Regional Environmental Conditions & Impacts Coordination

NOAA West

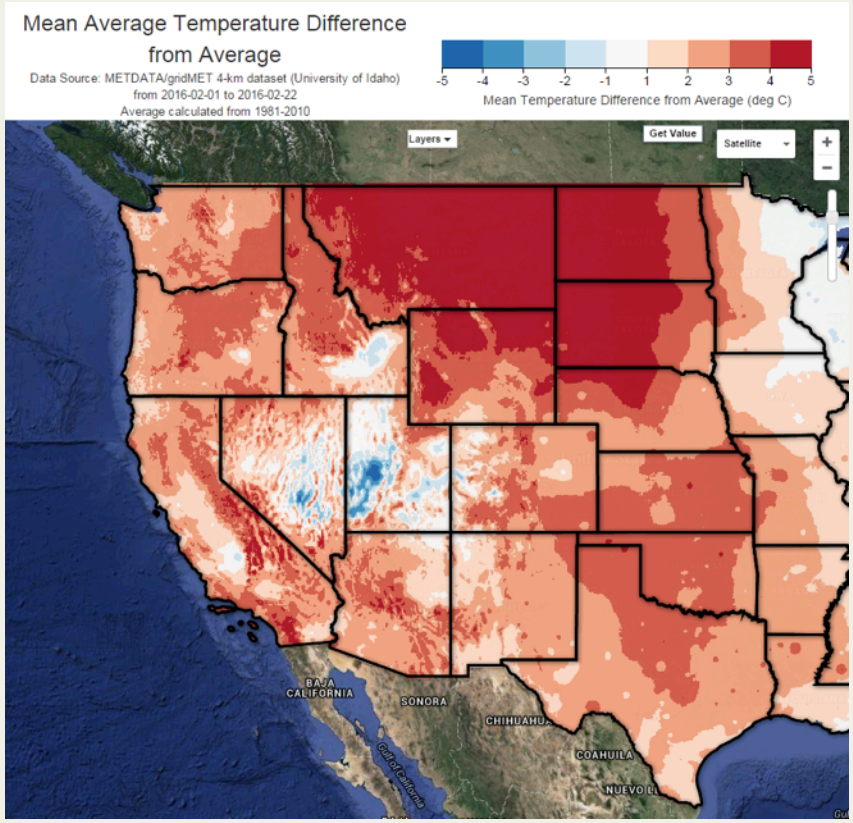
February 29, 2016

Call Agenda

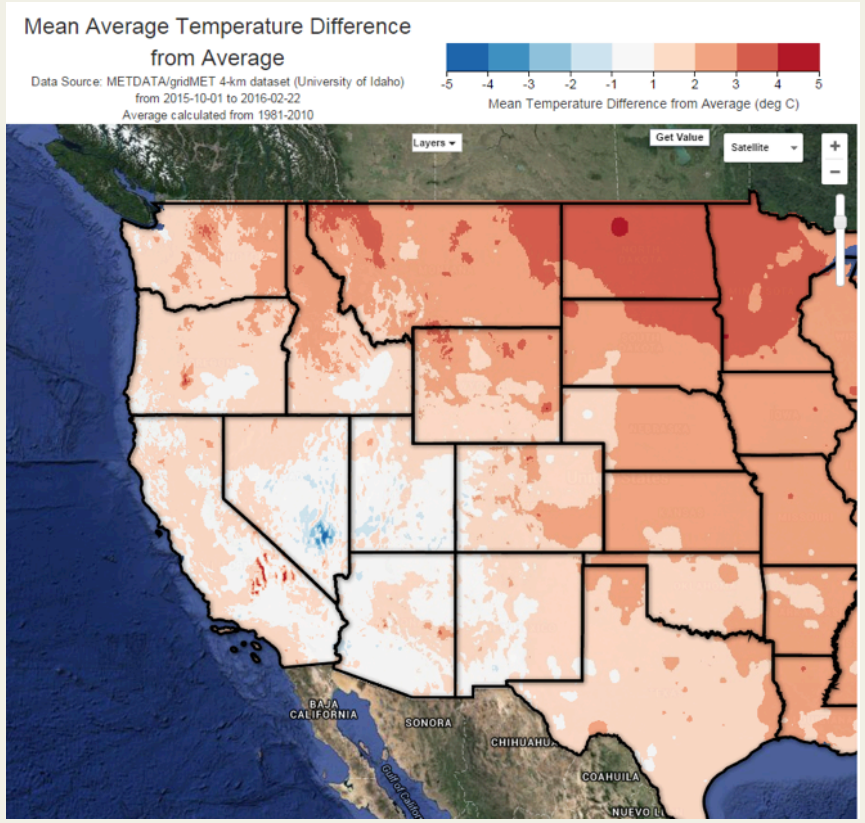
- Welcome
- El Niño and Regional Climate brief (D. McEvoy)
- Highlights:
  - NANOOS, regional monitoring & reporting updates
  - Dr. Bill Peterson, NOAA Fisheries
- Environmental conditions and impacts reporting update (T. Vann)
- Communications / “Stories” Update (M. Milstein)
- Discussion

