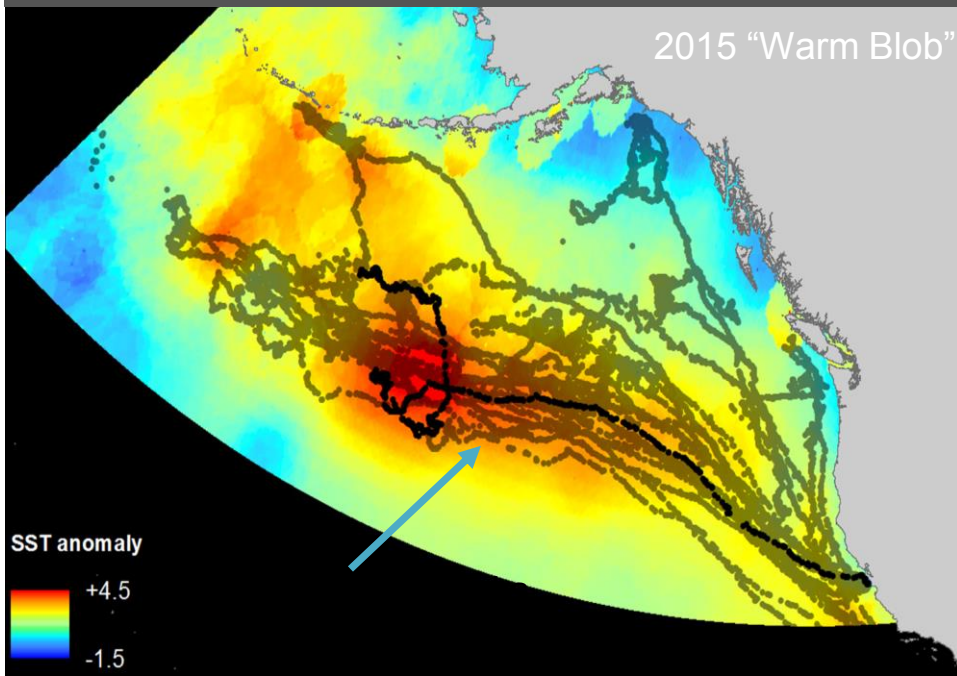








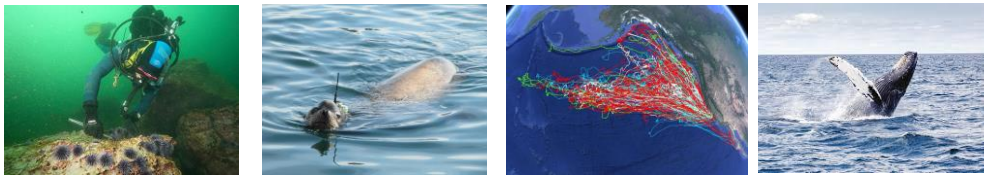




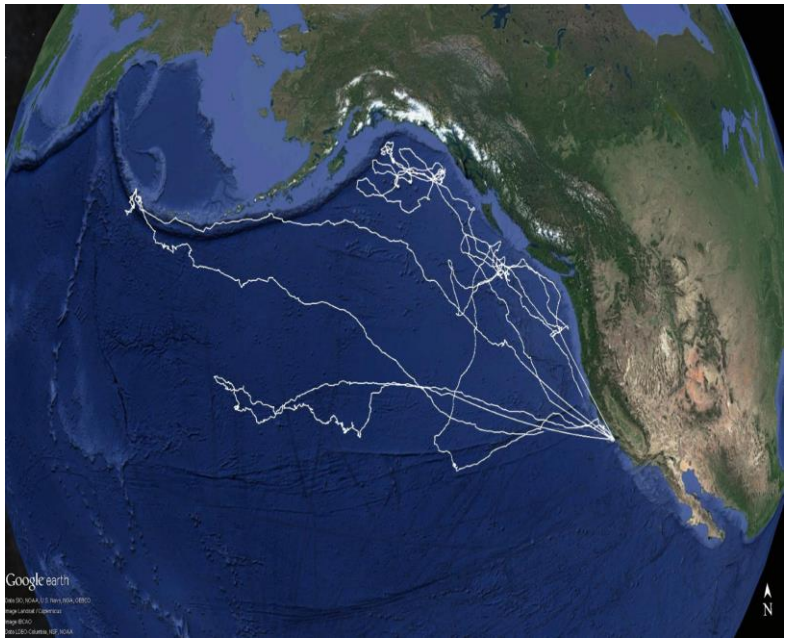
# --- SAVE THE DATE ---

# NANOOS-CeNCOOS-SCCOOS
## ATN-MBON-OTN
## Biological Observations Workshop

November 7–9, 2018
Santa Cruz, CA
Register HERE



Female Northern Elephant Seal Tracks obtained with CeNCOOS Tags




Identifying U.S. West Coast stakeholder needs and observation priorities for animal telemetry and marine biodiversity observations

**WORKSHOP OBJECTIVES**

- Identify and prioritize keystone monitoring and observational needs
- Identify the existing assets and capabilities in the region
- Document stakeholder uses of telemetry data
- Identify infrastructure and data management challenges and opportunities

