Week Ahead Forecast December 20, 2021

Hi Folks,

Let's start with our background conditions. Over the past week, much of the state has seen significant precipitation as shown in Figure 1 which is a map of observed precipitation provided by the National Weather Service California Nevada River Forecast Center (CNRFC). Note the scale goes up to 13 inches, but highest observed amounts are around 8 to 9 inches in the Sierra Nevada around and in Yosemite National Park.

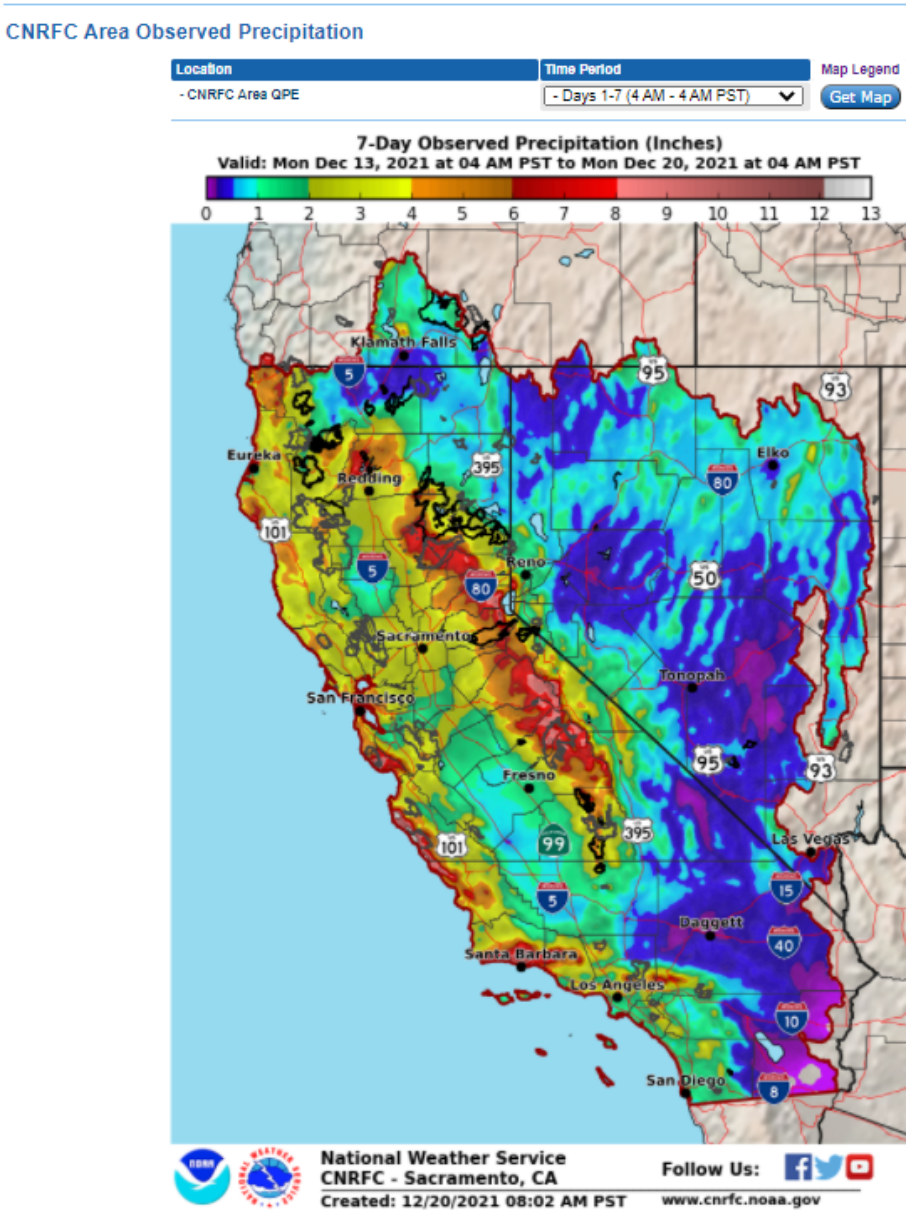

Figure 1. CNRFC map of past seven days' observed precipitation.

December is the first month we typically see the beginning of the seasonal snowpack development and this year, conditions started slow but have caught up to near average. The California Cooperative Snow Surveys has a network of automated snow sensors which are reporting 98% of average for this time of year. Daily summary reports can be found at: https://cdec.water.ca.gov/reportapp/javareports?name=DLYSWEQ.

Looking ahead, the CNRFC forecast of precipitation over the next six days is shown in Figure 2. As can be seen from the map, many parts of the Sierra Nevada and North Coast will equal or exceed the amount of precipitation received over the past week. This is significant as the system is wet from previous storms.

