



Madera County Drought Workgroup

Presenter: Felix Castro

Weather Forecast Office
Hanford, CA
Friday, January 20





Welcome! Topics to discuss:

Weather Forecast Office
Hanford, CA
Friday, January 20

- Brief Weather Outlook
- Atmospheric Rivers
- Snow Levels
- Drought conditions: Are the recent rains helping to end the drought?



6-10 Day Precipitation Outlook

Weather Forecast Office
Hanford, CA
Friday, January 20

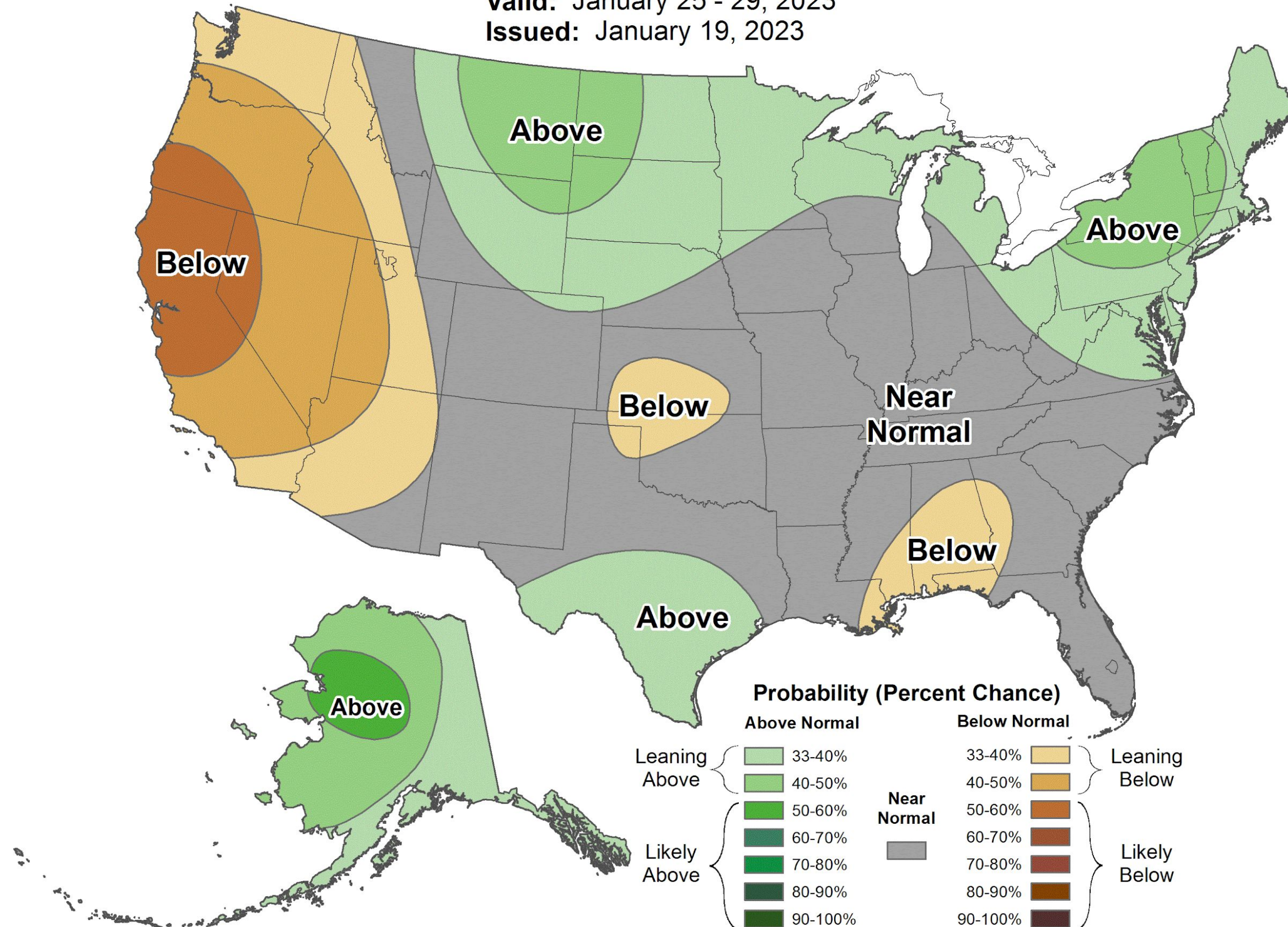


6-10 Day Precipitation Outlook



Valid: January 25 - 29, 2023

Issued: January 19, 2023





8-14 Day Precipitation Outlook

Weather Forecast Office
Hanford, CA
Friday, January 20

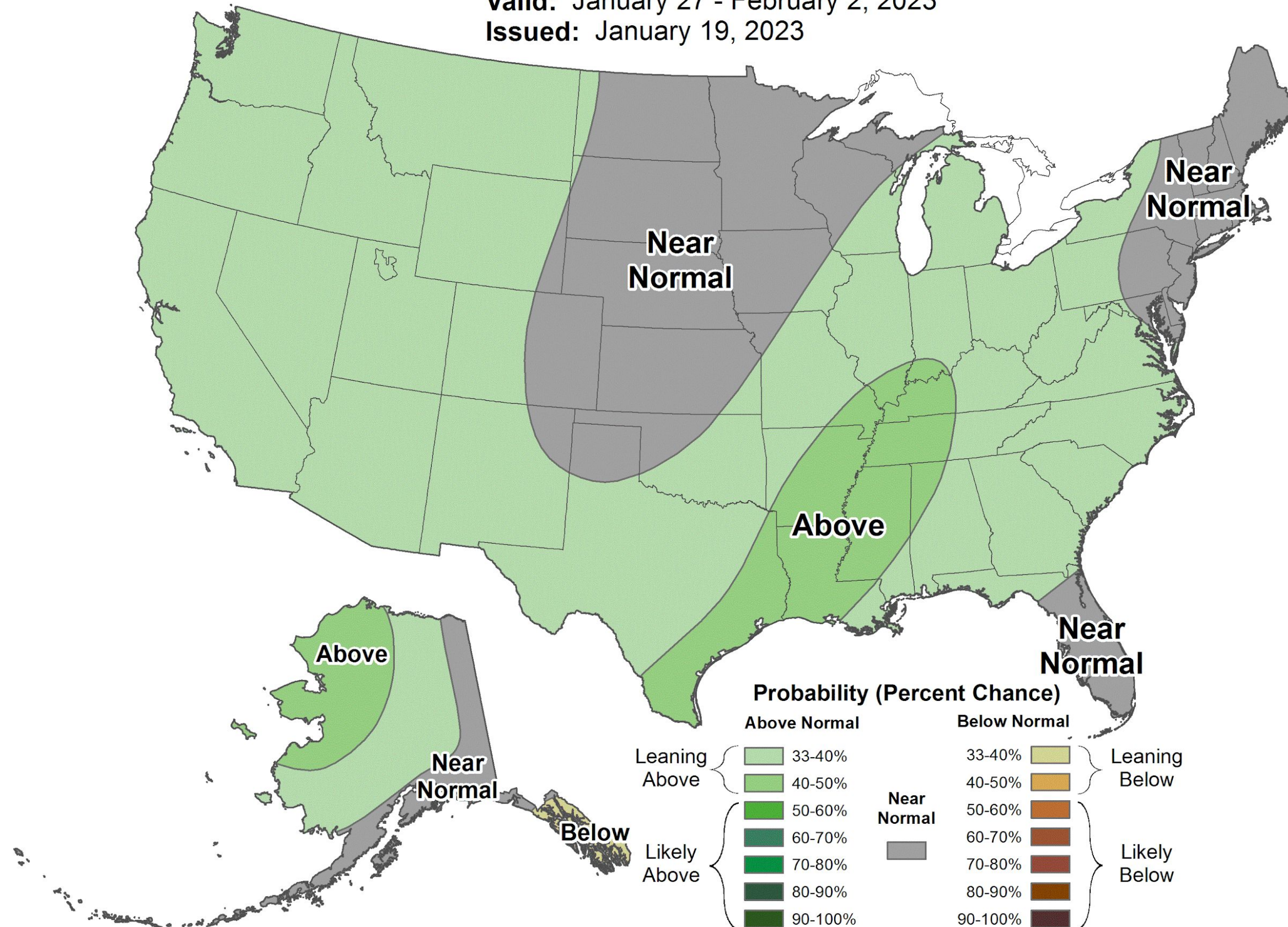


8-14 Day Precipitation Outlook



Valid: January 27 - February 2, 2023

Issued: January 19, 2023





8-14 Day Temperature Outlook

Weather Forecast Office
Hanford, CA
Friday, January 20

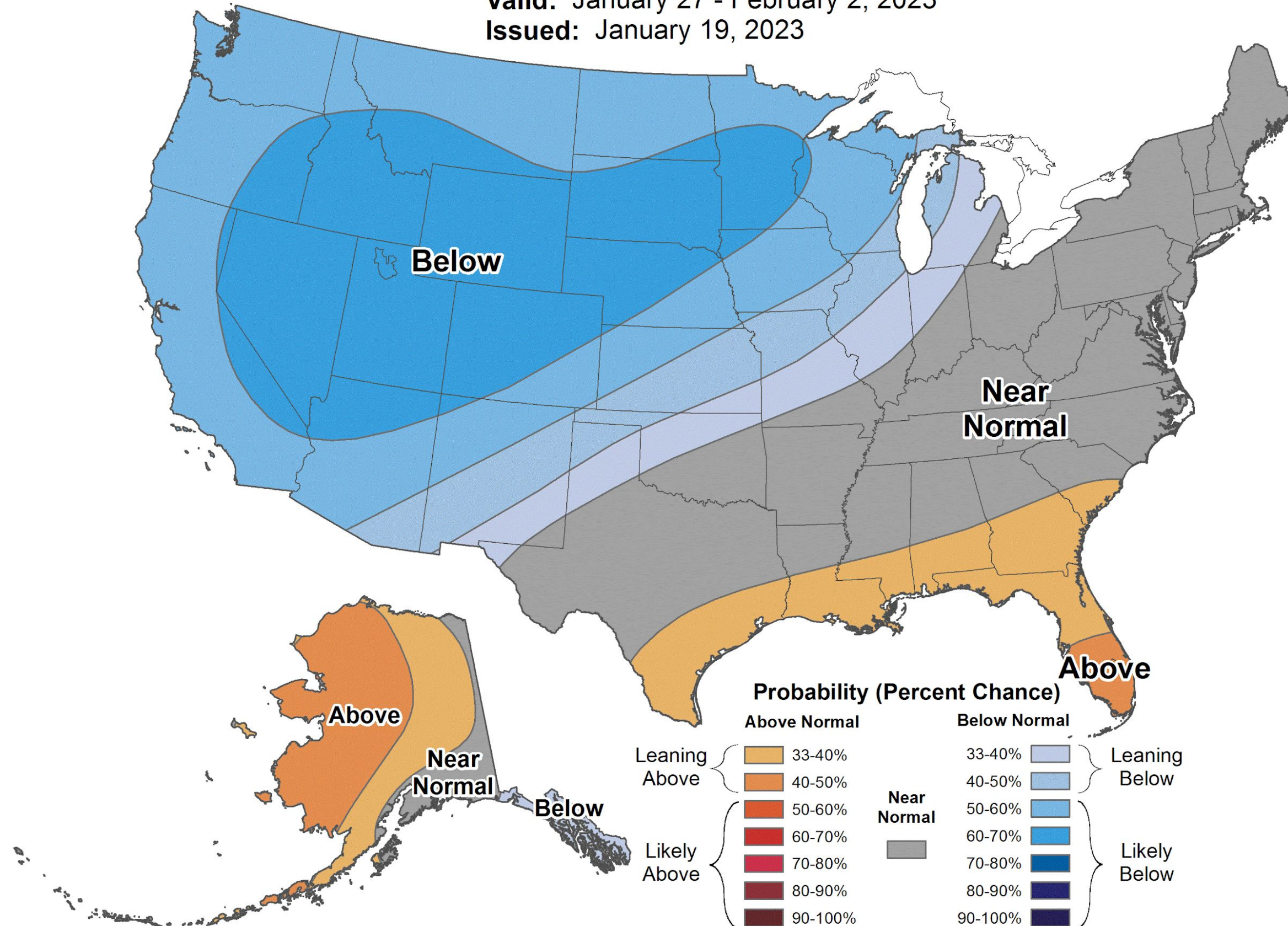


8-14 Day Temperature Outlook



Valid: January 27 - February 2, 2023

Issued: January 19, 2023





Monthly Precipitation Outlook

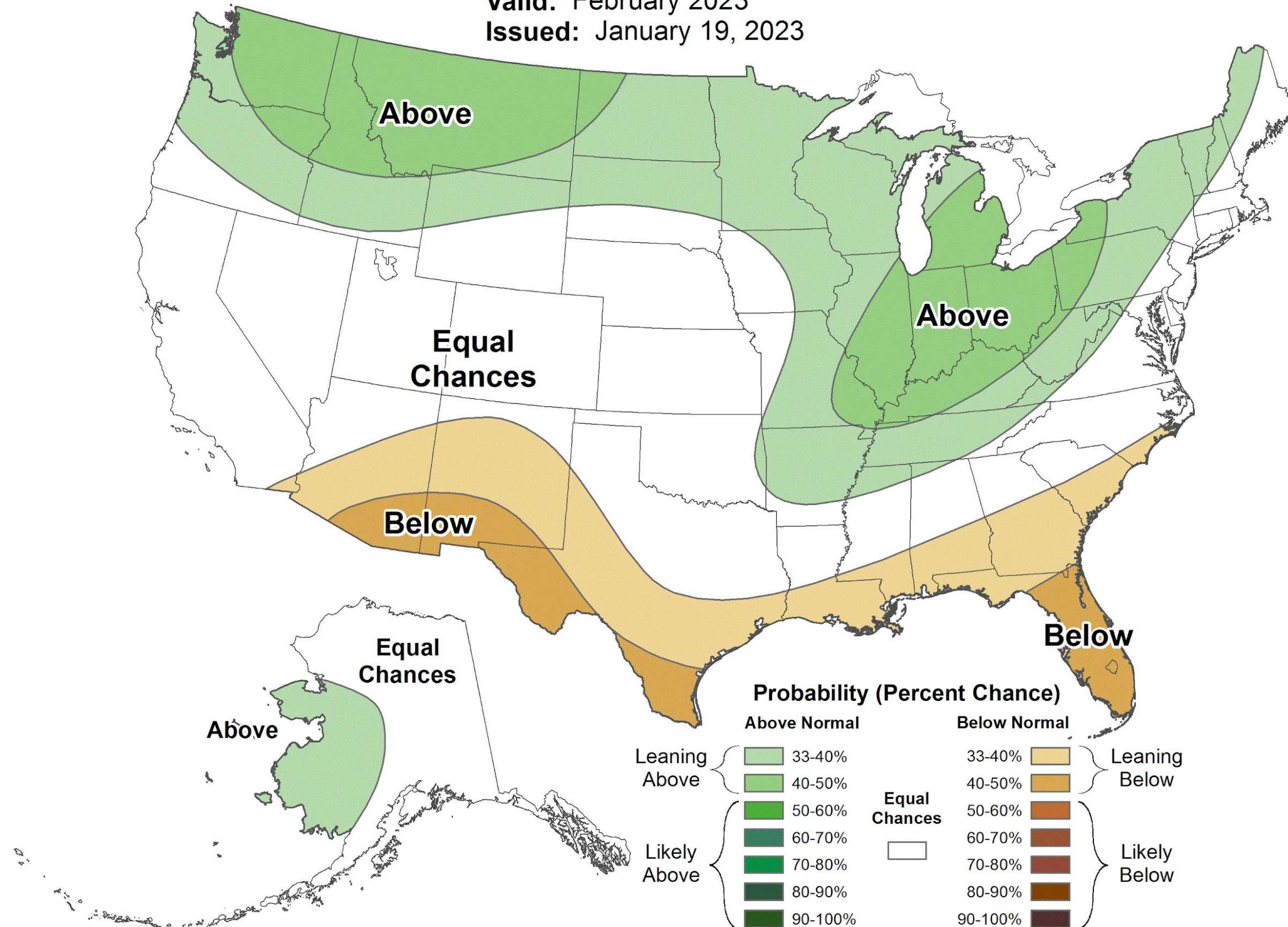
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Hanford, CA
Friday, January 20



Monthly Precipitation Outlook



Valid: February 2023
Issued: January 19, 2023





Atmospheric Rivers: What are they?

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Friday, January 20

Lets watch this short video:

<https://www.youtube.com/watch?reload=9&v=NULrvr8pTBg>

Quick Facts

On average, about 30-50% of annual precipitation in the west coast states occurs in just a few AR events, thus contributing to water supply.

In the strongest cases ARs can create major flooding when they make landfall and stall over an area.

ARs move with the weather and are present somewhere on the Earth at any given time.

On average, ARs are 400-600 km wide.

ARs are a default feature in the entire global water cycle, and are tied closely to both water supply and flood risks, particularly in the Western U.S.

A well-known example of a type of strong AR that can hit the U.S. West Coast is the "Pineapple Express," due to their apparent ability to bring moisture from the tropics near Hawaii to the U.S. west coast.

Improved understanding of ARs and their importance has come from more than a decade of scientific studies using new satellite, radar, aircraft & other observations & major weather model improvements.