# NOAA West Watch Update: Southern California

Megan Hepner, SCCOOS Program Coordinator

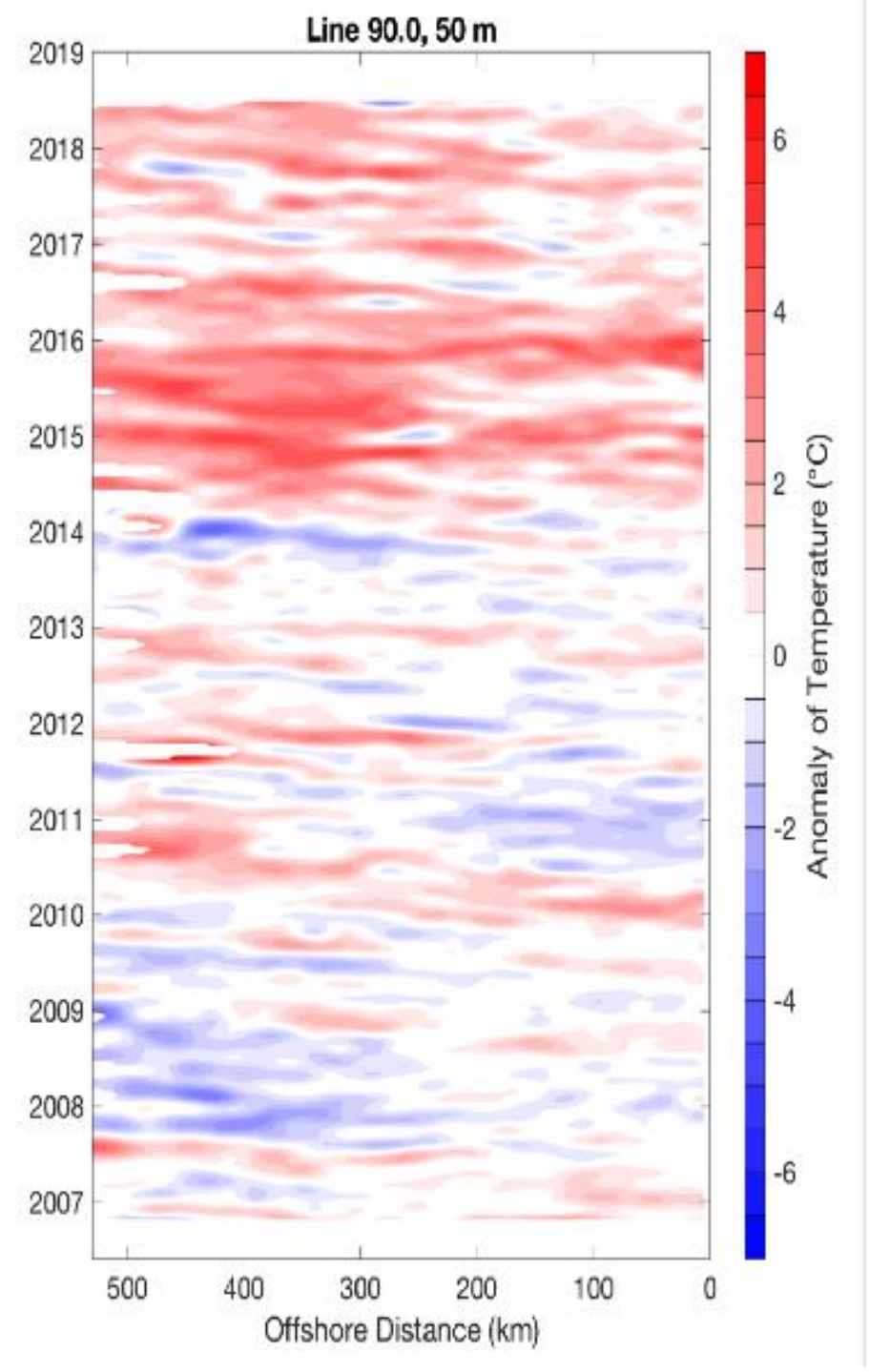
July 24th, 2018

www.sccoos.org

# Sea Water Temperature Anomalies – Spray Glider

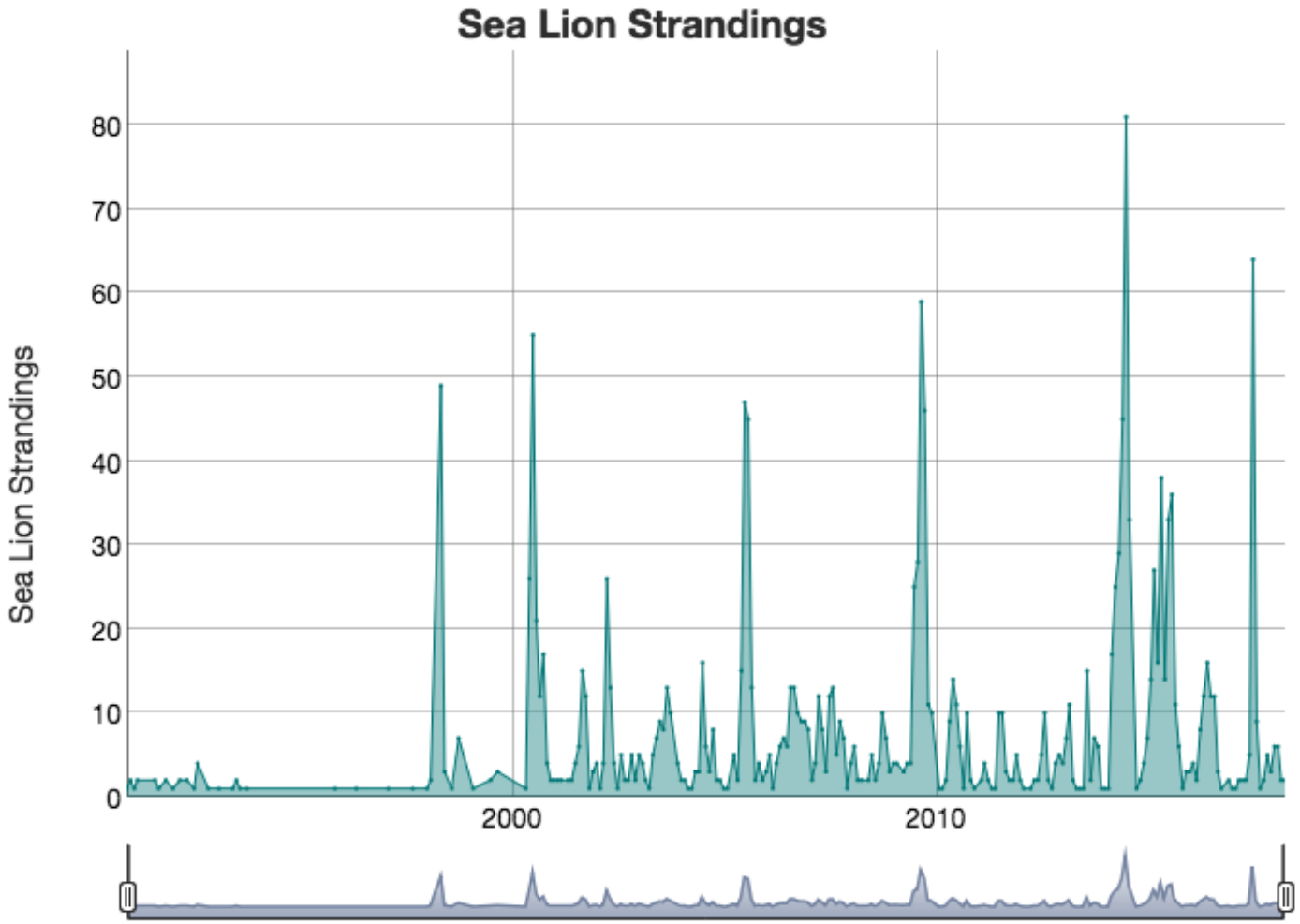
SCCOOS Update

# Sea Water Temperature Anomalies – Spray Glider




SCCOOS Update

# The Marine Mammal Center




http://rpubs.com/mhepner/marine_mammal_strandings

# SCCOOS Update

# Questions?

Megan Hepner, SCCOOS Program Coordinator

July 24th, 2018

www.sccoos.org

# Call Agenda

- Project Recap & Updates (Timi Vann)
- El Niño and Regional Climate brief (Dan McEvoy)
- Guest Speaker: (Sarah Kapnick: Snowpack Prediction)
- IOOS Nearshore Conditions brief (Jan Newton, Henry Ruhl, Megan Hepner)
- **Discussion:  Regional environmental conditions and impacts (All)**

# Select Regional Impacts

**Environmental Conditions**

- Record Heat Wave
- Wildfire
- Vog (volcanic dust & gases)
- Large Hail
- Tornadoes
- Drought
- Flash Flooding
- Haboob
- Damaging Wind
- Algal Blooms
- Mudslides and Debris Flows

**Human & Environmental Impacts**

- Property damage/Loss of property
- Impacts to recreational access
- Evacuations
- Increased human health risks
- Power outages
- Water Restrictions
- Agricultural losses
- Smokey Skies
- Unsafe Drinking Water
- Road Closures

**Open Discussion**

- Additional impacts to share with the group?
- Observations & thoughts on recently reported environmental anomalies?

# Thank You!

**Final Scheduled NOAA West Watch: September 25th, 1-2pm PDT/ 2-3pm PDT**

If you have an interest in seeing this webinar continue, please email Timi Vann at

timi.vann@noaa.gov

Thank You!

