



NOAA West Watch

*Reporting Regional Environmental
Conditions & Impacts in the West*

March 20, 2018

Call Agenda



- **Project Recap & Updates (Polly Hicks)**
- El Niño and Regional Climate brief (Dan McEvoy)
- Guest Speaker: Debris-Flow Hazards Following Wildfire (Dennis M. Staley, USGS)
- IOOS Nearshore Conditions brief (Julie Thomas, Marine Lebrech, Alex Harper)
- Environmental conditions and impacts reporting and discussion (Polly Hicks)
- Discussion

Project Recap and Updates



- NOAA West Watch bi-monthly webinars are a project of the NOAA West Regional Coordination Team
- Goals of the project:
 - **Document and share** environmental conditions information and impacts on human systems and NOAA mission at the regional scale
 - **Improve awareness** of environmental observations and human system impacts across NOAA mission lines
 - **Improve regional communication and coordination**
 - **Improve external communication** of regional impacts
- Next webinar: May 22nd, 1-2PM PDT/ 2-3PM MDT

Call Agenda



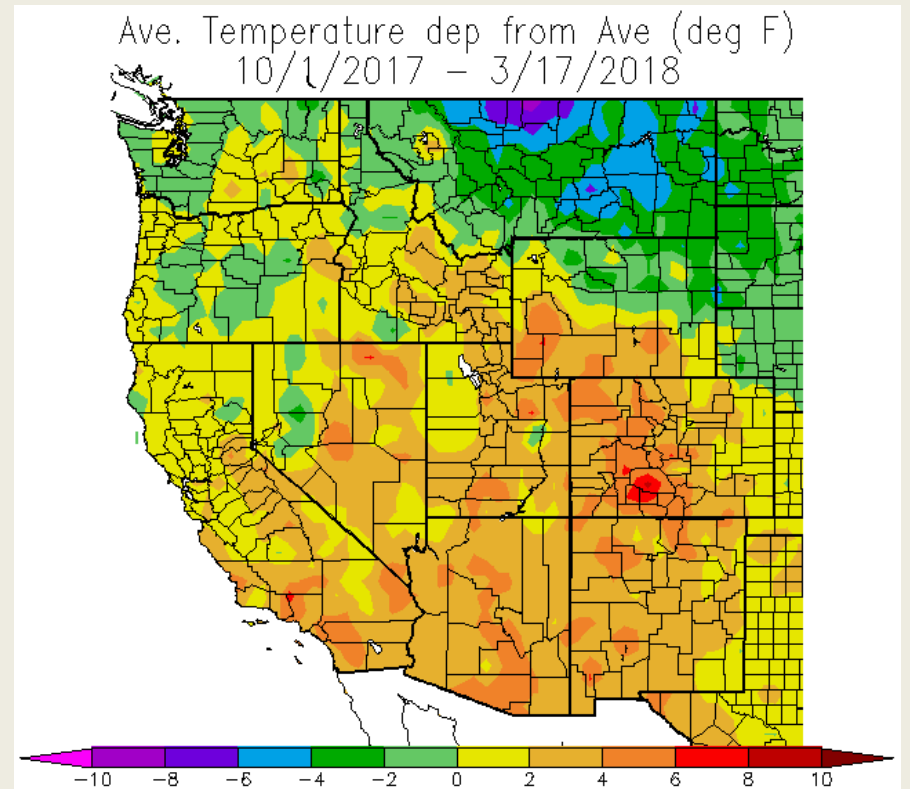
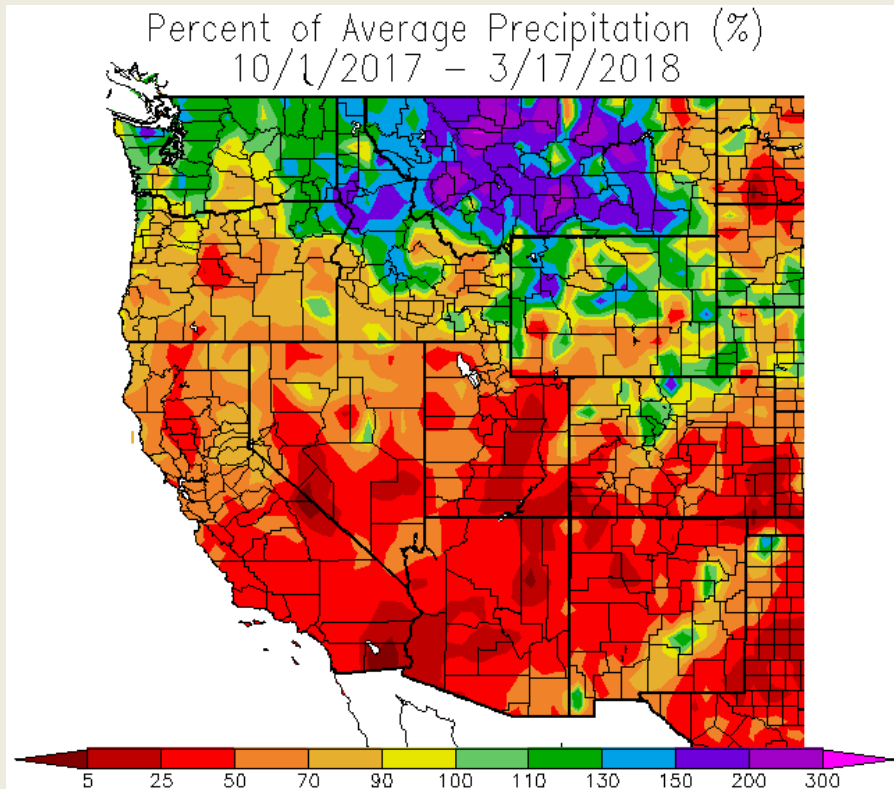
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Precipitation and Temperature



**Water Year To Date
% of Average Precipitation**

**Water Year To Date
Mean Temperature Departure From Average**

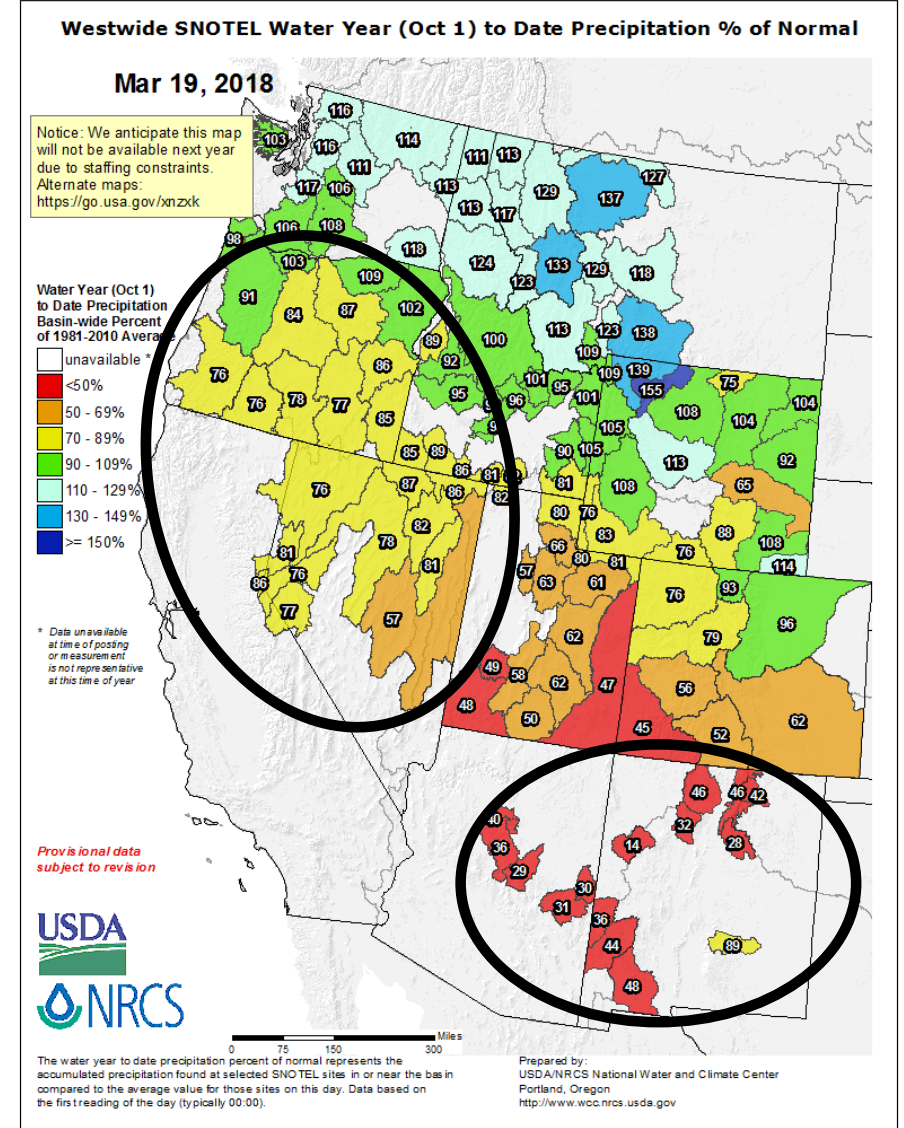
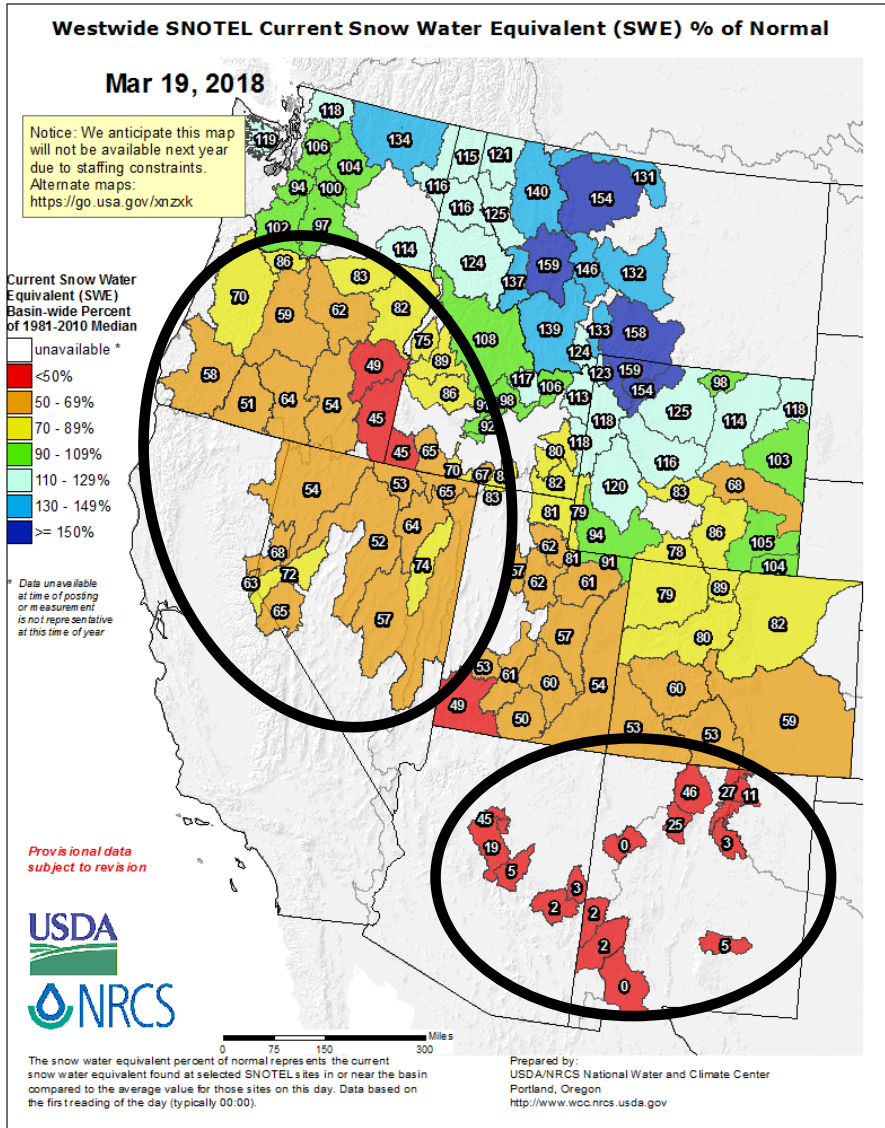


Snow drought continues, with some improvements

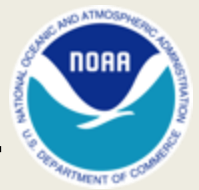


Snow Water Equivalent

Precipitation

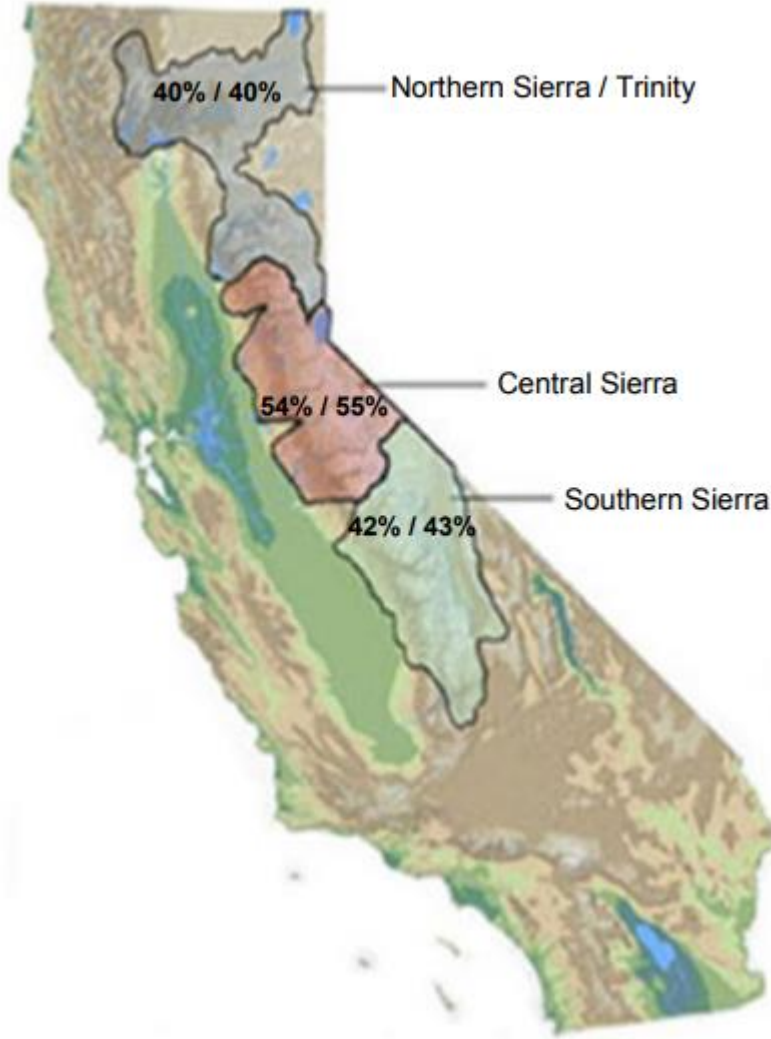


Snow Drought: California



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

Statewide Average: 48% of Average



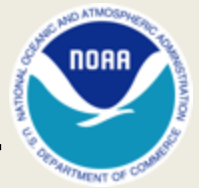
NORTH	
Data as of March 19, 2018	
Number of Stations Reporting	30
Average snow water equivalent (Inches)	11.2
Percent of April 1 Average (%)	40
Percent of normal for this date (%)	40

CENTRAL	
Data as of March 19, 2018	
Number of Stations Reporting	39
Average snow water equivalent (Inches)	16.0
Percent of April 1 Average (%)	54
Percent of normal for this date (%)	55

SOUTH	
Data as of March 19, 2018	
Number of Stations Reporting	28
Average snow water equivalent (Inches)	10.9
Percent of April 1 Average (%)	42
Percent of normal for this date (%)	43

STATE	
Data as of March 19, 2018	
Number of Stations Reporting	97
Average snow water equivalent (Inches)	13.1
Percent of April 1 Average (%)	47
Percent of normal for this date (%)	48