Temperature

Feb 1 – Feb 22, 2016



Oct 1, 2015 – Feb 22, 2016



climateengine.org

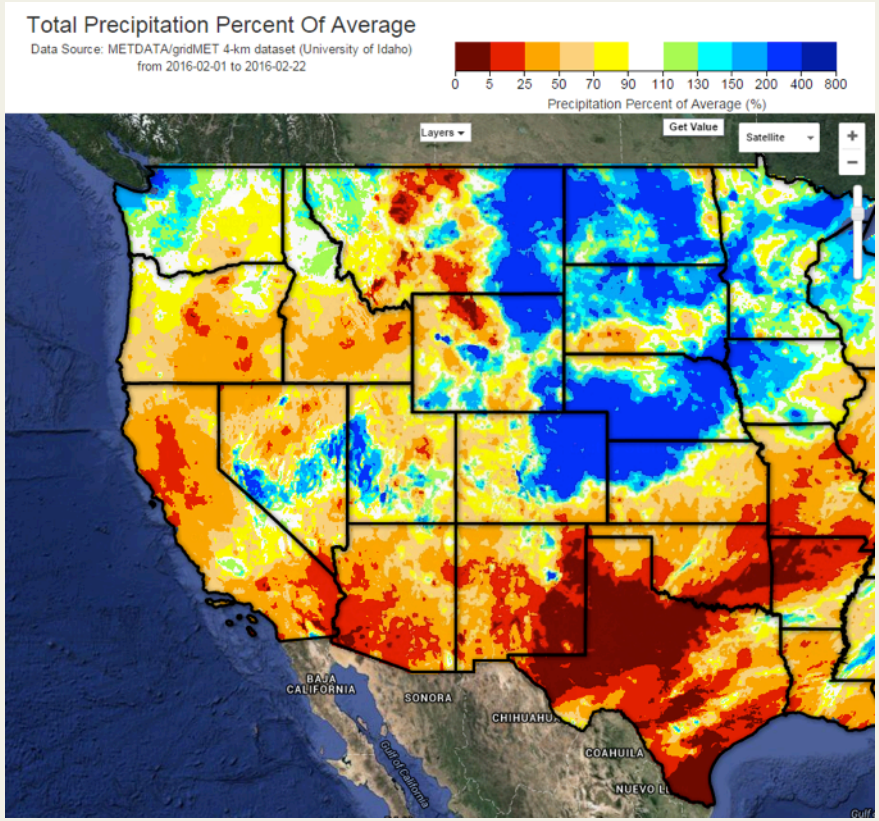
water year to date

Desert Research Institute

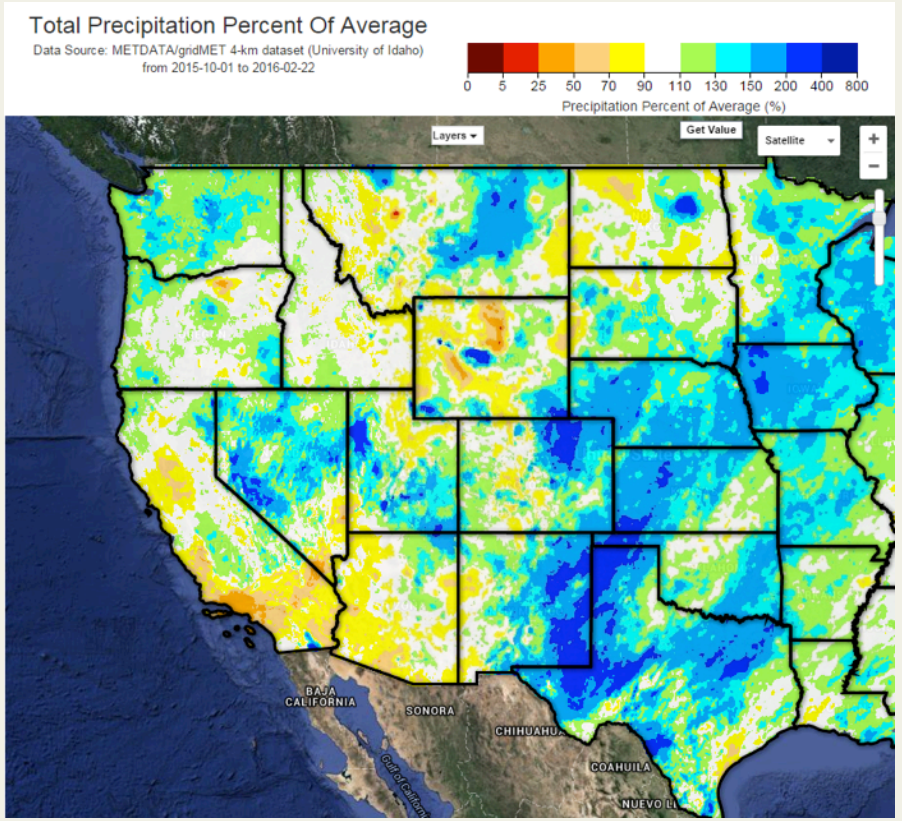
University of Idaho

Precipitation

Feb 1 – Feb 22, 2016



Oct 1, 2015 – Feb 22, 2016



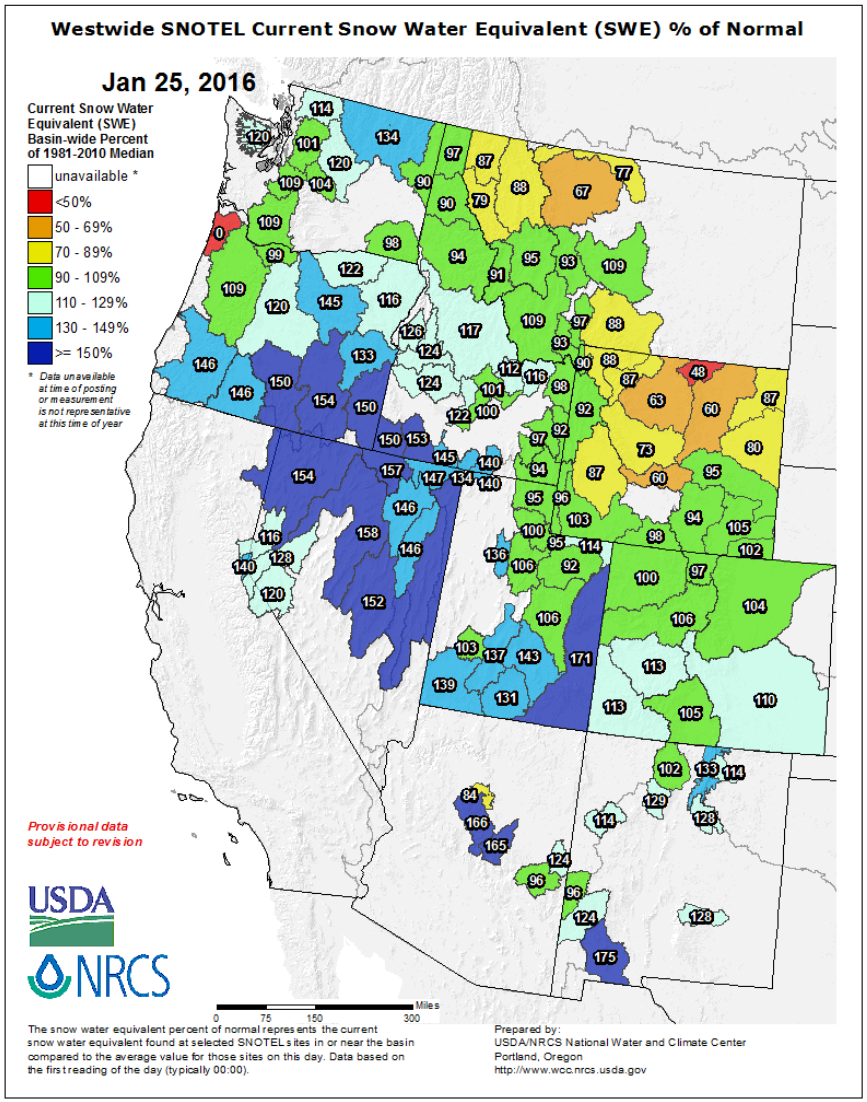
climateengine.org

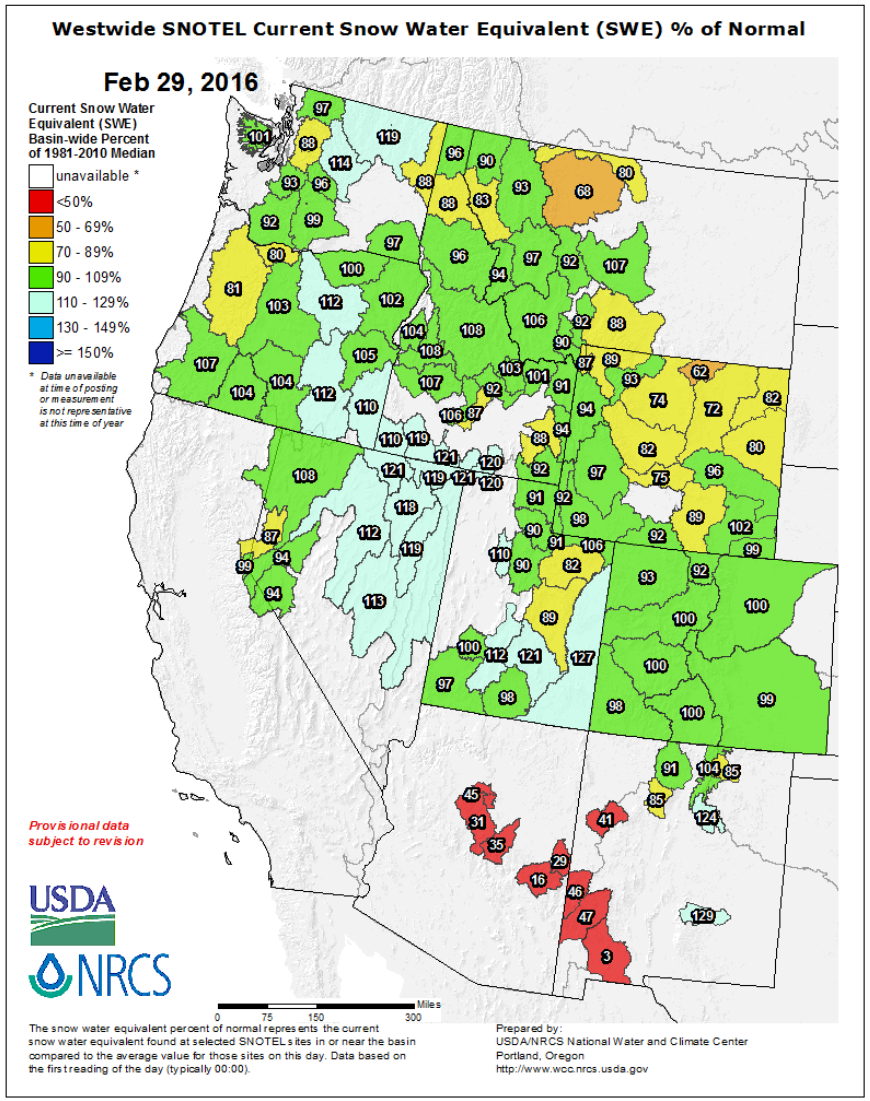
water year to date

Desert Research Institute

University of Idaho

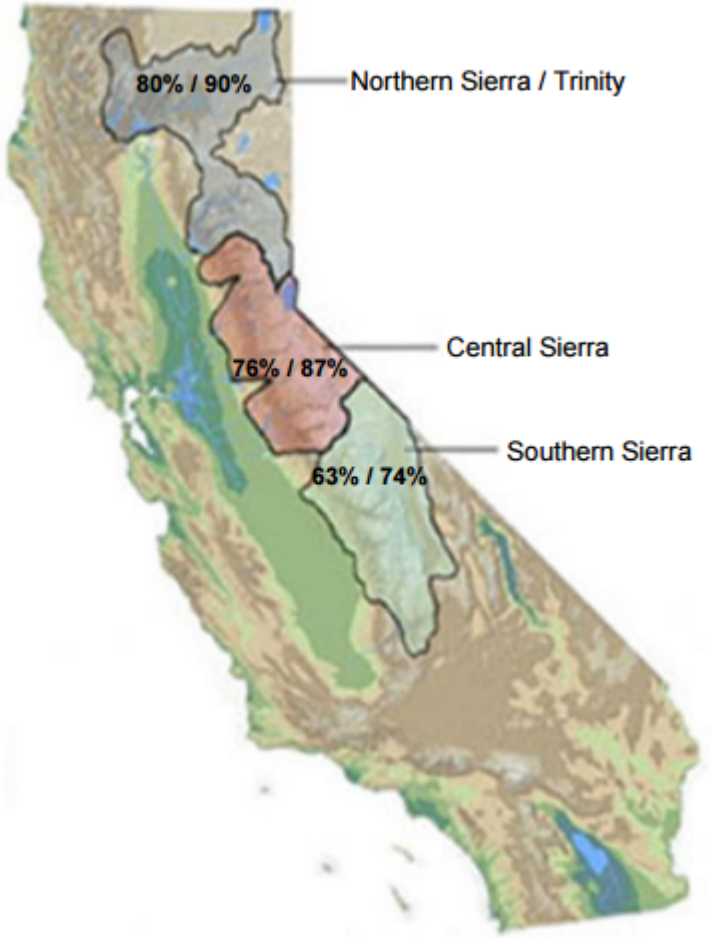
Snow Water Equivalent





Snow Water Equivalent

% of April 1 Average / % of Normal for This Date



NORTH	
Data as of February 29, 2016	
Number of Stations Reporting	28
Average snow water equivalent (Inches)	23.2
Percent of April 1 Average (%)	80
Percent of normal for this date (%)	90

CENTRAL	
Data as of February 29, 2016	
Number of Stations Reporting	40
Average snow water equivalent (Inches)	21.9
Percent of April 1 Average (%)	76
Percent of normal for this date (%)	87

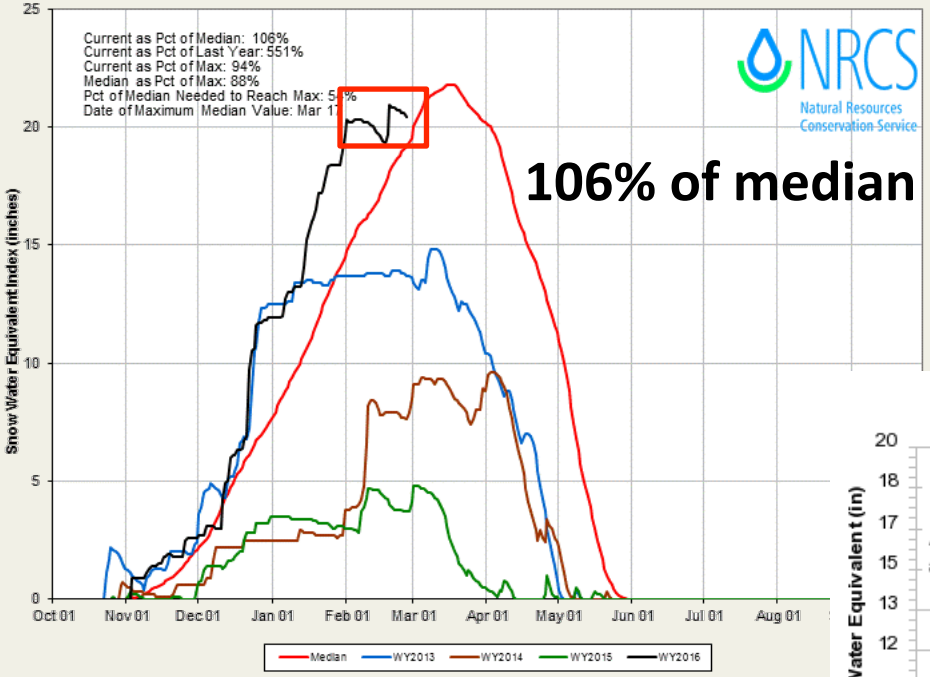
SOUTH	
Data as of February 29, 2016	
Number of Stations Reporting	29
Average snow water equivalent (Inches)	16.8
Percent of April 1 Average (%)	63
Percent of normal for this date (%)	74

STATE	
Data as of February 29, 2016	
Number of Stations Reporting	97
Average snow water equivalent (Inches)	20.8
Percent of April 1 Average (%)	74
Percent of normal for this date (%)	85

Statewide Average: 74% / 85%

Source: CA DWR

Snow Water Equivalent

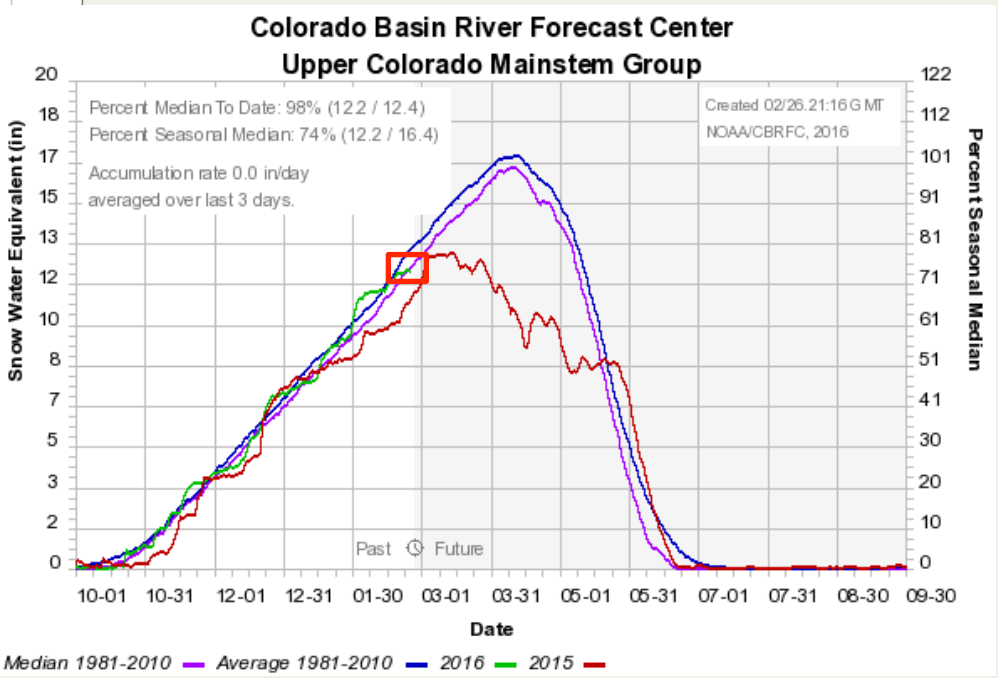


Lake Tahoe Basin

106% of median

Source: NRCS

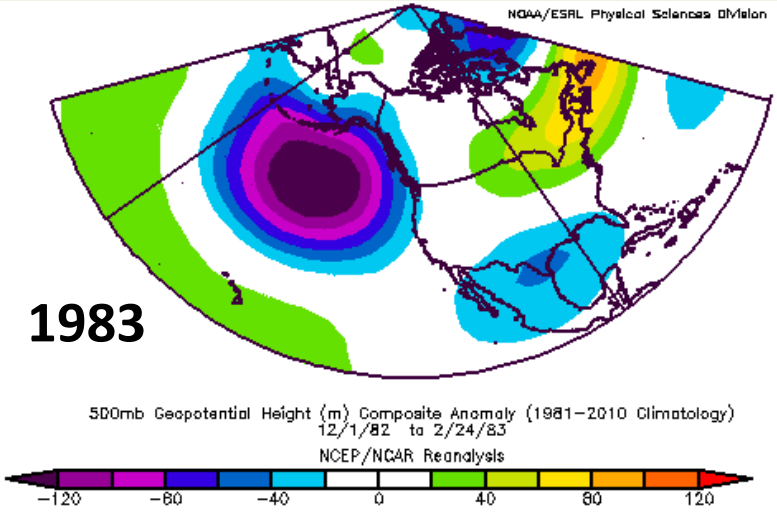
98% of median

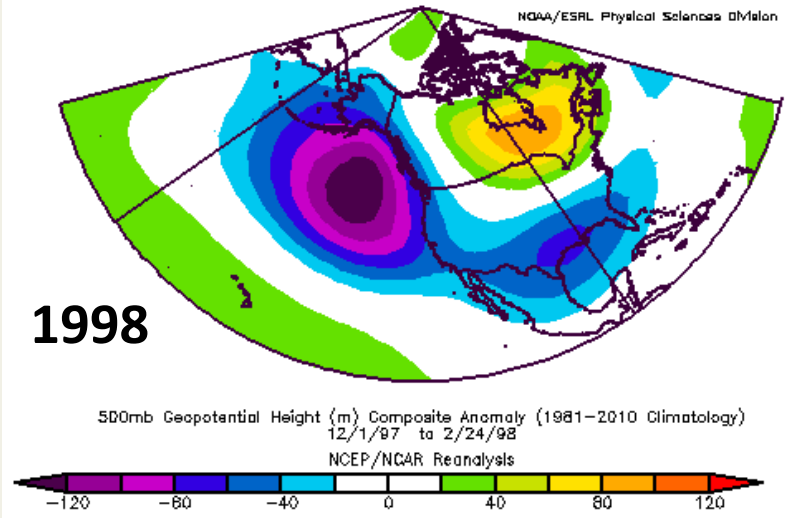


Upper CO Basin

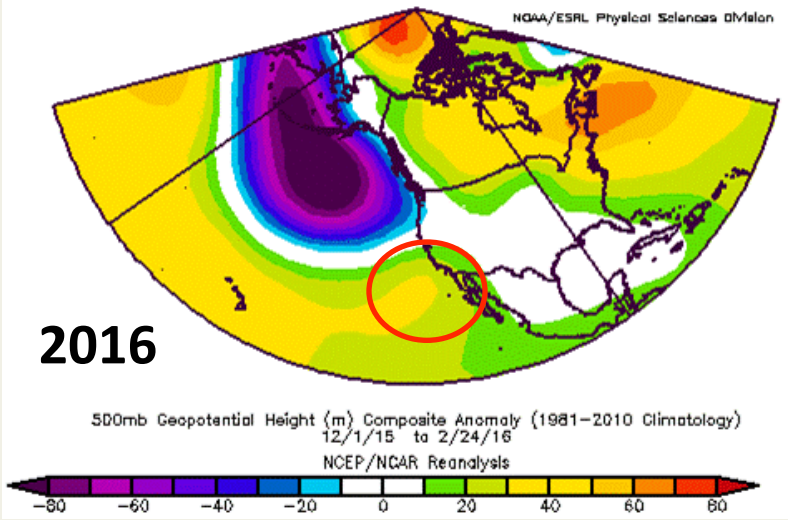
Source: CBRFC

Very Strong El Nino Flow Patterns

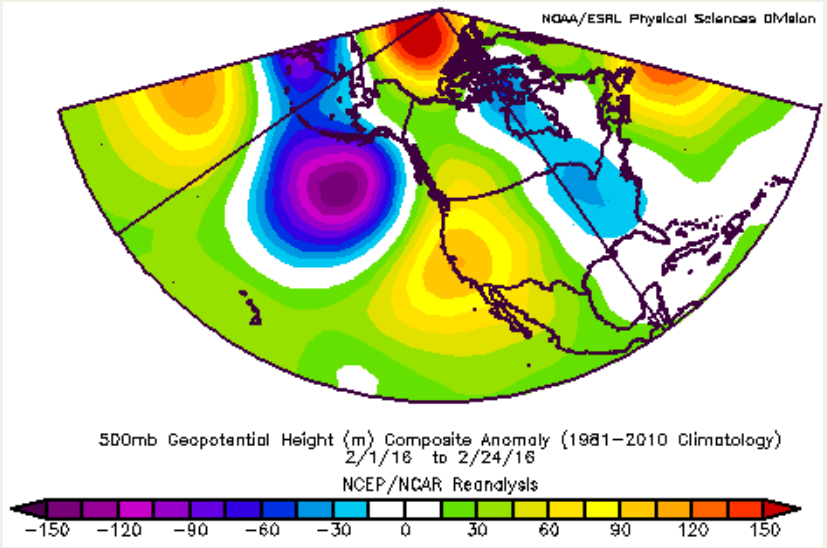


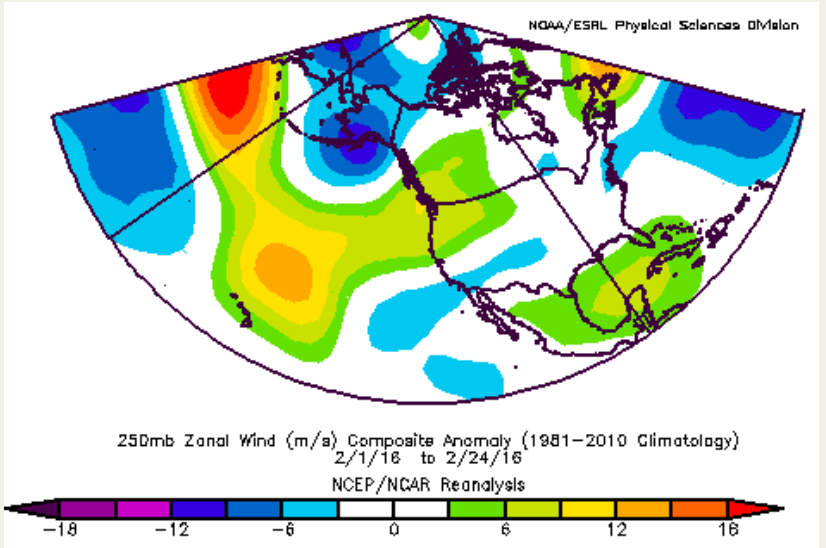


- 500 mb geopotential height anomalies
- Mid-troposhpere high and low pressure
- December 1 – February 24 mean