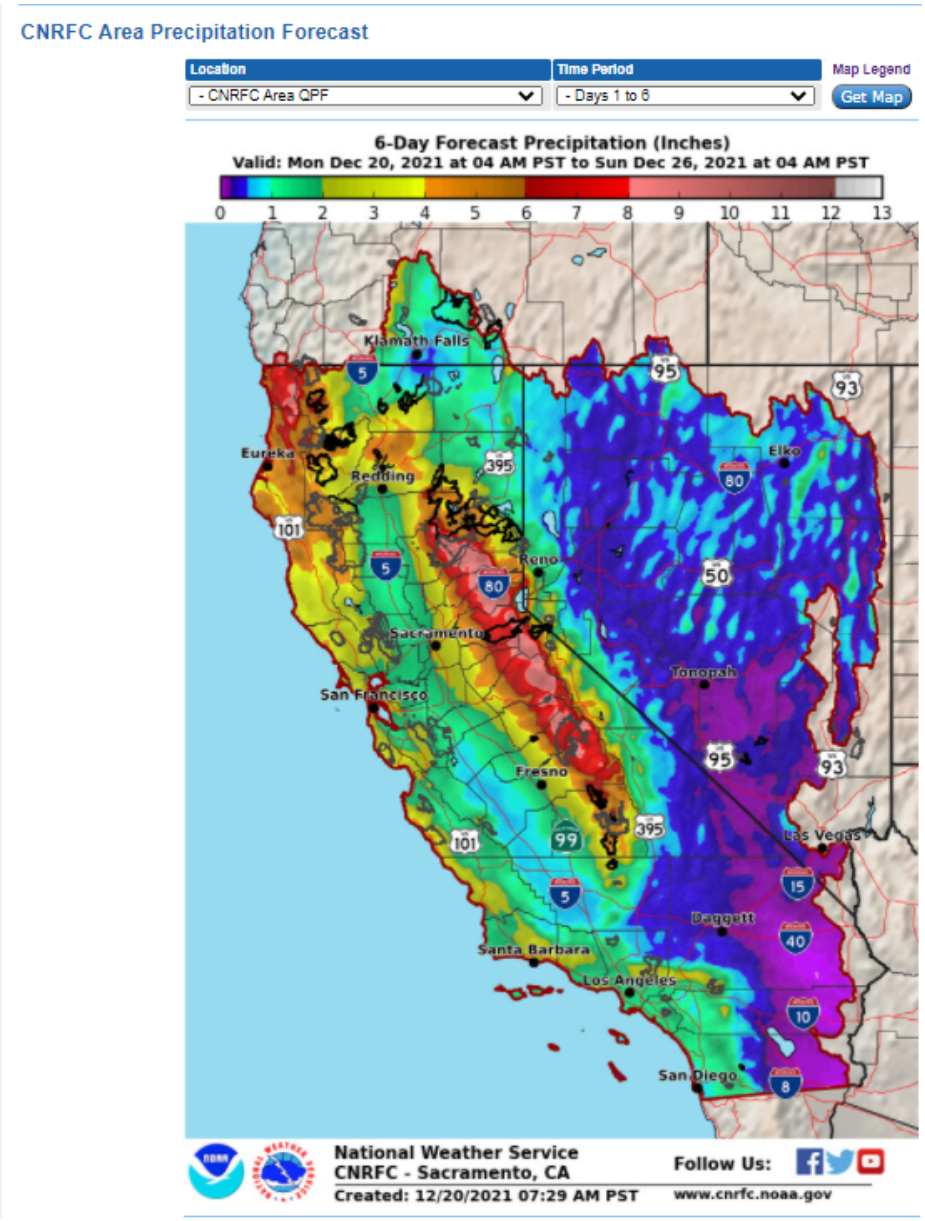

Figure 2. CNRFC map of forecast precipitation over the next six days.

Let's take a look at how the storms will come in over the next six days. Figure 3 through 8 show the CNRFC maps of daily precipitation forecasts starting with today 12/20/21 and going through Saturday 12/25/21. The North Coast is the focus of the beginning of the storm entering California with showers today and then more significant rainfall spreading across Northern California tomorrow with counties north of the Golden Gate seeing up to 2 inches. On Wednesday, the precipitation extends to near statewide with the Sierra Nevada seeing up to 3 inches. On Thursday the storm focus shifts a bit south with Southern California and the Sierra Nevada seeing the most precipitation with the highest amounts again nearing 3 inches. For Friday the next storm system moves in with the Sierra Nevada and North Coast seeing around 2 inches of precipitation. For Saturday, the storm continues with the heaviest precipitation in the Sierra Nevada.

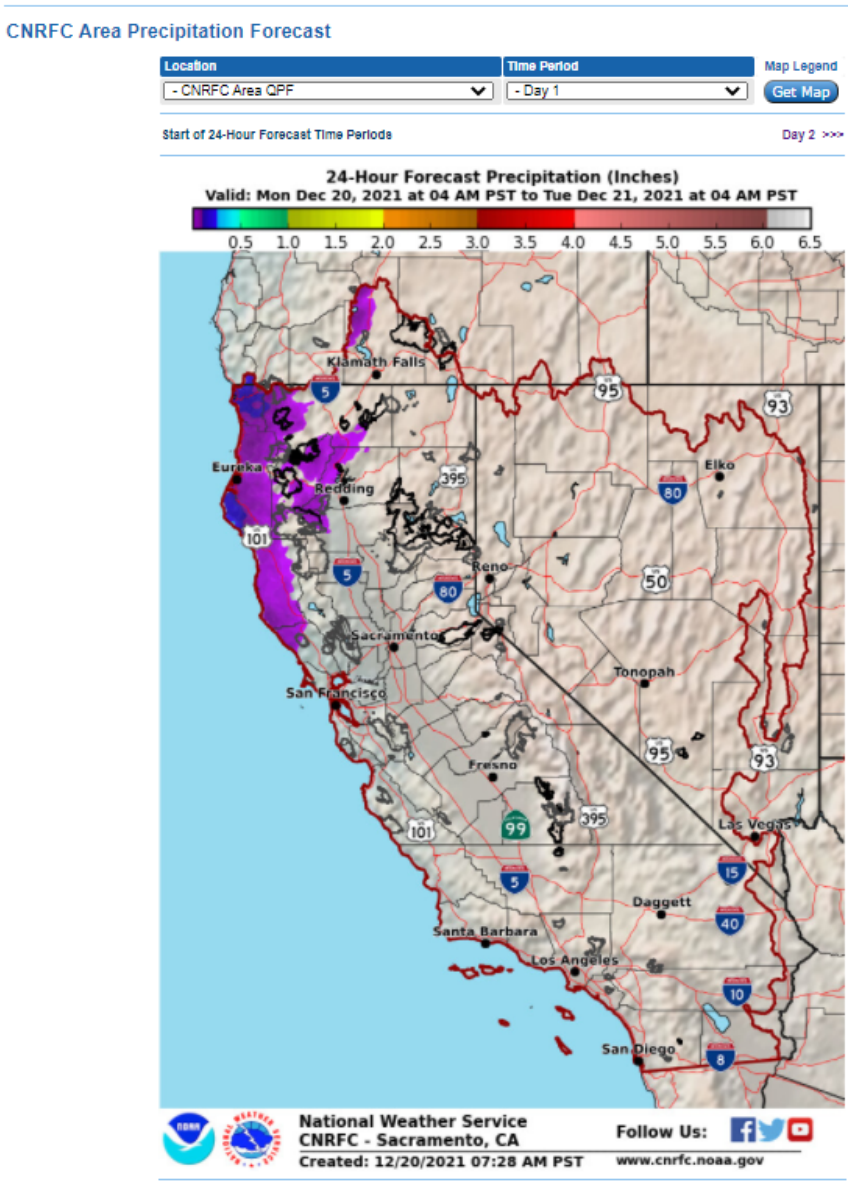

Figure 3. CNRFC map of forecast precipitation for 12/20/21.