Sierra Nevada Snow Bot

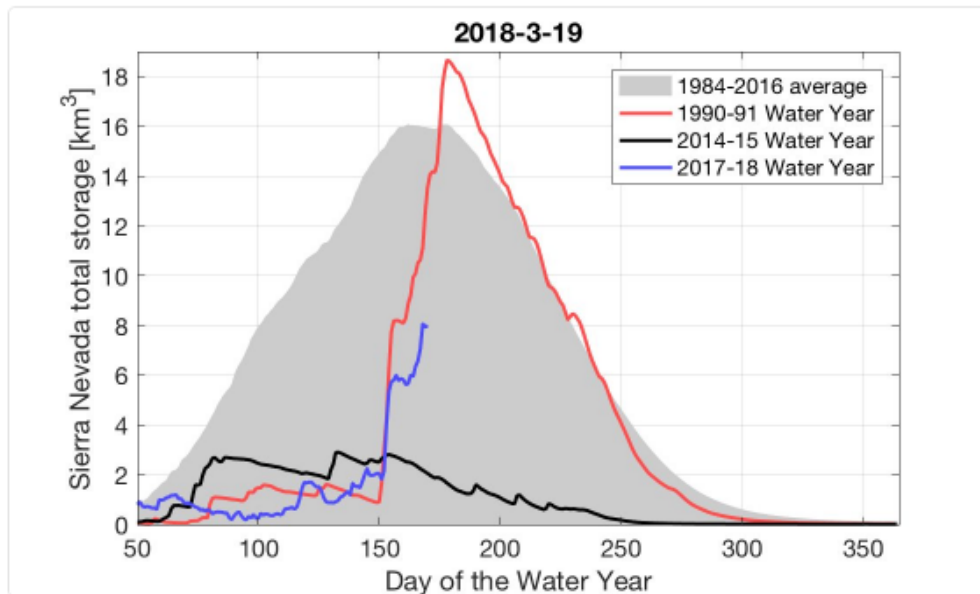


Sierra Nevada Snow Bot

@snowbot_SN

Following

Sierra Nevada SWE as of 2018-3-19: 8 km³. This is 50.1% of normal for this date. Model by @gcortes @UCLACivil #Snow #California #Water #Drought



9:21 AM - 19 Mar 2018



- “Miracle March”: 1991
- Sierra Nevada was on pace with 2015, lowest snowpack on record
- March has been wet and snowy helping to mitigate the drought conditions

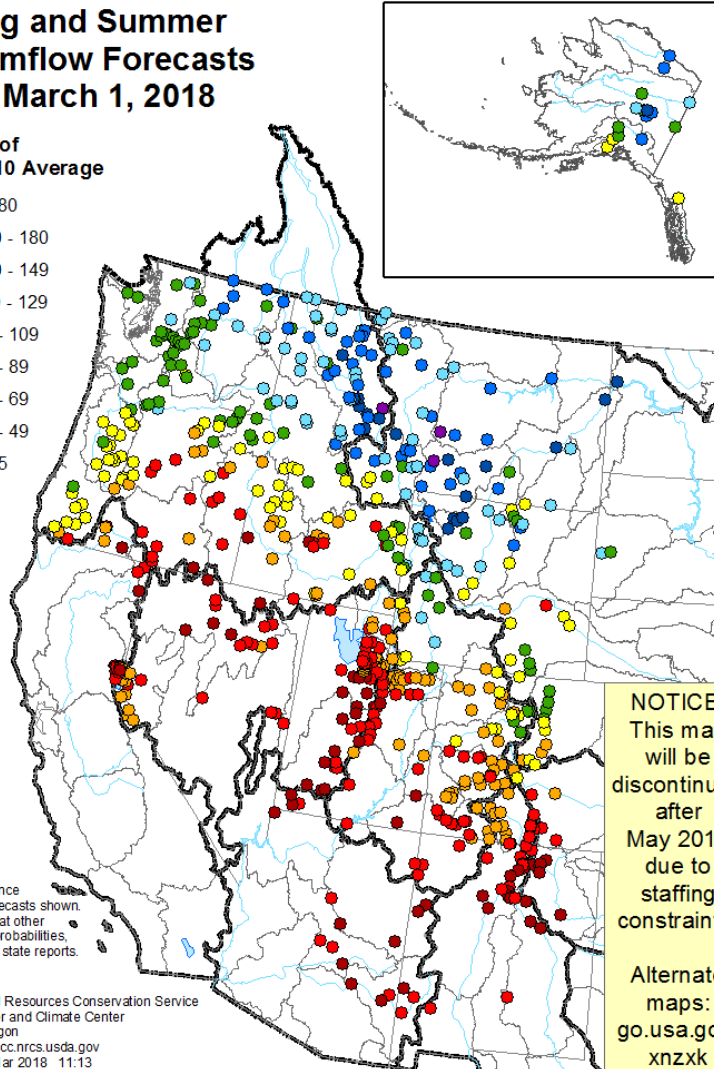
Seasonal Streamflow Forecasts, March 1



Spring and Summer Streamflow Forecasts as of March 1, 2018

Percent of 1981-2010 Average

- > 180
- 150 - 180
- 130 - 149
- 110 - 129
- 90 - 109
- 70 - 89
- 50 - 69
- 25 - 49
- < 25

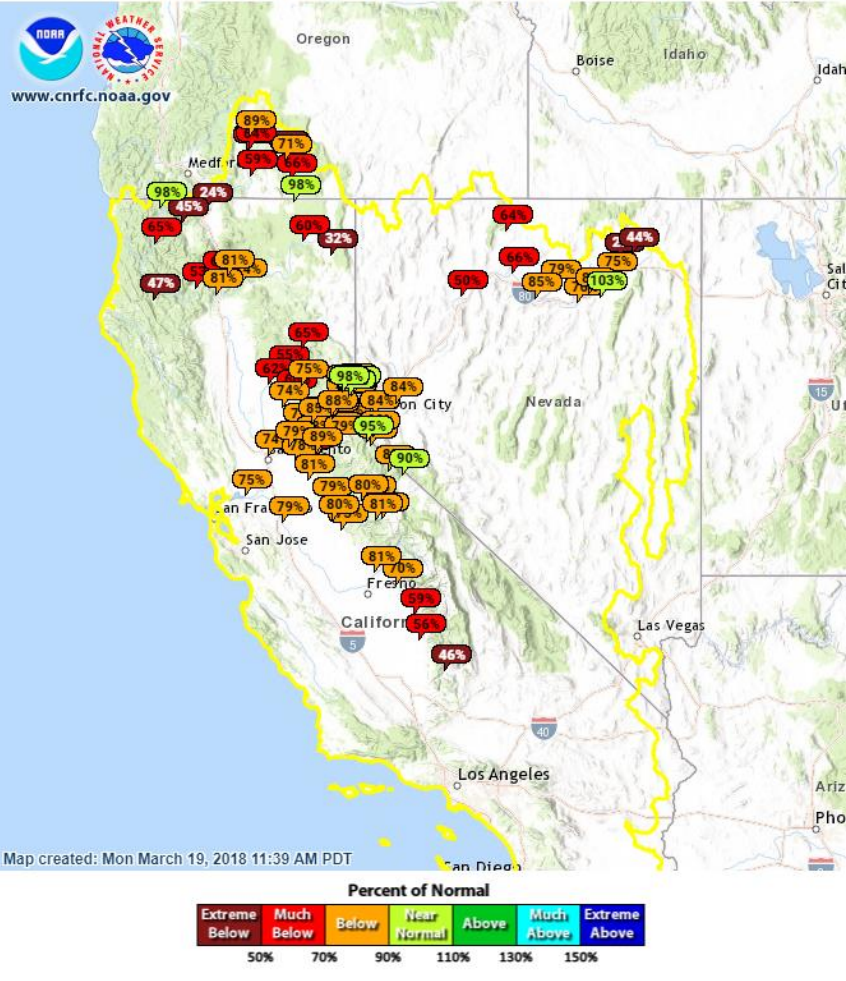


- Issued March 1, 2018
- % of average forecast runoff volume

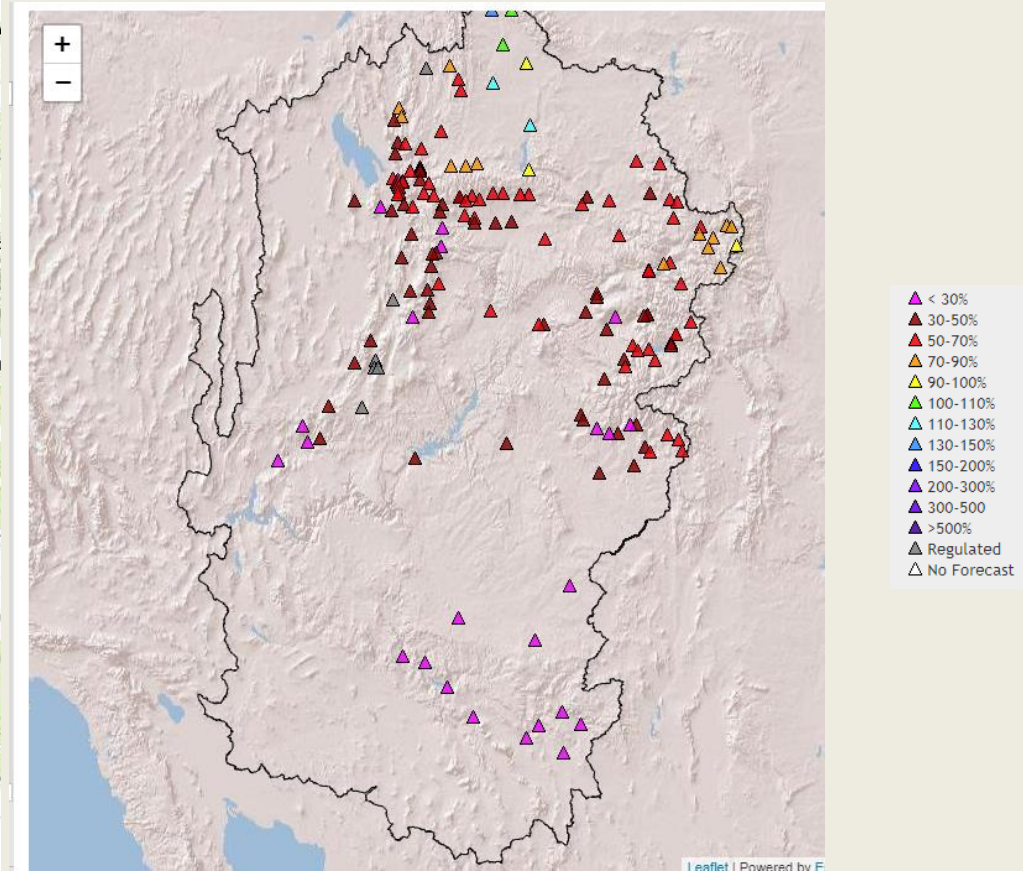
Seasonal Streamflow Forecasts, March 19



Forecast ESP Water Supply Seasonal Volume (WY2018)



Colorado River Basin



<https://www.cbrfc.noaa.gov/>

<https://www.cnrfc.noaa.gov/>

ENSO Status



- ENSO Alert System Status: **La Niña Advisory**
- La Niña conditions are present. *
- Equatorial sea surface temperatures (SSTs) are below average across the central and eastern Pacific Ocean.
- A transition from La Niña to ENSO-neutral is most likely (~55% chance) during the March-May season, with neutral conditions likely to continue into the second half of the year.

Credit: CPC

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

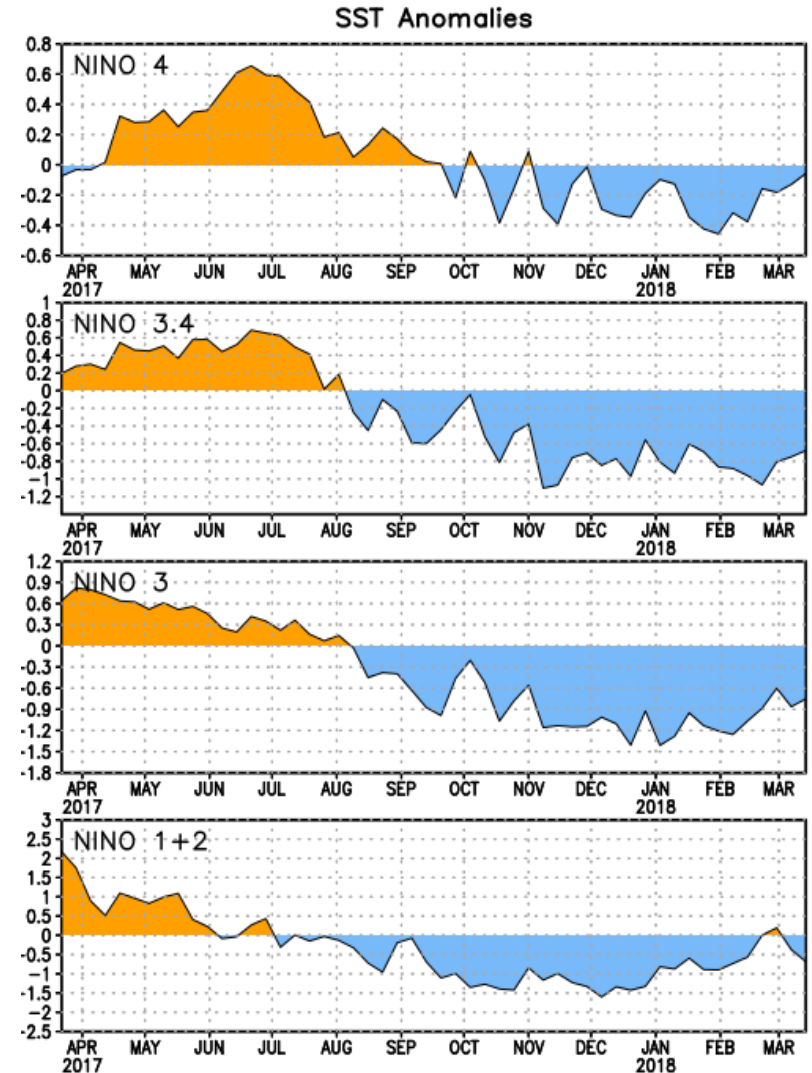
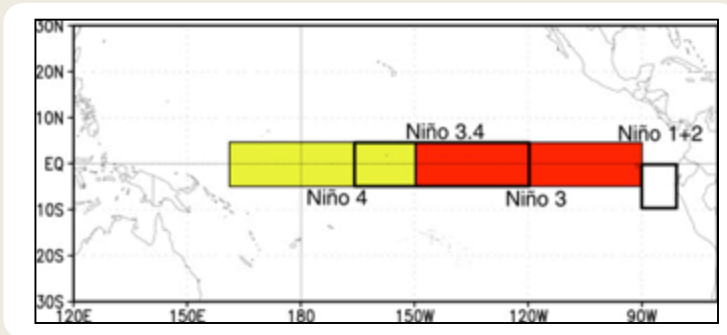
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/.