The science behind atmospheric rivers

An atmospheric river (AR) is a flowing column of condensed water vapor in the atmosphere responsible for producing significant levels of rain and snow, especially in the Western United States. When ARs move inland and sweep over the mountains, the water vapor rises and cools to create heavy precipitation. Though many ARs are weak systems that simply provide beneficial rain or snow, some of the larger, more powerful ARs can create extreme rainfall and floods capable of disrupting travel, inducing mudslides and causing catastrophic damage to life and property. Visit www.research.noaa.gov to learn more.

A strong AR transports an amount of water vapor roughly equivalent to 7.5–15 times the average flow of water at the mouth of the Mississippi River.

ARs are a primary feature in the entire global water cycle and are tied closely to both water supply and flood risks, particularly in the Western U.S.

On average, about 30–50% of annual precipitation on the West Coast occurs in just a few AR events and contributes to the water supply — and flooding risk.

ARs move with the weather and are present somewhere on Earth at any given time.

ARs are approximately 250–375 miles wide on average.

Scientists' improved understanding of ARs has come from roughly a decade of scientific studies that use observations from satellites, radar and aircraft as well as the latest numerical weather models. More studies are underway, including a 2015 scientific mission that added data from instruments aboard a NOAA ship.

WATER
VAPOR
COOLS

CALIFORNIA

Image not to scale.



Wet start to 2023

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Hanford, CA
Friday, January 20

Breakdown of Water Year 2023 over California

California Atmospheric Rivers	
Strength	Number of ARs
Weak	4
Moderate	10
Strong	4
Extreme	1
Exceptional	0
Total	19



CW3E
Center for Western Weather
and Water Extremes

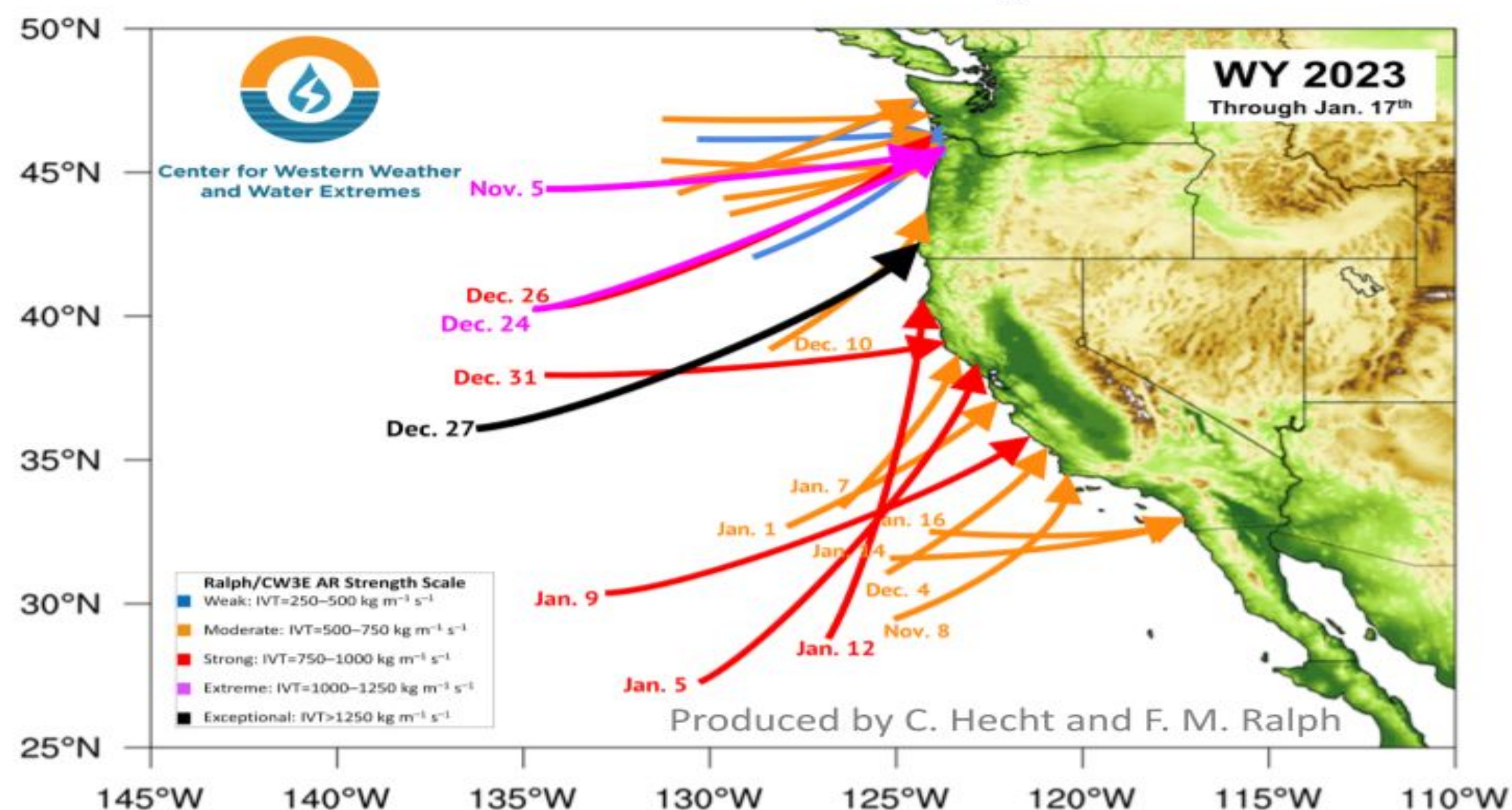
*Arrows are placed on the map where each AR was strongest over the coast

Water Year 2023 Through January 17th

Breakdown by Strength	
Strength	Number of ARs
Weak	3
Moderate	13
Strong	5
Extreme	2
Exceptional	1
Total	24

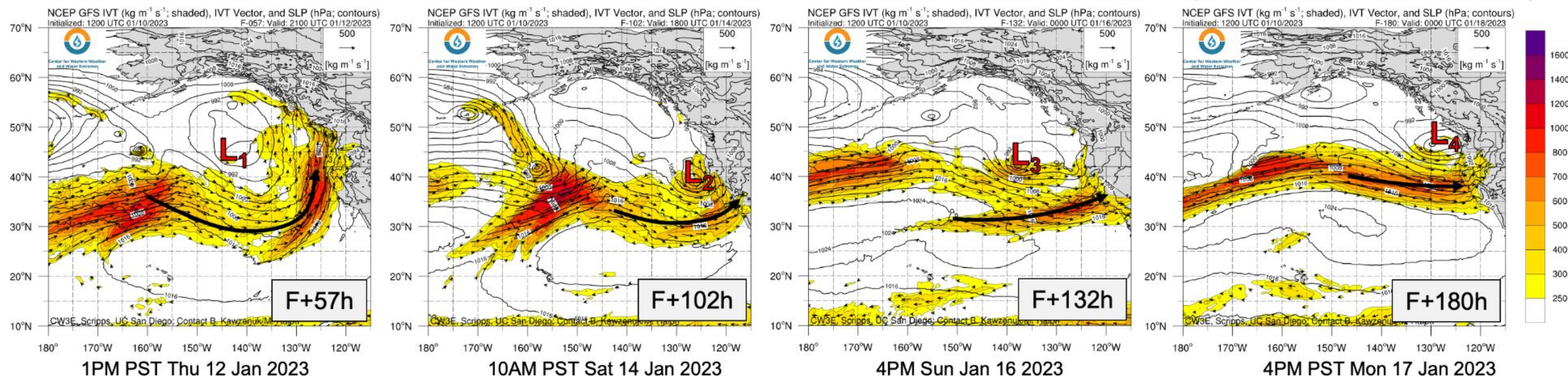
Breakdown by Region	
Region	Times Impacted
Washington	18
Oregon	20
N. California	17
C. California	15
S. California	10

24 atmospheric rivers made landfall over the U.S. West Coast between October 1st 2022 and January 17th 2023



CW3E AR Outlook: 10 January 2023

NCEP GFS Model IVT and SLP Forecast (initialized 1200 UTC 10 January 2023)



