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California Groundwater Conditions Update – Spring 2020

Groundwater levels and a dry 2020 Water Year

Groundwater provides an average of 40 percent of California's water supply in normal years and as much as 60 percent in dry years. Snowpack and reservoir storage also contribute a large percentage to the State's water supply, and is summarized on the DWR Current Conditions website. Other important factors enhancing California's water supply portfolio include conservation, desalination, and water reuse.

About 85 percent of Californians depend on groundwater for some portion of their water supply. Some communities rely entirely on groundwater for drinking water, and it is a critical resource for many farmers, urban areas, and ecosystems across the State. Groundwater basins act as a buffer between wet and dry periods, balancing out the variability in annual snowpack and reservoir storage by providing additional storage in wet years and additional supply in dry years.

Precipitation drives the hydrologic system and California's climate is the most variable of any state. In three of the last five water years, which begin on October 1, statewide precipitation was well above normal. Water Years 2017 and 2019 stand out as some of the wettest on record. Water Year 2020 began with robust reservoir storage and improved groundwater storage because of those wet years. However, Water Year 2020 ended dryer statewide than previous years, and is comparable to the drought years of 2013 and 2015 (**Figure 1**). The precipitation information provided in **Figure 1** is a summary that demonstrates the annual statewide variability in precipitation, although local conditions might tell a different story.

Changes in groundwater levels and groundwater trends

Data on groundwater levels show seasonal fluctuations and long-term changes or trends in groundwater storage. Groundwater levels are measured from a variety of groundwater wells located throughout the state. The data is collected by the Department of Water Resources (DWR) and also reported to DWR by CASGEM Monitoring Entities, Groundwater Sustainability Agencies implementing the Sustainable Groundwater Management Act, local agencies, and private well owners.

The changes in groundwater levels in this report illustrate how groundwater storage varies over selected time periods. In addition to precipitation, there are many factors that influence groundwater level changes and the data presented here does not distinguish the specific causes of these changes. The goal of this report is to assess groundwater level changes and trends by comparing California groundwater levels over time.

Groundwater Level Change Maps (**Figures 2-5**) give a snapshot of the physical change in groundwater levels between two periods of time, which can relate to the change in groundwater storage. Comparing various intervals of years can provide different information on groundwater storage. For example, a one-year comparison of groundwater levels provides information about

the possible short-term effects of a single wet or dry year, while a multi-year comparison provides information about long term changes in groundwater storage.

Trend analysis, shown in the Groundwater Trend Map (**Figure 6**), illustrates the statistical magnitude and direction of groundwater level change. The trend map depicts whether groundwater levels are decreasing or increasing rather than how much higher or lower groundwater levels are. The trend map analyzes and incorporates data from the most recent 20-year period, whereas the change maps only compare the data from the first and last year of each analysis.

Both types of maps allow for the depiction of spatial patterns in groundwater level variability over time. These maps are simple, powerful tools for informing the story of groundwater conditions from local to regional scales.

By the numbers

In this report, groundwater level change values compare spring 2020 to spring 2019, 2017, 2015, and 2010. The information is summarized in **Table 1**. Spring groundwater level data is an important indicator of groundwater conditions because spring generally corresponds to the pre-irrigation season. This time period is representative of the water year's peak groundwater levels. Associated maps display groundwater level increases and decreases and summarize data by hydrologic region.

The one-year change map (**Figure 2**) shows that approximately 63 percent of the statewide well measurements indicate stable conditions between the two years compared with net water level changes of +/- 5 feet, while 22 percent show a decrease in water levels. The remaining 15 percent show an increase in groundwater levels. Of note, groundwater level increases occurred in the Tulare Lake Hydrologic Region, which is typically associated with decreasing groundwater levels.

The three-year change map (**Figure 3)** follows the pattern of the one-year change map and shows that approximately 53 percent of the well measurements indicate net water level changes of +/- 5 feet. A cluster of well measurements with increased groundwater levels stretch from the Tulare Lake Hydrologic Region into the western portion of the San Joaquin River Hydrologic Region. Approximately 45 percent of groundwater measurements show a decrease in groundwater levels in the Sacramento Hydrologic Region.