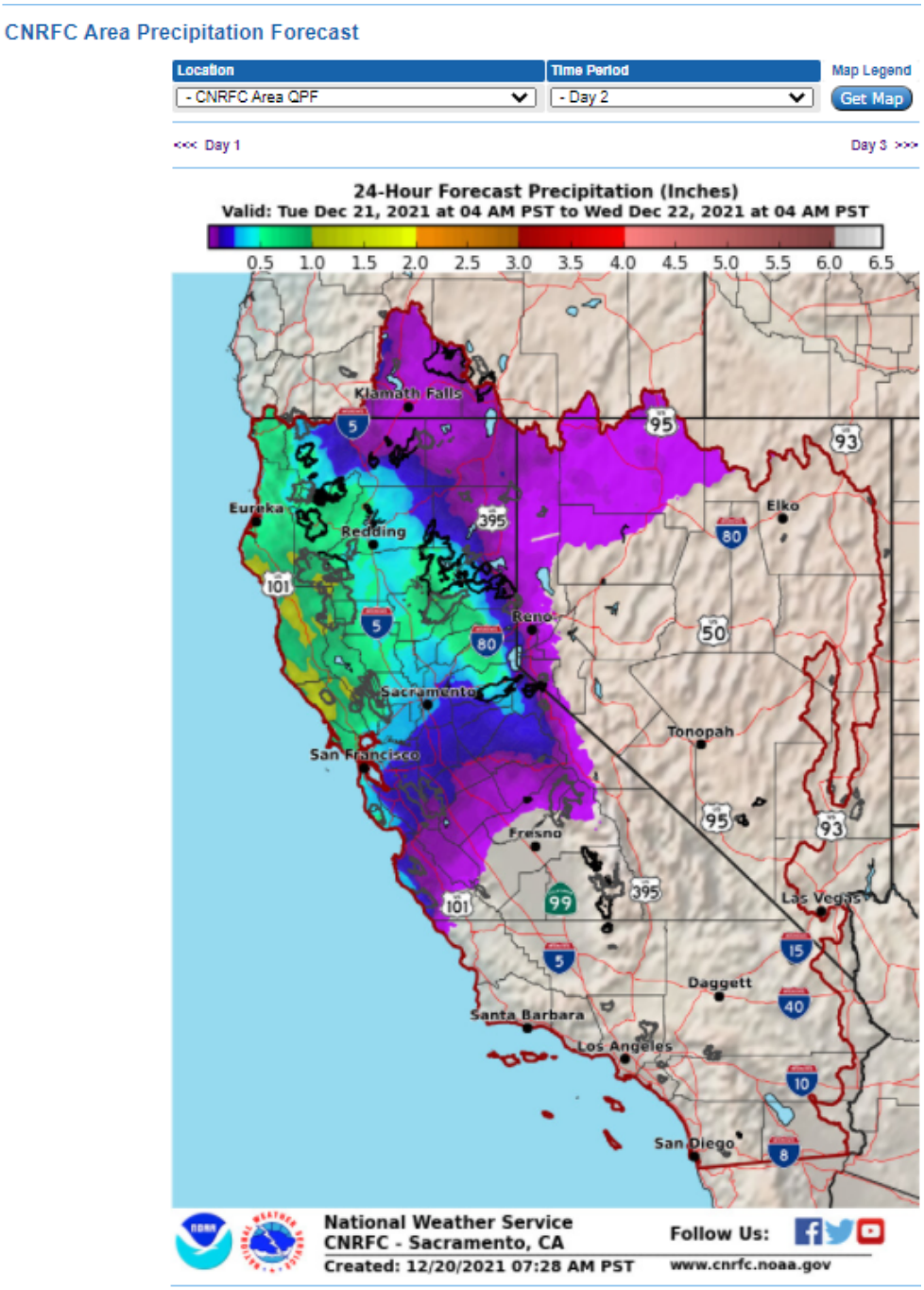

Figure 4. CNRFC map of forecast precipitation for 12/21/21.