Niño Region SST Departures (°C) Recent Evolution

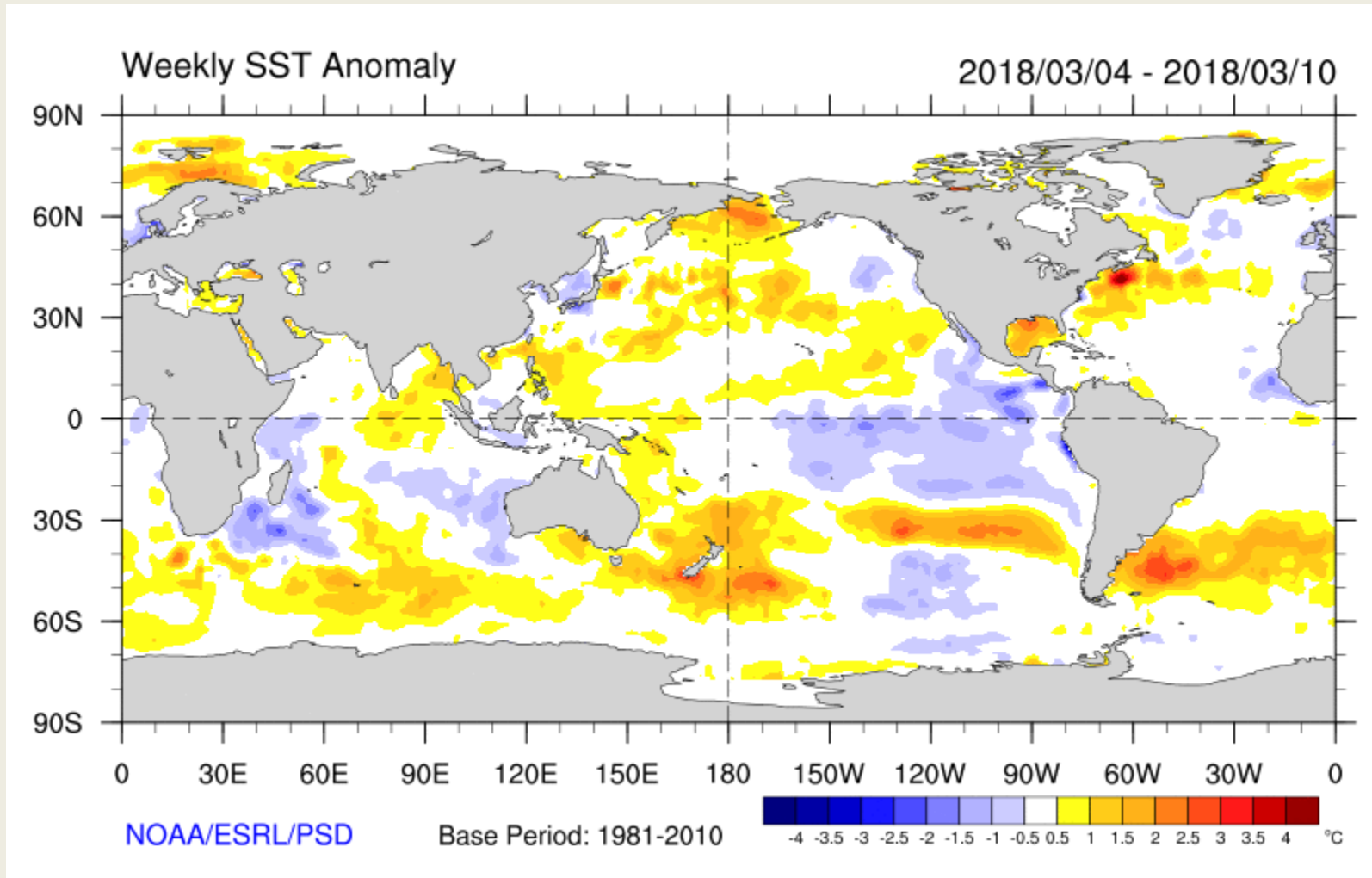


The latest weekly SST departures are:

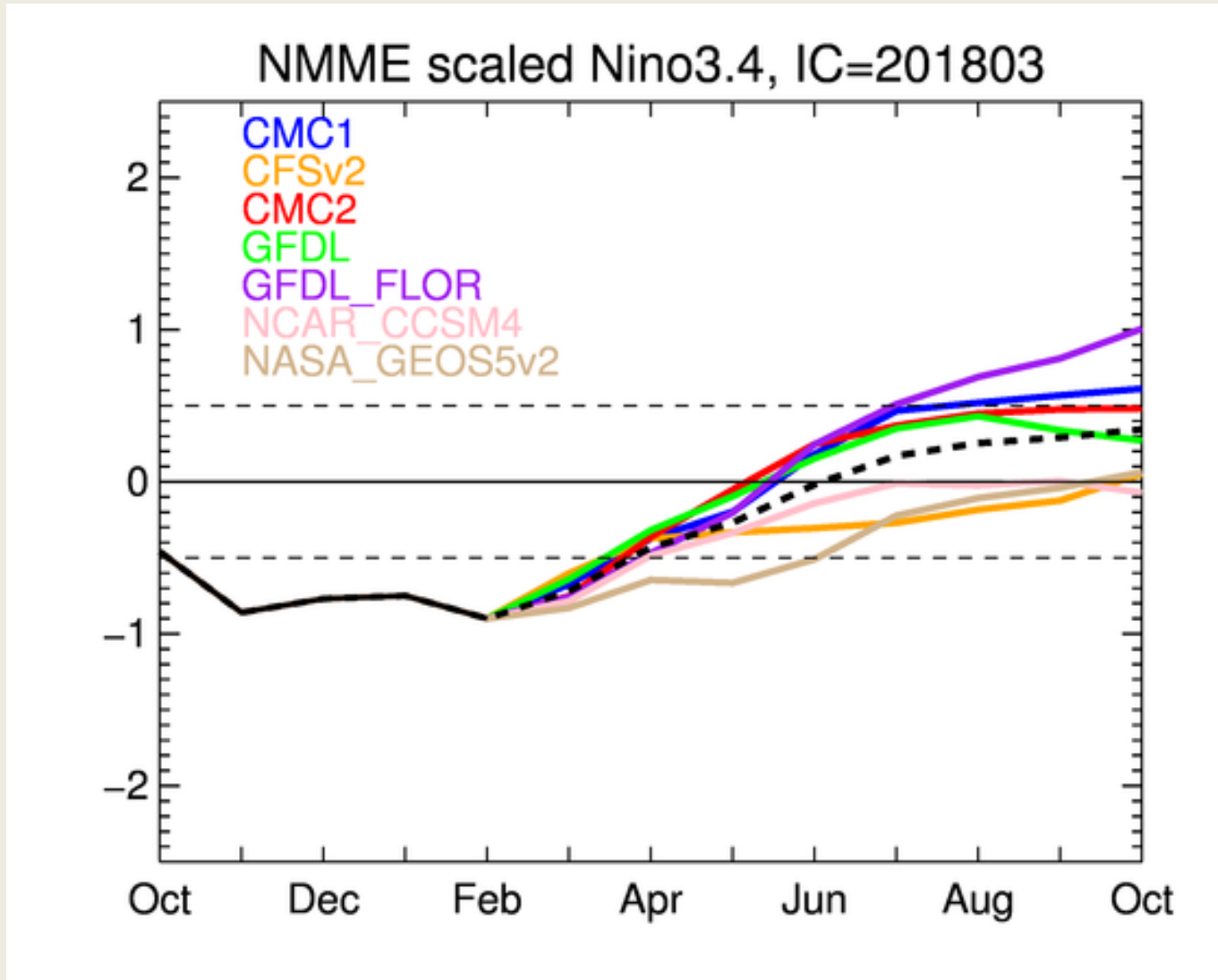
Niño 4	-0.1°C
Niño 3.4	-0.7°C
Niño 3	-0.7°C
Niño 1+2	-0.7°C



Current Sea Surface Temperatures



ENSO Forecasts



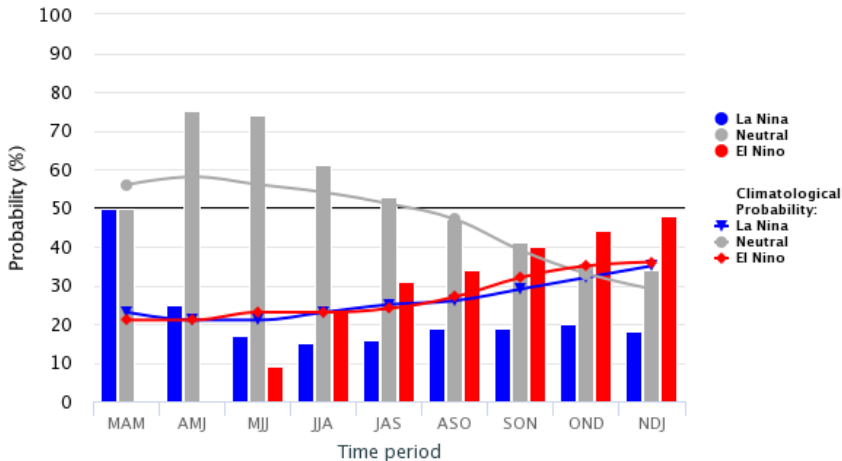
Source: NOAA/CPC

ENSO Forecasts



Mid-Mar IRI/CPC Model-Based Probabilistic ENSO Forecasts

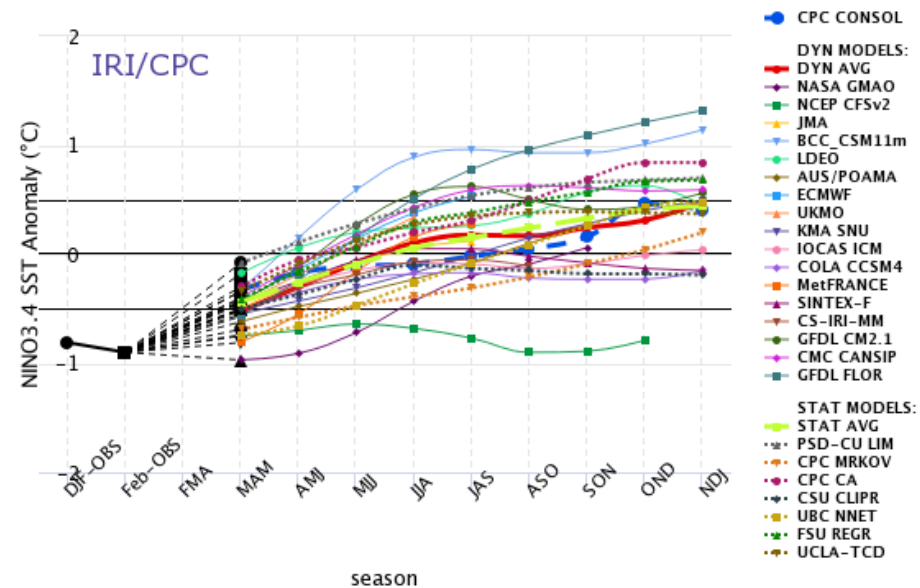
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: -0.5 °C to 0.5 °C



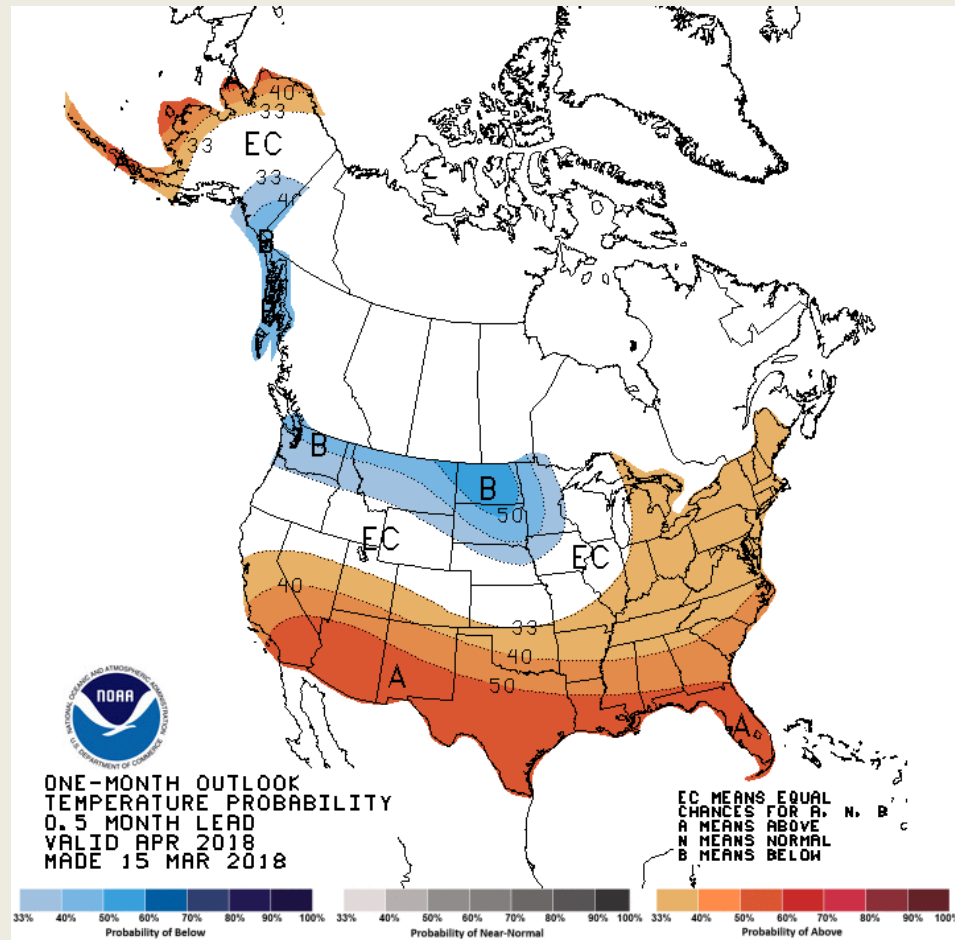
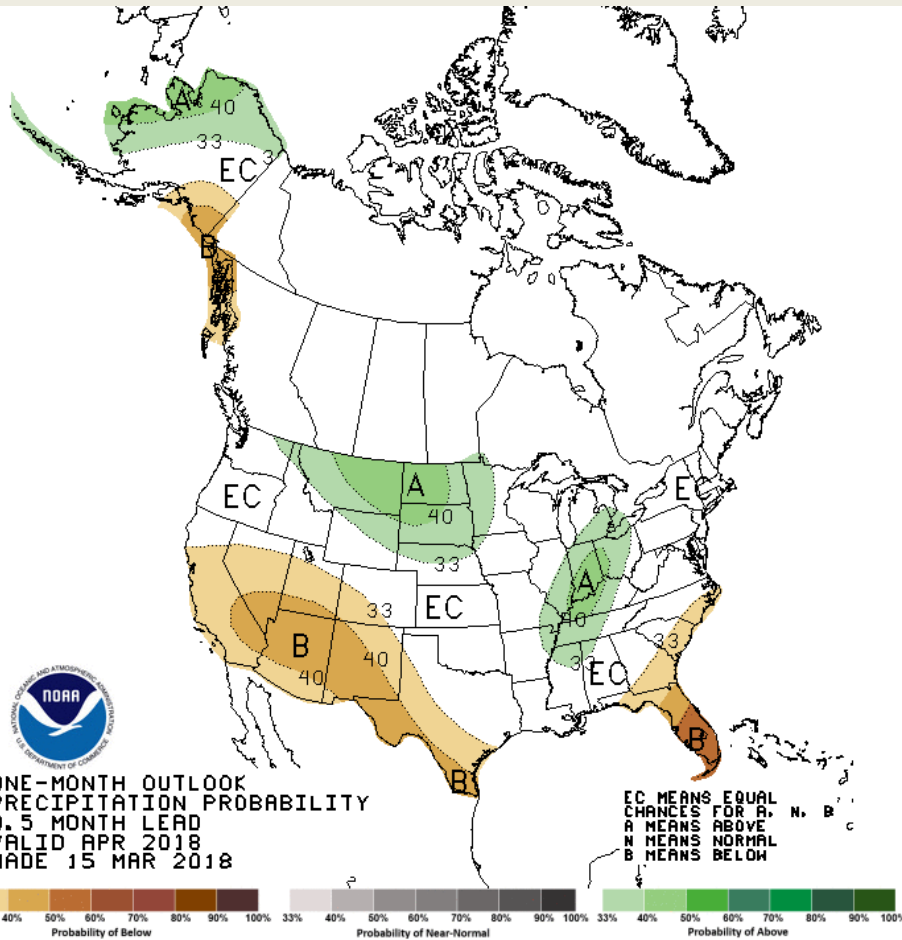
CPC/IRI El Niño forecast:

NMME models + other dynamical models + statistical models

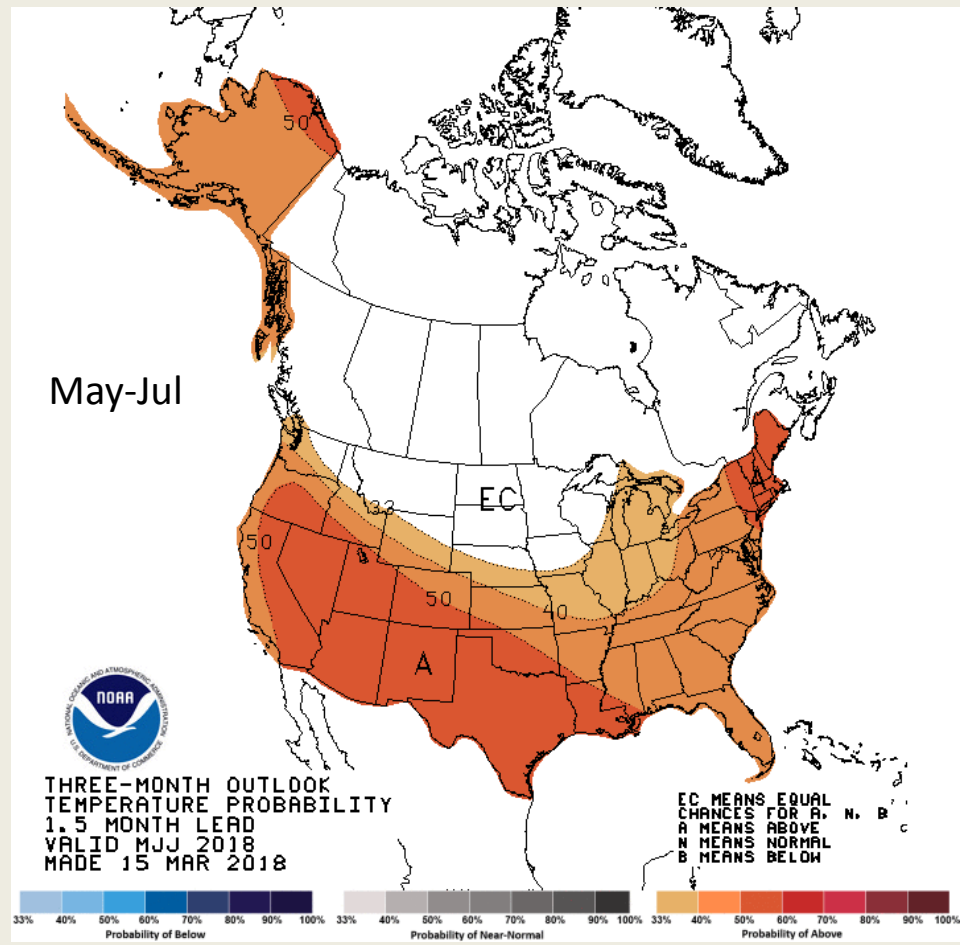
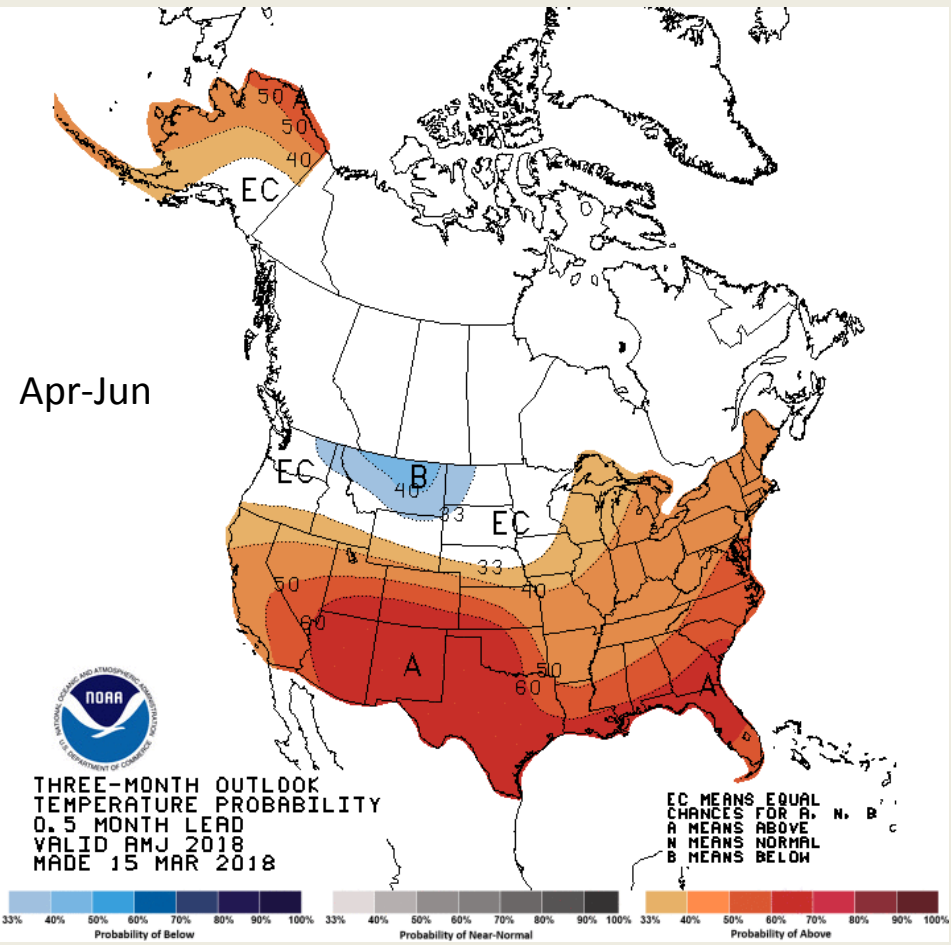
Mid-Mar 2018 Plume of Model ENSO Predictions



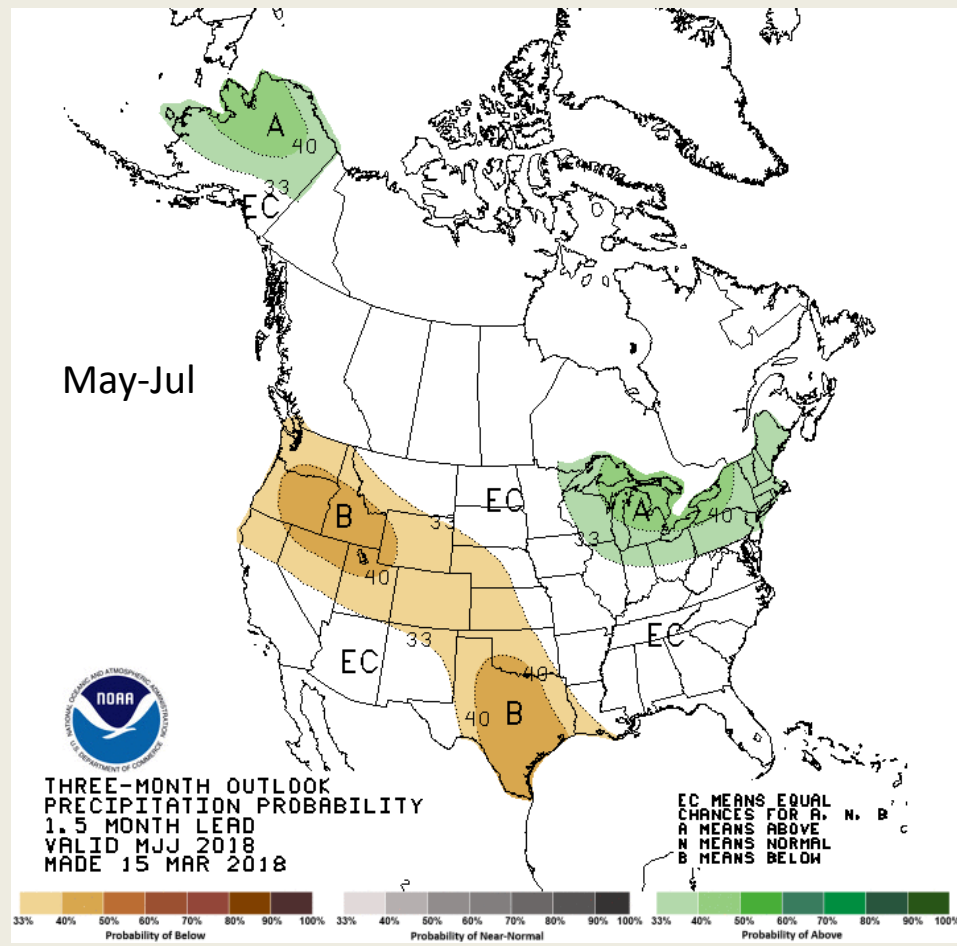
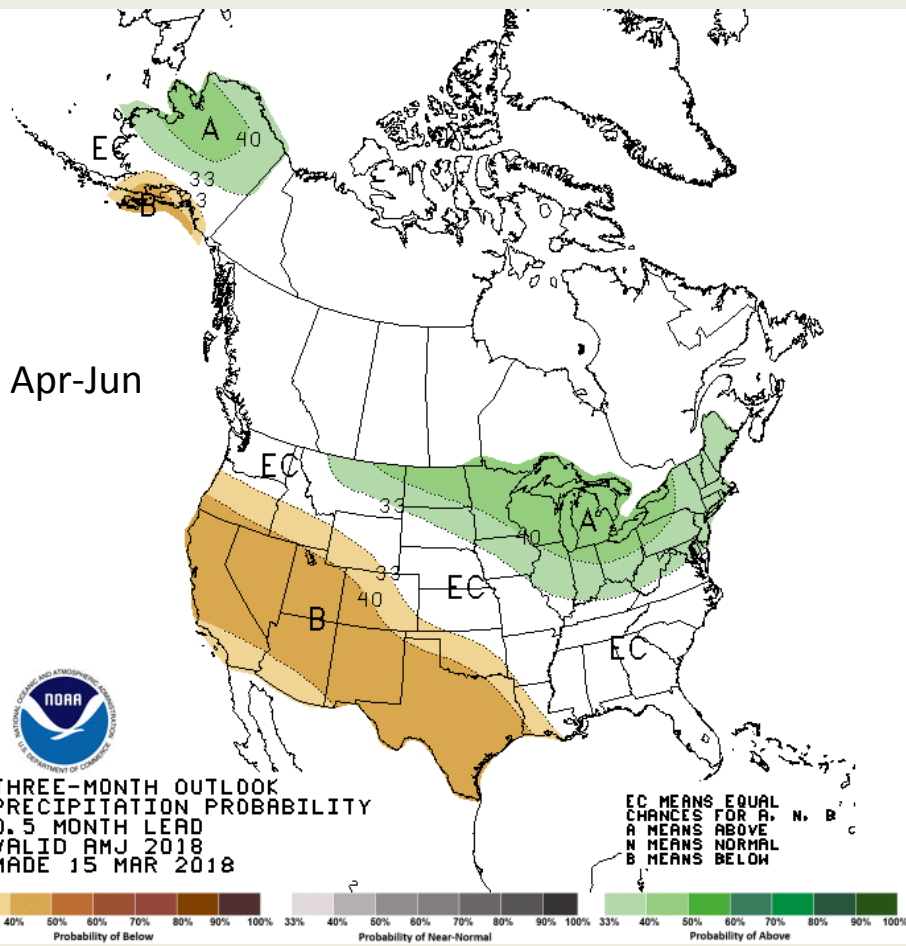
April U.S. Forecasts



U.S. Seasonal Temperature Forecasts



U.S. Seasonal Precipitation Forecasts



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Debris-Flow Hazards Following Wildfire



Dennis M. Staley, Jason W. Kean, and Francis K. Rengers

U.S. Geological Survey Landslide Hazards Program, Golden, CO, USA

Fire-induced Changes That Contribute to Increased Hydrologic Hazard



Reduces soil infiltration capacity

Combustion of Canopy
+ Physical and Chemical Changes in Soils
Enhanced runoff and Erosion

Fire-induced Changes That Contribute to Increased Hydrologic Hazard



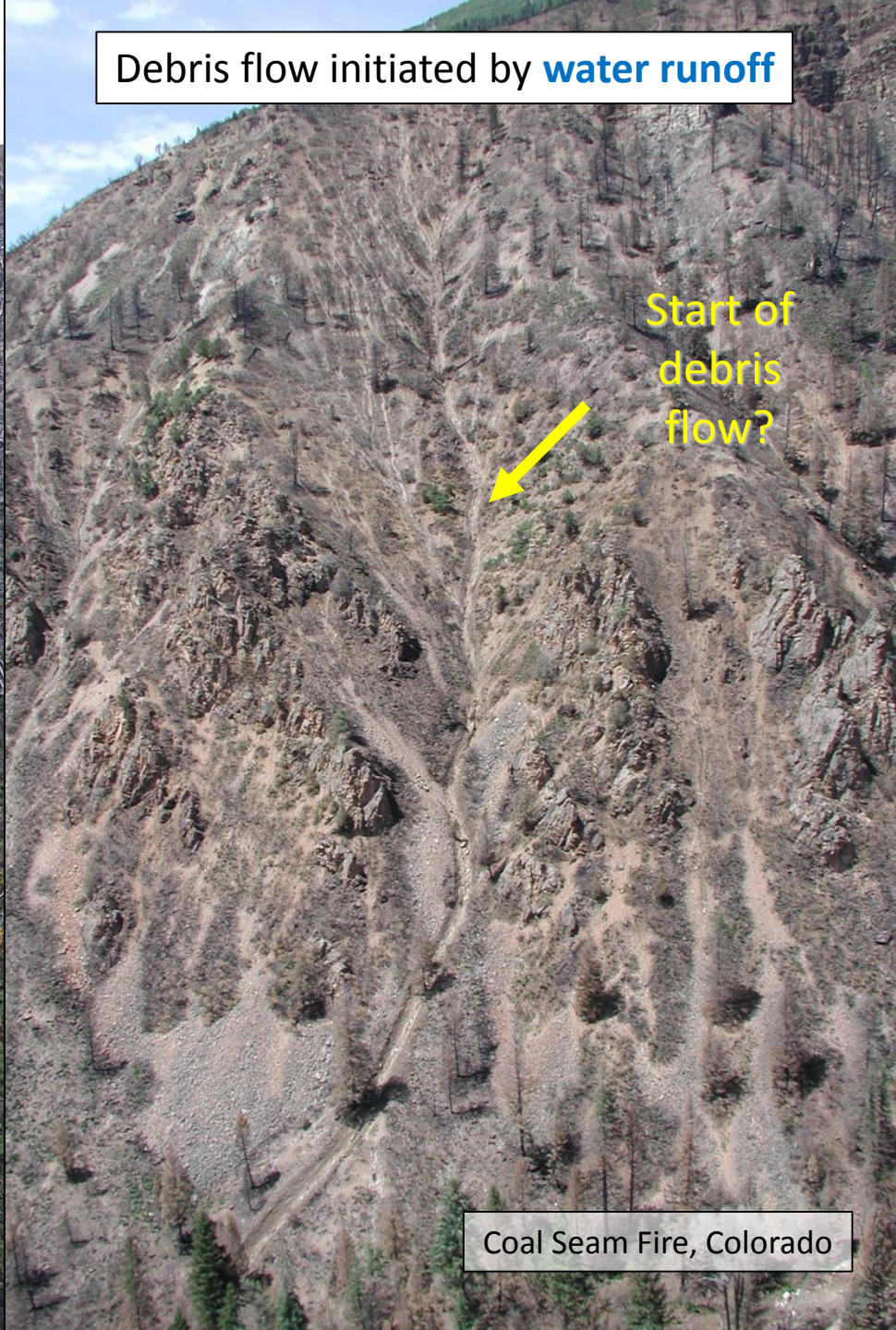
Combustion of Canopy
+ Physical and Chemical Changes in Soils
Enhanced runoff and Erosion