Very Strong El Nino Flow Patterns





- 500 mb geopotential height anomalies
- Mid-troposhpere high and low pressure
- **February 1 – February 24, 2016 mean**

- 250 mb zonal wind anomalies
- West to east jet stream level winds
- **February 1 – January 24, 2016 mean**

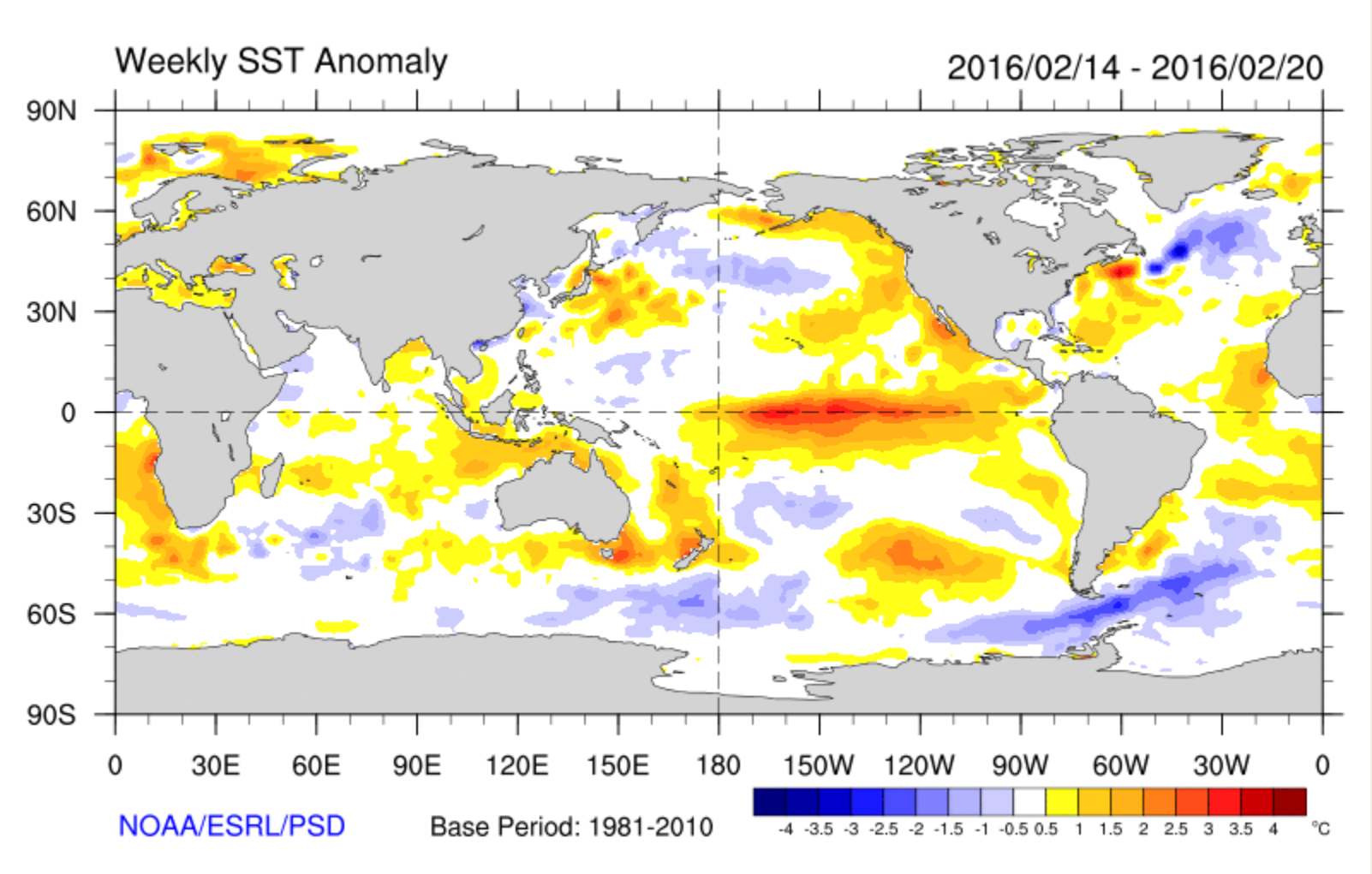
El Nino Status

- ENSO Alert System Status: El Niño Advisory
- El Niño conditions are present
- Positive equatorial sea surface temperature (SST) anomalies continue across most of the Pacific Ocean.
- A transition to ENSO-neutral is likely during late Northern Hemisphere spring or early summer 2016, **with a possible transition to La Niña conditions during the fall**.*

Credit: CPC

* Note: These statements are updated once a month (2nd Thursday) in association with the ENSO Diagnostics Discussion, which can be found by clicking here.

Current Sea Surface Temperatures

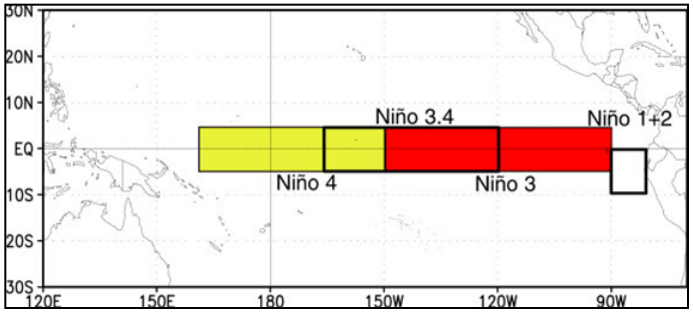


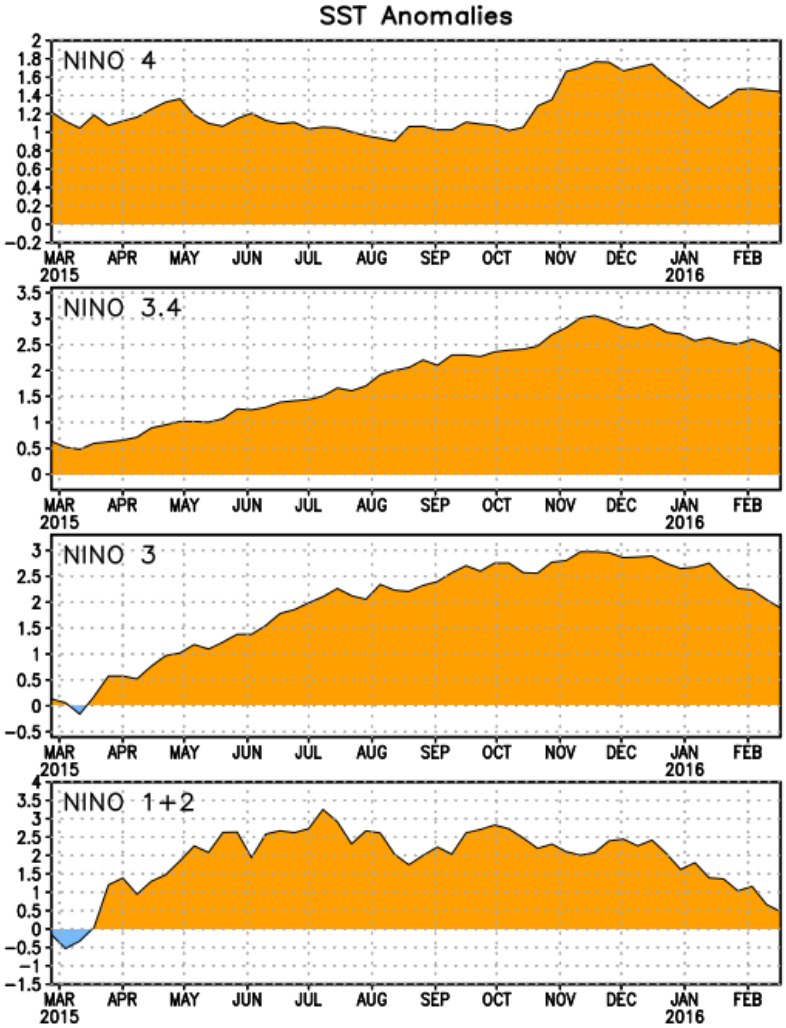
Source: NOAA/ESRL

Niño Region SST Departures (ºC) Recent Evolution

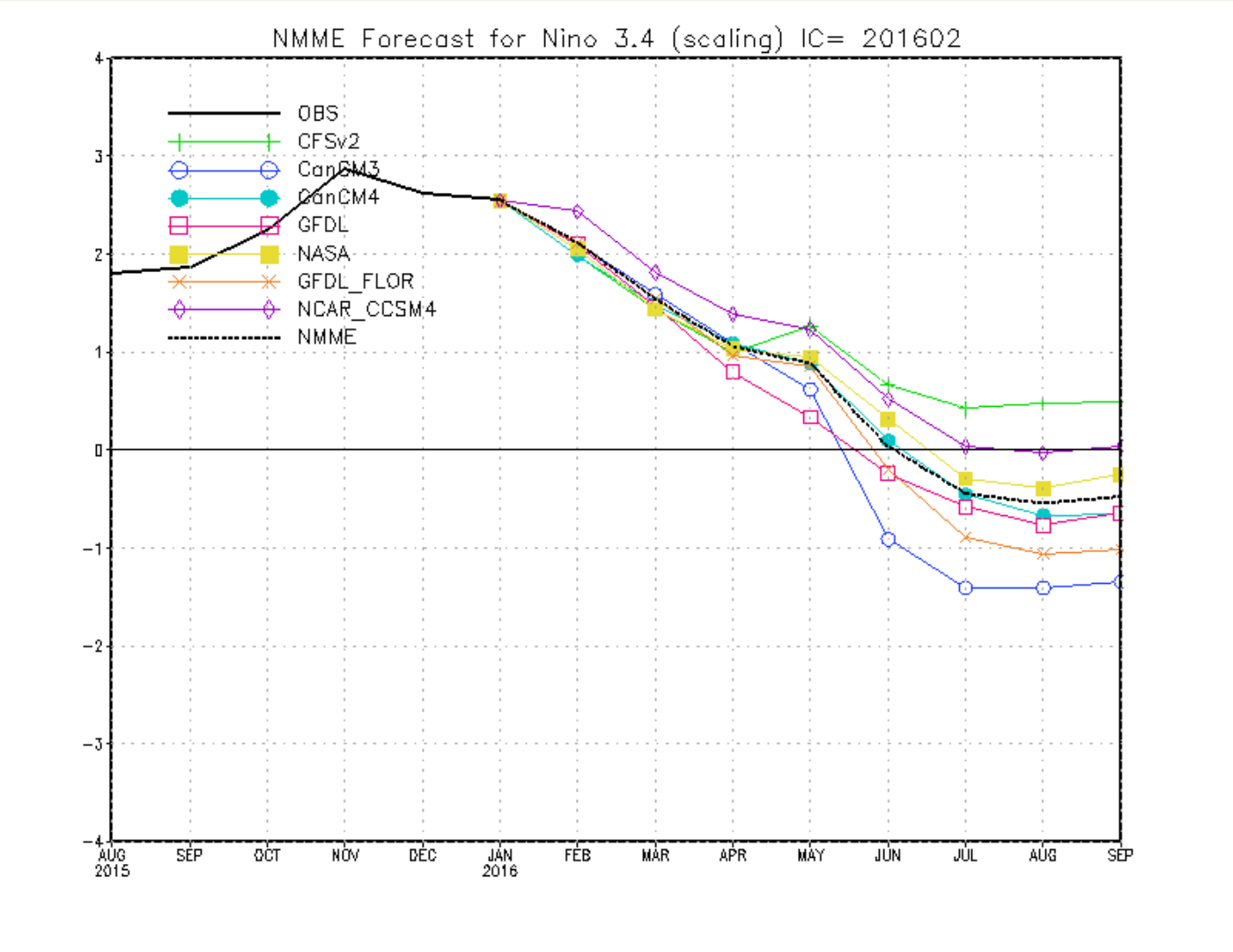
The latest weekly SST departures are:

Niño 4	**1.4ºC**
Niño 3.4	**2.4ºC**
Niño 3	**1.9ºC**
Niño 1+2	**0.5ºC**



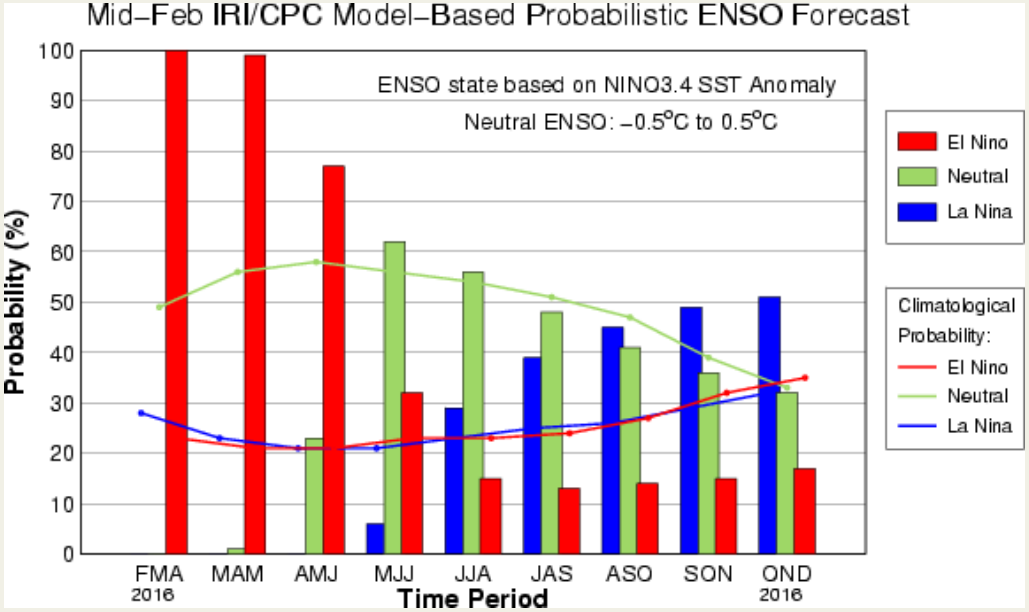


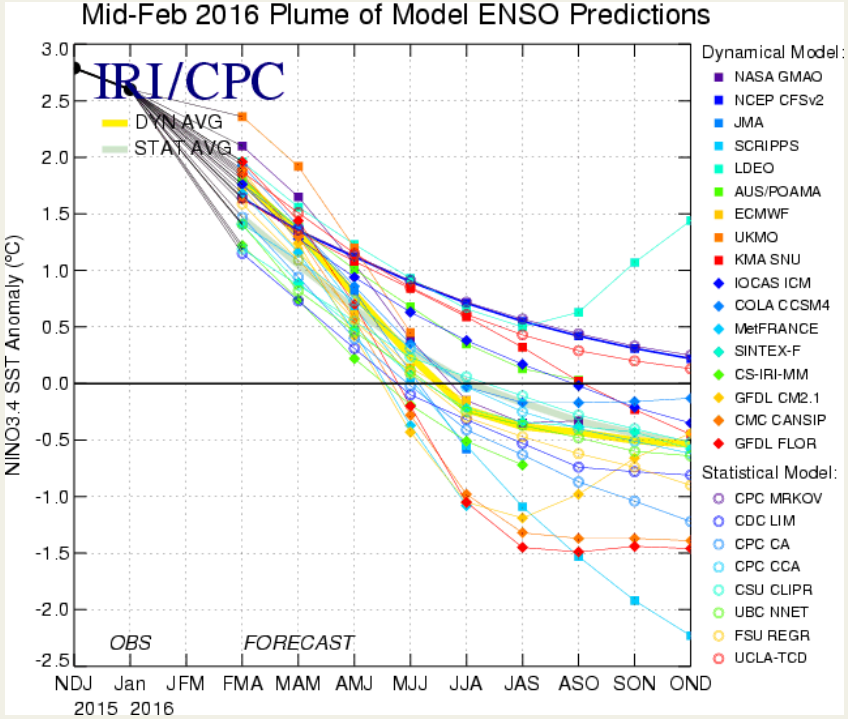
ENSO Forecasts



Source: NOAA/CPC

ENSO Forecasts



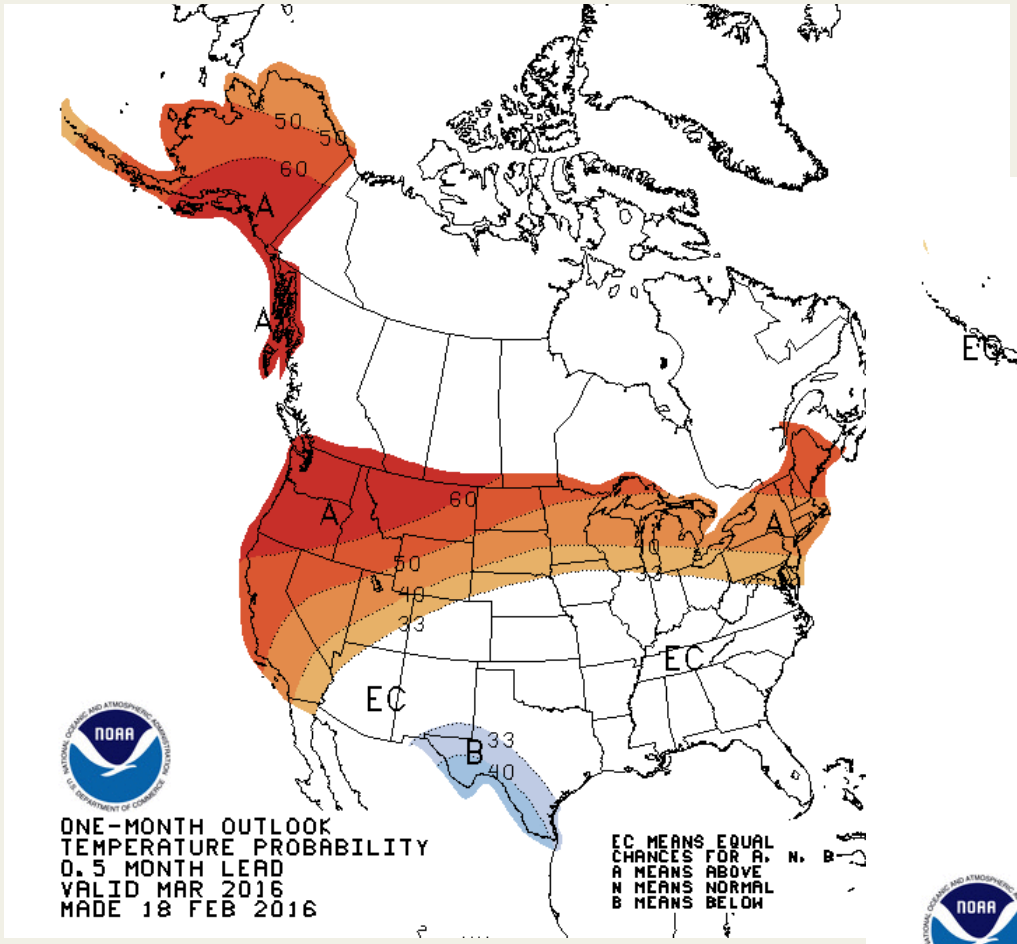


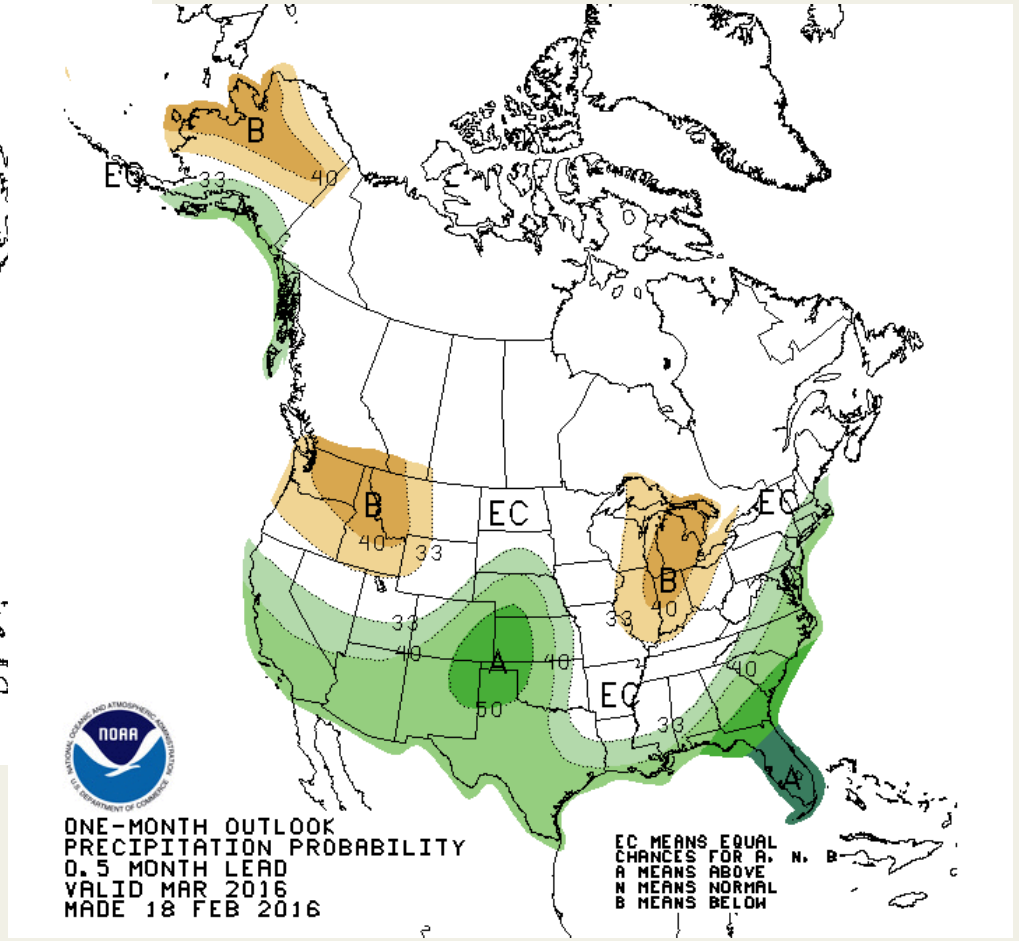
CPC/IRI El Nino forecast:

NMME models + other dynamical models + statistical models

Source: CPC/IRI

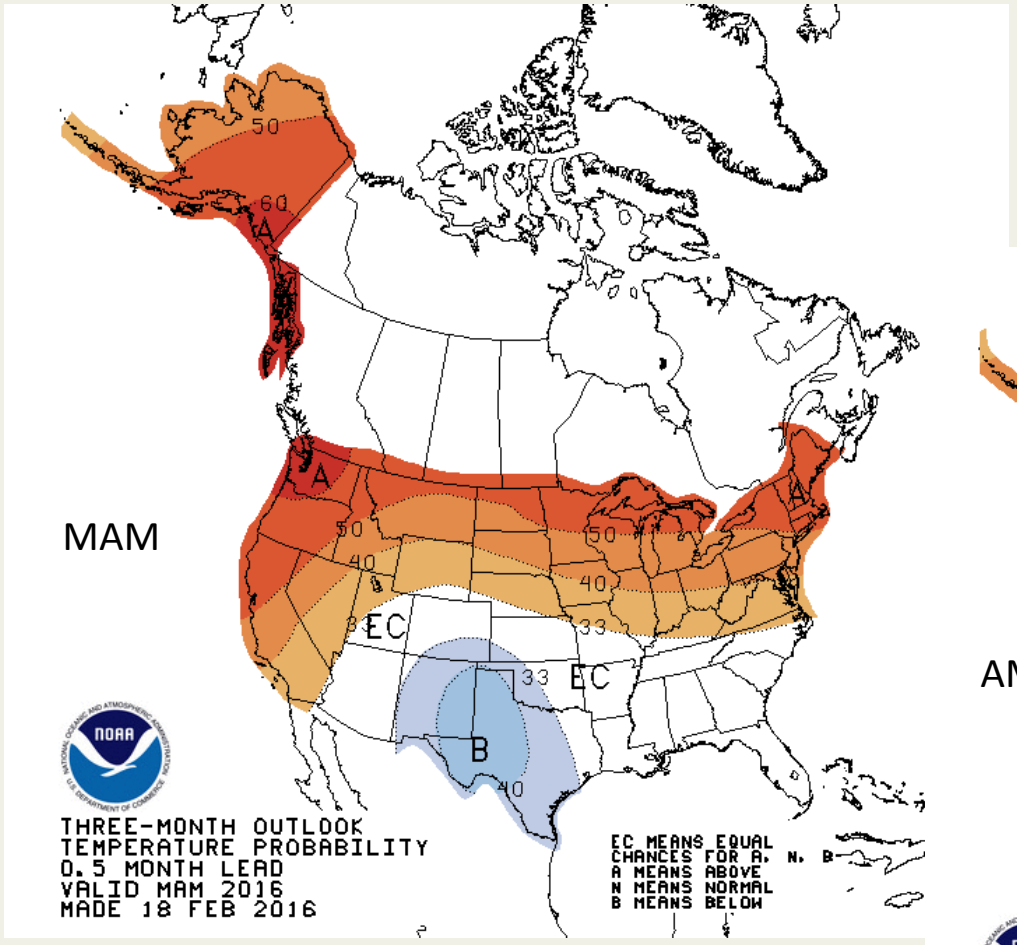
March U.S. Forecasts

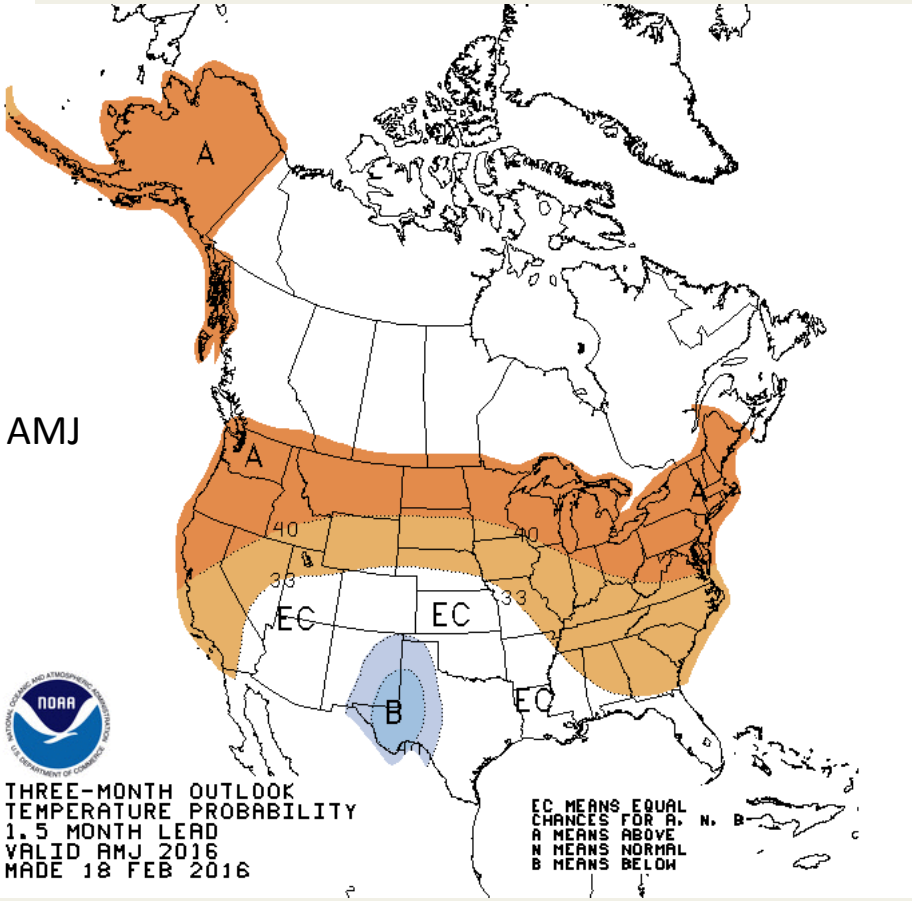




Source: NOAA/CPC

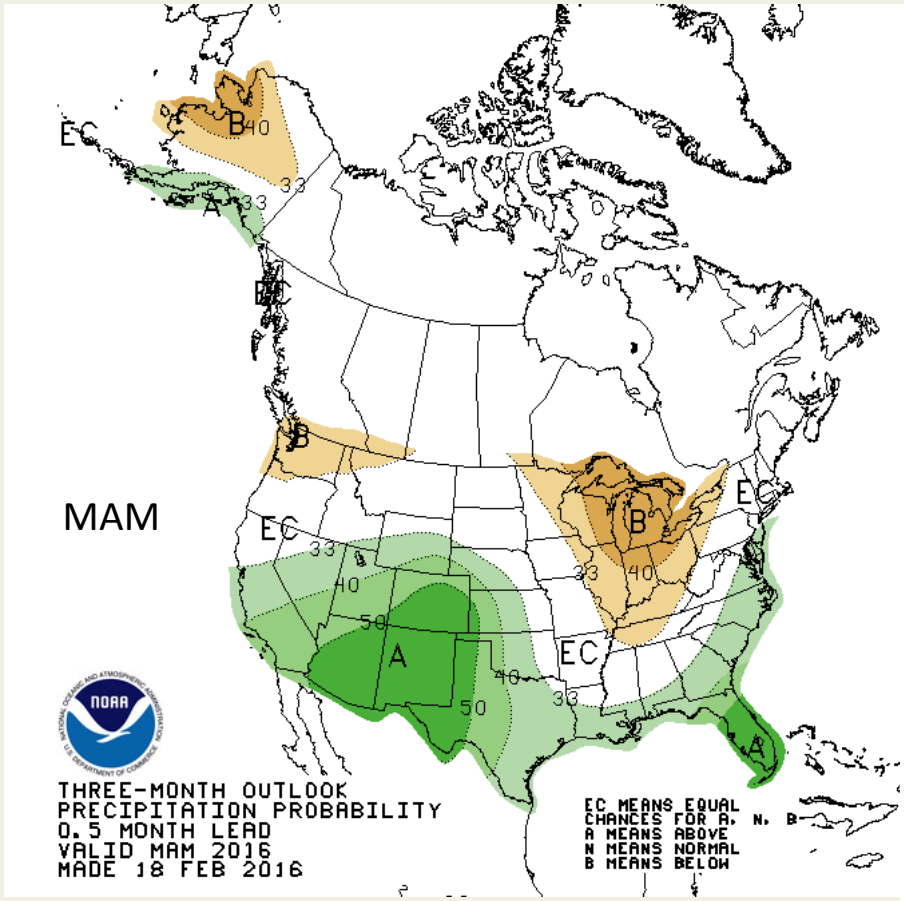
U.S. Temperature Forecasts

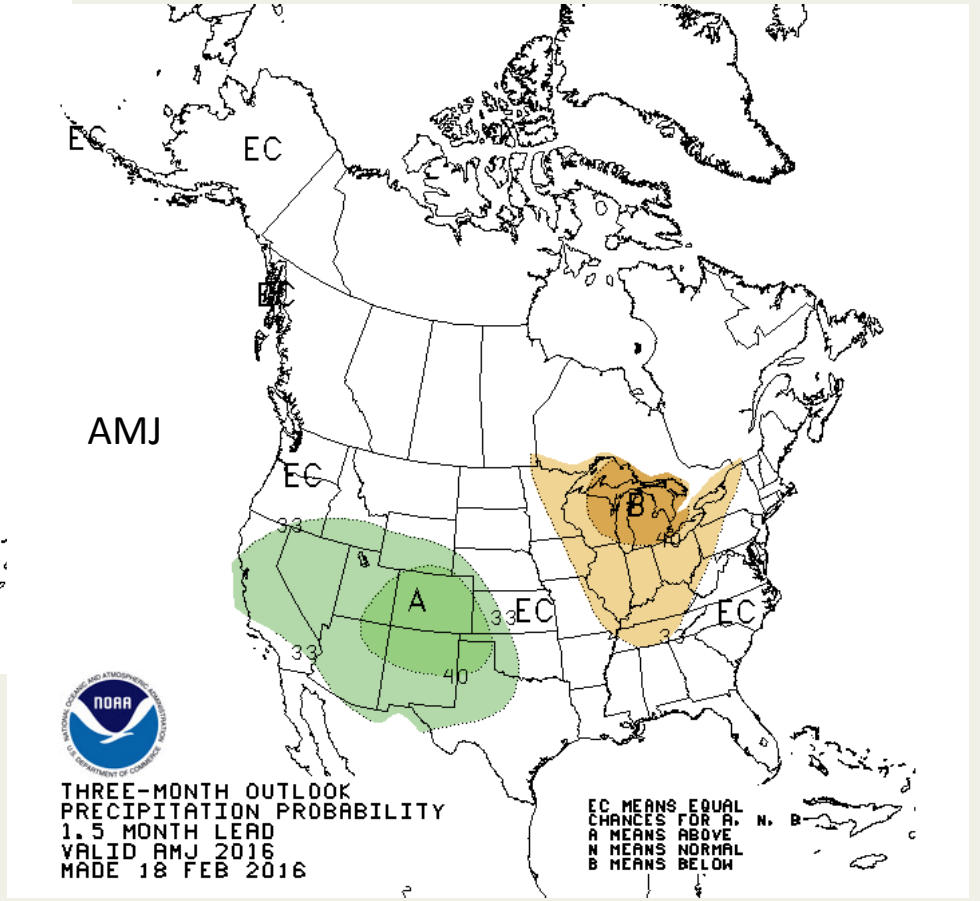




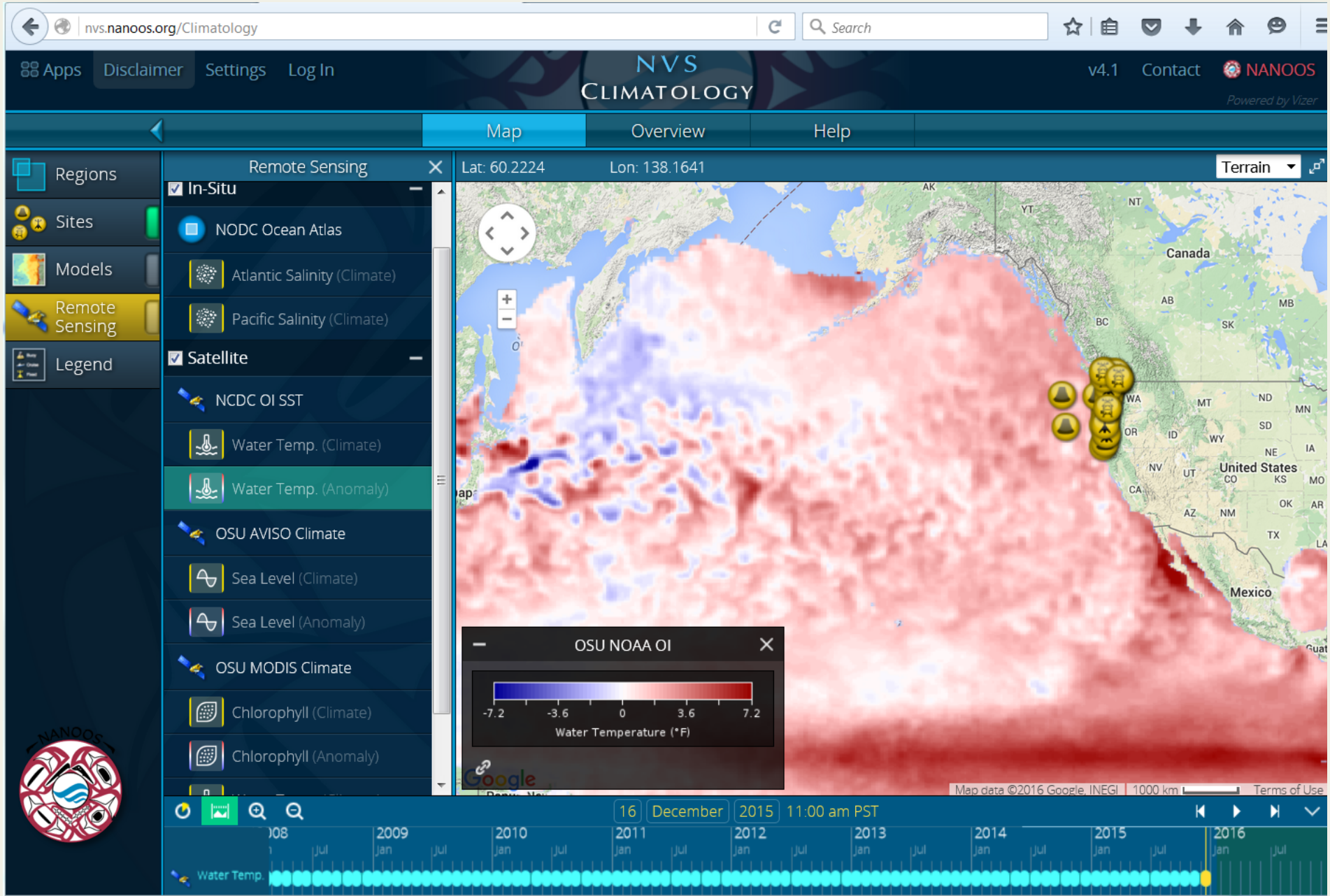
Source: NOAA/CPC

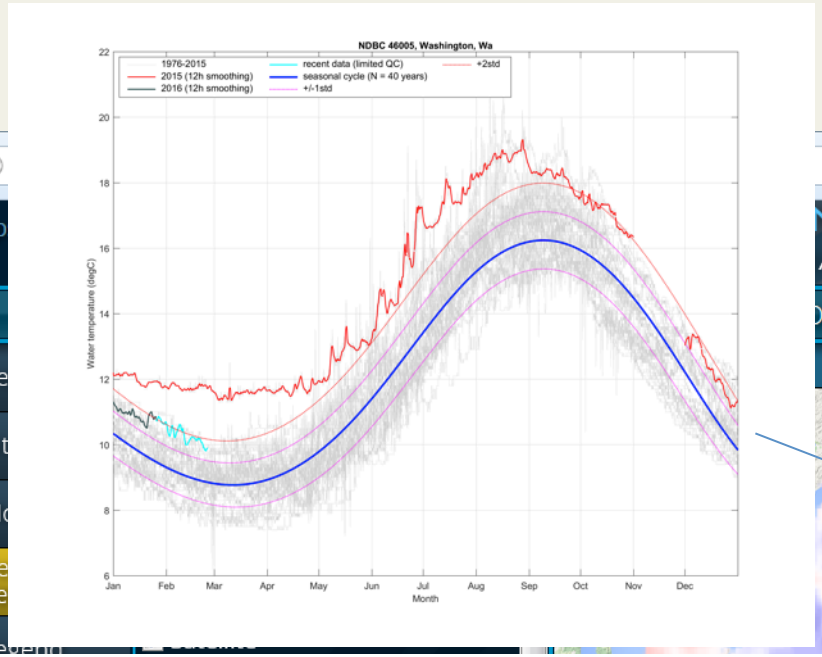
U.S. Precipitation Forecasts

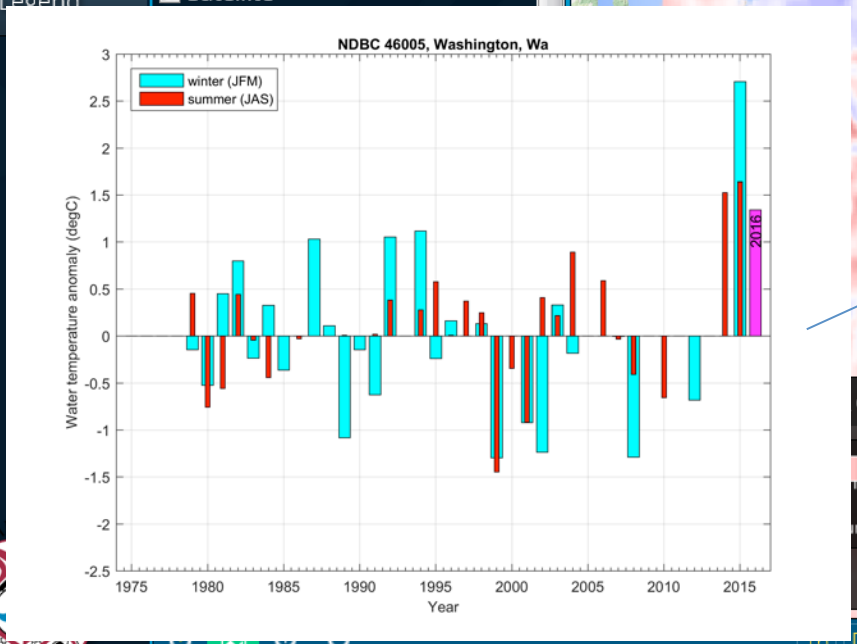


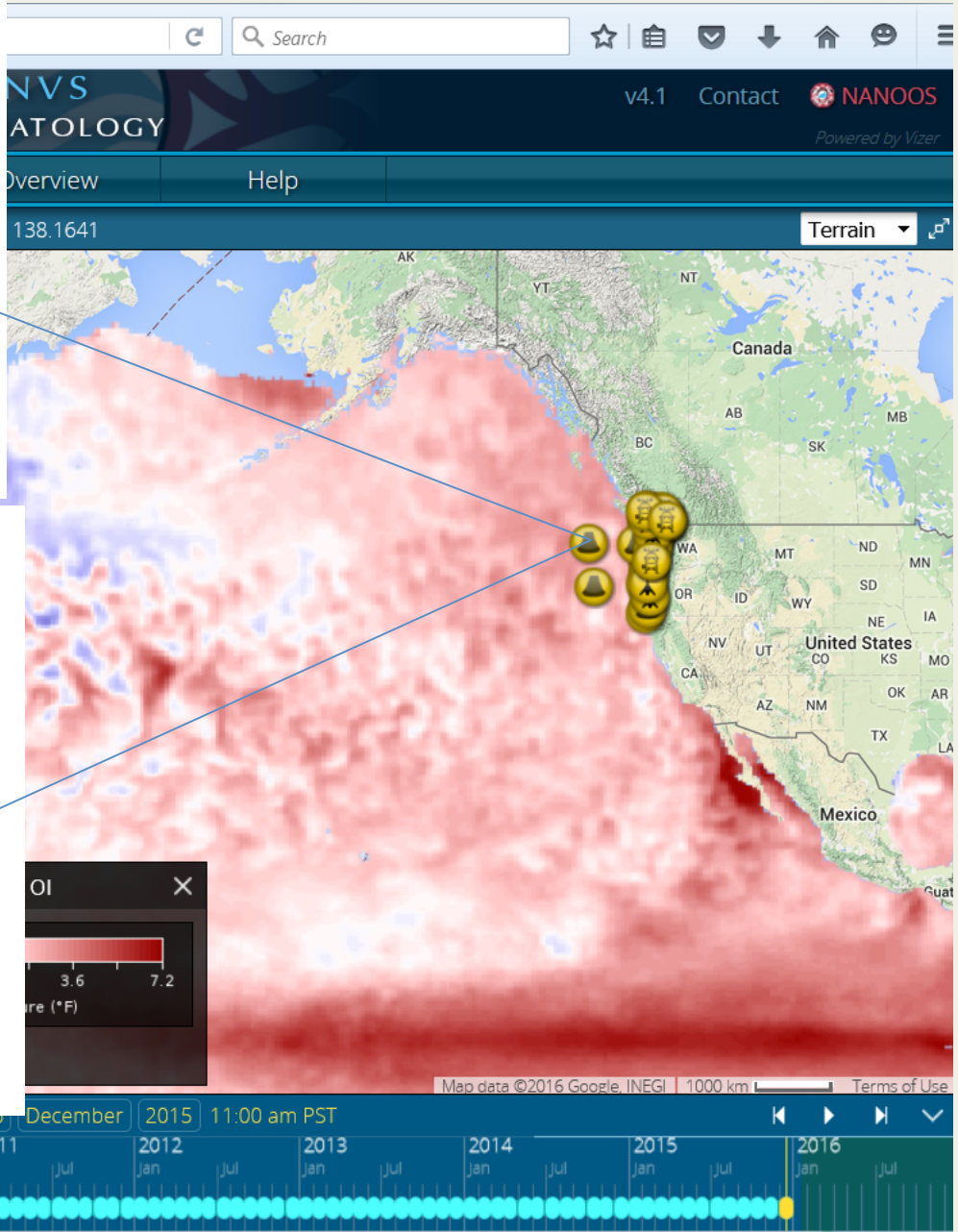


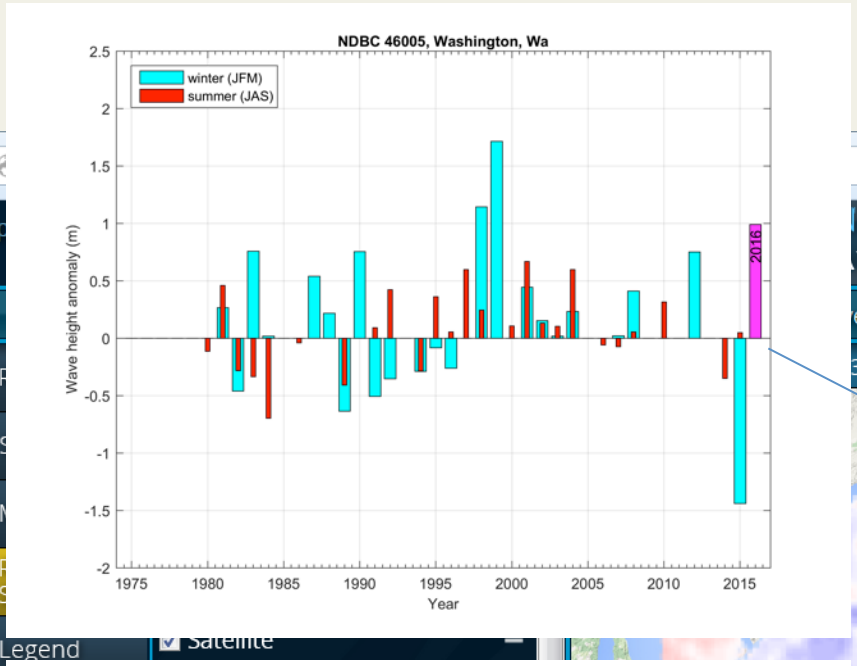
NANOOS

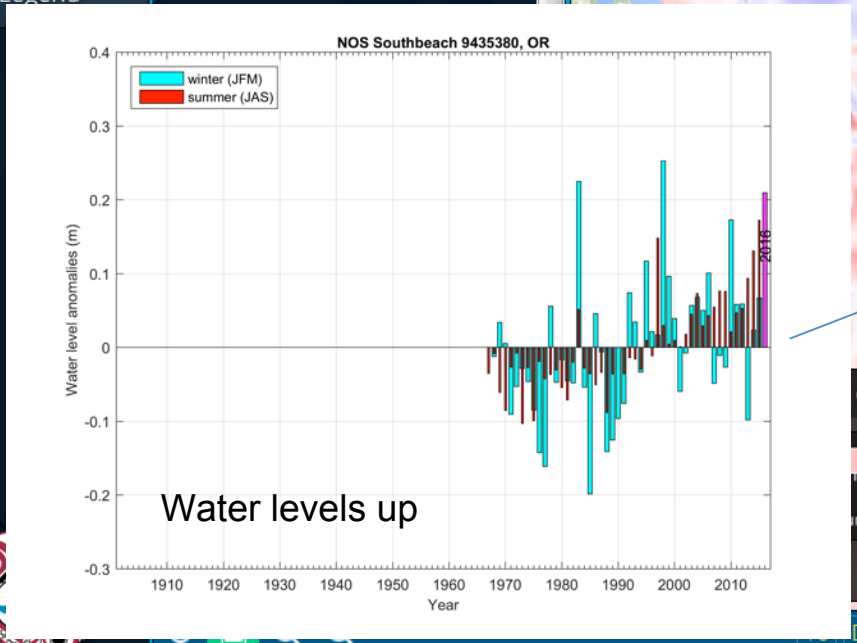

nvs.nanoos.org/Climatology
Search
Apps
Disclaimer
Settings
Log In
NVS
CLIMATOLOGY
v4.1
Contact
NANOOS
Powered by Vizer
Map
Overview
Help
Regions
Sites
Models
Remote Sensing
Legend
Remote Sensing
In-Situ
NODC Ocean Atlas
Atlantic Salinity (Climate)
Pacific Salinity (Climate)
Satellite
NCDC OI SST
Water Temp. (Climate)
Water Temp. (Anomaly)
OSU AVISO Climate
Sea Level (Climate)
Sea Level (Anomaly)
OSU MODIS Climate
Chlorophyll (Climate)
Chlorophyll (Anomaly)
Lat: 60.2224
Lon: 138.1641
Terrain
Canada
United States
Mexico
OSU NOAA OI
-7.2
-3.6
0
3.6
7.2
Water Temperature (°F)
Map data ©2016 Google, INEGI
1000 km
Terms of Use
16
December
2015
11:00 am PST
2008
2009
2010
2011
2012
2013
2014
2015
2016
Water Temp.


NDBC 46005, Washington, Wa
1976-2015
2015 (12h smoothing)
2016 (12h smoothing)
recent data (limited QC)
seasonal cycle (N = 40 years)
+/-1std
+2std
Water temperature (degC)
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

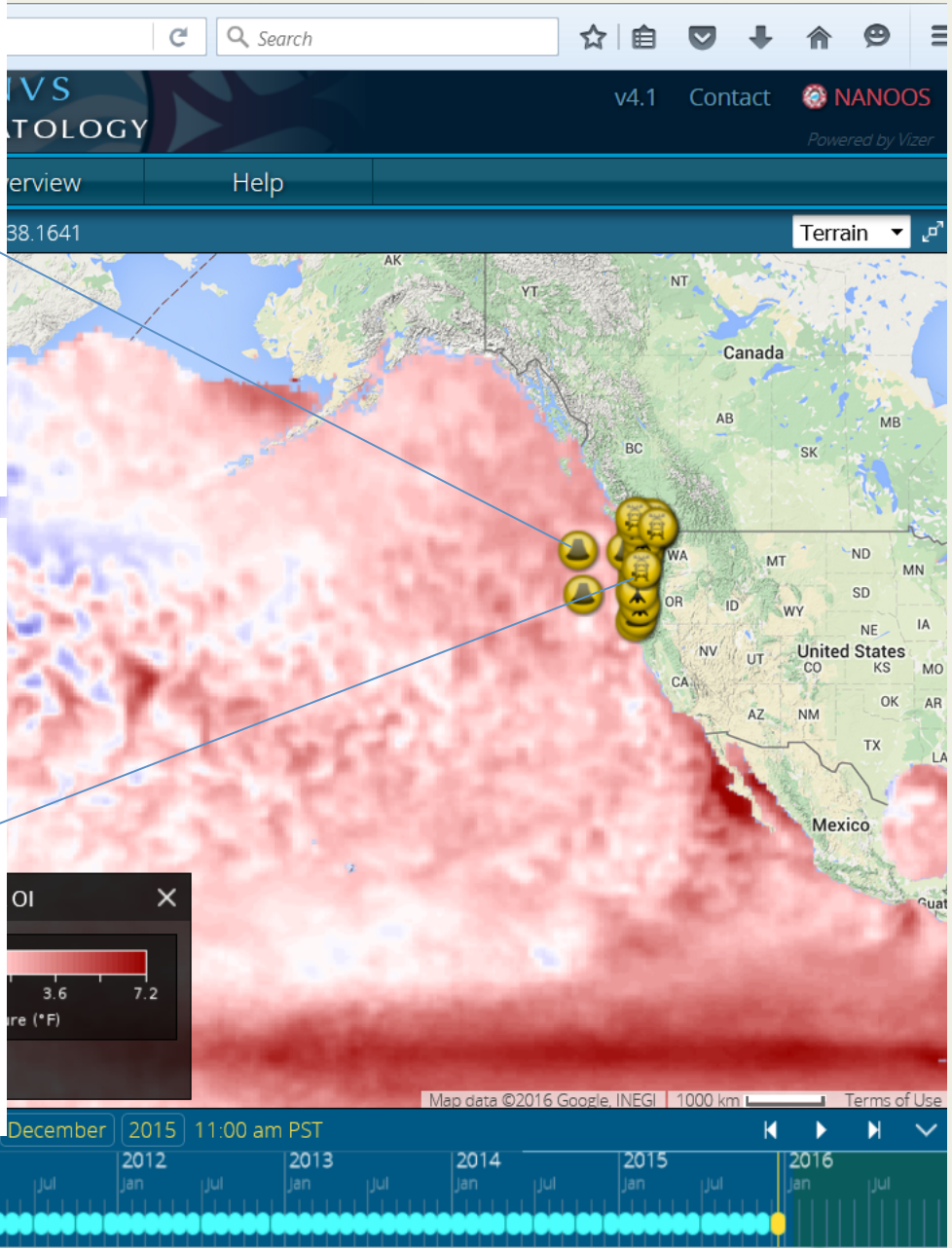