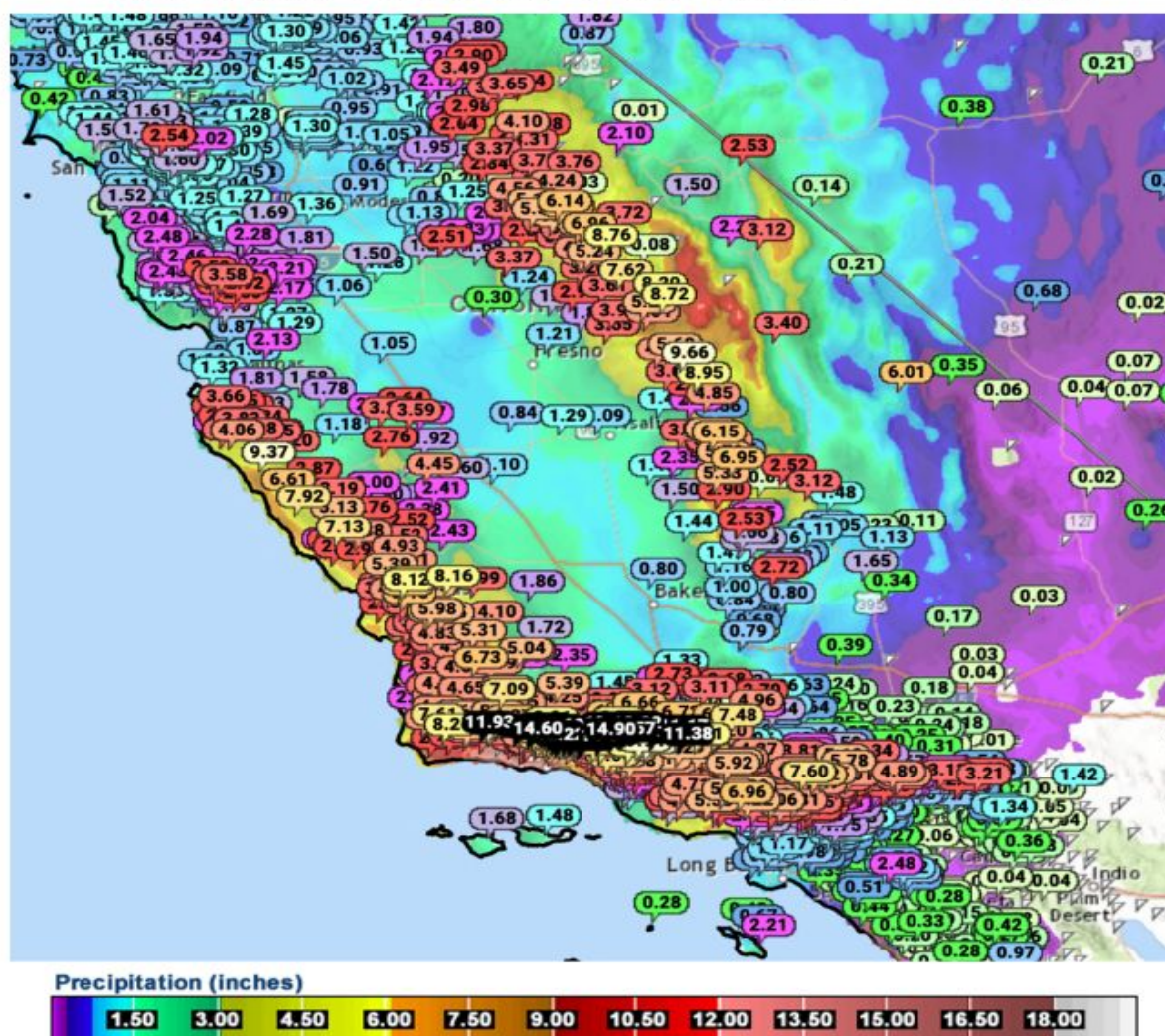
Four Atmospheric Rivers are forecast to make landfall over U.S. West Coast over the next week

- The first AR is forecast to make landfall around 7 AM 11 January, bringing moderate-to-strong southerly AR conditions to coastal locations across Northern CA, OR, & WA
- The second AR is forecast to make landfall over the Central CA coast around 1 AM on the 14th, bringing moderate AR conditions to coastal points south of Monterey
- A third AR is then forecast to make landfall over a similar location to the second at ~7AM on the 15th
- The large-scale flow regime is then forecast to shift northward and a fourth, moderate-to-strong, AR is forecast to make landfall over Northern CA at ~10 AM on the 17th