Debris flow initiated by a **landslide**



Elliot State Forest, Oregon

Debris flow initiated by **water runoff**



Coal Seam Fire, Colorado

Debris Flow: Fish burn area [2016], Duarte, CA: January 20, 2017



Debris Flow: Fish burn area [2016], Duarte, CA, January 20, 2017



Floods and Debris Flows Happen Quickly, and Do Not Require Lots of Rain



Manitou Springs, Colorado

July 1, 2013

Storm Duration = ~15 minutes

Max 15 minute Intensity = ~50 mm/h

Flow Duration = < 10 minutes

Flooding: Waldo Canyon burn area [2012], Colorado Springs, CO: July 1, 2013

MANITOU SPRINGS, CO / KUSA

BREAKING

VIDA URBONAS - @VIDAURBONAS

DEADLY FLOODING IN MANITOU SPRINGS



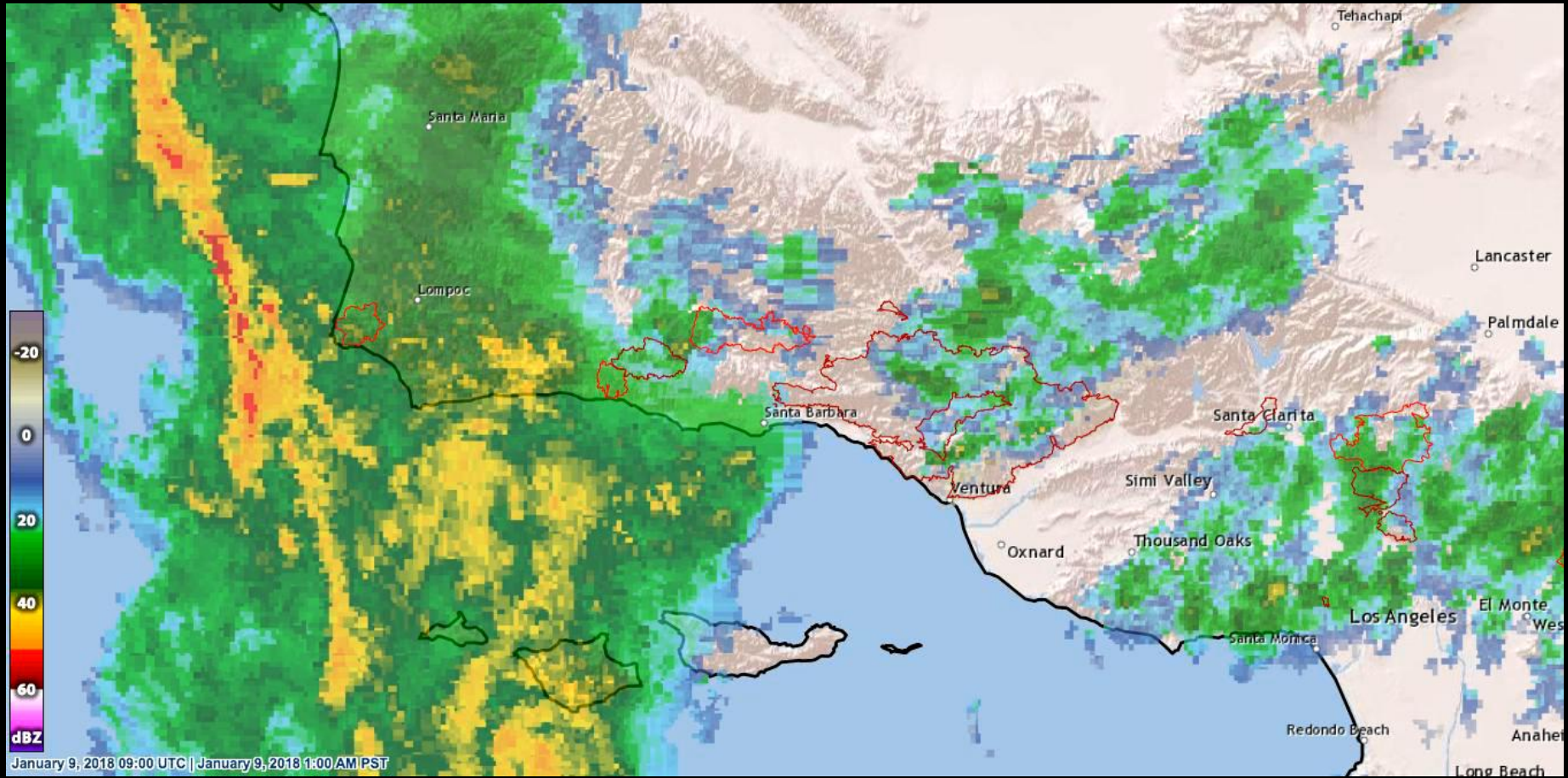
SUNNY START

CRASHES CLOSE I-70

POSSIBLE KIDNAPPING



Intensity Matters!



Debris Flows Travel At High Velocity And Can Be Very Destructive



Montecito, California, January 9, 2018

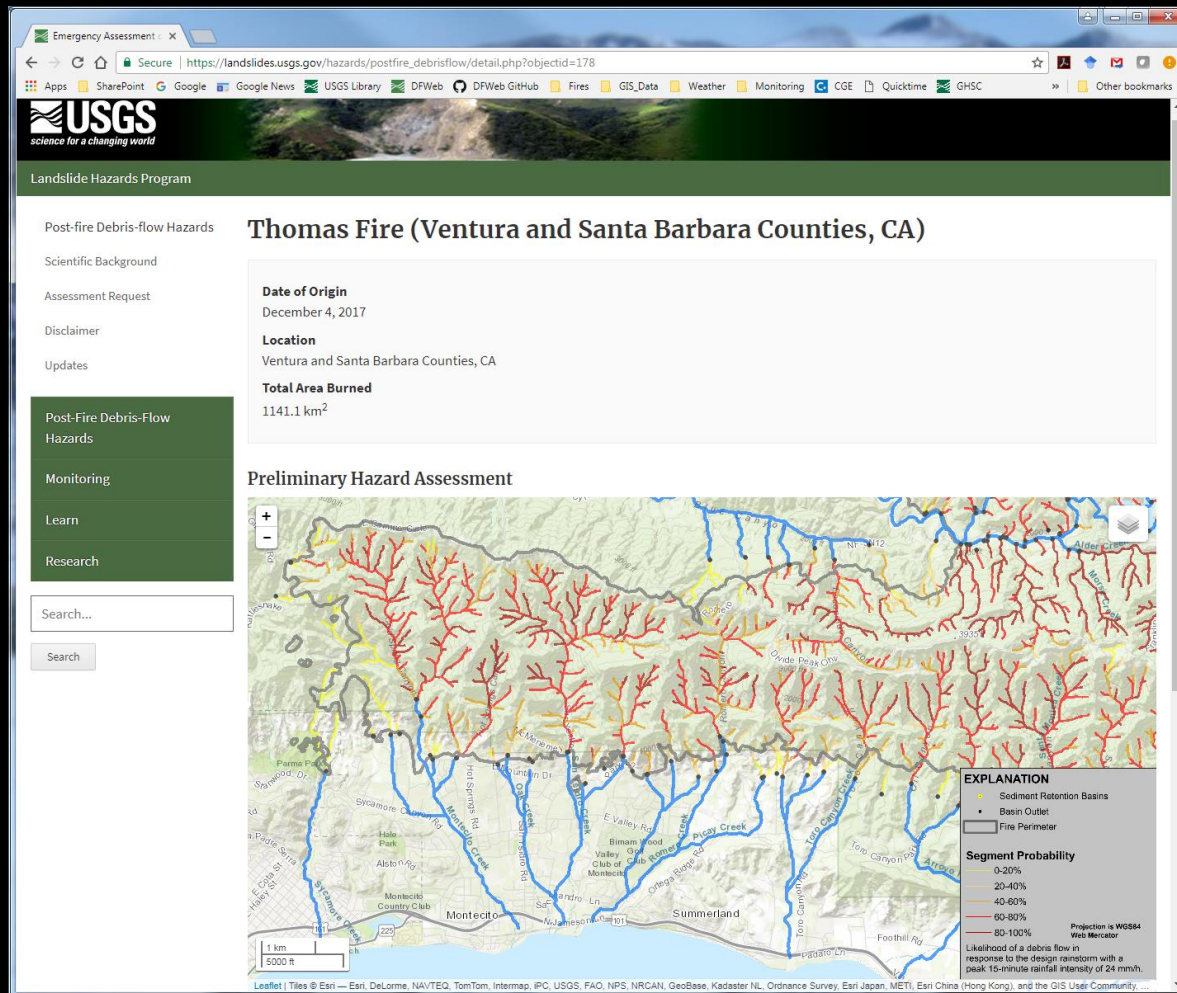
Storm Duration = Several Hours of low intensity rainfall, with 15 minute burst

Max 15 minute Intensity = ~120 mm/h

Flow Duration = 15 - 30 minutes*

21 Fatalities, 2 missing, 100+ Homes Completely Destroyed, 100s more damaged

https://landslides.usgs.gov/hazards/postfire_debrisflow/



- Likelihood of debris flow
- Estimated magnitude of debris flow.
- Combined hazard.
- Estimated rainfall-intensity duration threshold.

Take-Home Messages



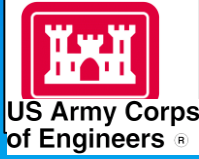
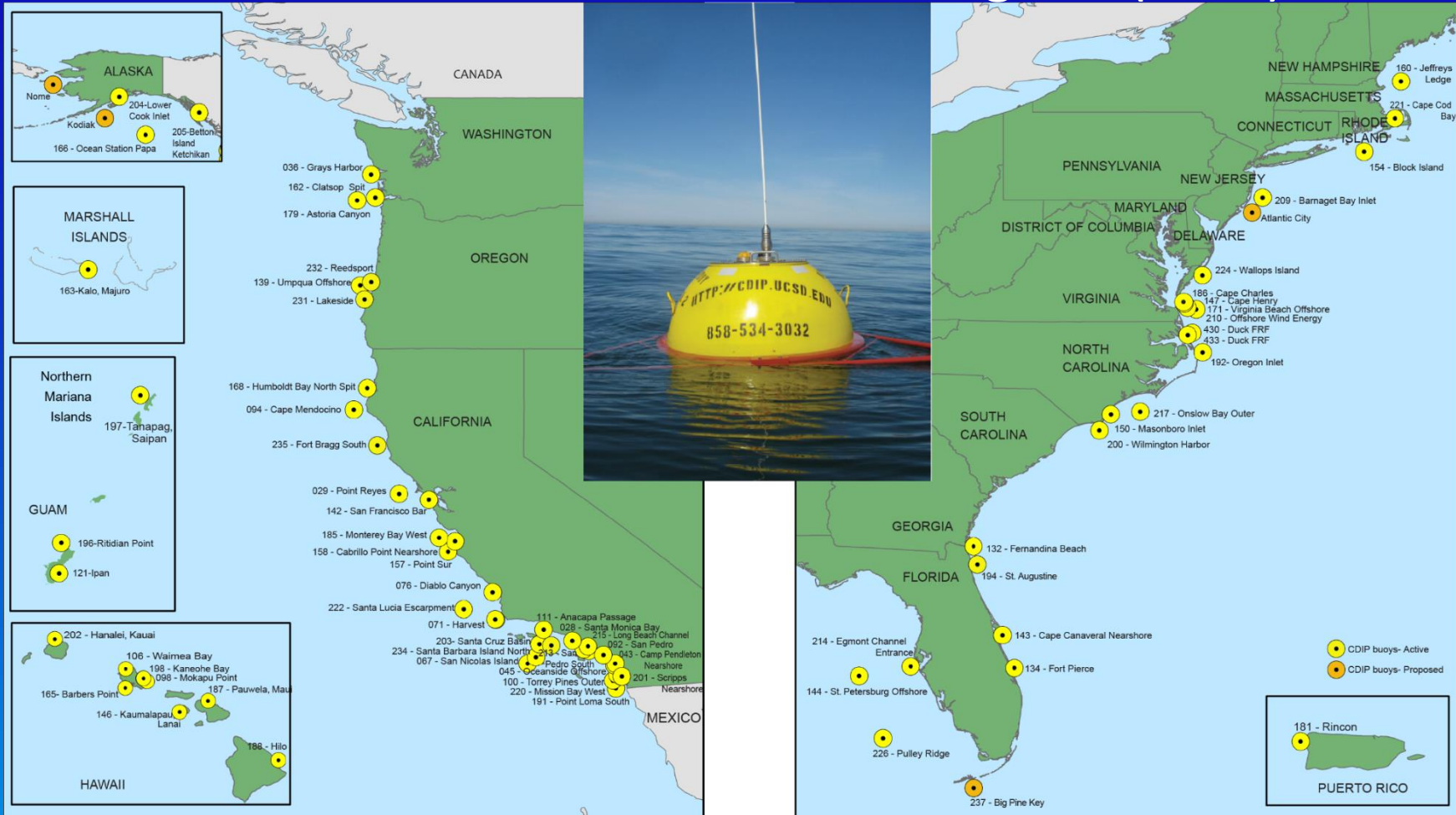
- **Post-fire floods and debris flows do not require any antecedent moisture.**
- **Post-fire floods and debris flows can be triggered within minutes of intense rainfall.**
- **Hazards may persist 2 – 5+ years following wildfire.**
- **Avoidance is the best form of risk reduction.**
- **USGS provides debris-flow hazard assessments**

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Coastal Data Information Program (CDIP)



Partners:

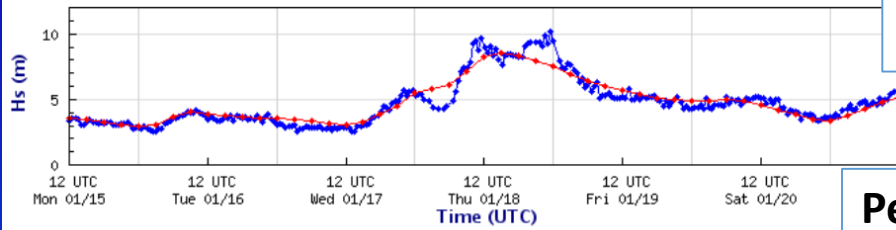


Grays HARBOR, WA

Jan 2018

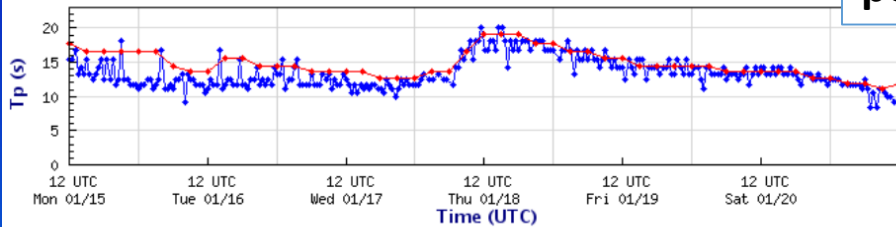
Observations: CDIP buoy 036
Forecast: NOAA WW3 46211

Wave height - Station 036



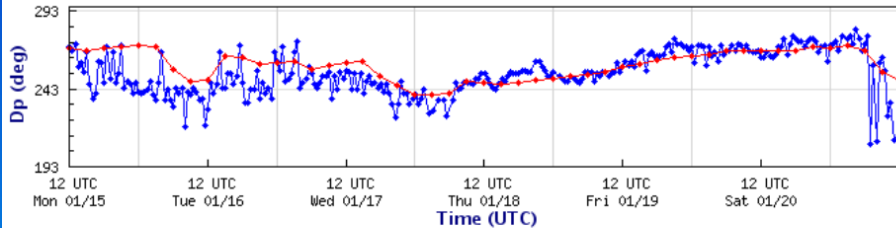
Sig. wave height ~ 10 m

Peak period - Station 036

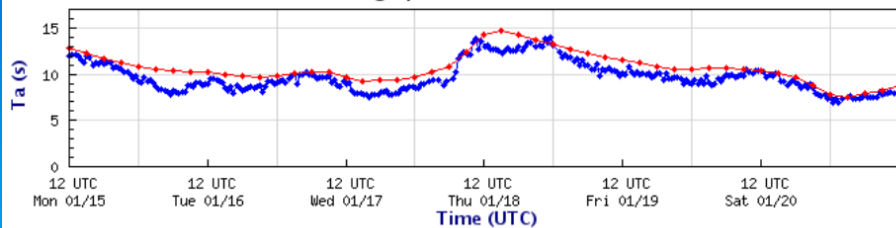


Peak wave period > 18 sec

Peak direction - Station 036



Average period - Station 036



Waves runup covered geotube sand cover during high tide



US Army Corps of Engineers

David Michalsen, Seattle District, "Barrier Island Restoration for Storm Damage Reduction: Willapa Bay, Washington", ICCE, 2010

Westport, Grays Harbor, WA



November 6, 2009, 23ft waves @18 sec
 (Photo: David Michalsen & Scott Brown, USACE Seattle)

Date (PST)	Hs (ft)	Tp (s)	Ta (s)	Dp (deg)	SST (F)	C
2006-02-04 05:01	39.37	15.38	13.15	233	50.7	
2006-02-04 06:31	35.63	18.18	12.87	237	50.7	
2006-02-04 06:01	33.43	16.67	12.64	236	50.7	
2018-01-18 15:33	33.33	16.67	13.92	251	49.3	
2006-12-13 18:24	33.04	18.18	13.27	268	50.2	
2006-02-04 04:01	32.71	13.33	11.84	219	50.7	
2018-01-18 14:33	32.51	16.67	13.86	255	49.3	
2006-12-13 16:54	32.35	16.67	13.35	261	50.2	
2006-12-13 16:24	32.15	16.67	12.66	264	50.2	
2003-10-12 04:26	31.99	16.67	12.76	265	55.6	
2007-12-03 10:59	31.92	15.38	11.37	213	49.8	
2006-12-13 18:54	31.86	18.18	12.79	271	50.2	
2018-01-18 03:33	31.63	20.00	13.54	253	49.3	
2007-12-03 08:59	31.50	16.67	11.46	214	49.5	
2007-12-03 11:29	31.43	15.38	11.51	209	49.8	
2006-12-13 15:54	31.30	16.67	12.70	261	50.4	
2006-12-13 19:54	31.10	18.18	13.25	265	50.2	
2018-01-18 16:03	31.07	16.67	13.10	254	49.3	
2007-12-03 12:29	31.07	16.67	11.72	216	50.0	
2018-01-18 02:33	31.00	18.18	13.90	250	49.5	
2015-12-10 14:24	30.84	18.18	12.72	247	52.2	
2018-01-18 13:33	30.64	18.18	13.18	261	49.3	
2000-01-16 13:37	30.64	14.28	11.05	213	47.5	
2018-01-18 12:03	30.61	16.67	13.41	254	49.3	
2003-10-12 00:56	30.61	15.38	12.52	268	56.7	