NDBC 46005, Washington, Wa
winter (JFM)
summer (JAS)
Water temperature anomaly (degC)
2016
Year


Search
NVS
ATOLOGY
v4.1
Contact
NANOOS
Powered by Vizer
Overview
Help
138.1641
Terrain
Canada
United States
Mexico
Map data ©2016 Google, INEGI
1000 km
Terms of Use
December
2015
11:00 am PST
Water Temp.



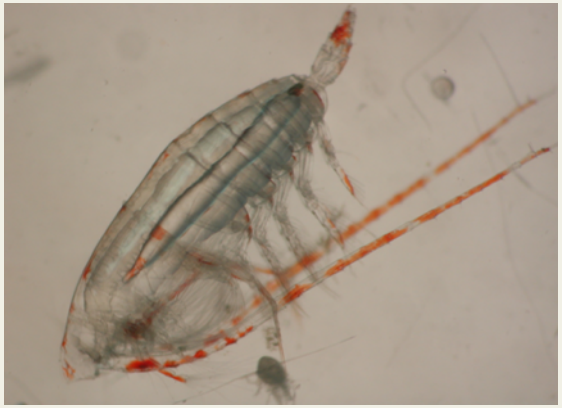


Water levels up



State of the California Current 2014-15: Impacts of the Warm-Water "Blob"

Bill Peterson
Oceanographer and Senior Scientist
Northwest Fisheries Science Center
Newport OR



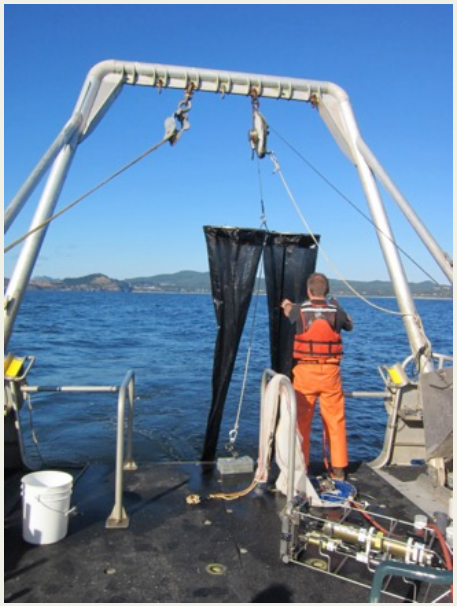
NOAA Fisheries

What we do at Newport

- Long-term ocean observations from oceanographic cruises every two weeks, since 1996.

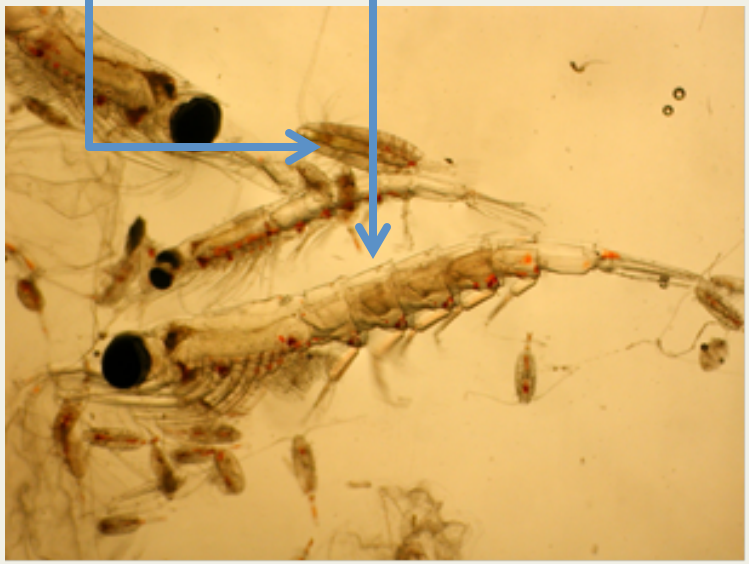
- Track oceanographic and ecosystem conditions
  - Water temperature, salinity, nutrients
  - Plankton samples for phytoplankton, zooplankton (copepods and krill) and fish eggs/ larvae
  - Date are used to forecast salmon returns

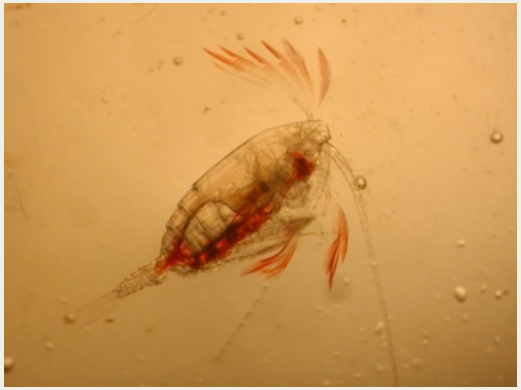
- Why a focus on zooplankton?
  - The link in the food chain between the microscopic plants (phytoplankton) and fishes



Copepods and Krill

- Adult boreal cold water copepod species are large, ~ 2-8 mm
- Adult tropical warm water copepod species are smaller – think pencil leads or ball point pen: 0.5 mm or 0.7 mm
- Krill are much larger, 25 mm in length as an adult

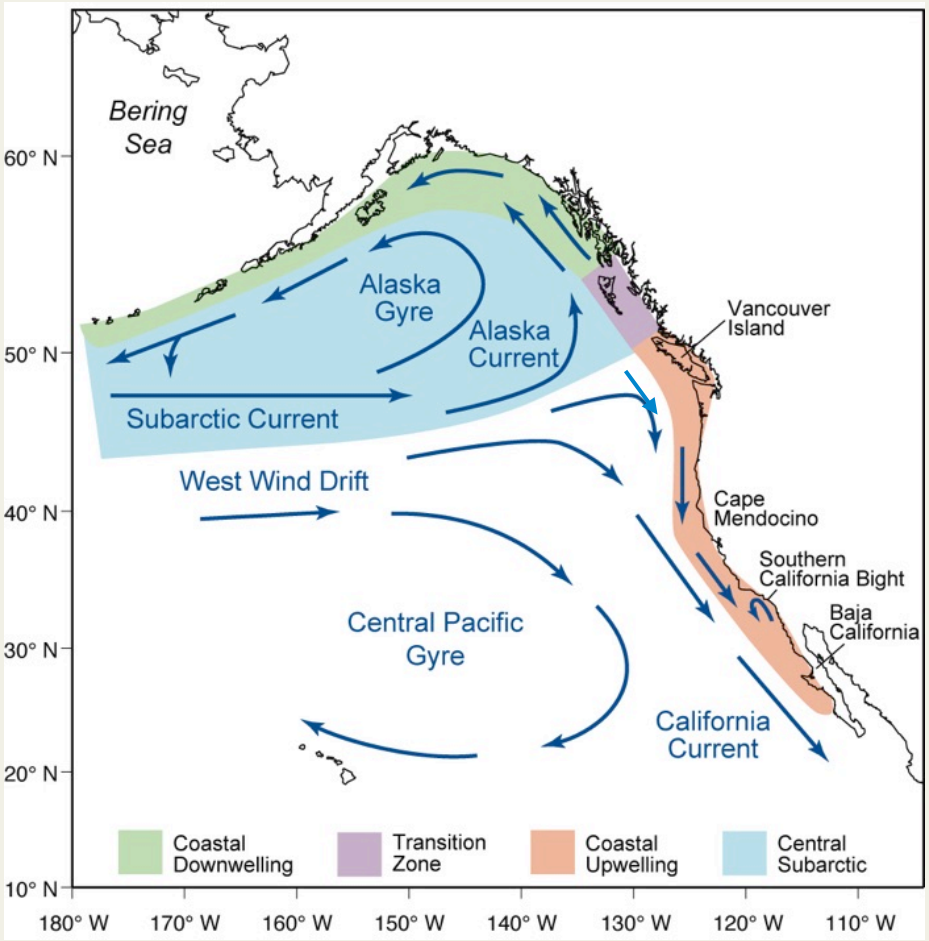




- Copepods are the most abundant metazoans on the planet
- Thus the world as we know it, would not be the world as we know it, without copepods.

