

DEPARTMENT OF WATER RESOURCES

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**Fall 2017 Groundwater Level Data Summary****Groundwater Levels Rebounding?****Background**

California's climate is the most variable of any state, historically swinging from dry conditions to flood and back to dry, with climate change intensifying these swings. The Department's assessment of the state's water conditions is comprehensive and dynamic, and considers many factors including reservoirs, snowpack, and groundwater levels. Fall 2017 marked the transition from the extremely wet water year of 2017 to water year 2018, which is shaping up to fall short of average precipitation. Despite the dry conditions of the 2018 water year thus far, current statewide reservoir storage is at normal levels thanks to the exceptional water year 2017 (Figure 1). Reservoirs, however, account for only one-third of the California water supply and groundwater basins can contribute close to 40 percent of California's annual water supply in an average year.

Groundwater levels, which provide information about our underground water storage, can also rebound with a wet year, but the response is delayed, and depending on the groundwater basin, can take years to actualize. It typically takes several years of above average precipitation to make up for groundwater declines. Comparing fall groundwater measurements to the previous year's measurements can demonstrate how groundwater levels respond to conditions. Groundwater levels rose due to the record-setting precipitation of 2017, however, groundwater levels have not returned to pre-drought 2011 levels. A one-year comparison of groundwater levels can provide information about the short-term effects of a wet or dry year, while a multi-year comparison of groundwater levels provides information about trends in groundwater storage.

Data Coverage

Based on measurements submitted to DWR by February 21, 2018, 88 percent of the typical fall groundwater level measurements have been reported statewide.¹ The coverage map (Figure 2) shows a comparison of the total fall 2017 reporting and typical reporting in previous years. Typical reporting wells include wells with water level data submitted over the past four fall seasons (2013-2016), and includes CASGEM and voluntary measurements. The map also displays a table of data coverage by hydrologic region.

By the Numbers

Using average statewide precipitation for each water year from 1970 to 2017 (Figure 3), water year 2017 was recorded as one of the wettest on record; however, it was preceded by five years of below average to average precipitation that resulted in a

¹ This includes CASGEM and voluntary groundwater level measurements collected by DWR, CASGEM Monitoring Entities, and other cooperators.

² A Fall groundwater level measurement is a measurement collected from a well between September 1st and November 30th and nearest in time to October 15th if there are multiple measurements in the time period.

multi-year drought. The effects of this variability in hydrologic conditions on groundwater supplies and storage can be seen by looking at the changes in groundwater levels over different time periods. The one-year and six- year changes in groundwater levels are depicted in figures 4 and 5 respectively.

Based on the one-year groundwater level change map (Figure 4), fall 2017 groundwater levels across the state have generally recovered to, or surpassed, the fall 2016 levels. This reflects the groundwater response to the exceptionally wet 2017 winter. Approximately 34 percent of wells measured in 2017 displayed moderately higher groundwater levels (increases greater than five feet) compared to fall 2016 and approximately 60 percent of the wells showed less than five feet of change in groundwater levels. Only 6 percent of the wells displayed groundwater level decreases greater than five feet compared to fall 2016. Areas on the one-year change map (Figure 4) that display decreases in groundwater level, even after the wet year, may be indicative of a continuing decline in groundwater level, or may just be due to the variability in local irrigation practices and measurement collection dates compared with the previous year.

Comparison of fall 2017 measurements to pre-drought fall 2011 measurements (Figure 5), tells a different story and demonstrates the lingering effects of the 2012 – 2015 drought period. Approximately 9 percent of wells statewide displayed increases in groundwater level elevations greater than five feet. Approximately 44 percent of the wells showed less than five feet of change, and approximately 47 percent of the wells displayed lower groundwater level elevations (decreases greater than five feet) compared to fall 2011.

Thus, fall 2017 groundwater levels have mostly recovered from 2016 levels, but they have not yet recovered to pre-drought (2011) conditions in many areas of the state. This includes areas along the west side of the Sacramento Valley, the San Joaquin Valley, and portions of Los Angeles, Orange, Riverside, San Benito, San Bernardino, Santa Barbara, and Ventura. Counties. There is insufficient data coverage to determine the long-term effects of drought on Imperial, Monterey, San Diego, San Luis Obispo, and San Mateo counties.