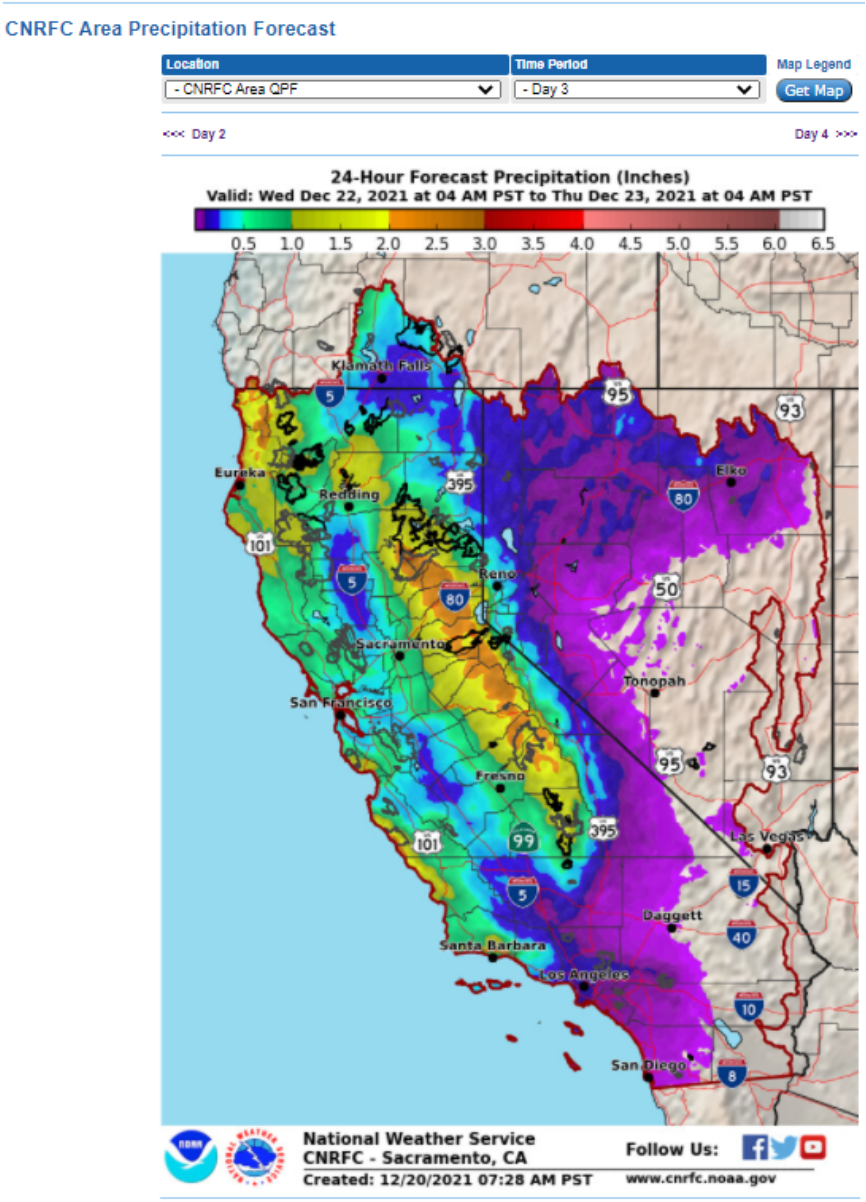

Figure 5. CNRFC map of forecast precipitation for 12/22/21.

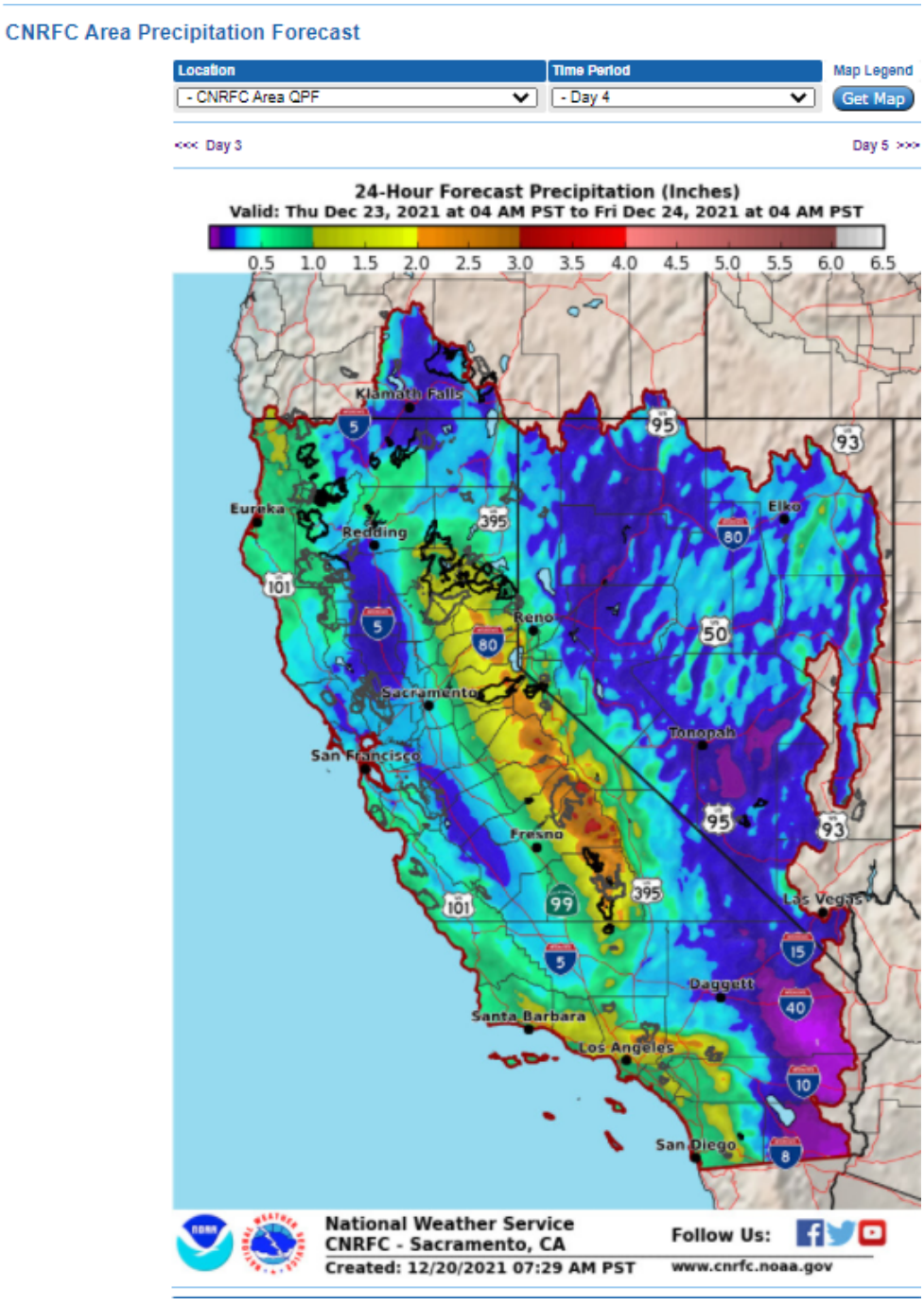

Figure 6. CNRFC map of forecast precipitation for 12/23/21.