Ocean Circulation Patterns

Plankton are drifters thus their presence/absence provides information on variations in circulation patterns and source waters that feed the California Current



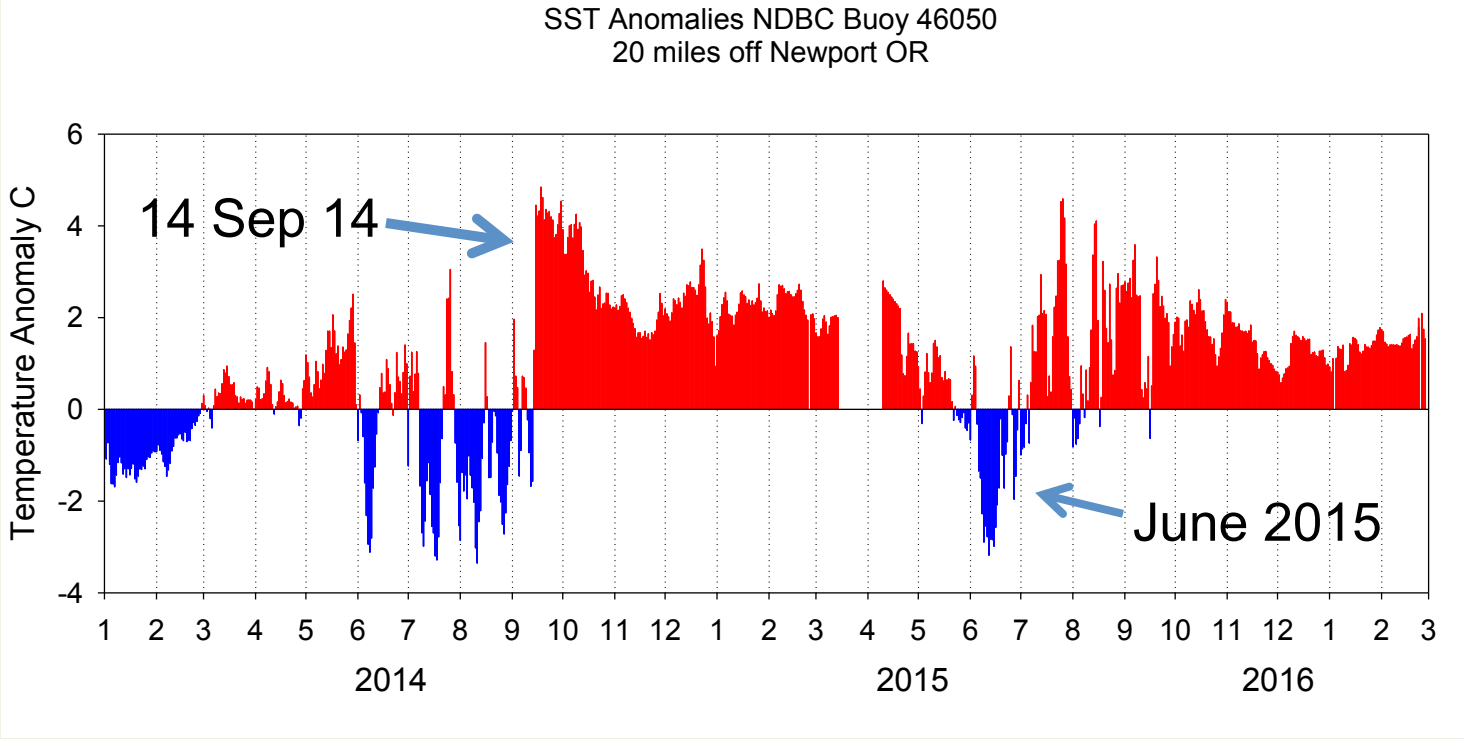
1. Subarctic Coastal Currents bring cold water and lipid-rich **"northern" copepod** species to the N. California Current; (Cheesburgers)

2. A weak California Current and onshore flow of the West Wind Drift brings warm subtropical water and lipid-poor **subtropical "southern" copepods** to the NCC (Popcorn)

3. Therefore, bioenergetics of the food chain is affected by the source waters which feed the Calif. Current

The Blob

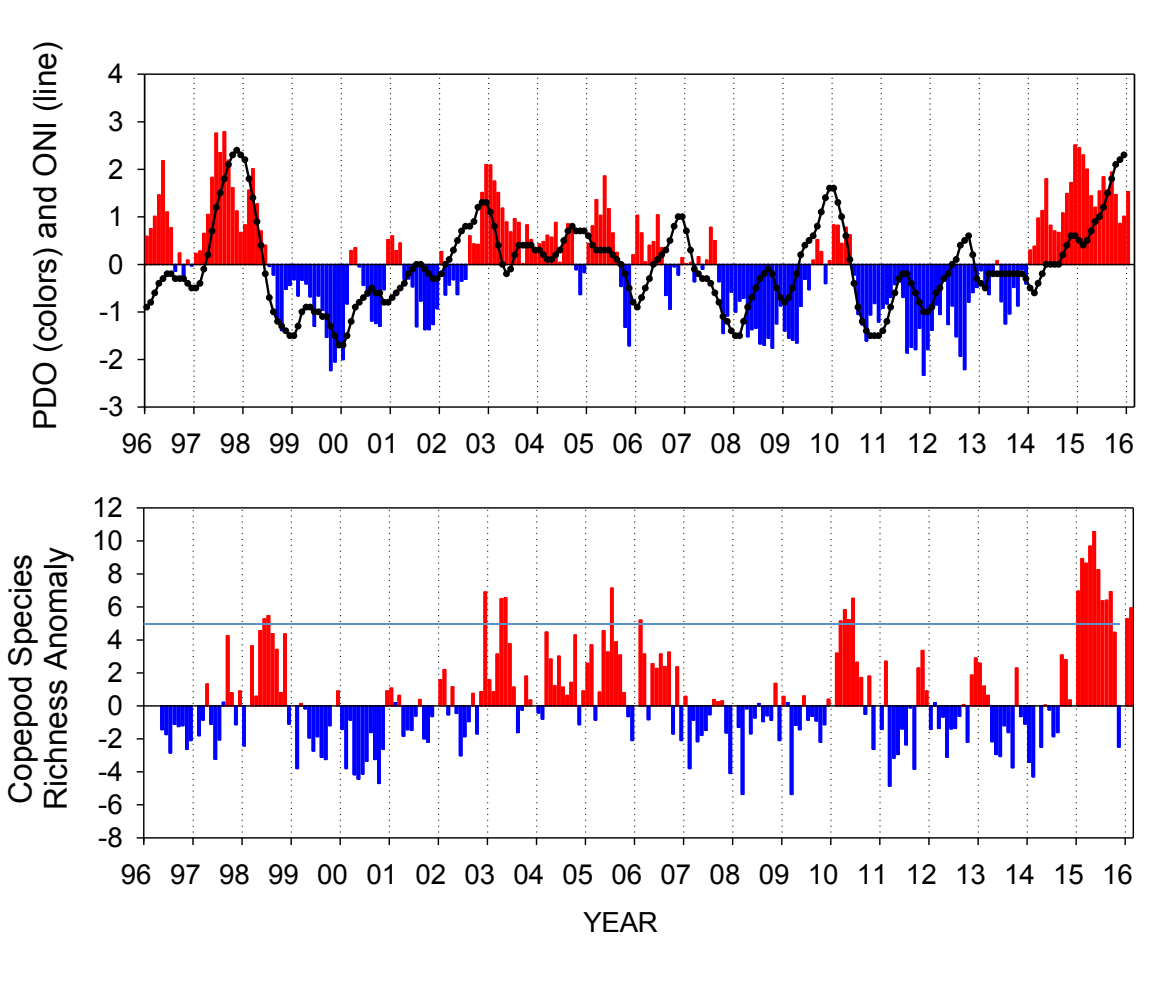
Daily sea surface temperatures at the NOAA Buoy 46050: 20 miles off Newport: Jan 2014 – Feb 2016



- Upwelling season very short in 2014 (June through early September)
- On 14 Sep 2014 upwelling winds weakened, the Blob came onshore and SST jumped 7°C in 6 hours.
- Anomalies of + 2°C during most of 2015 and + 4°C anomalies were seen off Newport in July and September 2015
- Upwelling in 2015 the 5th strongest in 70 years, but only upwelled nearshore

NOAA Fisheries

PDO, ONI (upper) and Copepod Species Richness (lower)



- Copepods track PDO and ONI with ~ 4 month lag
- Higher richness = greater species diversity, due to warm water off Oregon
- Twice as many species in 2015 suggesting different origin of warm source waters

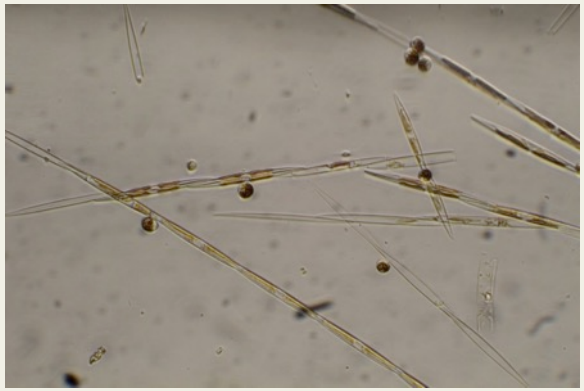
Krill

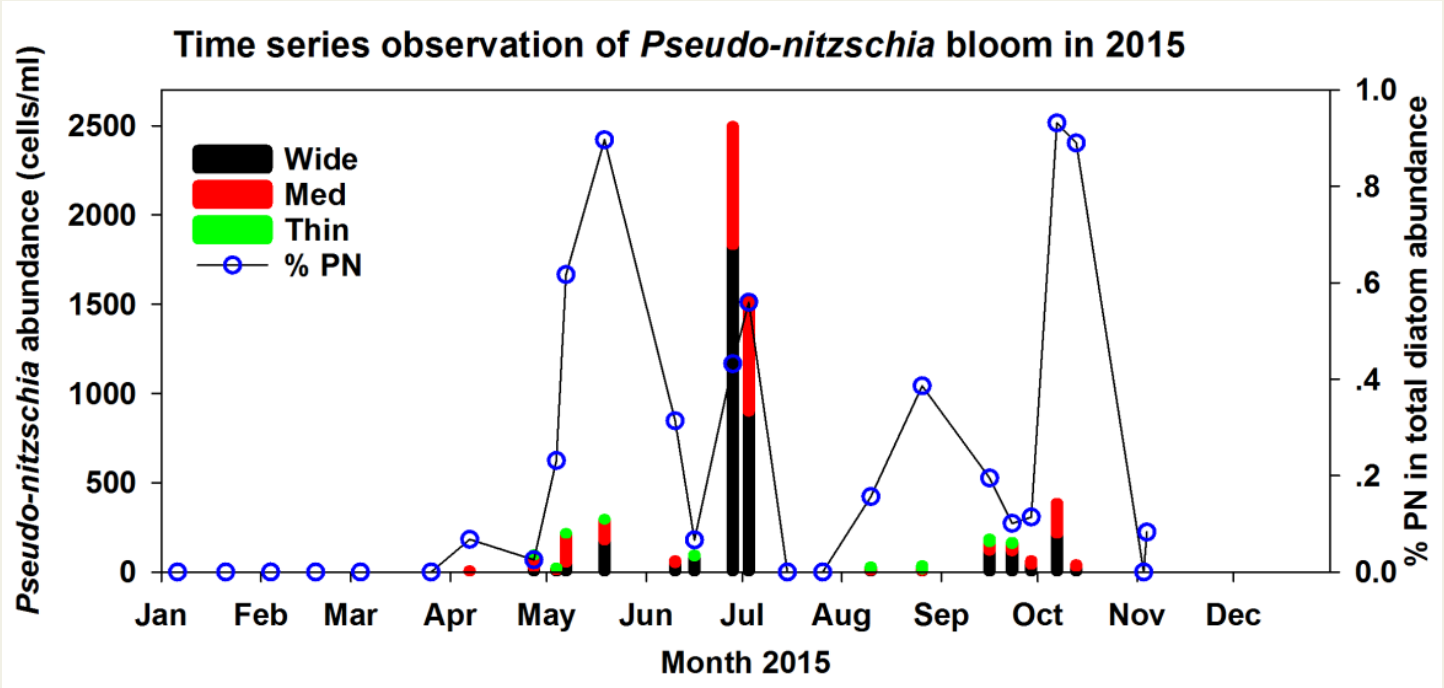
- Still working up the data (finished sample analysis on Friday)

- Three key results
  - Coastal species = zero
  - Offshore species nearly zero
  - Those krill that were present were very small, 10-12 mm, but were mature adults

Harmful Algal Bloom

- Wide-spread from CA to Alaska suggests a common trigger (The Blob?)
- Longest duration (May-November)
- Very toxic – domoic acid, a neurotoxin
- Have manuscript submitted to Proc. Natl. Acad. Sci.





Impacts on Fisheries

- Chinook salmon returns to the Columbia River quite high but not a surprise because:
  - spring-run Chinook went to sea in 2013;
  - fall-run Chinook in 2012

- Sockeye returns in summer were initially near-record, however due to warm CR river temperatures, the run nearly failed

- Coho returns to CR in fall 2015 (went to sea in spring 2014) lowest since 1998 El Niño; coho returns to coastal streams poor in 2015

- Hake (whiting) harvest in 2015 poor

- Opening of Dungeness Crab fishery delayed until 4 Jan 2016 which impacted local economy in December

Expectations for 2016

- Won't know about spring Chinook salmon until April/May for fish that went to sea in 2014; one year later for fish out in 2015.
- Copepod species richness is still very high and copepod abundance still very low, suggesting that Blob water is still present.
- Food chain still dominated by small, warm water, lipid-poor copepods; this is an "early warming indicator" that poor ocean conditions will likely continue.
- An environmental disaster looming, especially so if the food chain does not recover soon.

Why is/was the Blob so different from an El Niño?

- It seems that the North Pacific Gyre/Transition Zone shifted northward, bringing offshore tropical waters near to our coast, and this is the water that came onshore

- Therefore, it was eastward transport of subtropical warm water, not northward of subtropical water, that has given us all of this interesting "biology" (first sightings of many species of copepods (but not krill), reptiles, fish and birds) and the potential for the birth of an ecological nightmare that has not yet gone away.

- What about the 2016 El Niño? Most recent cruise (on the F/V Shimada, mid February) showed that the Blob zooplankton continue to dominate and no "El Niño" plankton have appeared yet.