Resources

This document presents a summary of fall 2017 groundwater level data available in the DWR groundwater level database as of February 21, 2018 and includes a discussion of fall 2017, data coverage and groundwater level trends. Statewide precipitation data come from the [U.S. Climate Divisional Database](#)³, which have data from January 1895 to the present.

Additional information and groundwater level change maps for different time periods (including one-, three-, five-, and ten-year groundwater level change maps⁴) can be obtained from the [DWR Data and Tools](#) webpage. Geospatial datasets of this groundwater level data can be downloaded from the [Groundwater Information Center Interactive Map Application](#)⁵.

3 <https://www.ncdc.noaa.gov/monitoring-references/maps/us-climate-divisions.php>

4 <https://www.water.ca.gov/Programs/Groundwater-Management/Data-and-Tools>

5 <https://gis.water.ca.gov/app/gicima/>



Reservoir Conditions

Ending At Midnight - March 4, 2018

CURRENT RESERVOIR CONDITIONS

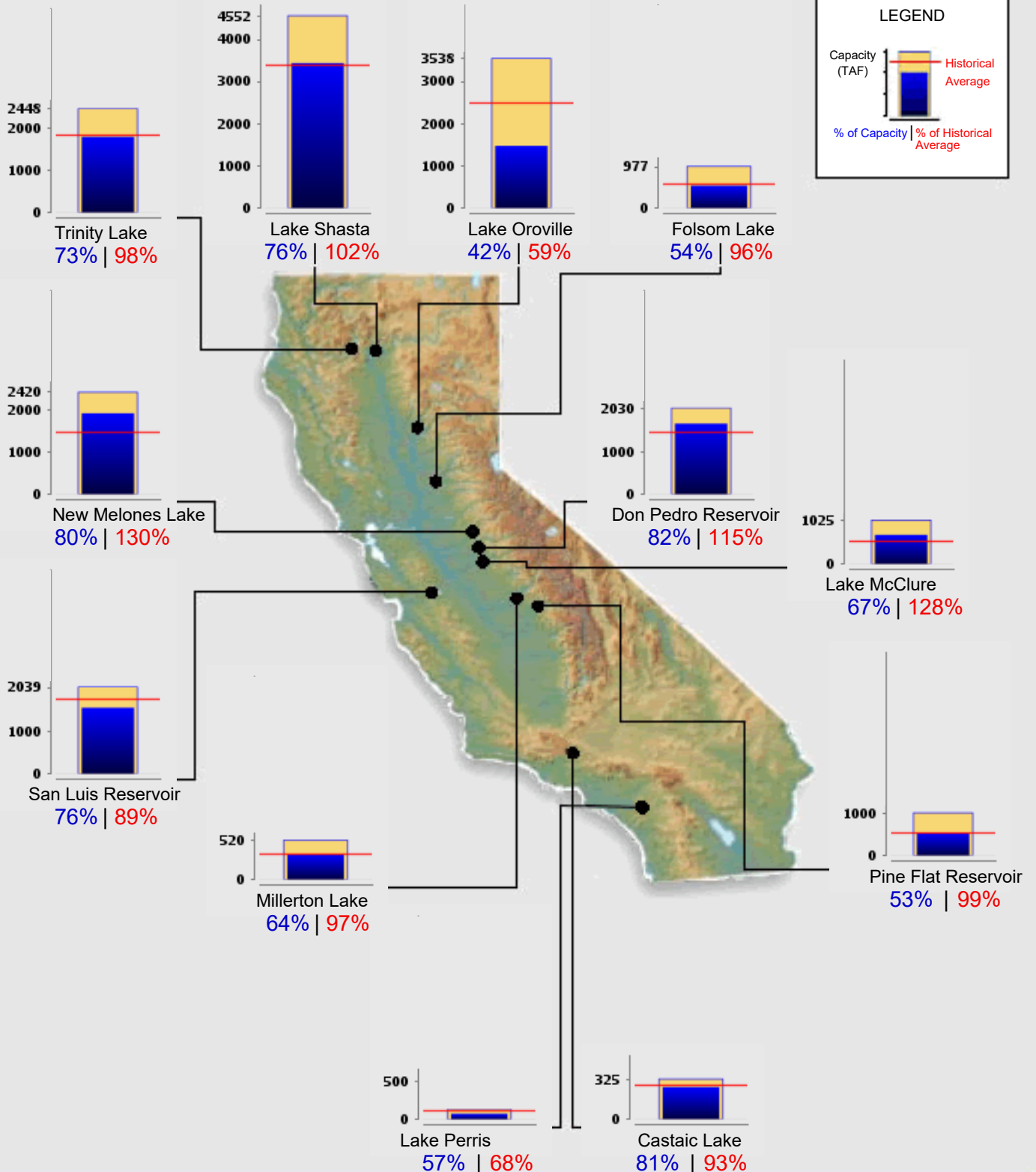


Figure 2. Fall 2017 Groundwater Level Data Coverage*

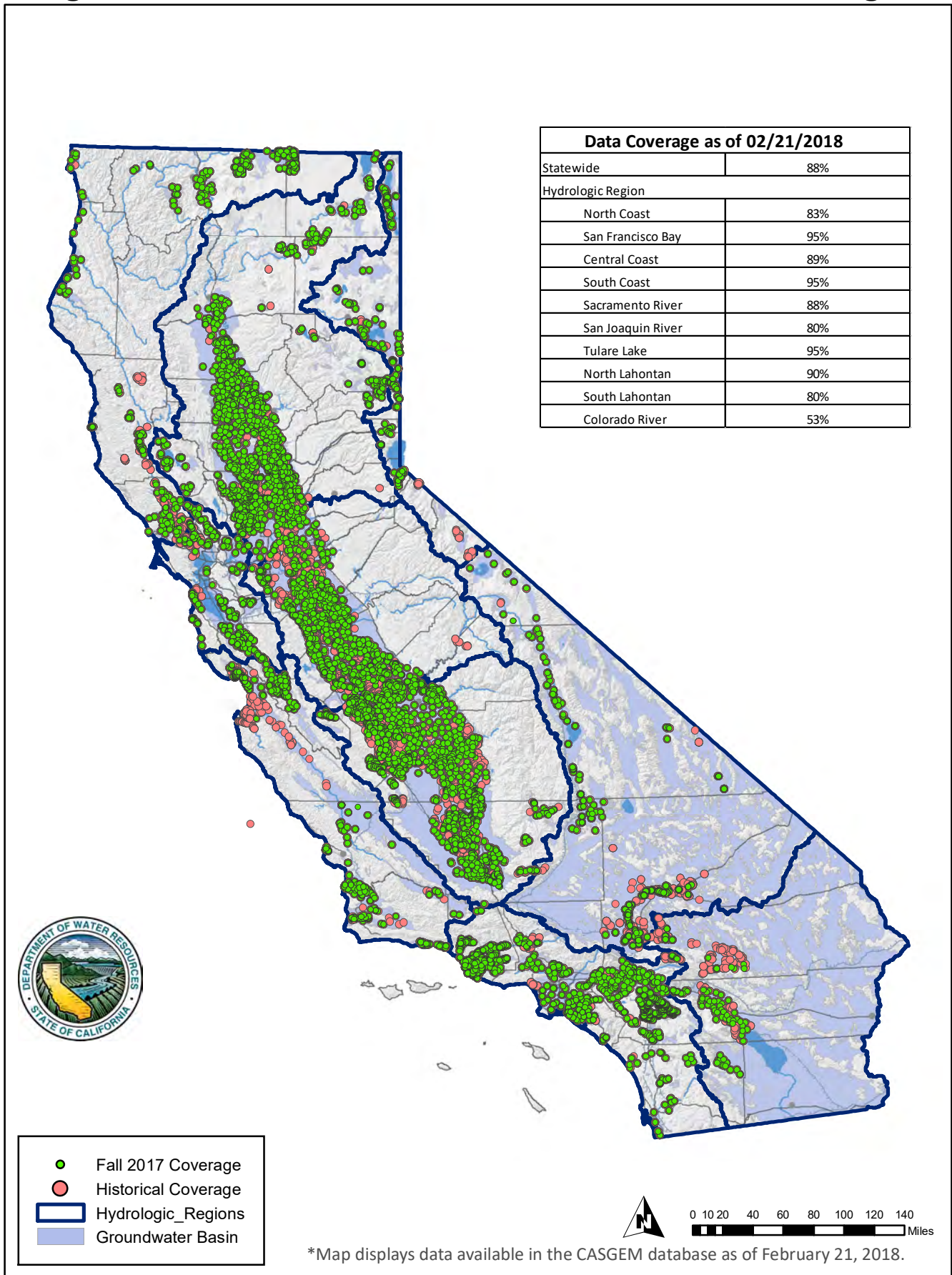
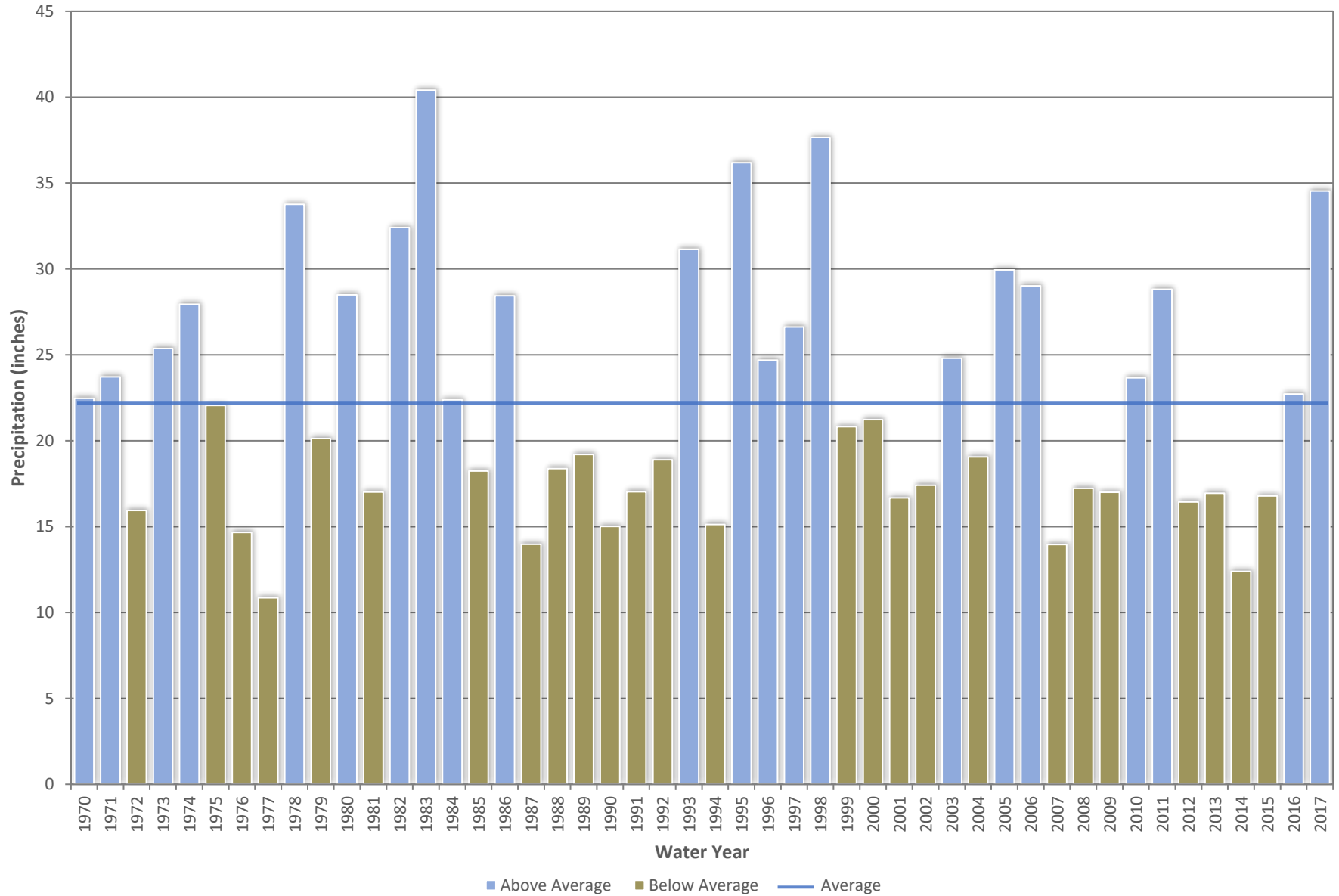
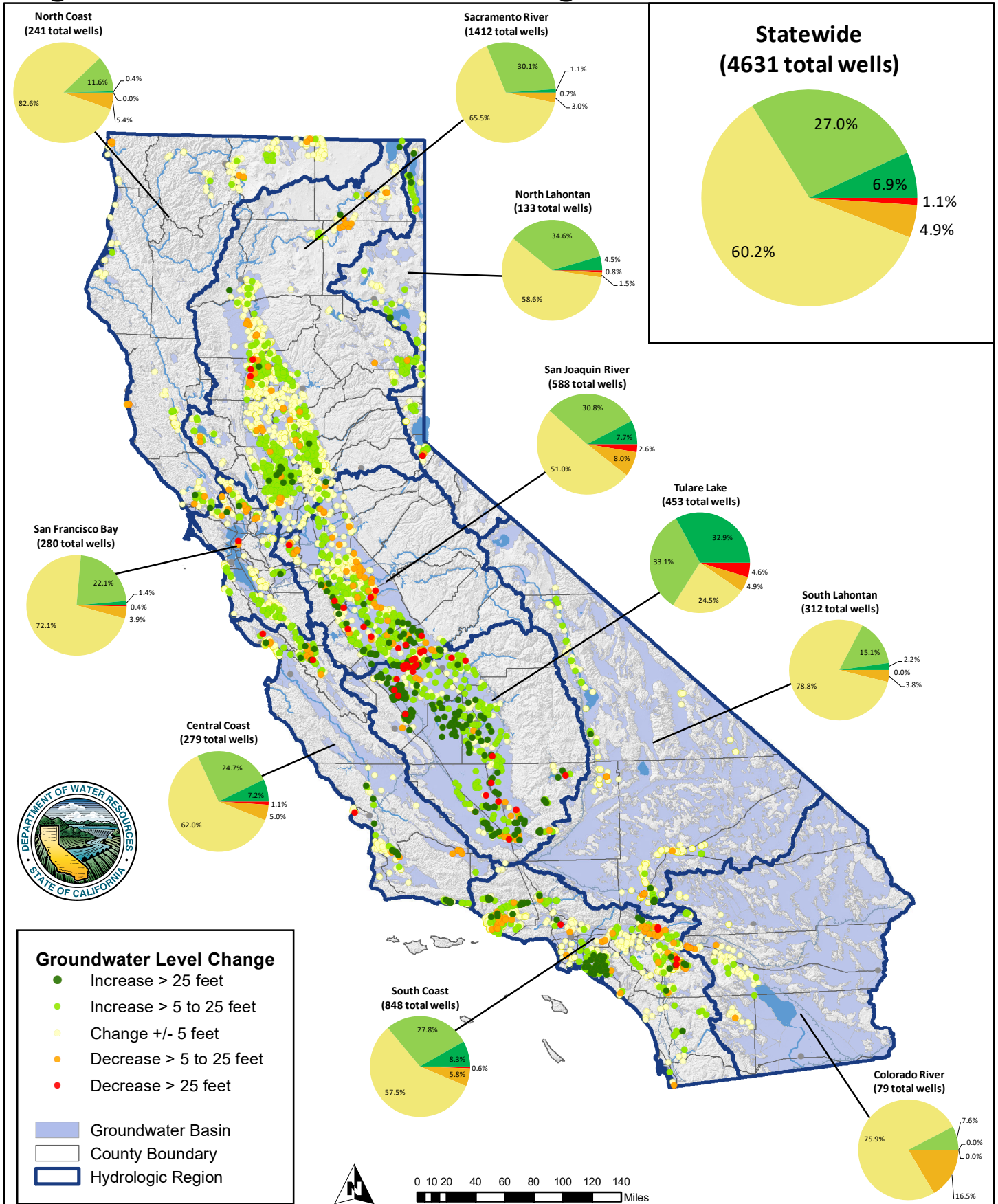