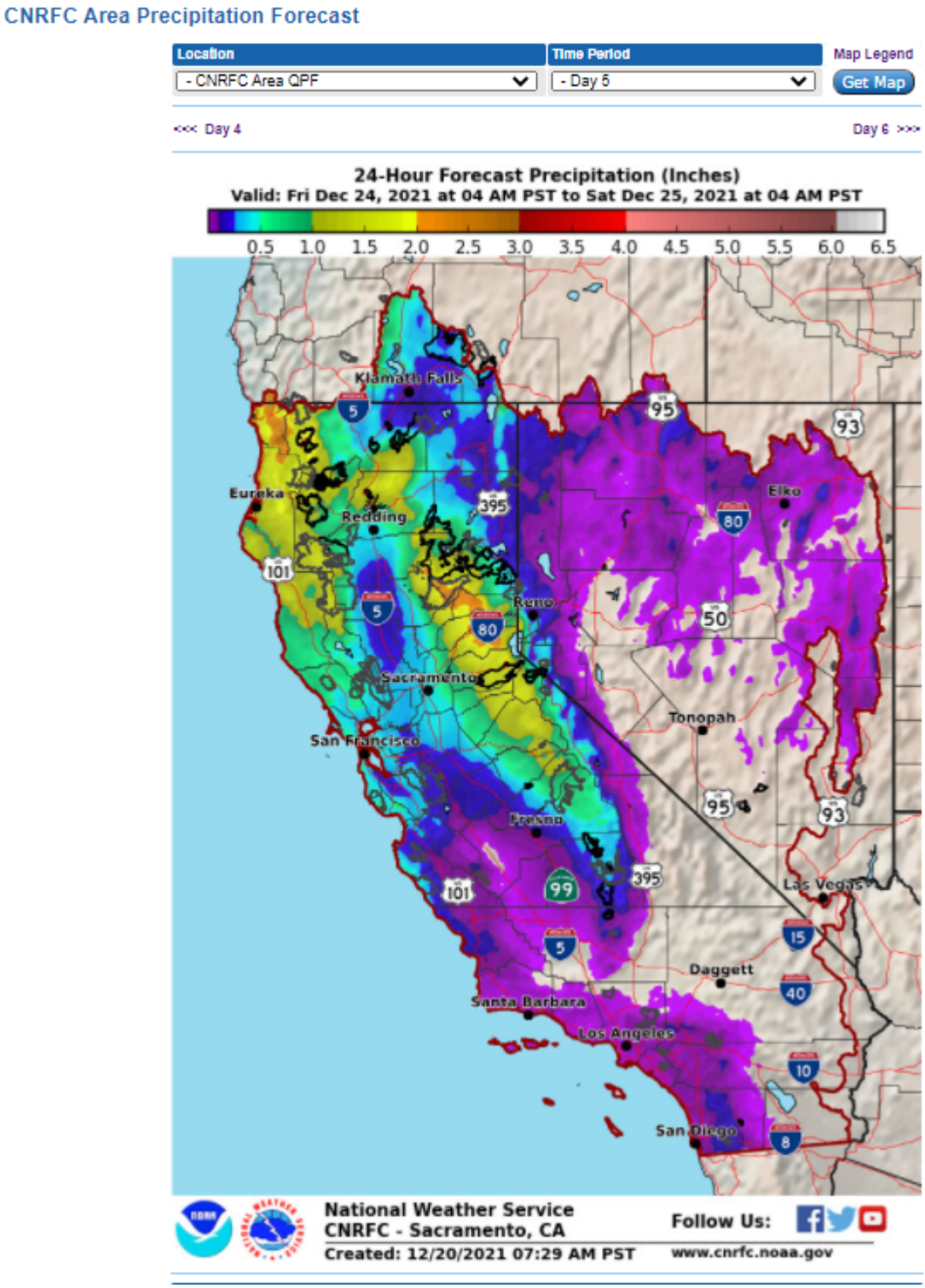

Figure 7. CNRFC map of forecast precipitation for 12/24/21.