Max Significant Wave Heights
 1981 - present

Portland District - Mouth of the Columbia River

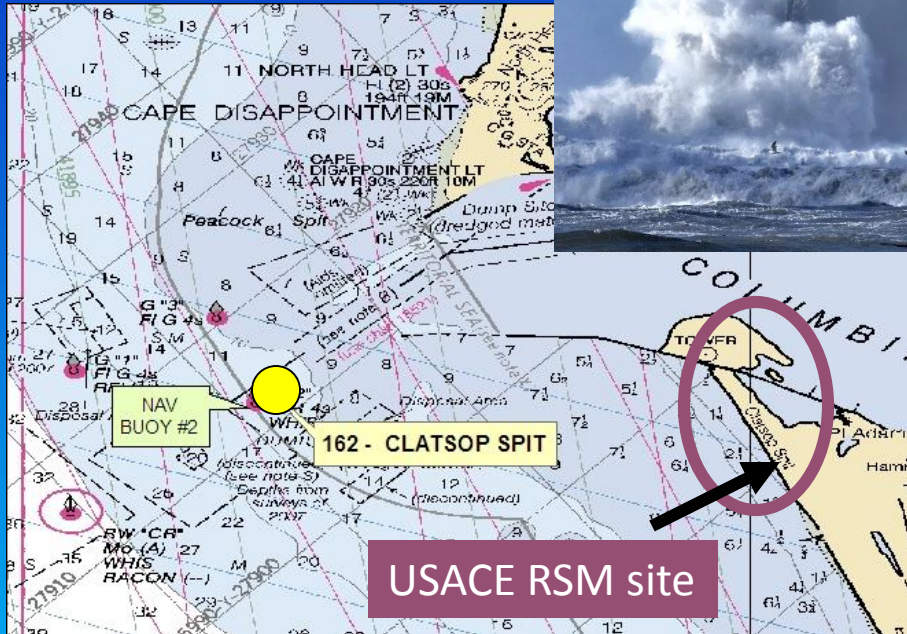
Regional Sediment Management (RSM) :

“... it is really GOOD to have CDIP wave-riders OPERATIONAL on the WEST Coast... these are huge assets to have while we are being subjected to El Nino and big wave events.”

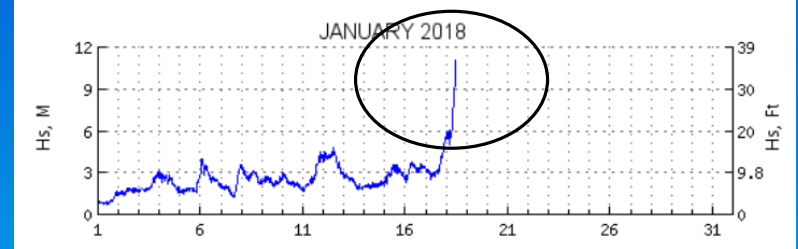
Rod Moritz USACE



JANUARY 2018



162 CLATSOP SPIT, OR (BUOY)



Waves measured 11m significant height
Water depth = 25m



US Army Corps of Engineers

Portland District Dredging – Columbia River Navigation



“CDIP’s timely and accurate wave data update every 30 minutes and are highly utilized by the maritime community, where they are critical to safe and efficient navigation by dredging project managers as well as by military, commercial, and recreational mariners.” Captain Dan Jordan, Columbia River Bar Pilots

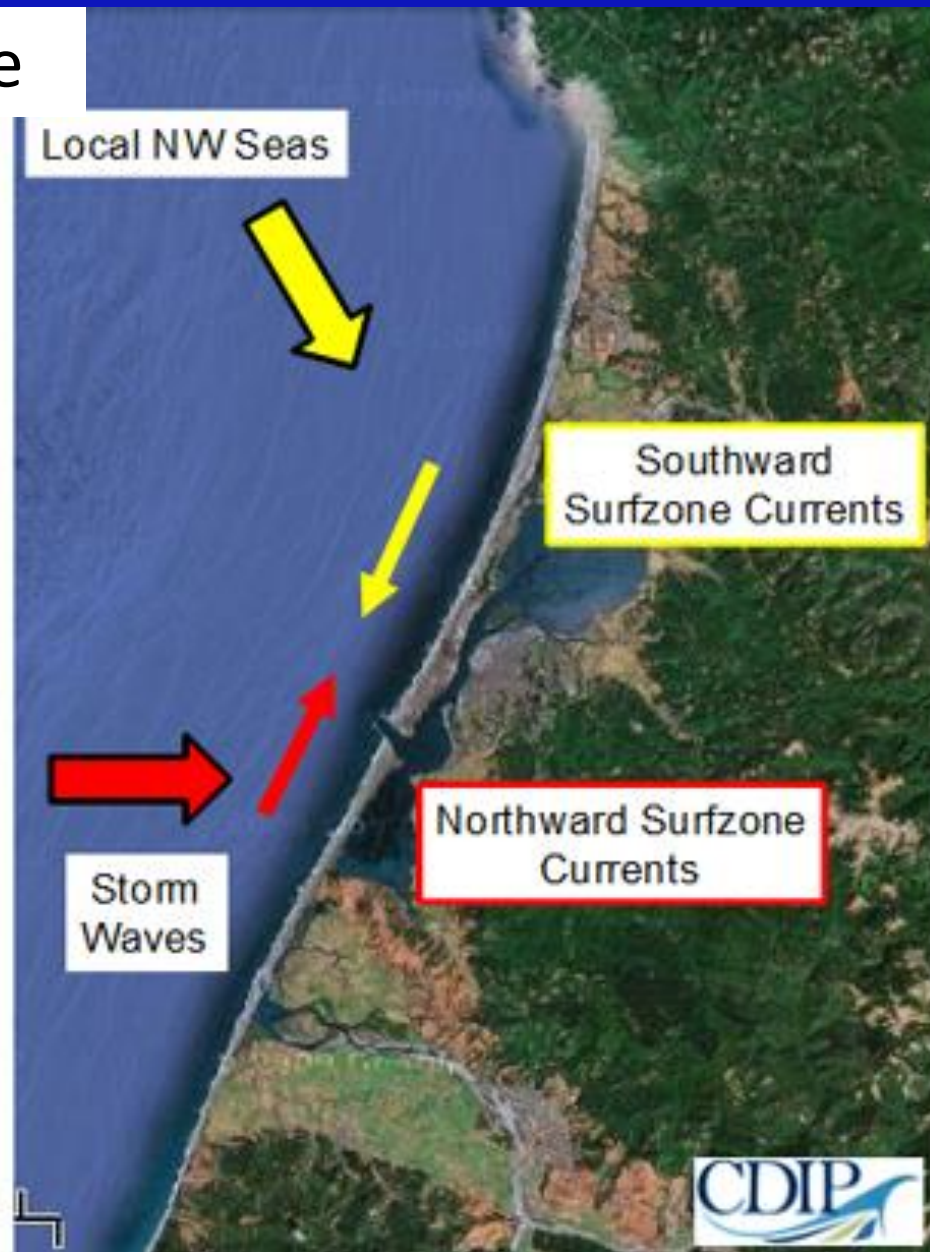


San Francisco Corps District

Humboldt Channel Entrance

Wave-driven Surfzone Currents & Sediment Transport

- Balance between year-round NW seas and W storm waves
- Summer months dominated by NW seas and southward transport
- Winter months dominated by W sea & swells and northward transport



Humboldt North Spit

- Buoy data are reviewed prior to annual on-site jetty inspections
- Data are used in the North Jetty site design (when repairs are needed)

*Anne Sturm, James Zoulas, and John Dinger,
South Pacific Division*



3-5 people die per year in nearshore boating accidents (Troy Nicolini – NWS, Eureka).



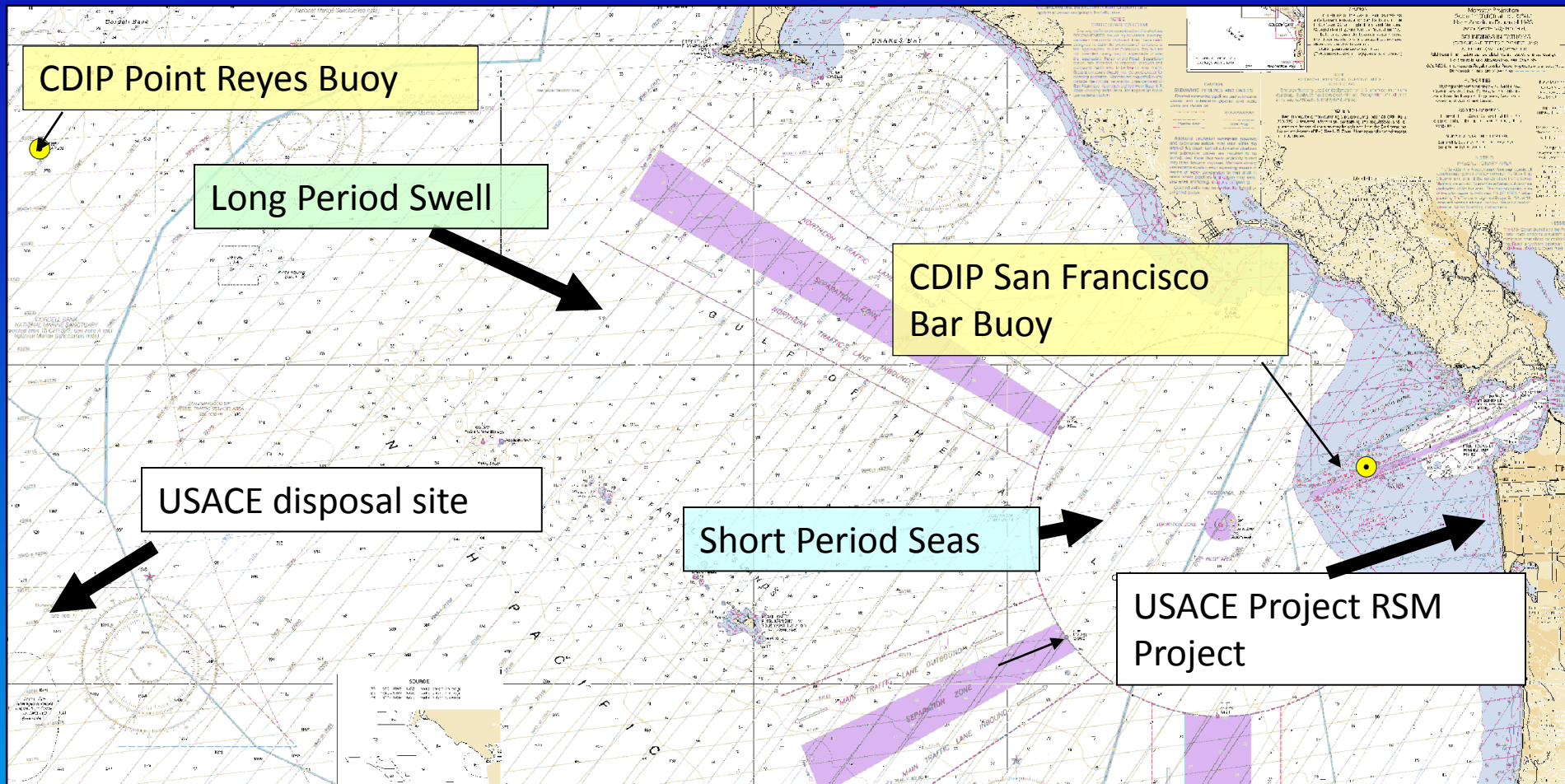
20ft Hs waves – Jan 26, 2017



US Army Corps
of Engineers

<https://www.youtube.com/watch?v=46A7eYkCRI8>

San Francisco District



San Francisco District

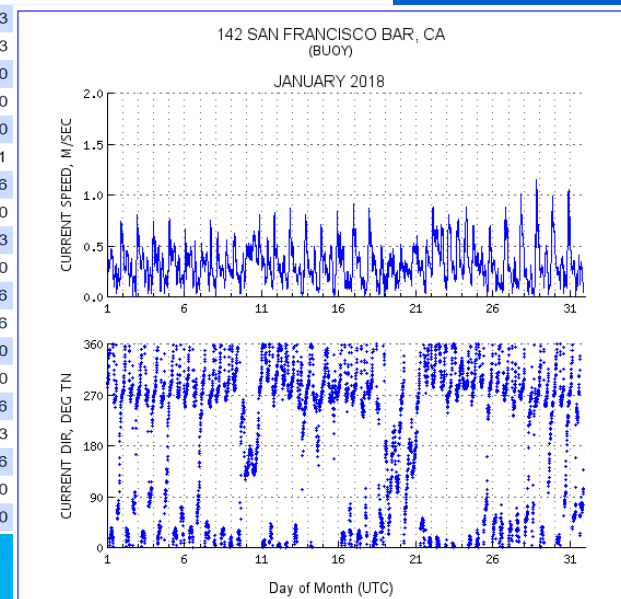
- 1) Assess conditions for dredge material placement sites near the San Francisco Bar and Ocean Beach
- 2) Assess real-time conditions for hopper dredge captains during annual O&M dredging activities.

Anne Sturm, James Zoulas, and John Dingler, South Pacific Division



Date (PST)	Hs (ft)	Tp (s)	Dp (deg)	Ta (s)	SST (F)	Current sp (kt)	Current dir (deg)
2018-01-31 10:30	6.59	12.50	281	9.46	53.4	0.54	71
2018-01-31 10:00	6.27	13.33	281	9.06	53.4	0.58	79
2018-01-31 09:30	6.92	13.33	279	9.97	53.4	0.60	73
2018-01-31 09:00	6.50	13.33	283	9.60	53.4	0.60	70
2018-01-31 08:30	5.68	13.33	278	9.34	53.2	0.52	90
2018-01-31 08:00	5.91	12.50	276	9.26	53.2	0.45	75
2018-01-31 07:30	6.07	13.33	280	9.23	53.2	0.25	54
2018-01-31 07:00	5.84	12.50	276	8.74	53.4	0.27	339
2018-01-31 06:30	6.20	11.76	278	8.84	53.2	0.58	304
2018-01-31 06:00	6.79	13.33					
2018-01-31 05:30	6.00	13.33					
2018-01-31 05:00	6.14	12.50					
2018-01-31 04:30	6.36	12.50					
2018-01-31 03:30	5.97	12.50					
2018-01-31 03:00	5.94	11.11					
2018-01-31 02:30	5.94	11.76					
2018-01-31 02:00	5.54	12.50					
2018-01-31 01:30	5.94	13.33					
2018-01-31 01:00	5.61	12.50					
2018-01-31 00:30	5.51	11.76					
2018-01-31 00:00	5.68	11.76					
2018-01-30 23:30	5.91	12.50					
2018-01-30 23:00	5.84	12.50					
2018-01-30 22:30	5.31	11.76					
2018-01-30 22:00	5.28	13.33					
2018-01-30 21:30	4.89	11.76					
2018-01-30 21:00	4.99	12.50					
2018-01-30 20:30	5.02	12.50					