Figure 3. Statewide Annual Precipitation



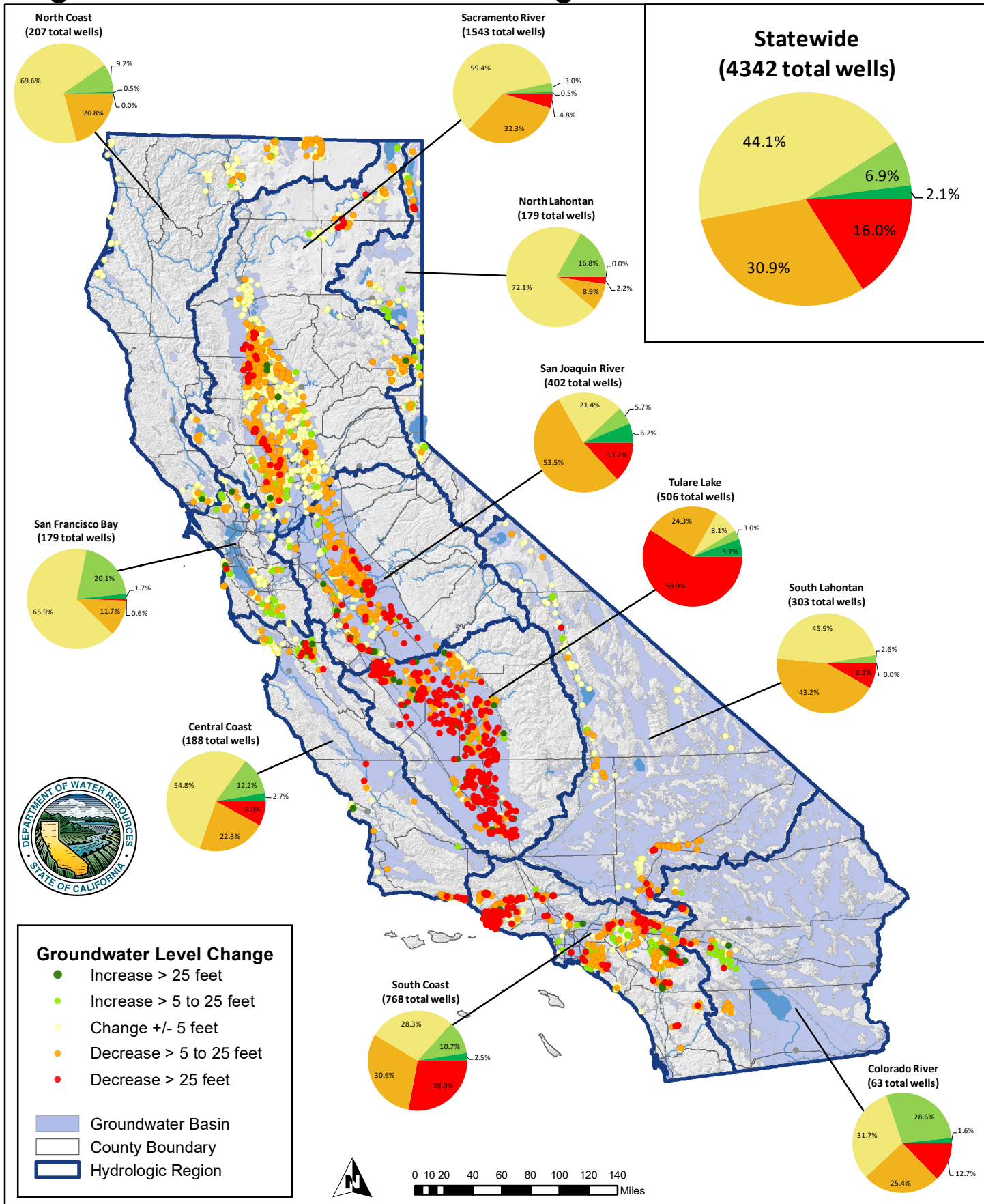
Data source: NOAA National Centers for Environmental information, Climate at a Glance: U.S. Time Series, Precipitation (<http://www.ncdc.noaa.gov/cag/>)

Figure 4. Groundwater Level Change* - Fall 2016 to Fall 2017



*Groundwater level change determined from water level measurements in wells. Map and chart based on available data from the DWR Water Data Library as of 02/21/2018. Document Name: PIEMAP_F1716_25ft Updated: 2/26/2018. Data subject to change without notice.

Figure 5. Groundwater Level Change* - Fall 2011 to Fall 2017



*Groundwater level change determined from water level measurements in wells. Map and chart based on available data from the DWR Water Data Library as of 02/21/2018. Document Name: PIEMAP_F1711_25ft Updated: 2/26/2018. Data subject to change without notice.