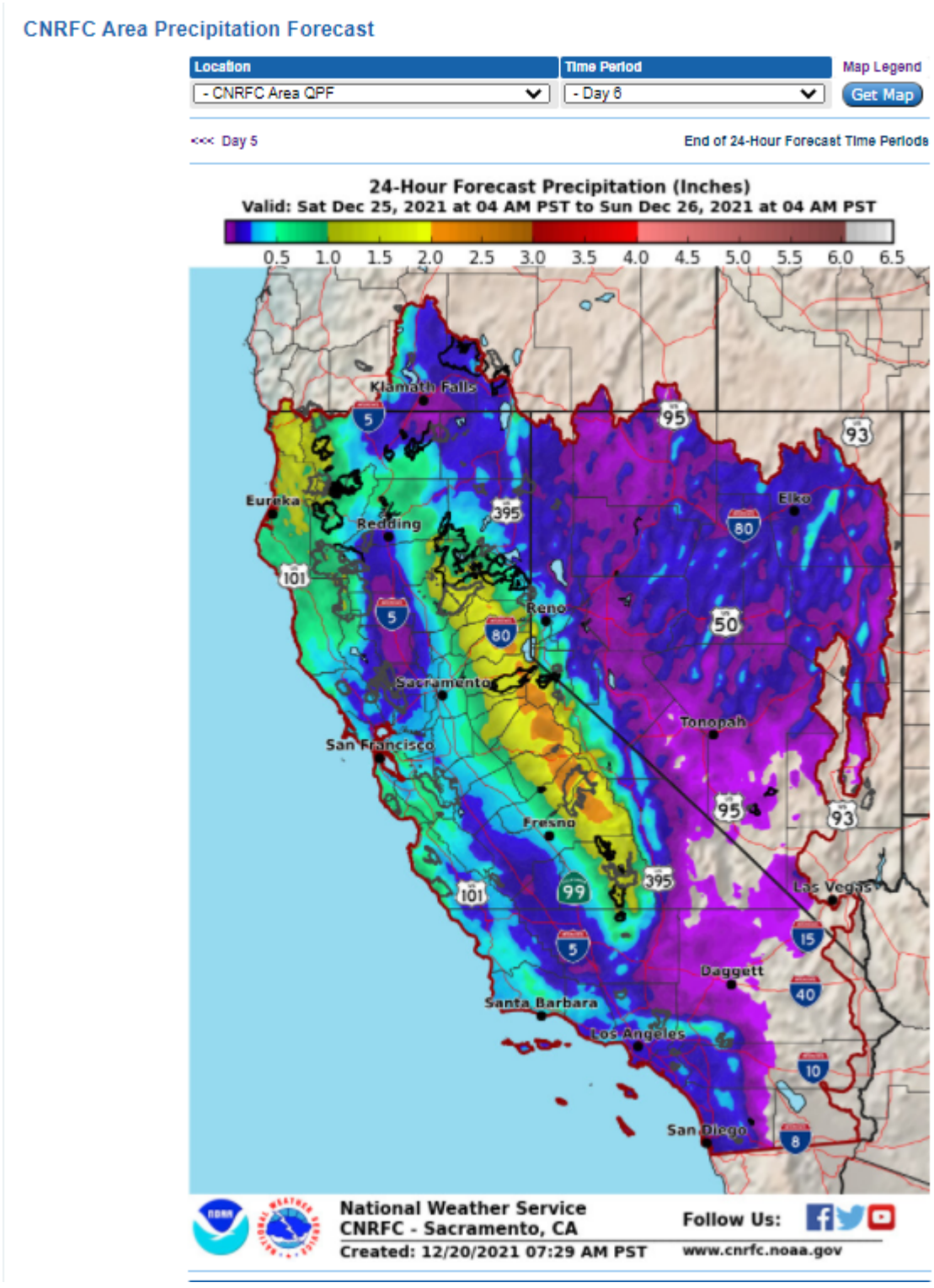

Figure 8. CNRFC map of forecast precipitation for 12/25/21.

With all of the precipitation coming in, freezing elevation (the elevation where rain turns to snow) becomes really important. The CNRFC produces rough maps of freezing elevation at: https://www.cnrfc.noaa.gov/fzlvlForecast.php?cwa=RSA&img=10. An example of a map for Wednesday at 10am is shown in Figure 9. Freezing elevations range from 5000 feet in the north part of the State to over 12,000 feet around San Diego. This would indicate that rain will be falling across most of I-80 except at the top of Donner Pass at 10am on Wednesday. For a watershed perspective of freezing elevation, the Scripps' Center for Western Weather and Water Extremes (CW3E) has an interactive map showing the freezing elevation evolution at the watershed scale at: https://cw3e.ucsd.edu/DSMaps/DS_freezing.html. The data is based on their high-resolution forecast modeling which is available with support from the Atmospheric Rivers Research Program. An example is shown in Figure 10 for the Upper Yuba. The colors of the bars show how much of the precipitation is rain, mixed, or snow with the lines above depicting the forecast freezing elevation and the ensemble range. A plot of watershed area and elevation is also shown.

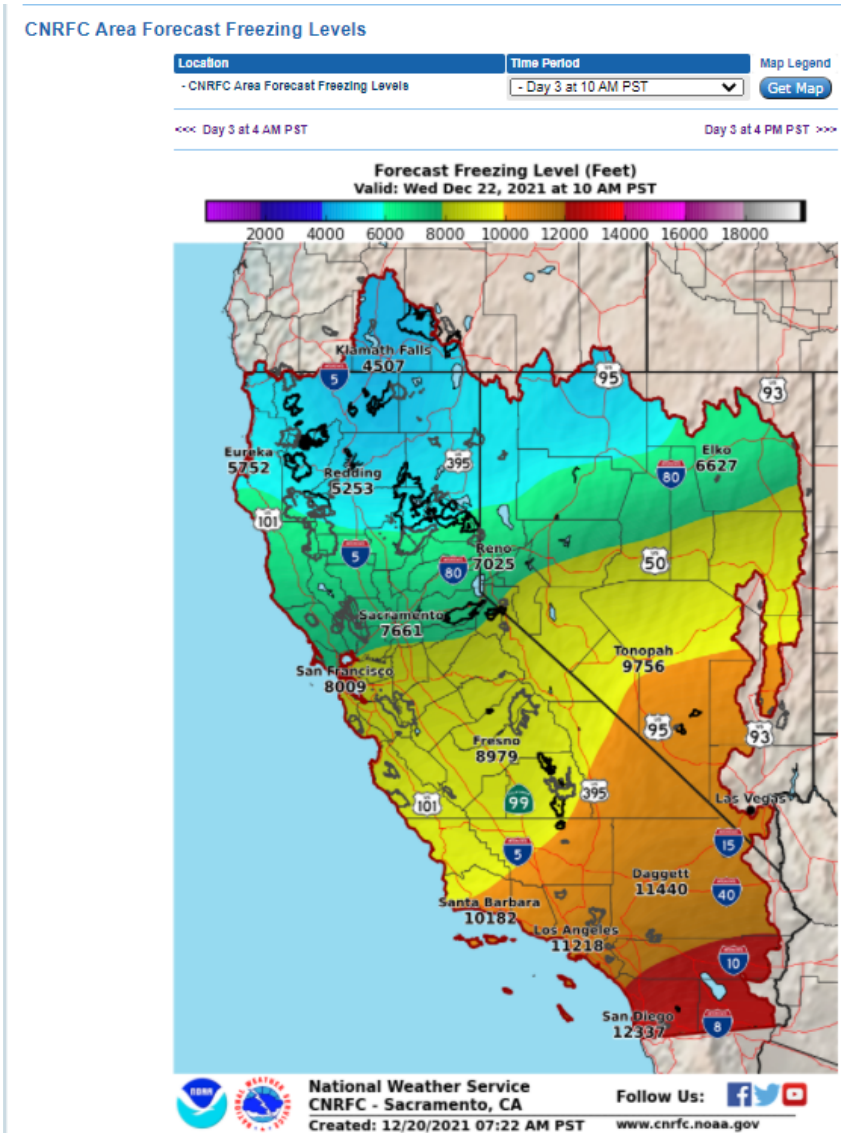

Figure 9. CNRFC map of freezing elevation forecast for Wednesday 12/22/21 at 10am.