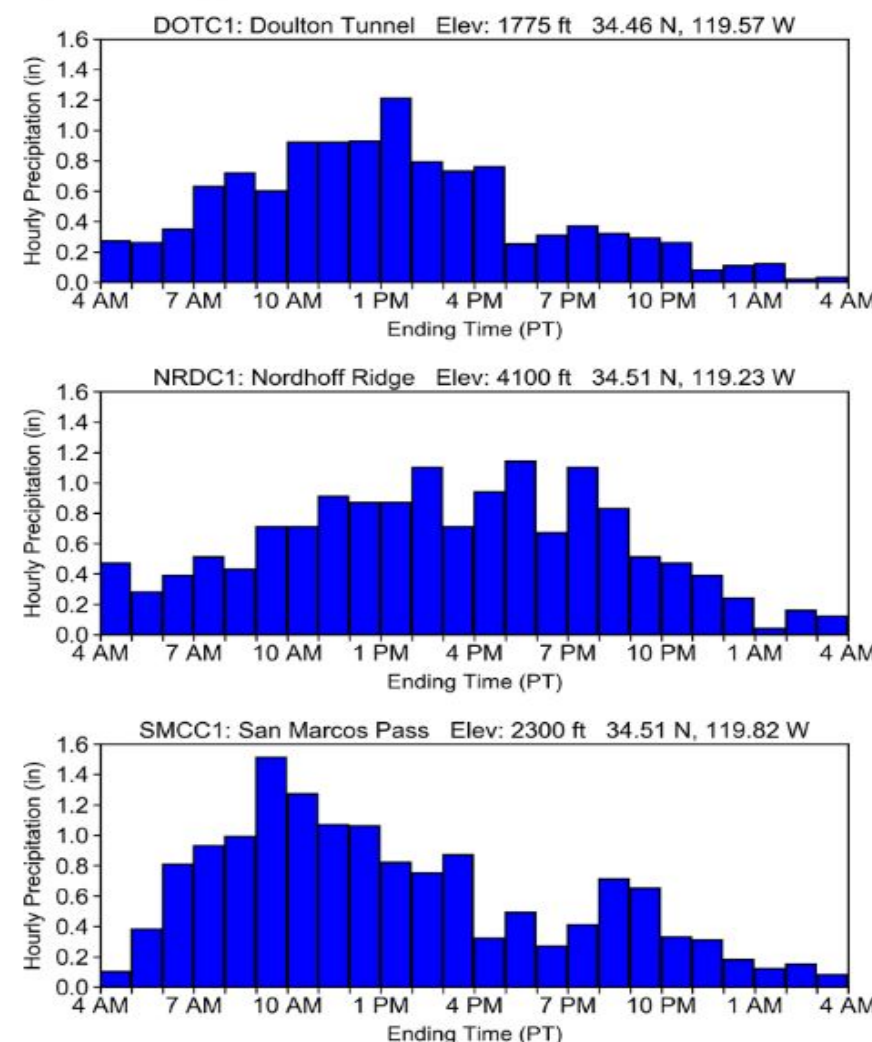
CW3E AR Outlook: 10 January 2023

Observed & Forecast Precipitation from the Ongoing Storm

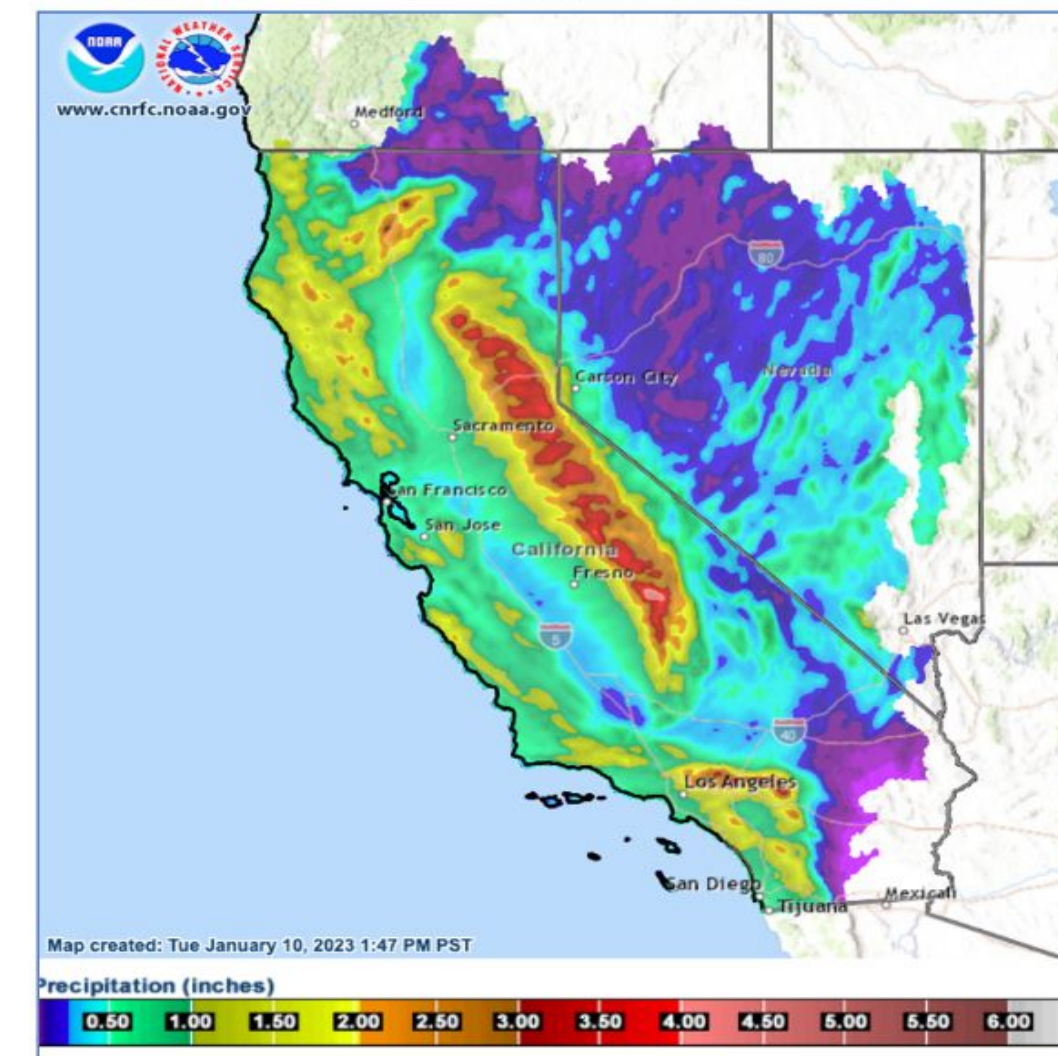
CNRFC 24-h QPE: Valid 4 AM PT 10 Jan



Hourly Precipitation: Valid 4 AM PT 9–10 Jan



CNRFC 24-h QPF Valid 4 AM PT 11 Jan



- This storm produced at least 4–8 inches of precipitation in a 24-hour period over the Southern Sierra Nevada, Central California Coast Ranges, and eastern Transverse Ranges
- Some locations in the mountains of Santa Barbara and Ventura Counties received more than 10 inches of precipitation, with sustained hourly rainfall rates in excess of 0.50 inches/hour
- An additional 2–4 inches of precipitation are expected by Wednesday morning in the Sierra Nevada, with 1–3 inches expected in the California Coast Ranges, Transverse Ranges, and Peninsular Ranges



Snow levels

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Hanford, CA
Friday, January 20

- Snow levels depends on temperature
- Available moisture
- Winds

[National Snow Analyses - NOHRSC - The ultimate source for snow information \(noaa.gov\)](#)

[Interactive Map \(usda.gov\)](#)

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Tehachapi Pass

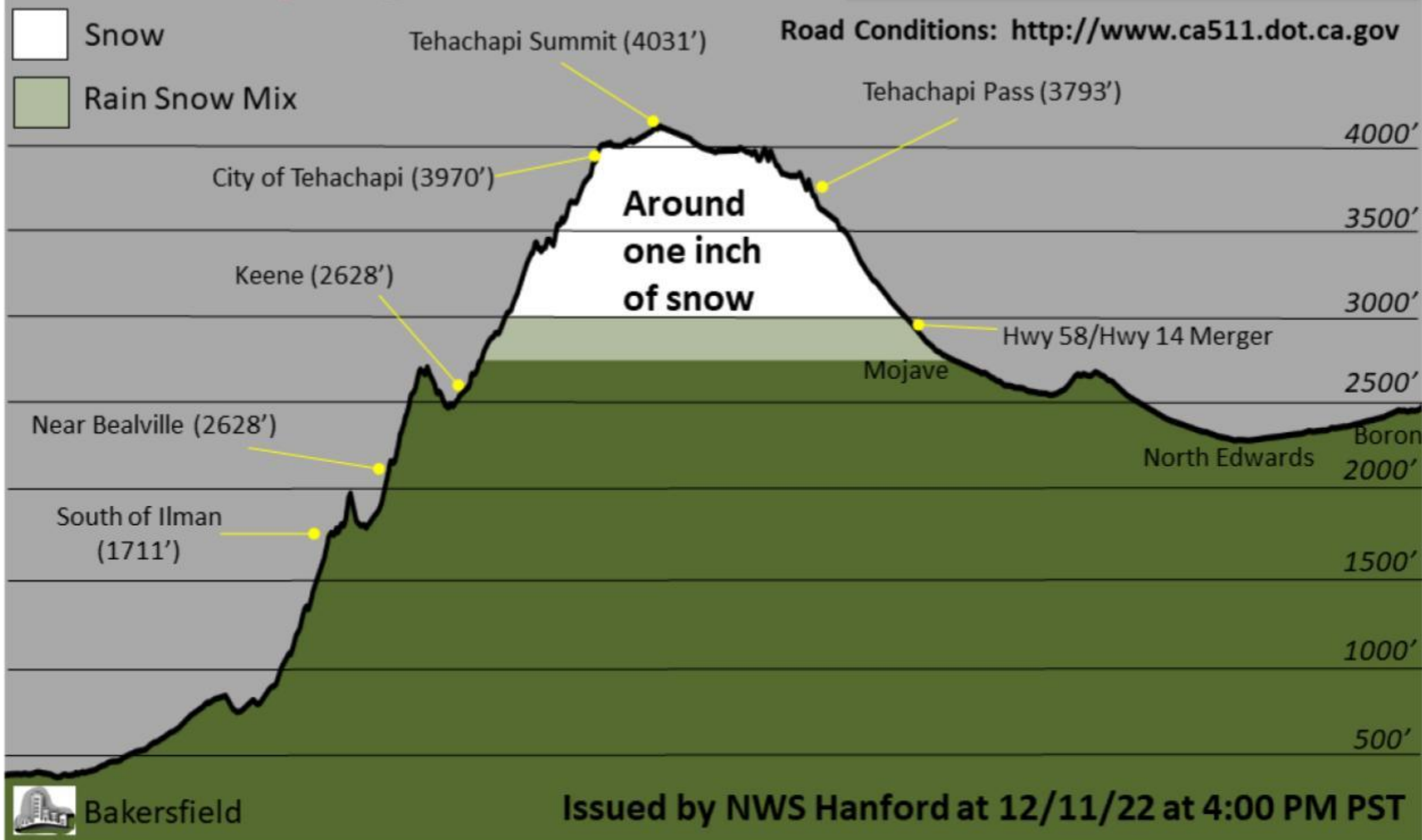


Snow Forecast Highway 58 Elevation Profile



When: This evening into Monday afternoon

Impacts: Motorists should prepare for slick, icy roads. Travel delays are possible.