The five-year change map (**Figure 4**) shows groundwater levels following the end of the latest drought and depicts a different story about the changes of groundwater levels. Forty-eight percent of groundwater measurements are stable with +/- 5 ft of change, and over 35 percent of groundwater measurements show an increase in groundwater levels statewide.

Conversely, the 10-year change map (**Figure 5**) illustrates how some groundwater basins have not fully recovered to pre-drought conditions, specifically in the Central Valley, Sacramento River, San Joaquin River, and Tulare Lake hydrologic regions where 40 to 70 percent, respectively, of well measurements show a decrease in groundwater levels.

Figures 6 shows the trend of change, which is the magnitude of decreasing or increasing groundwater levels, – over 20 years. Water Years 2000 to 2020 are summarized in **Table 2**, which includes droughts from 2001 to 2002, 2007 to 2009, and the most recent from 2012 to 2016. During this period of stressed water resources, more than 50 percent of statewide wells demonstrated a decreasing trend and less than 10 percent demonstrated an increasing trend.

Groundwater level trends were more pronounced in the southern Central Valley and less pronounced in the north end of the valley. There were several clusters of wells with steep groundwater level declines across the state during this period, including the western edge of the Sacramento Valley in the Sacramento River Hydrologic Region, the southeastern area of the San Joaquin Valley in the San Joaquin River Hydrologic Region, and the majority of groundwater basins within the Tulare Lake Hydrologic Region. There were also notable increases in groundwater levels in the basins in the southeastern portion of the Sacramento Valley in an area roughly overlying Sacramento County. San Francisco Bay observes the most stable groundwater levels of all regions. The Central Coast and Colorado River Hydrologic Regions show the highest overall percentage of wells with groundwater level increases, however, there were relatively few wells analyzed in these regions.

Closing thoughts

Groundwater levels are still recovering from the last drought as shown in the five-year change map. However, runoff resulting from a wet 2019 water year filled reservoirs and contributed to recovering groundwater levels when compared to the previous year's levels (2019 Seasonal Groundwater Report). Spring 2020 groundwater measurements have shown that groundwater levels are lower in general than the previous year. Furthermore, groundwater levels in many regions of California have not fully recovered to pre-drought conditions as shown in the 10-year change map with trends continuing to show a majority of groundwater levels decreasing over a 20-year time period.

DWR assessments of California's water conditions tell a story that is comprehensive and dynamic for the state's 515 groundwater basins (California's Groundwater). Moving forward, DWR will continue to provide seasonal groundwater reports and is working towards automating the analysis of groundwater level data to improve timely access of this information and data. Additional information and groundwater level change and trend maps for previous time periods can be found on the DWR Groundwater Management Data Tools Website under the Mapping Tab. Geospatial datasets of the groundwater level data used to develop this report can be viewed and downloaded from the SGMA Data Viewer.

Table 1: Statistical Summary of Groundwater Level Change Maps (**Figures 2-5**)

Period	Total Well Count	Decrease > 25 ft	Decrease 5 to 25 ft	Change +/- 5 ft	Increase 5 to 25 ft	Increase >25 ft
1-Year Change: 2020 levels compared to 2019 levels	5,023	2.7%	19.6%	63.4%	11.1%	3.1%
3-Year Change: 2020 levels compared to 2017 levels	4,776	2.9%	20.8%	53.2%	16.9%	6.3%
5-Year Change: 2020 levels compared to 2015 levels	4,492	3.3%	11.8%	48.5%	27.2%	9.2%
10-Year Change: 2020 levels compared to 2010 levels	2,289	9.6%	28.4%	47.1%	11.0%	3.8%

Table 2: Statistical Summary of Groundwater Level Trend Map (**Figure 6**)

Period	Total Well Count	Decrease > 2.5 ft	Decrease 0.01 - 2.5 ft	Change +/- .01 ft	Increase 0.01 - 2.5 ft	Increase > 2.5 ft
20-Year Trend: 2000 to 2020	3781	17.1%	41.4%	34.5%	5.7%	0.7%