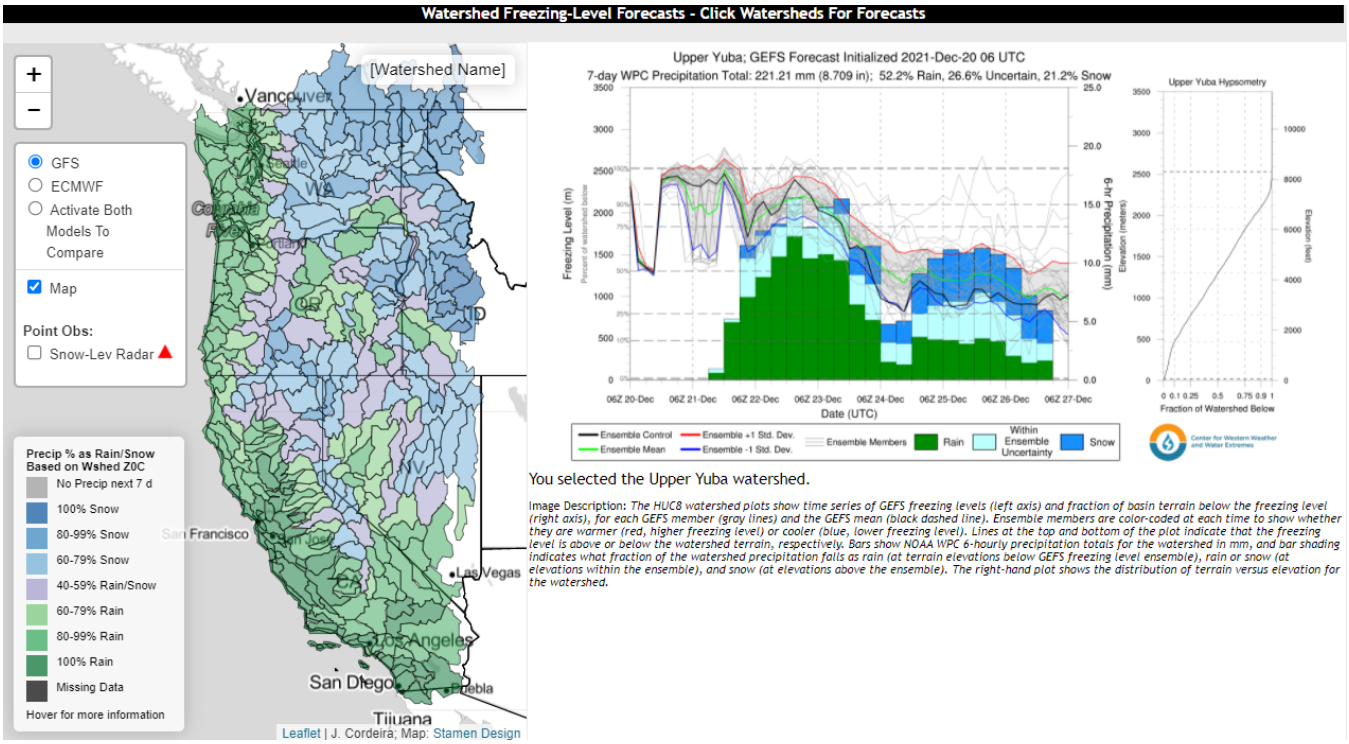

Figure 10. Experimental freezing elevation forecast at the watershed scale from CW3E.

When we pair the graphic in Figure 10 with the watershed water volume forecast from CW3E (shown in Figure 11) we can see that this is a good winter storm with a mix of warm conditions early generating some runoff and then snow later in the week adding to the seasonal snowpack. If you hover over the watershed, the range of precipitation volume shows up. For the Upper Yuba this is 274 thousand acre feet to 475 thousand acre feet.