Thanks to Michael Dillabough and Capt Kixon



Contributions from NANOOS re PNW coastal conditions

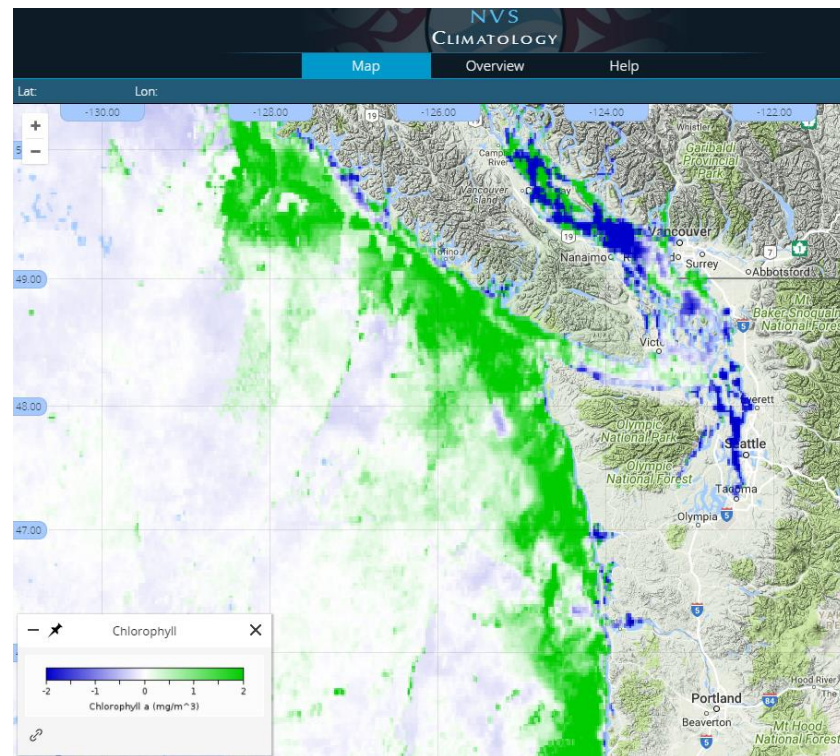
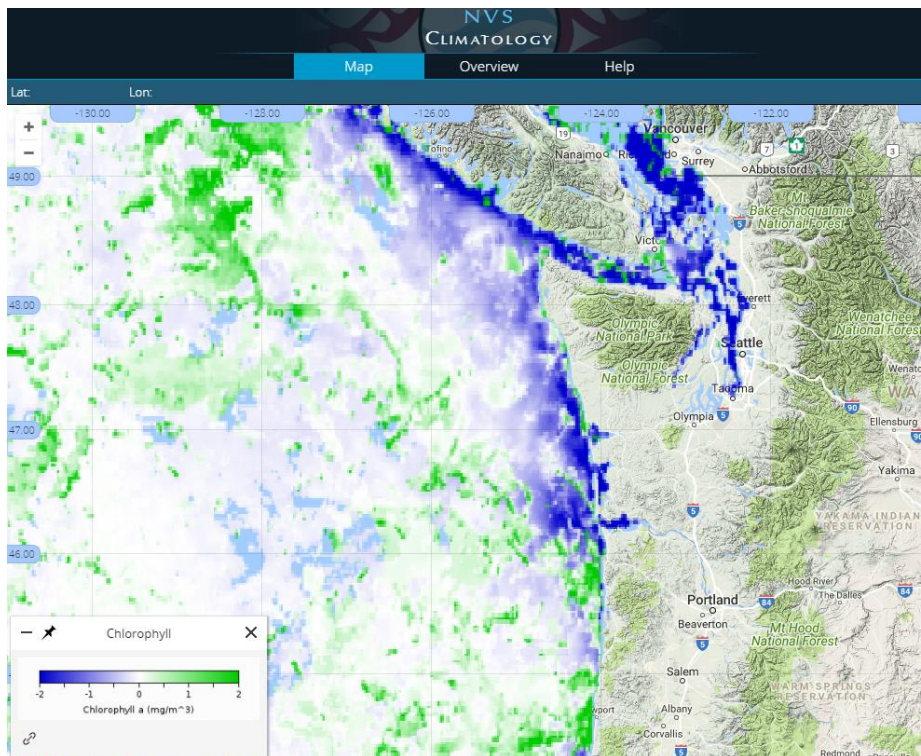