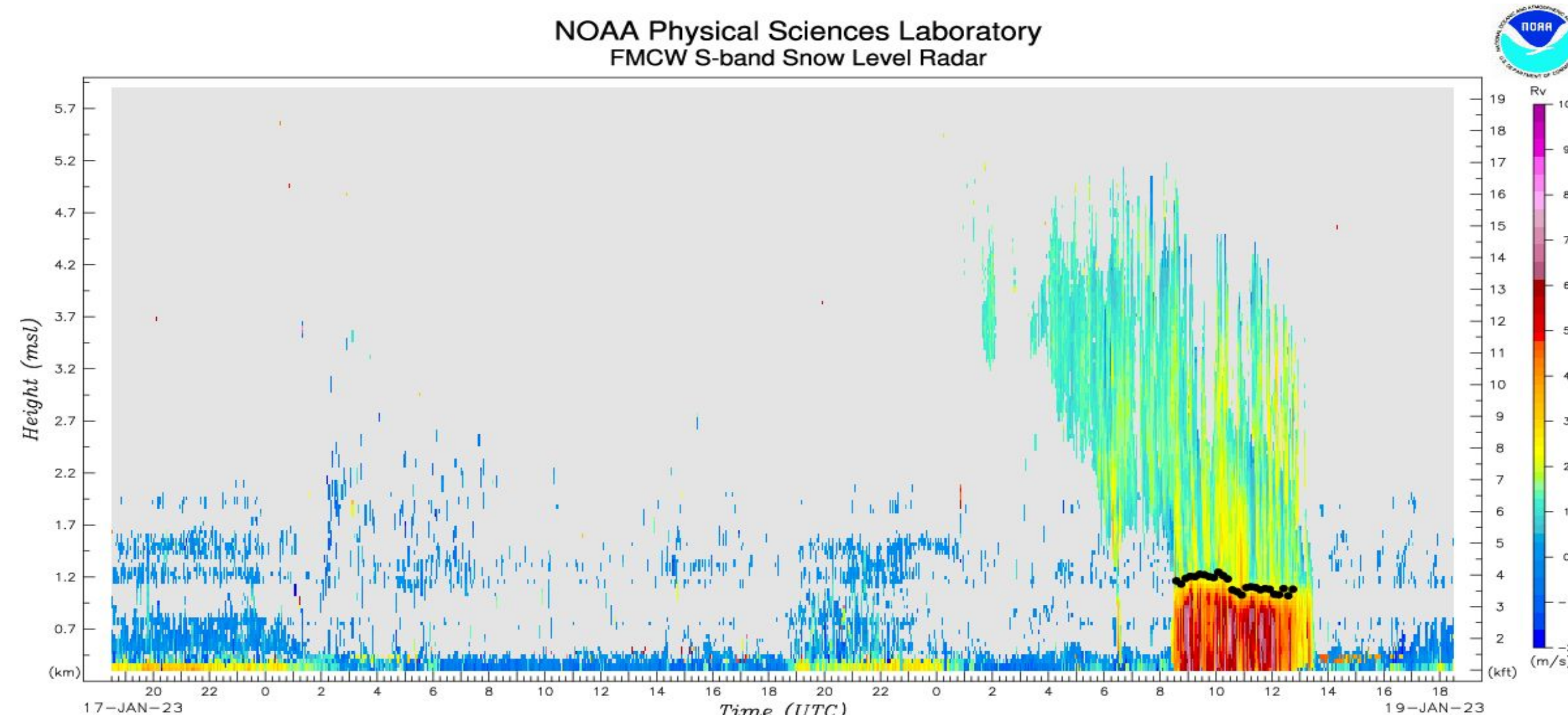




Snow levels example

Weather Forecast Office
Hanford, CA
Friday, January 20

NOAA Physical Sciences Laboratory FMCW S-band Snow Level Radar



New Exchequer Dam, CA (NER)
37.5972 N, 120.2775 W, 259 m

• Snow Level

Time (UTC)	1900	2000	2100	2200	2300	00 0	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800
Snow Level (m)	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Snow Level (ft)	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Sfc Temp (C)	85.91	89.58	86.91	84.01	78.89	83.03	82.67	83.90	85.39	88.07	90.23	91.50	93.61	93.72	93.07	93.20	92.87	91.45	90.20	88.13	86.30	84.33	76.33	65.89

Time (UTC)	1900	2000	2100	2200	2300	00 0	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800
Snow Level (m)	none	none	none	none	none	none	none	none	none	none	none	none	none	none	1195	1209	1087	1079	1051	none	none	none	none	none
Snow Level (ft)	none	none	none	none	none	none	none	none	none	none	none	none	none	none	3919	3965	3567	3540	3447	none	none	none	none	none
Sfc Temp (C)	73.34	74.23	72.43	70.98	72.43	73.60	75.24	79.02	84.04	84.31	73.62	75.66	78.36	77.40	77.85	82.64	82.92	86.95	89.36	87.13	86.09	85.10	85.18	83.97



Are the recent rains helping to end the drought?

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Hanford, CA
Friday, January 20

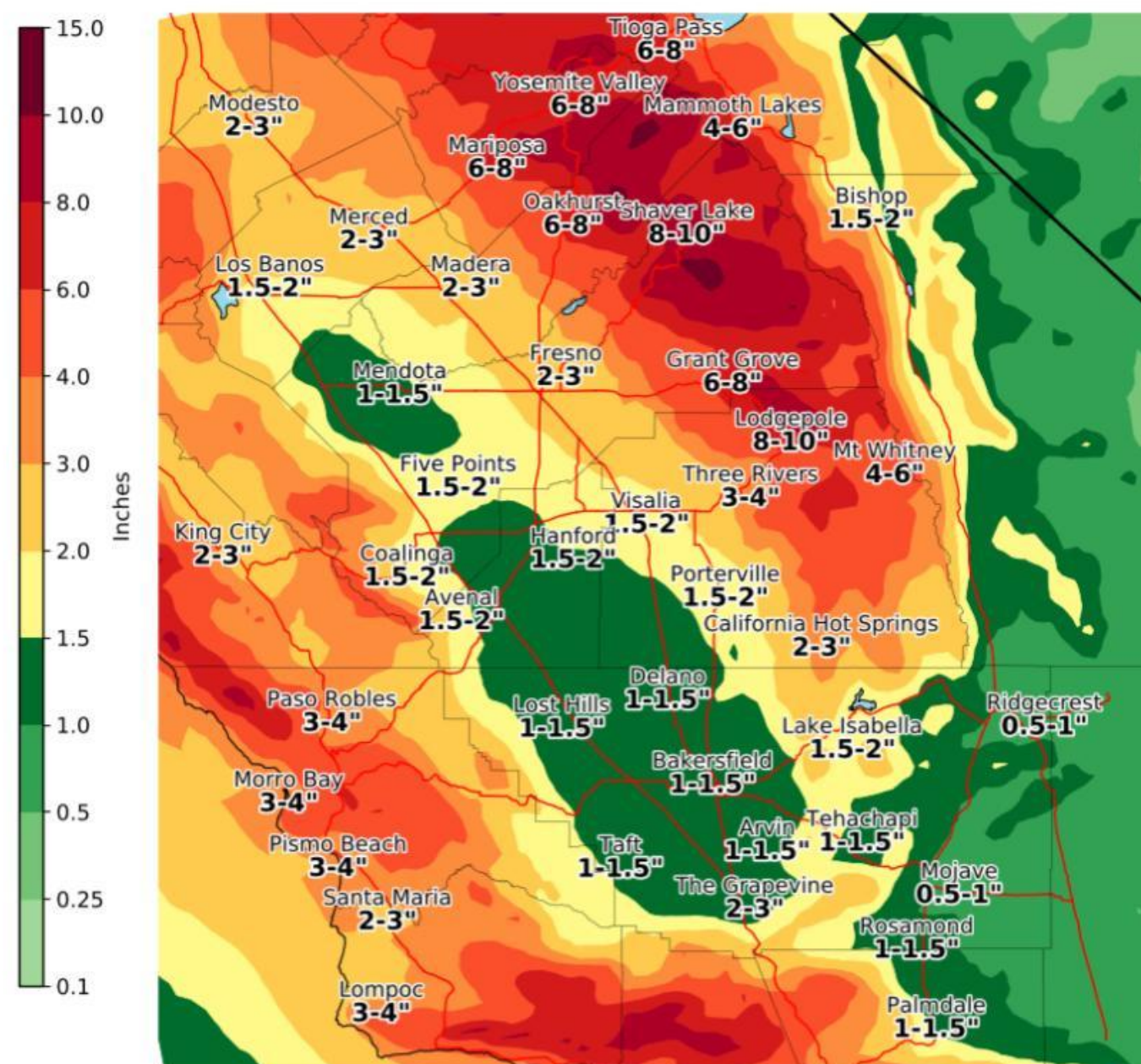


Projected Rain Totals Monday Through Tuesday Night

Weather Forecast Office
Hanford, CA
Monday, January 9

Projected Rainfall Amounts

Valid: 01/08/2023 10:00 PM - 01/10/2023 10:00 PM PST



Location Rain Totals:

Merced: 2-3 inches

Madera: 2-3 inches

Oakhurst: 6-8 inches

Mariposa: 6-8 inches

Particular Wording in the Excessive Rainfall Outlook Discussion:

"[...] Impacts from flash flooding or more rapid inundation will become increasingly likely – especially across the several burn scars since 2020."