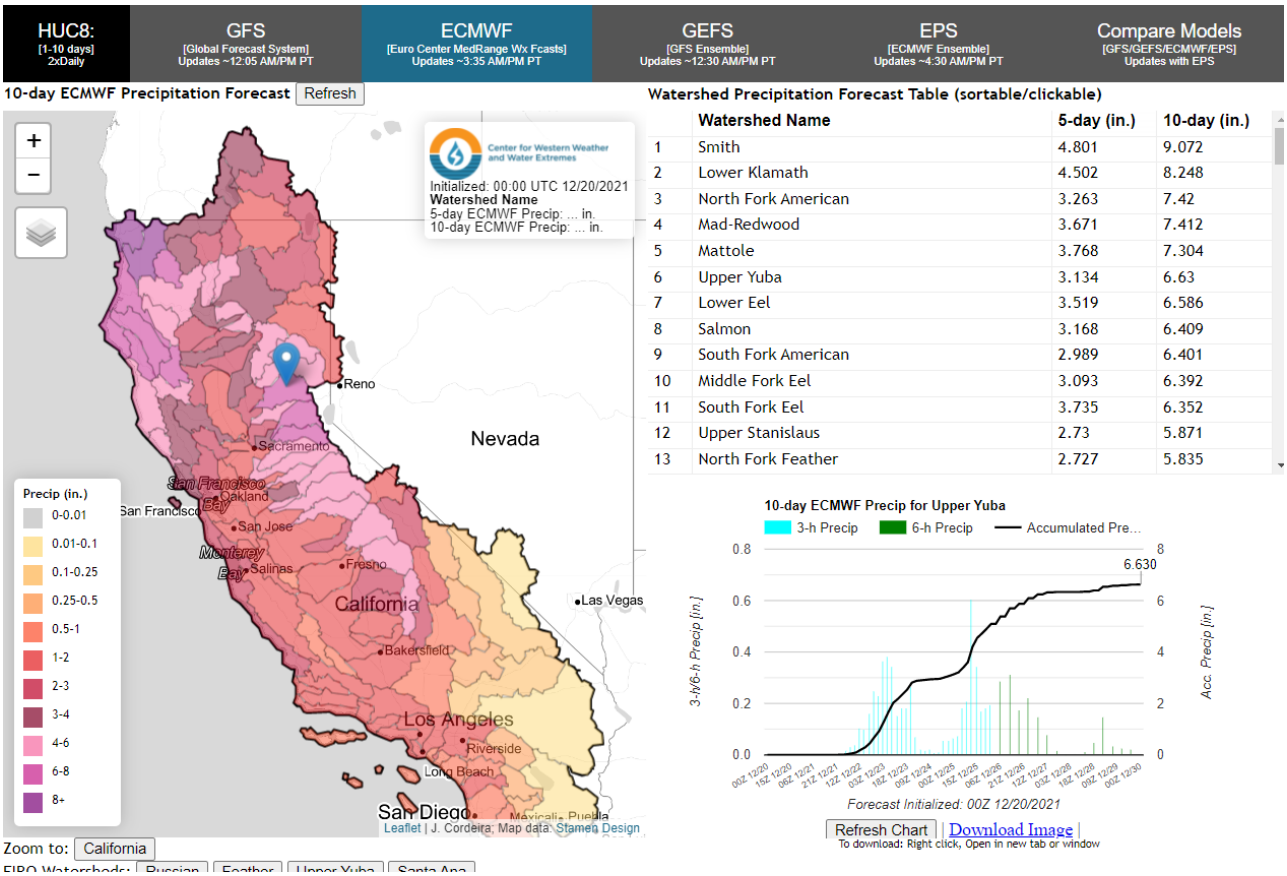

Figure 11. Watershed precipitation forecast from CW3E.

Finally, let's look at the home page of the CNRFC (Figure 12) where we see that 2 points are currently forecast to reach monitor stage – the Cosumnes River at Michigan Bar and the Sacramento River at Tisdale Weir. For Tisdale Weir this is notice that it will begin flowing which puts water into the Sutter Bypass. The Tisdale Weir is a passive weir meaning when water gets high enough in the Sacramento River, it automatically flows over the weir into the bypass. This is expected to happen Friday 12/24/21. For Michigan Bar, monitor stage is at 7 feet and the forecast has the river exceeding 7 feet on Thursday near noon and peaking at 7.2 feet at 11pm on Thursday. Stay tuned as the forecast evolves this week to see if additional precipitation outside the forecast window may cause additional monitor stages to show up. Please let me know if you have any questions.

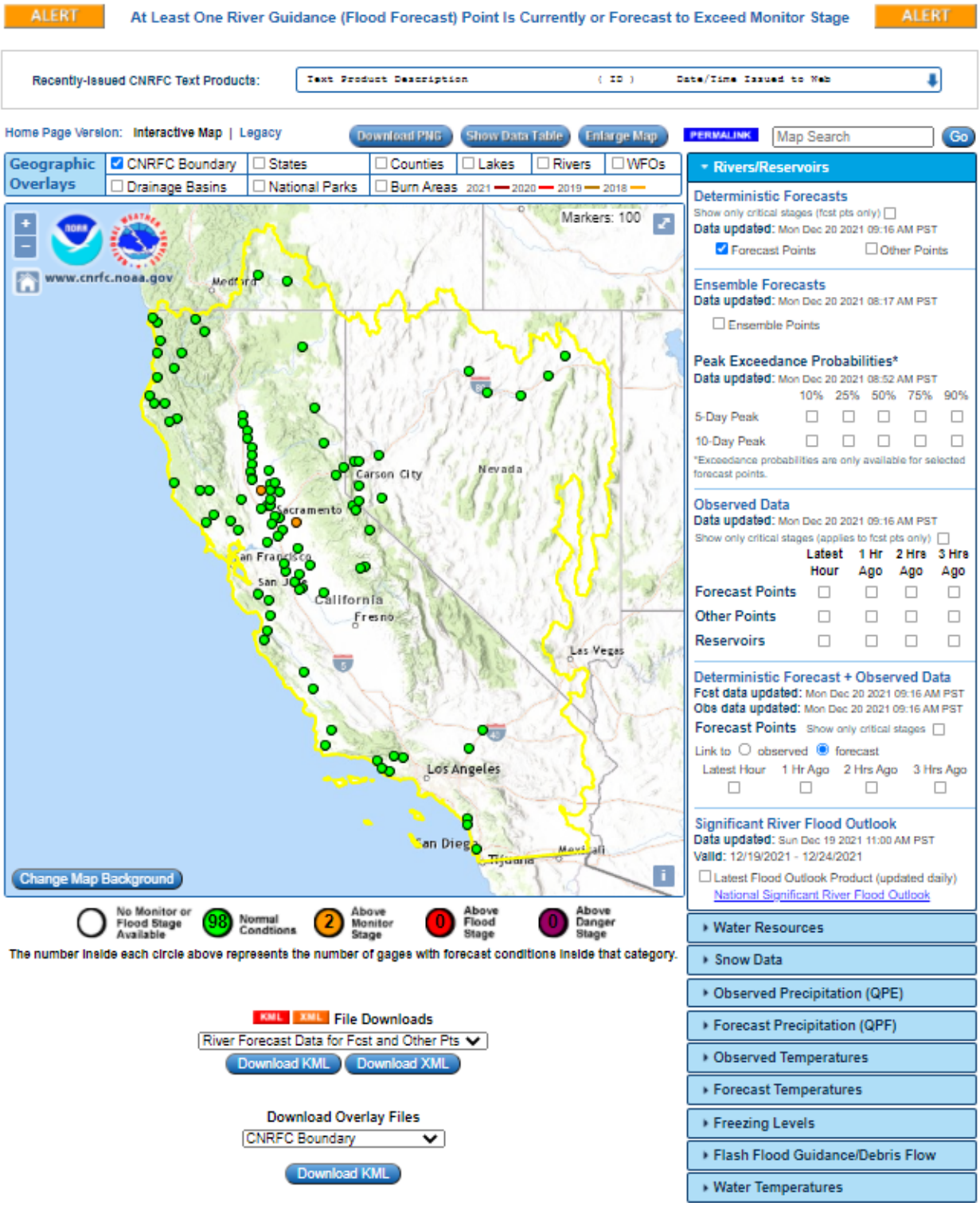

Figure 12. Home page map from the CNRFC showing 2 monitor stages currently foreast.