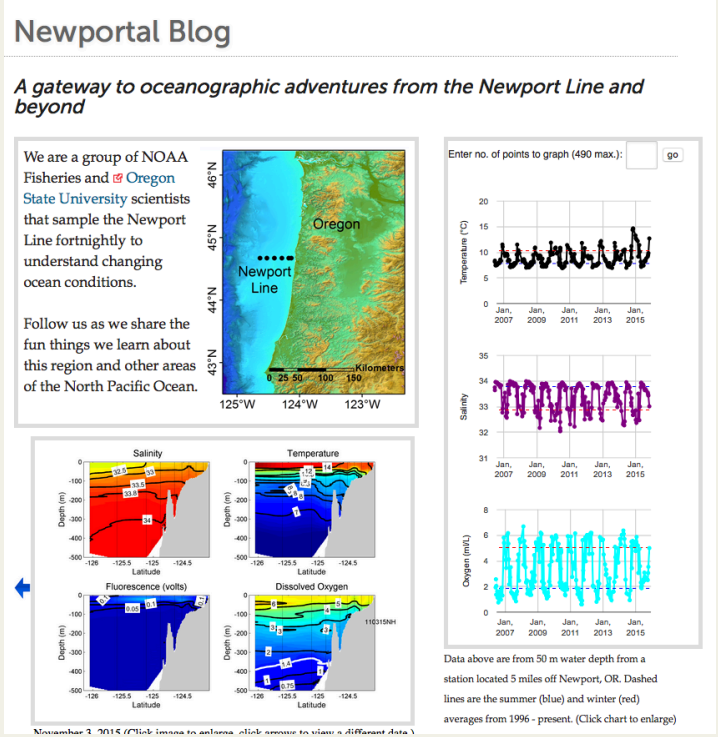
- ONI index is still very strong and many impacts have been seen elsewhere (but not in the California Current). Different from past major El Niño events (although the 1972 event did not show itself in the northern California Current).

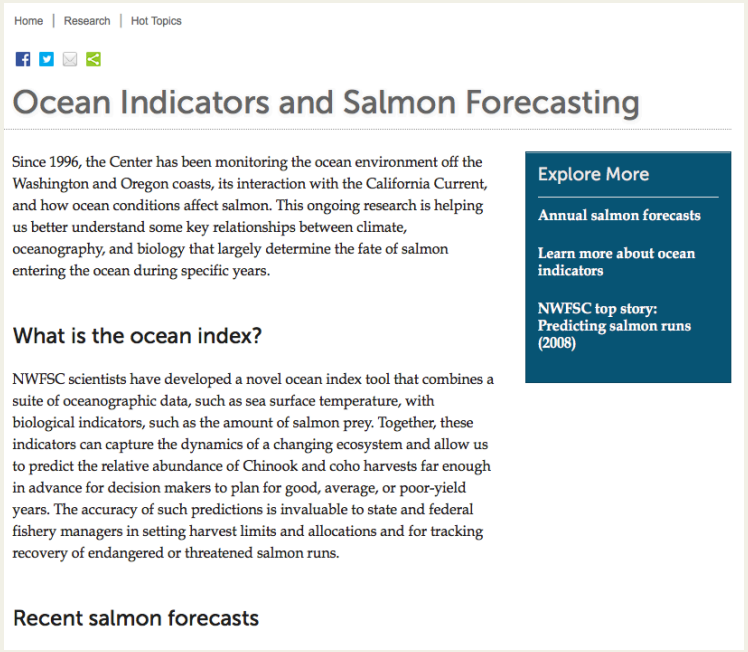
NOAA Fisheries

Northwest Fisheries Science Center webpage www.nwfsc.noaa.gov

Two buttons of interest:

- Newportal Blog
- Salmon Forecasting





Any Questions?

Regional Impacts Summary – 01/23 to 02/26

Reporting Status:

- 196 entries since July 1, 2015
- Last reporting period: 40 environmental conditions & human/ecosystem system impacts

Reminder: To insert a regional impact, click on the Google Doc, or email Timi Vann or Michael Milstein

Environmental Conditions Capture:

- El Niño
- Warm ocean temperatures
- Record breaking air temperatures
- Domoic acid toxin
- Positive snow pack
- Drought

Human & Ecosystem Impacts:

- Coastal erosion; property loss
- Coral bleaching
- Fisheries (crab; salmon return)
- Increased energy costs (electricity)
- Forestry (die off; invasive species; wildfire)
- Sick and starved marine mammals
- Sea star wasting disease
- Water supply (water delivery estimates & curtailments; reservoir operations)

Headlines

OCEANS:
Warming waters boost disease -- studies

Oregon's Snowpack Shows Huge Improvement From Year Ago

Seals Suffer Tough Ocean Conditions

Good news for dry times — Sierra snowpack highest in 4 years

Unusually Warm Ocean Water Is Literally Making Sea Lions Sick

California to release more reservoir water thanks to El Niño storms

Warm Waters Linked To Sea Star Wasting

Ochre sea stars have suffered a 95 percent die-off in SLO County

Rains restore flows to the San Joaquin River, benefiting fish, communities and farmers

Has El Niño abandoned L.A.?

Lowest salmon return since 1939

El Niño's not done yet: Weeks of dry weather ahead, but more rain expected after that

Gov. Brown requests federal disaster aid for California crabbers

RISING SEAS:
El Niño pummels coast in preview of warmer world

Northern California salmon run devastated, again, by drought

Buoyed by recent rains, Folsom Lake levels triple

Dry February could bring problems for drought-stricken Valley

Sacramento agencies ask: Why release water from Folsom Lake during drought?

Drought's hardest-hit sectors may need years of support

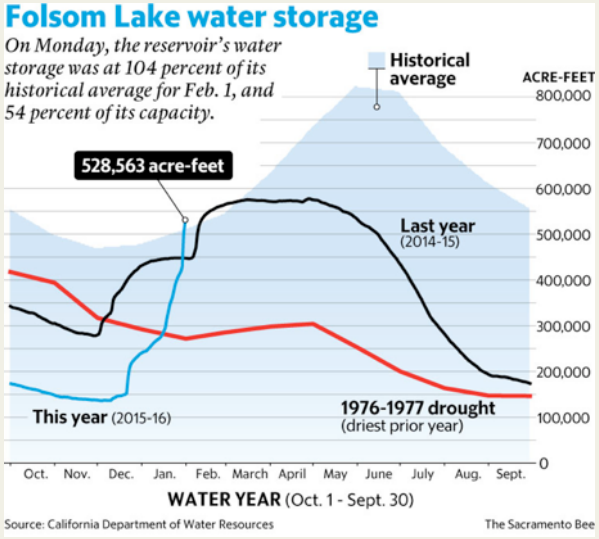
FORESTS:
Drought could devastate Calif. ecosystems -- USFS

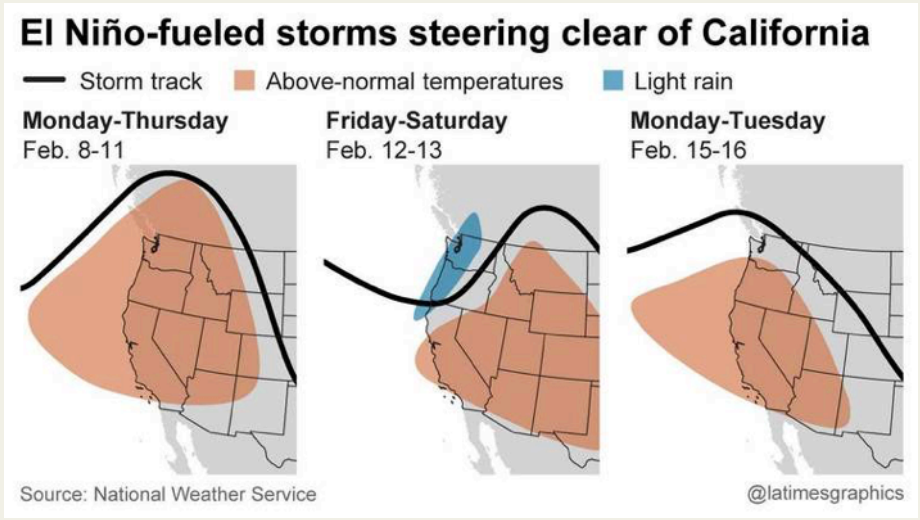
ELECTRICITY:
Calif. drought raised power prices by $2B

DROUGHT:
Los Angeles looks to capture stormwater

Impacts in Pictures

Feb. 9: Folsom, CA. Reservoir operators are nearly doubling the amount of water outflow from Folsom dam to make room for the above average Sierra snowpack and future storms.





Feb. 8: San Diego, CA. Temperatures soared 20 degrees above the average for this time of year. Roland Lizarondo/KPBS

Impacts in Pictures

While this year's strong El Niño has yet to produce many drought-busting storms, it is accelerating erosion up and down California's coast, including at the University of California, Santa Barbara.

Feb. 8: Gov. Brown asked the Obama Administration to declare California's crab fishery a federal disaster. Fisherman Joe Tomasello on his boat in Santa Cruz, CA.

Star wasting disease has occurred before, but not at the magnitude or extent currently observed – the "largest observed die-off of a wild animal in the ocean". Scientist now link the die-off to warming ocean.

Pacific Grove, CA: Females aren't ready to give birth and struggle to nurse pups.

Death Valley “Superbloom”

Telling Regional Stories - Update

NOAA West Watch

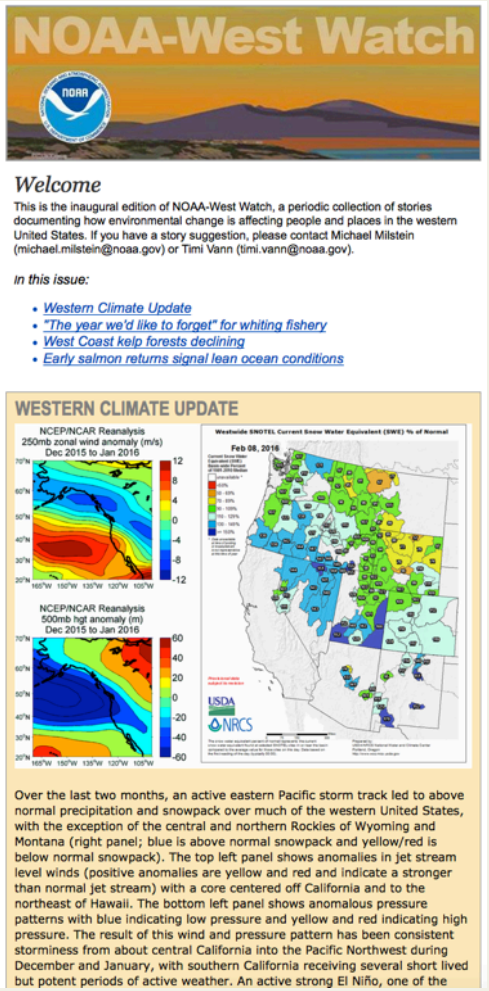
What it is: A periodic collection of stories documenting how environmental change is affecting people and places in the western United States.

What it isn't: Scientific assessment of cause and effect, or forecast or "outlook" product. We are not attributing impacts to specific causes; these stories may help inform future lines of inquiry and research.

What will we do with these?

- Utilize stories to help develop a retrospective seasonal report.
- Communicate impacts of changing environmental conditions within the region via compelling "special interest" stories.
- Broadly share stories.

Please help share these stories, and provide us with your ideas!



NOAA-West Watch

Welcome

This is the inaugural edition of NOAA-West Watch, a periodic collection of stories documenting how environmental change is affecting people and places in the western United States. If you have a story suggestion, please contact Michael Milstein (michael.milstein@noaa.gov) or Timi Vann (timi.vann@noaa.gov).

In this issue:

- Western Climate Update
- "The year we'd like to forget" for whiting fishery
- West Coast kelp forests declining
- Early salmon returns signal lean ocean conditions

WESTERN CLIMATE UPDATE

NCEP/NCAR Reanalysis
250mb zonal wind anomaly (m/s)
Dec 2015 to Jan 2016

NCEP/NCAR Reanalysis
500mb hgt anomaly (m)
Dec 2015 to Jan 2016

Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal
Feb 08, 2016

Over the last two months, an active eastern Pacific storm track led to above normal precipitation and snowpack over much of the western United States, with the exception of the central and northern Rockies of Wyoming and Montana (right panel; blue is above normal snowpack and yellow/red is below normal snowpack). The top left panel shows anomalies in jet stream level winds (positive anomalies are yellow and red and indicate a stronger than normal jet stream) with a core centered off California and to the northeast of Hawaii. The bottom left panel shows anomalous pressure patterns with blue indicating low pressure and yellow and red indicating high pressure. The result of this wind and pressure pattern has been consistent storminess from about central California into the Pacific Northwest during December and January, with southern California receiving several short lived but potent periods of active weather. An active strong El Niño, one of the

"The year we'd like to forget" for whiting fishery

After some of the most productive fishing on record for whiting, or hake, in recent years in the Pacific Northwest, commercial fisheries came up almost empty when fishing for the prolific species in the fall of 2015, according to officials of American Seafood Co. in Seattle. The almost complete absence of hake in what had been the most productive areas off Washington and Oregon corresponded with increases in typical water temperatures. Water temperatures that had hovered around 58 to 62 degrees F in previous seasons came close to 64 degrees F this fall. Fishing vessels searched up to 190 miles offshore, far beyond the typical area where they find hake, but found none. Some vessels harvested only around 60 tons over the course of 10 or more days, when they had previously produced close to 1,500 tons in the same period. The whiting fishery did not come close to catching its full quota and left tens of thousands of tons of the available quota in the water. The poor fishing had ripple effects throughout the industry as customers that expected a big whiting catch suddenly had to look elsewhere. "A lot of product that a lot of people were waiting for turned out not to be there," said Roger Mjeltevik of American Seafood Co. in Seattle. "It was the year we'd like to forget."

The American Seafood Co. ship Ocean Rover on whiting fishing grounds off the Pacific Northwest. Courtesy American Seafood Co.

The difficulty the fishing industry encountered in finding hake last fall made NOAA Fisheries' first-ever winter hake survey especially timely (although the survey was not directly related or in response to the reduced harvest). On Jan. 9 the survey set out from Newport, Ore., aboard the NOAA research vessel Bell M. Shimada for a month to map the distribution of hake and collect biological data in the winter, when the species spawns. The spawning distribution and behavior of hake has been poorly understood, in large part because of a lack of winter data. The survey was a trial run to assess whether scientists could locate and gather winter information on hake, one of the largest commercial fisheries in Northwest waters.

Two-year-old hake collected by offshore survey. NOAA Fisheries/NWFSC.

The winter survey located hake, but much farther offshore than the fish usually occur in summer and fall, according to chief scientist Sandy Parker-Stetter, who has documented the survey's progress on the Northwest Fisheries Science Center's Newportal Blog. Research biologist Allan Hicks suggested that hake may have been very widely distributed last fall and not present in the dense feeding aggregations the fishing fleet typically pursues. He noted that fishing vessels did catch hake, but not in the high volumes the vessels had become used to in recent seasons. Hake do tend to move north in winter, and Canadian fishing vessels also caught low volumes. Scientists were as surprised as anyone by the low catches, he said. NOAA survey data from 2015 showed that West Coast hake are doing well, and remain present in large volumes, said Hicks, who serves on the Joint Technical Committee that analyzes hake data.

West Coast kelp forests declining

Kelp forests along the West Coast from Northern California to Oregon and Washington are declining significantly after more than two years of unusually warm water and a major increase in purple sea urchins that consume the underwater vegetation. While kelp growth commonly fluctuates on a seasonal basis and has declined during previous warm El Nino periods, the current decline is more widespread and severe than scientists have seen before, said Laura Rogers-Bennett of the California Department of Fish and

Telling Regional Stories - Update

Possibilities for the next NOAA West Watch story collection:

- High waves, storm impacts: Coastal erosion, flooding, effects on marine transportation
- Nexus of drought, wildfire & invasive species

Help us identify and explain other impacts – send your story ideas! We seek to include stories that span the region – the 11 Western States (not just the West Coast).

Announcements & Open Discussion

1. Next WRECIC call: **March 21, 1pm – 2pm (Pacific)**.
2. Open Discussion or Parting Comments