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(559) 584-3752



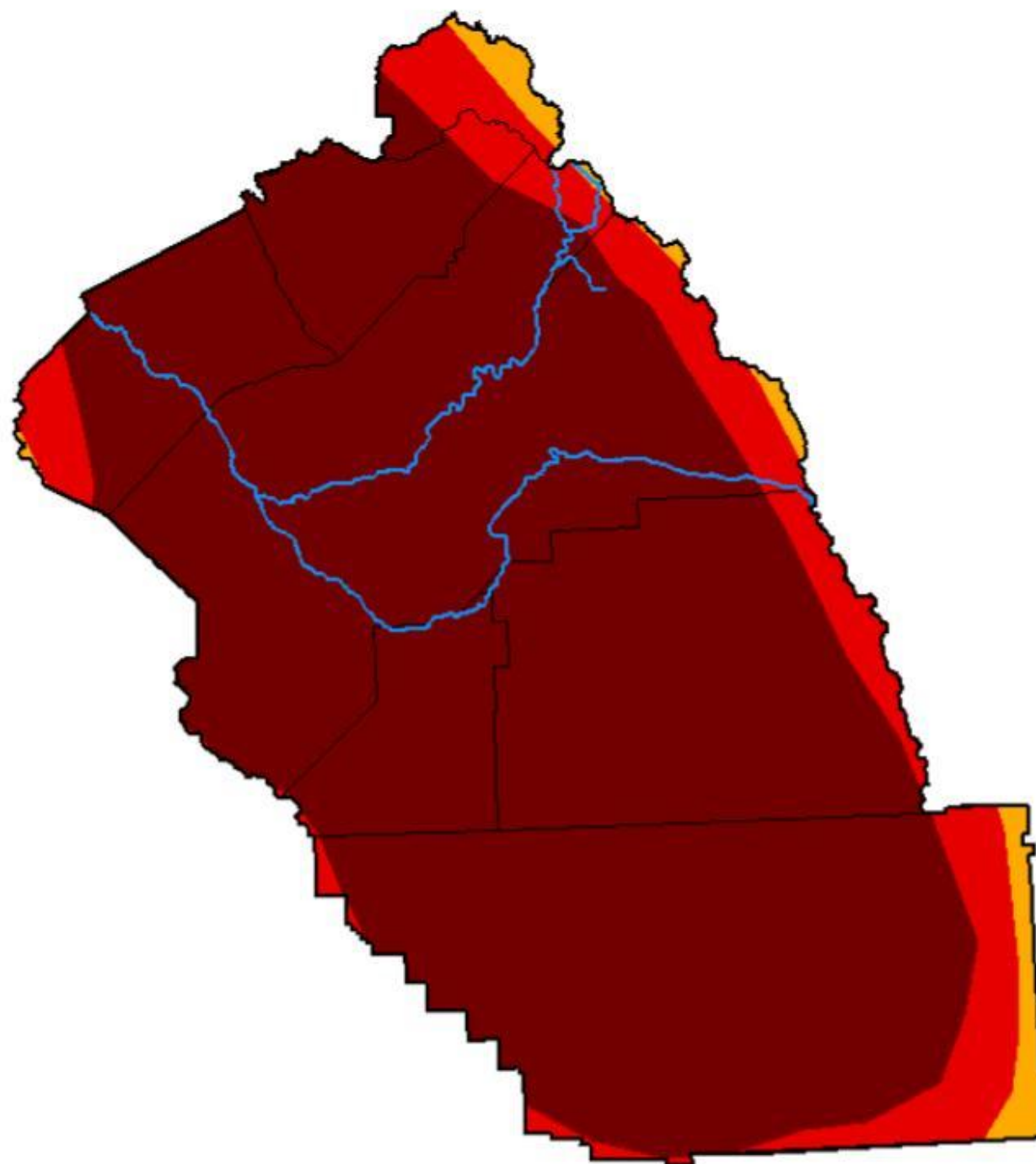
weather.gov/hanford



Hanford, CA Current Drought Conditions

Weather Forecast Office
Hanford, CA
Monday, November 14

U.S. Drought Monitor Hanford, CA WFO



November 8, 2022

(Released Thursday, Nov. 10, 2022)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	97.55	85.95
Last Week 11-01-2022	0.00	100.00	100.00	100.00	97.55	85.95
3 Months Ago 08-09-2022	0.00	100.00	100.00	100.00	95.85	85.87
Start of Calendar Year 01-04-2022	0.00	100.00	100.00	96.37	16.19	0.00
Start of Water Year 09-27-2022	0.00	100.00	100.00	100.00	97.55	85.95
One Year Ago 11-09-2021	0.00	100.00	100.00	100.00	100.00	95.24

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

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National Drought Mitigation Center



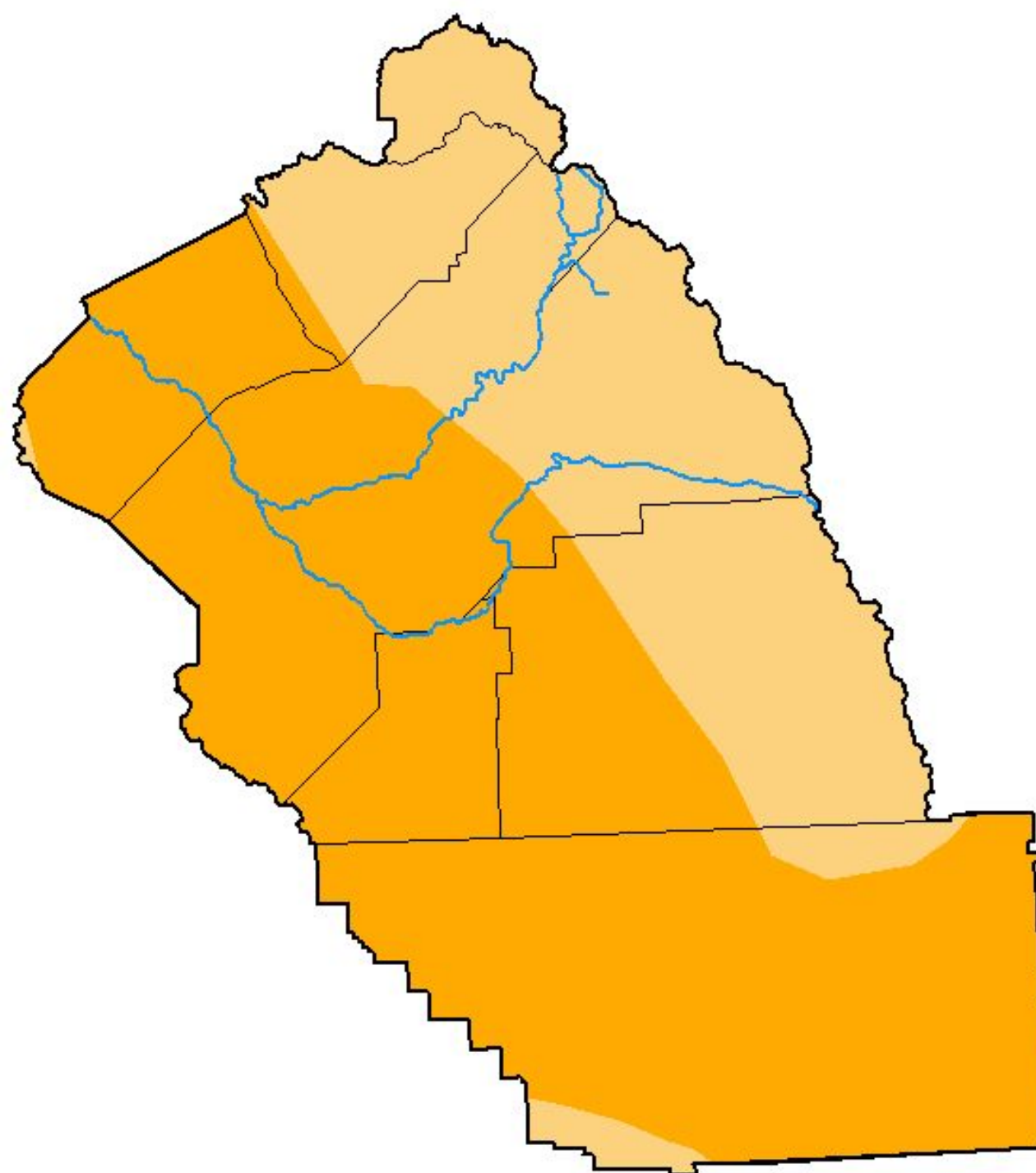
droughtmonitor.unl.edu



Hanford, CA Current Drought Conditions

Weather Forecast Office
Hanford, CA
Friday, January 20

U.S. Drought Monitor Hanford, CA WFO



January 17, 2023

(Released Thursday, Jan. 19, 2023)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	64.91	0.00	0.00
Last Week 01-10-2023	0.00	100.00	100.00	65.93	0.00	0.00
3 Months Ago 10-18-2022	0.00	100.00	100.00	100.00	97.55	85.95
Start of Calendar Year 01-03-2023	0.00	100.00	100.00	88.26	63.71	0.00
Start of Water Year 09-27-2022	0.00	100.00	100.00	100.00	97.55	85.95
One Year Ago 01-18-2022	0.00	100.00	100.00	96.26	0.00	0.00