# Impacts in Pictures - Back-Up Slides

# Impacts in Pictures

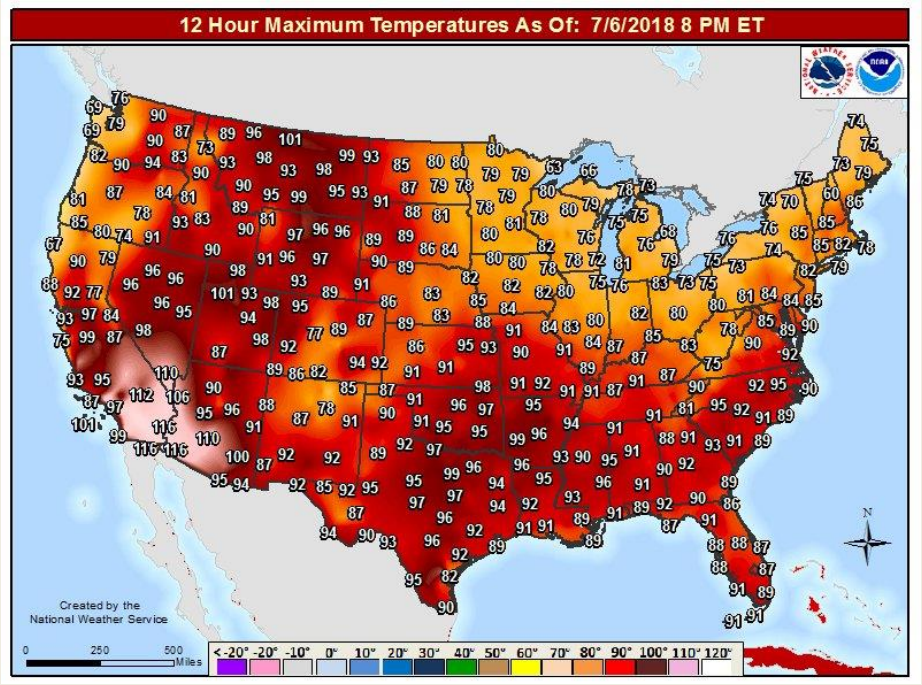
Large wildfires continue to burn across the West. The largest of the fires was the Martin Fire in NV that burned through 435,000 acres. The 416, Spring Creek, and Badger Creek Fires in CO have burned through 180,000 acres and have destroyed more than 200 homes. The Spring Creek fire is now the 3rd largest in CO history. Fires in CA destroyed nearly 100 homes. The Dollar Ridge Fire in UT has burned 57,000 acres and destroyed hundreds of structures, 74 of which were homes.

Photo: Martin Fire
Jeff Mullins – Elko Daily Free Press

Photo: 416 Fire
Jerry McBride – Durango Herald

# Impacts in Pictures

A dangerous heat wave swept through the southwest United States during the first weekend in July. Many all-time high temperature records were broken. Some of these were Van Nuys Airport (117), Burbank Airport (114), UCLA (111), Santa Ana (114) and Ramona (115), according to the National Weather Service. Many other locations broke records with temperatures above 110 degrees. The consequent usage of power for cooling purposes caused the electric grid to exceed 5,700 megawatts on July 7, making it the 2nd-highest weekend day in Los Angeles history. This led to 80,000 people without power at some point during the weekend




Credit: Los Angeles NWS Twitter Feed

# Impacts in Pictures

Phoenix was subject to large monsoonal thunderstorms. The Valley was inundated with heavy rain, extremely high winds, and thousands of lighting strikes. Haboob dust storms resulted from the high winds. According to NWS Phoenix, one such dust storm traveled "clear across the Sonoran Desert", ultimately traveling 200 miles, impacting travel and human health and safety. Another storm dropped visibility to less than a mile at one point during the event and forced temporary closures of SR-347 and I-10.

Photo: Reed Timmer

# Impacts in Pictures

Two EF3 tornadoes touched down in Wyoming in early June. This is quite a event since there has only been seven EF3 or stronger tornadoes reported in Wyoming since 1950. The first tornado touched down near Gillette and caused significant damage to a local housing subdivision. The second tornado, touched down north of Laramie. This tornado ripped apart barns and garages and left as many as 800 people without power.

Photo: Aaron Voos Twitter Feed

# Impacts in Pictures

Reports of large, damaging hail from storm throughout CO and NM were numerous during the month of June. Hail up to 3 inches in diameter impacted roofs and cars in the Colorado Springs area. According to the Colorado Springs Gazette, the storm was the worst hail in the region in more than 20 years. A car dealership in Frederick, CO saw golf ball sized hail that damaged over 250 vehicles. Morgan County, CO saw baseball sized hail with 70 mph winds. The small town of Otis, NM saw 3 inch diameter hail with strong winds that tore a roof off a building.

Photo: WeatherNation

Photo: Arapahoe Sherriff Department Twitter Feed