Chlorophyll Anomaly

January 2018

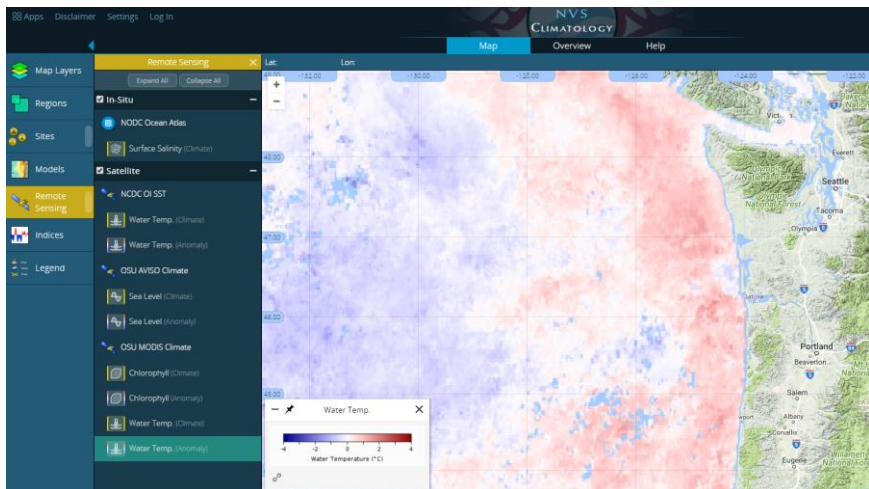
February 2018



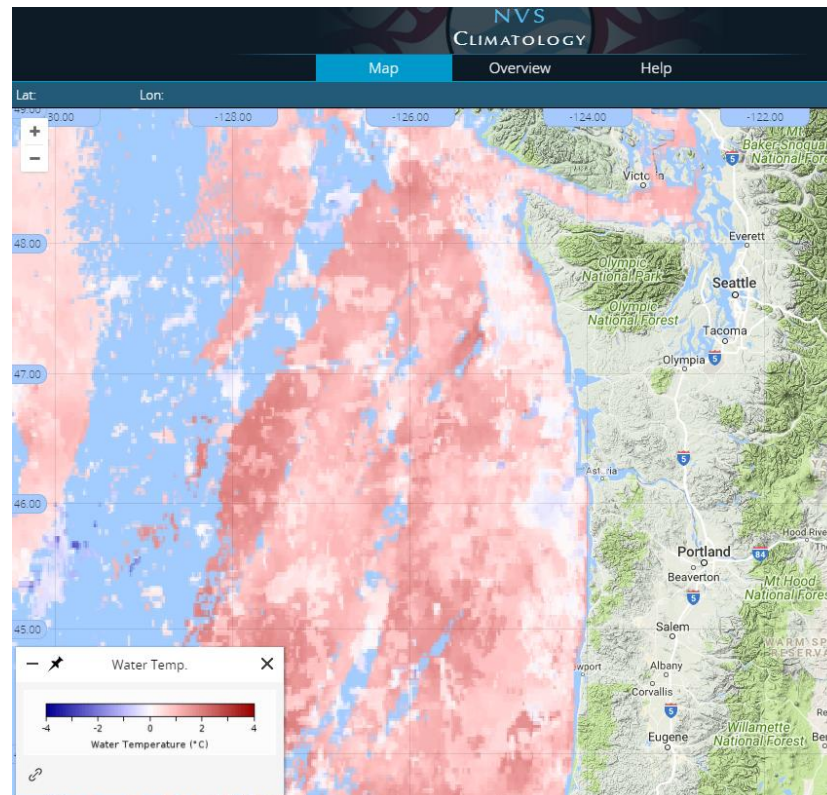


Sea Surface Temperature Anomaly

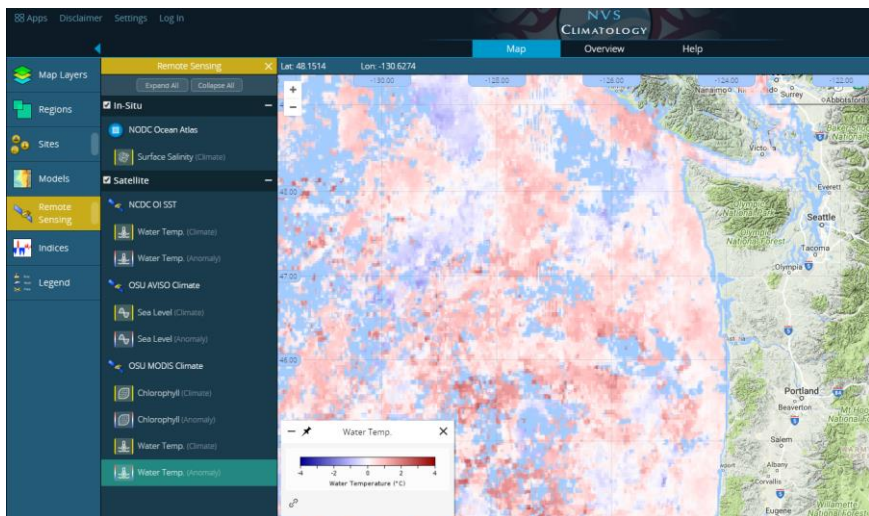
February 2017



February 2018

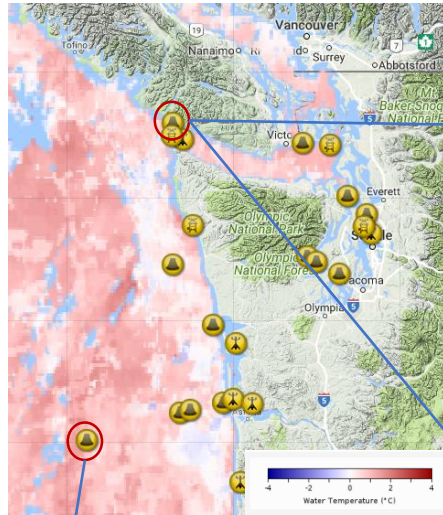


November 2017

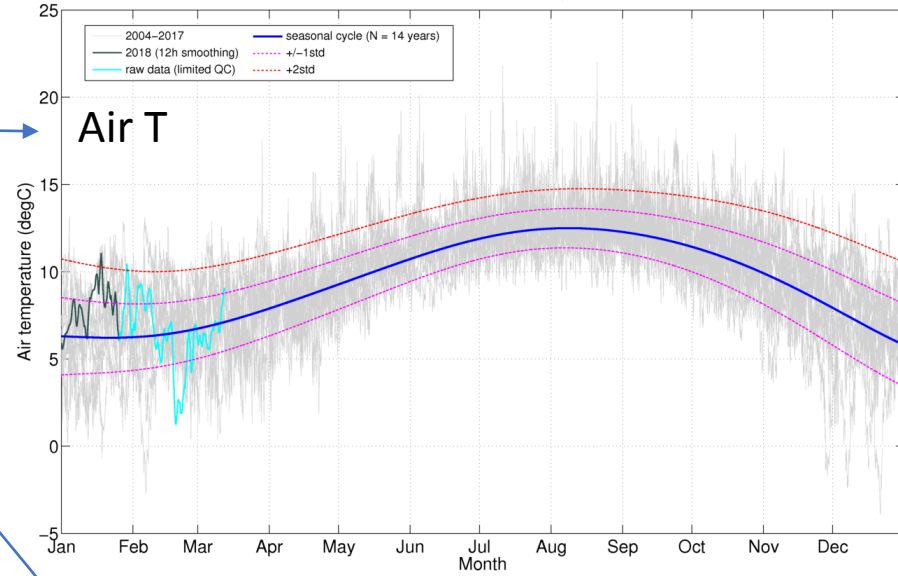




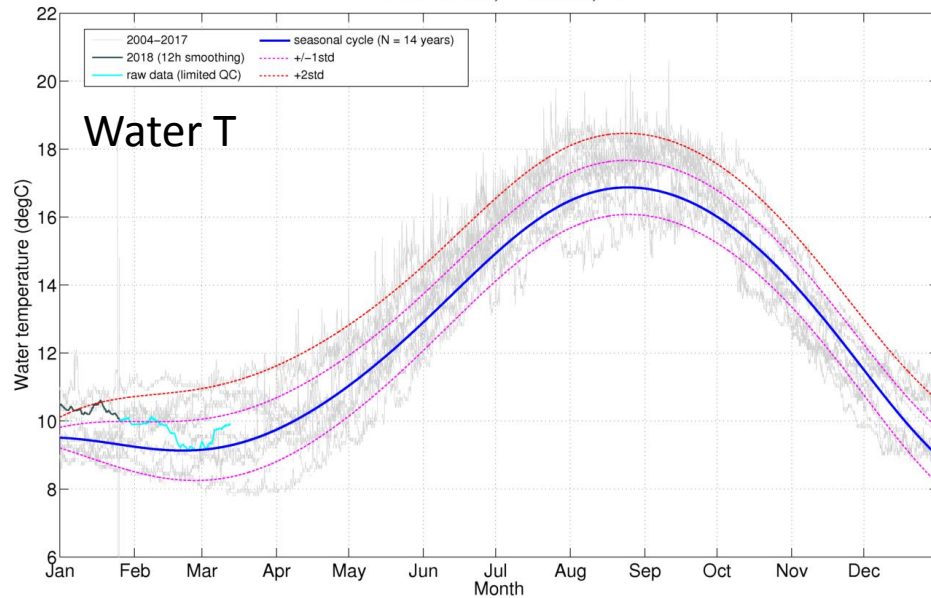
Air & Water Temperature Anomalies



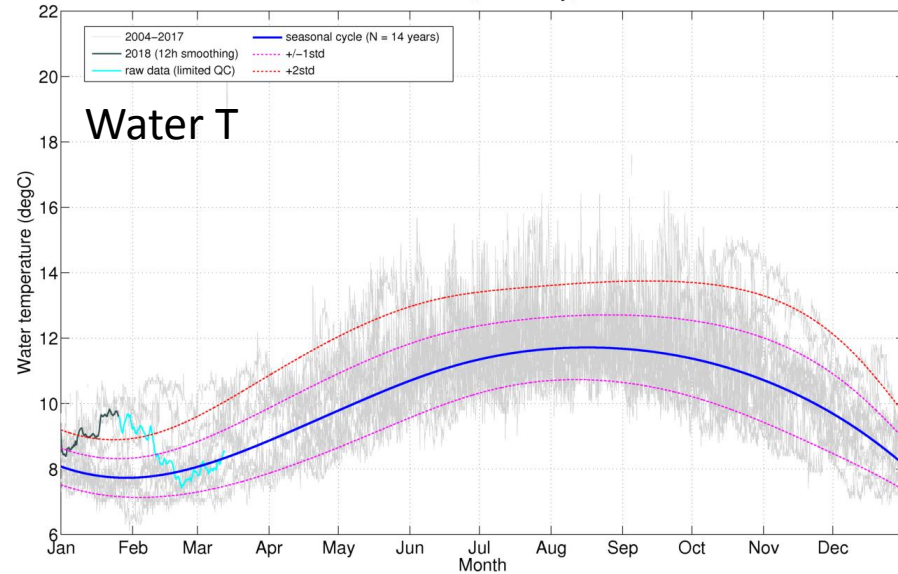
NDBC 46087, Neah Bay, Wa

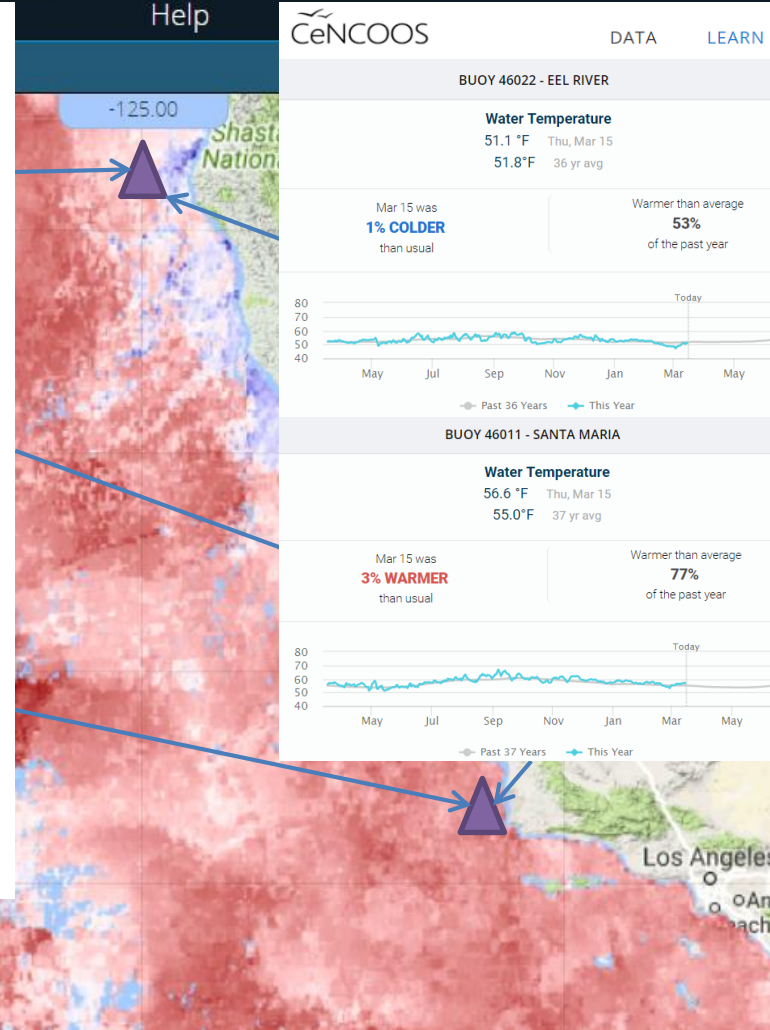
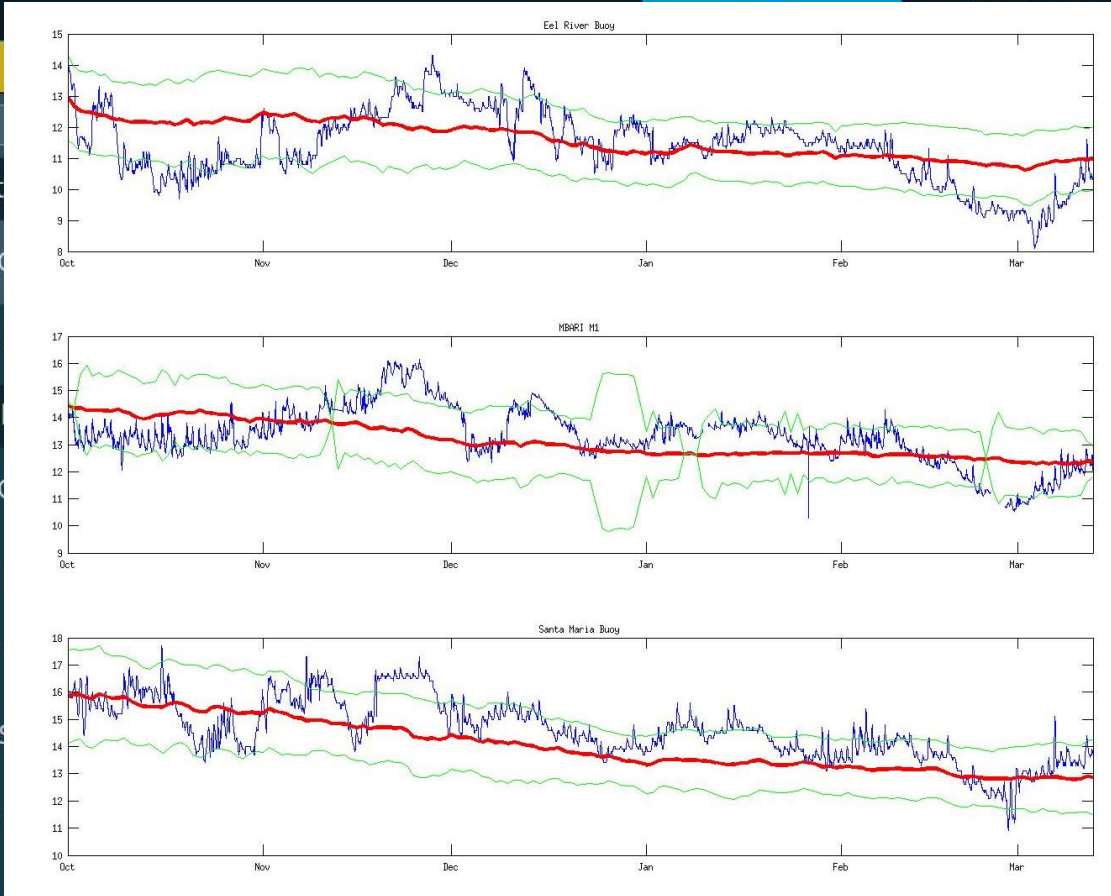


NDBC 46089, Tillamook, Or



NDBC 46087, Neah Bay, Wa





BUOY 46022 - EEL RIVER

Water Temperature
51.1 °F Thu, Mar 15
51.8°F 36 yr avg

Mar 15 was **1% COLDER** than usual

Warmer than average **53%** of the past year

BUOY 46011 - SANTA MARIA

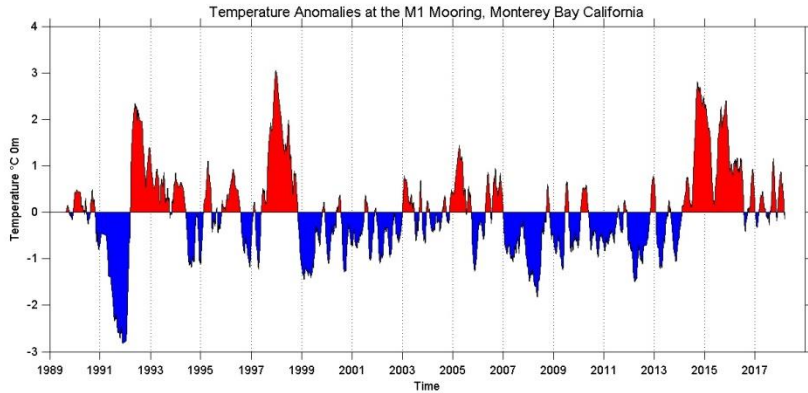
Water Temperature
56.6 °F Thu, Mar 15
55.0°F 37 yr avg

Mar 15 was **3% WARMER** than usual

Warmer than average **77%** of the past year

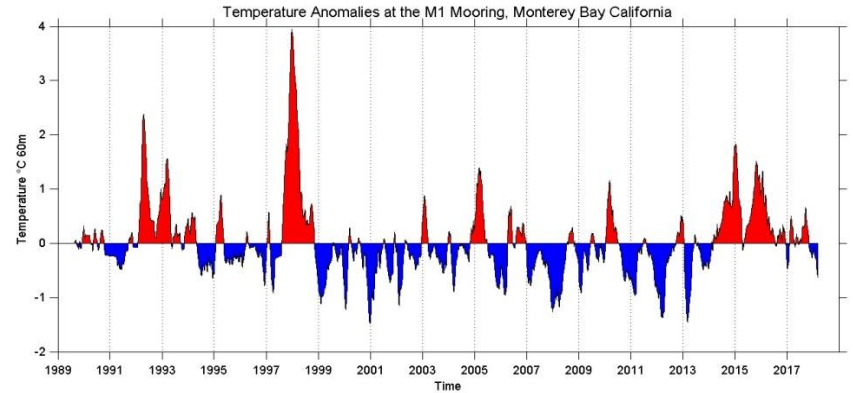
Seasonal Cooling Trend in Monterey Bay

M1 Buoy



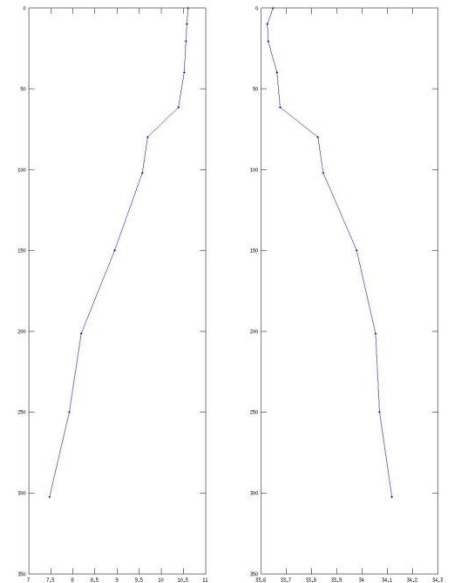
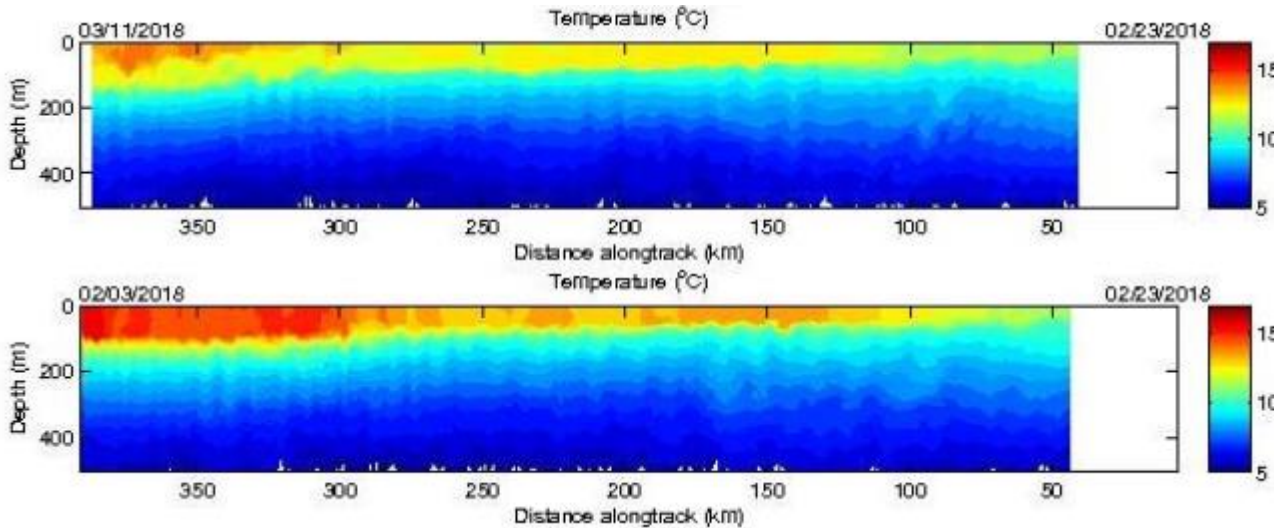
Note: 60 point moving average applied to daily averaged values.
Monterey Bay Aquarium Research Institute

Updated: 16-Mar-2018

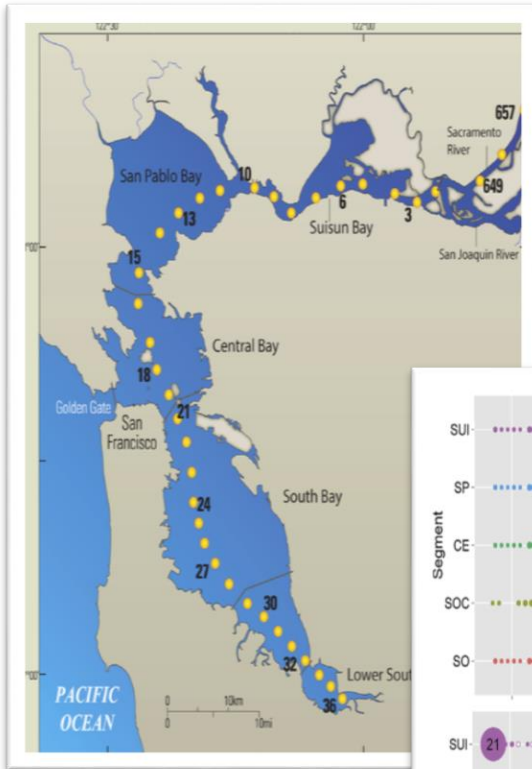


Note: 60 point moving average applied to daily averaged values.
Monterey Bay Aquarium Research Institute

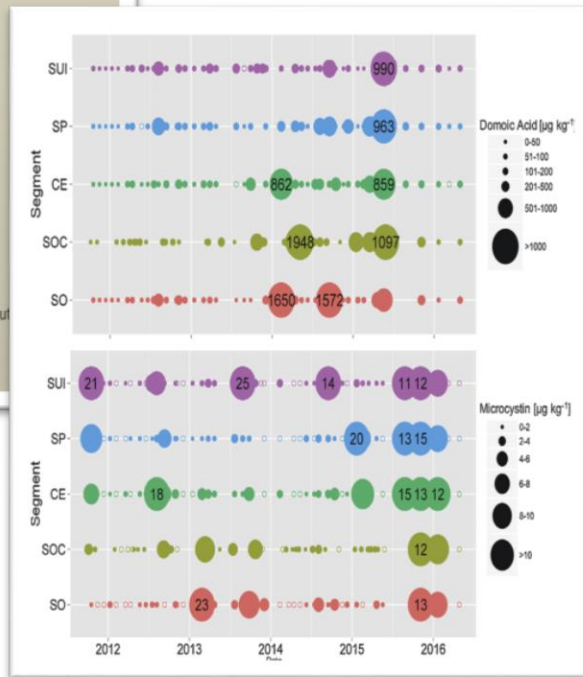
Spray Glider



New SF Bay HAB Study from UCSC



Simultaneous occurrence of three marine algal toxins and one freshwater algal toxin in San Francisco Bay



Peacock et al
2018
Harmful Algae

Two new OA buoys deployed in SF Bay by EOS SFSU

Bay Ocean Buoy (BOB)
Marine Acidification Research Inquiry (MARI)

Long-term water quality monitoring + carbon chemistry + atmospheric CO_2



Photo Credit: Steve Babuljak

Call Agenda



- Project Recap & Updates (Polly Hicks)
- El Niño and Regional Climate brief (Dan McEvoy)
- Guest Speaker: Debris-Flow Hazards Following Wildfire (Dennis M. Staley, USGS)
- IOOS Nearshore Conditions brief (Julie Thomas, Marine Lebrech, Alex Harper)
- **Environmental conditions and impacts reporting and discussion (Polly Hicks)**
- Discussion

Regional Impacts Summary



Reporting Status:

- 35 entries since January 20, 2018

Environmental Conditions

- Drought
- Snowpack/snow drought
- Wildfires and smoke
- Mudslides
- Water temperatures
- Algal bloom
- Tsunami watch
- Changing ocean conditions
- Global temperature

Human & Environmental Impacts

- Economic impacts
 - Recreational & tourism
 - Agriculture
- Reservoir levels/water restrictions
- Evacuations
- Species impacts
 - Disease susceptibility
 - Average size of individuals
- Harvest restrictions
- Increased human health risks

Impacts in Pictures



Low snowpack in much of the region is impacting recreational use and local economies. By early January, Colorado had lowest snow-pack in 30 years. By February the Sierra Nevada only had 23% of their average snowpack. The lack of snow caused many low-elevation downhill and cross country ski areas to close early or fail to open resulting in potential millions of dollars in economic losses.



Impacts in Pictures



Drought and reduced snowpack is impacting reservoir levels and causing concerns for water users. Lake Powell is expected to get only 47% of its average inflow due to low snowpack.

OR Governor Brown declared a Drought Emergency for Klamath Co, which is at 45% snowpack. Officials predict \$557M in economic losses impacting 4,500 jobs in agriculture, natural resources and recreation.

Lack of snow may also impact water temperatures. For the Sacramento River, the BOR is delaying the allocation of water to some agriculture users incase releases are needed to keep temperatures low for endangered chinook salmon.



Impacts in Pictures



Wind-driven fire in rural central California forced evacuations in February.

30,000 individuals were forced to evacuated due to a potential mudslide threat along the Santa Barbara Coast. The evacuations were in the same area that experienced severe mudslides in January.



Mike Eliason/Santa Barbara County Fire/Handout via REUTERS



Matt Udkow/Santa Barbara County Fire Department/Associated Press

Impacts in Pictures



The northern Pacific sardine population (from Mexico to British Columbia) has plummeted 97 percent since 2006. An assessment by NOAA Fisheries and the Pacific Fishery Management Council projects that only 52,065 metric tons of sardines will be along the West Coast on July 1; below the 150,000 metric-ton threshold required for commercial fishing. It is anticipated that the fishery will be closed for a fourth year in a row. The source of the declines is related to both natural fluctuations as well as changing ocean conditions.



Photo: CHUCK KIRMAN, AP

Impacts in Pictures



WA Governor Inslee announced an initiative that directs state agencies to take immediate and long-term steps to protect the Southern Resident Killer Whales. The endangered orcas are at a 30-year low with only 76 individuals down from 98 in 1995.



Call Agenda



- Project Recap & Updates (Polly Hicks)
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- Environmental conditions and impacts reporting and discussion (Polly Hicks)
- **Discussion (all)**
 - Additional impacts to report?
 - Observations on recent environmental anomalies?

Next NOAA West Watch: May 22nd, 1-2pm PDT/ 2-3pm PDT