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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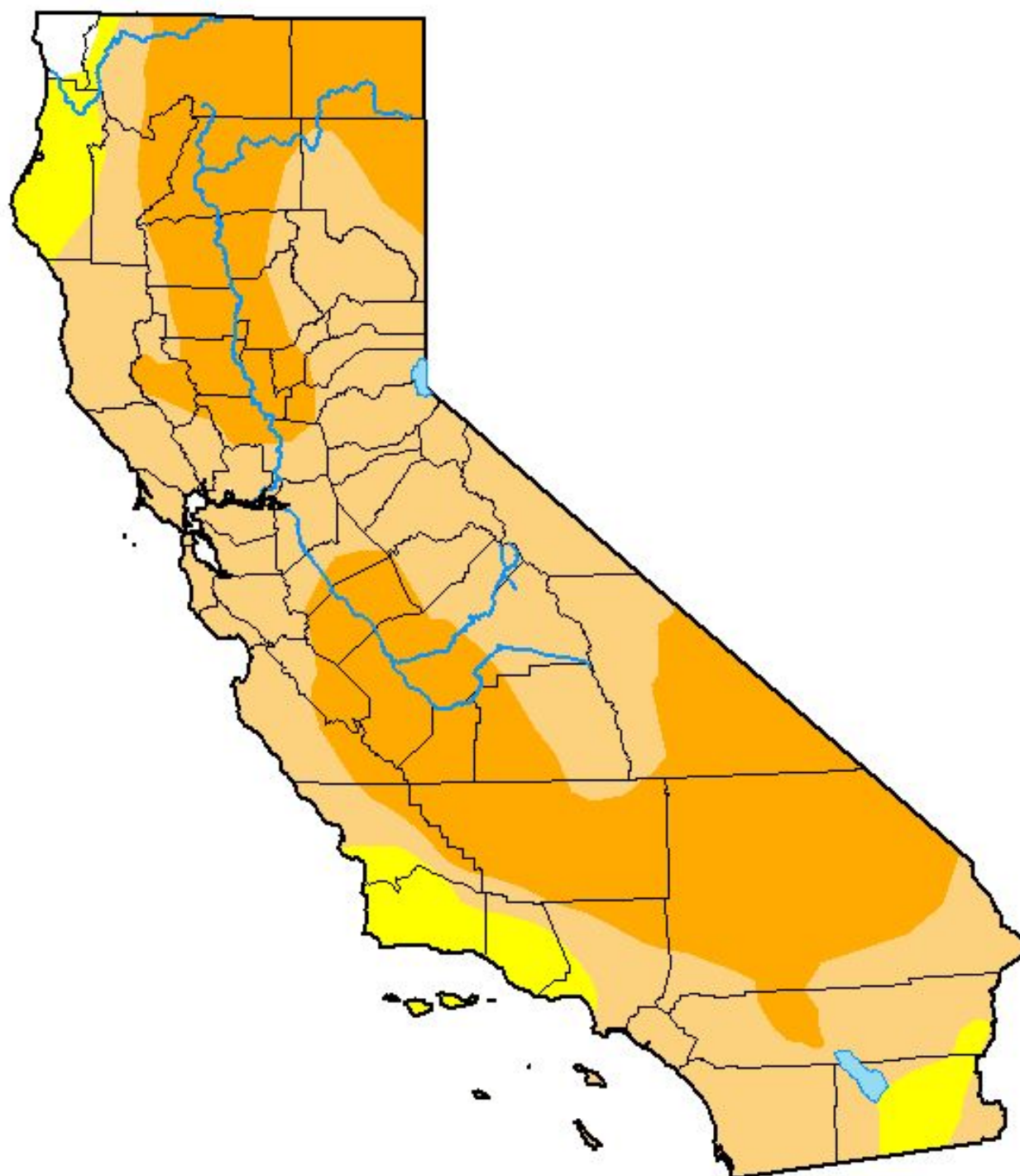
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California Current Drought Conditions

Weather Forecast Office
Hanford, CA
Friday, January 20

U.S. Drought Monitor California



January 17, 2023

(Released Thursday, Jan. 19, 2023)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.64	99.36	92.12	42.84	0.00	0.00
Last Week <i>01-10-2023</i>	0.00	100.00	95.38	46.00	0.32	0.00
3 Months Ago <i>10-18-2022</i>	0.00	100.00	99.77	91.83	40.91	16.57
Start of Calendar Year <i>01-03-2023</i>	0.00	100.00	97.93	71.14	27.10	0.00
Start of Water Year <i>09-27-2022</i>	0.00	100.00	99.76	94.01	40.91	16.57
One Year Ago <i>01-18-2022</i>	0.00	100.00	99.25	66.39	1.39	0.00

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

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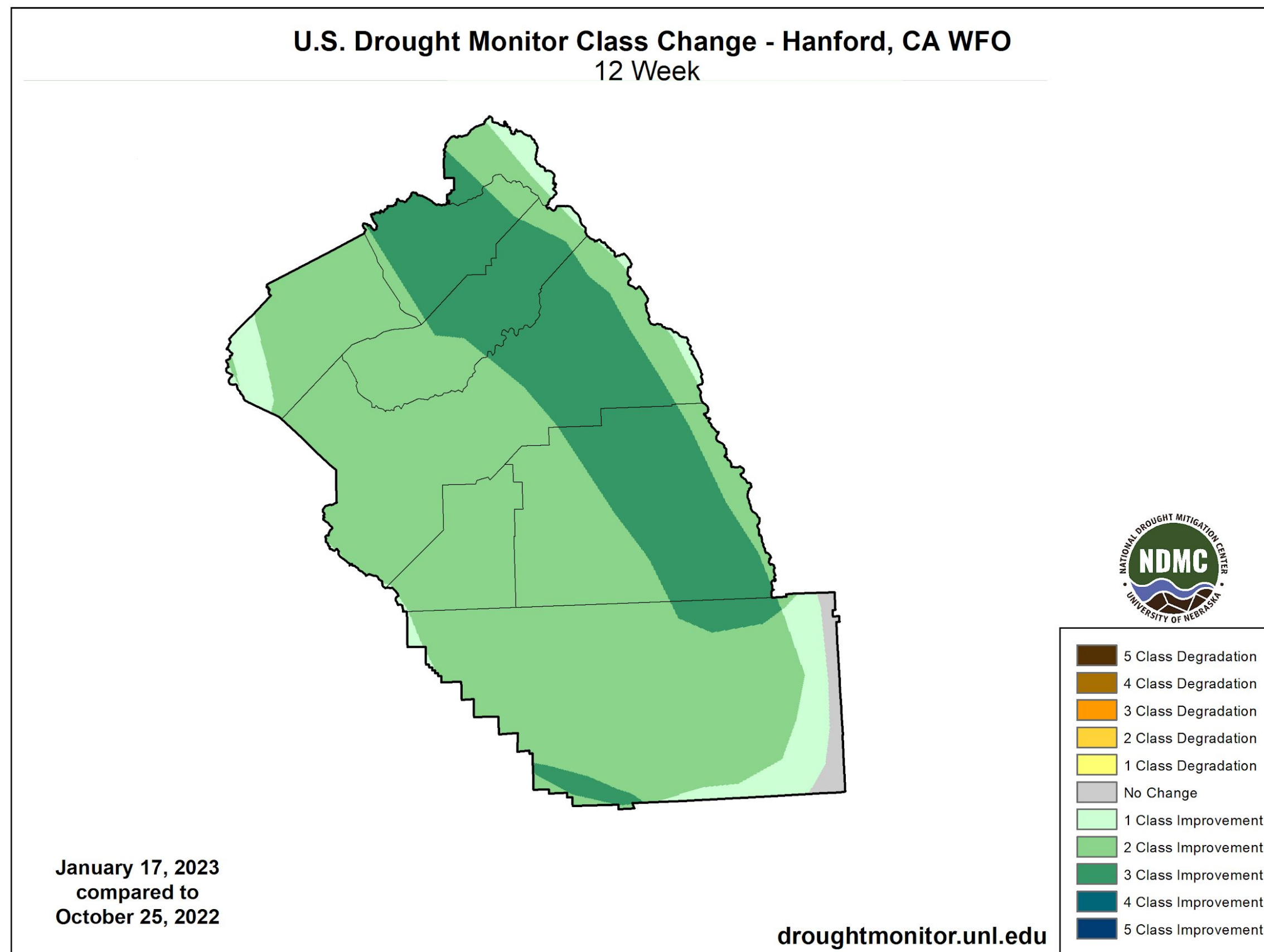


droughtmonitor.unl.edu



Hanford, CA 12 Week Drought Change

Weather Forecast Office
Hanford, CA
Friday, January 20





Social media posts/flooding at Madera

Weather Forecast Office
Hanford, CA
Friday, January 20

Brittany Jacob on Twitter: "“LEAVE NOW.” An evacuation order has been issued for Bass Lake RV Resort & Sierra Springs Village due to flooding. ⚠️ There is an immediate threat to life. The area is being closed to public access. Take action immediately. !! A shelter has been set up in Oakhurst. @ABC30 <https://t.co/c153ZXWGvG>" / Twitter

Olen Hogenson KMPH on Twitter: "Heavy rain has caused extreme flash flooding in Madera county. This is willow creek near bass lake, California.@KMPHFOX26 <https://t.co/ED8y6hYR1g>" / Twitter





Questions?

Weather Forecast Office
Hanford, CA
Friday, January 20

**If you have questions, or want to be added
to partner email list, please contact:**

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Felix.Castro@noaa.gov**

**A Forecaster can be reached 24/7
 (559) 584-9051 or nws.hanford@noaa.gov**