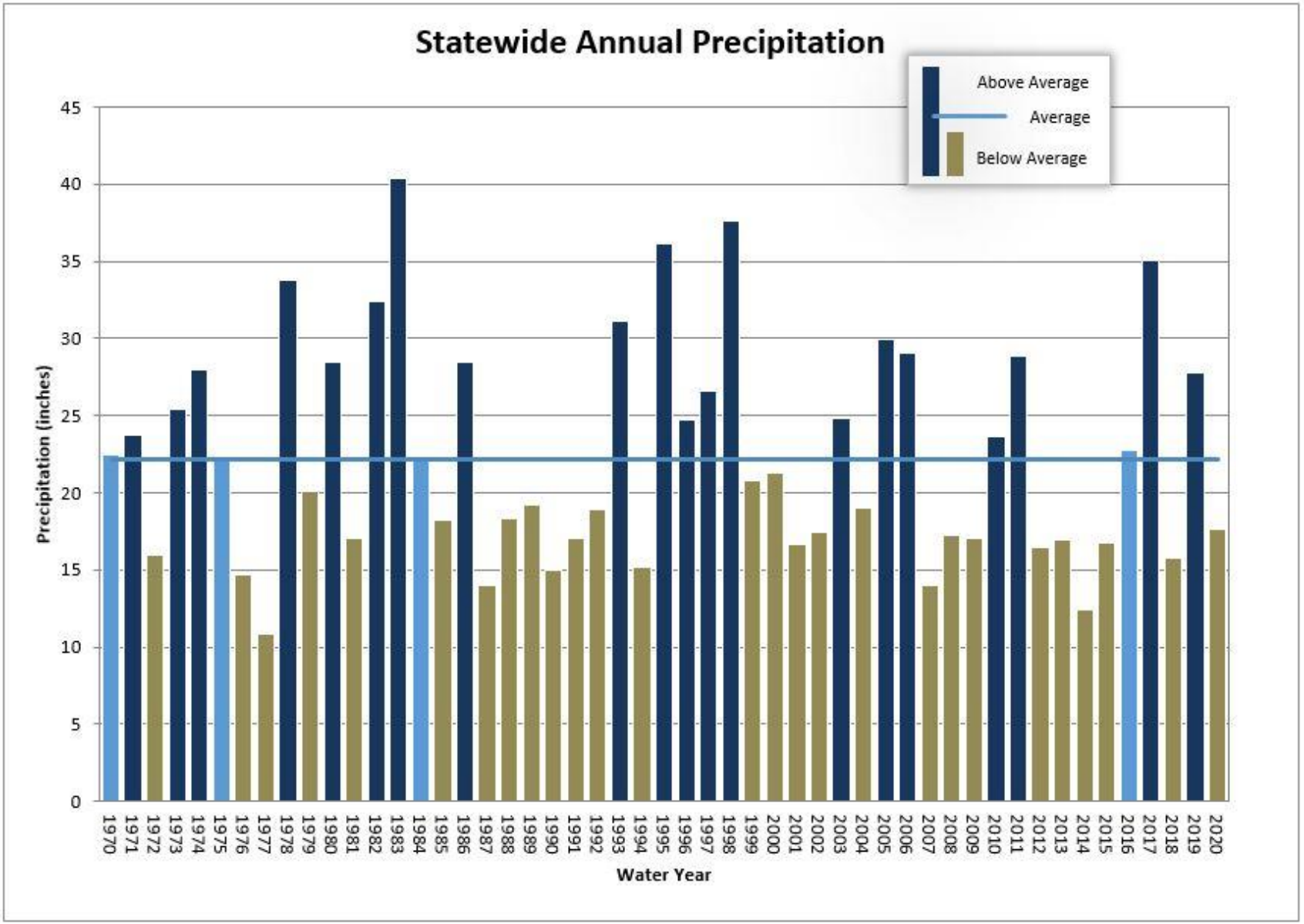


Figure 1: Statewide Annual Precipitation, NOAA National Centers for Environmental Information,(Climate at Glance: U.S. Time Series, Precipitation)

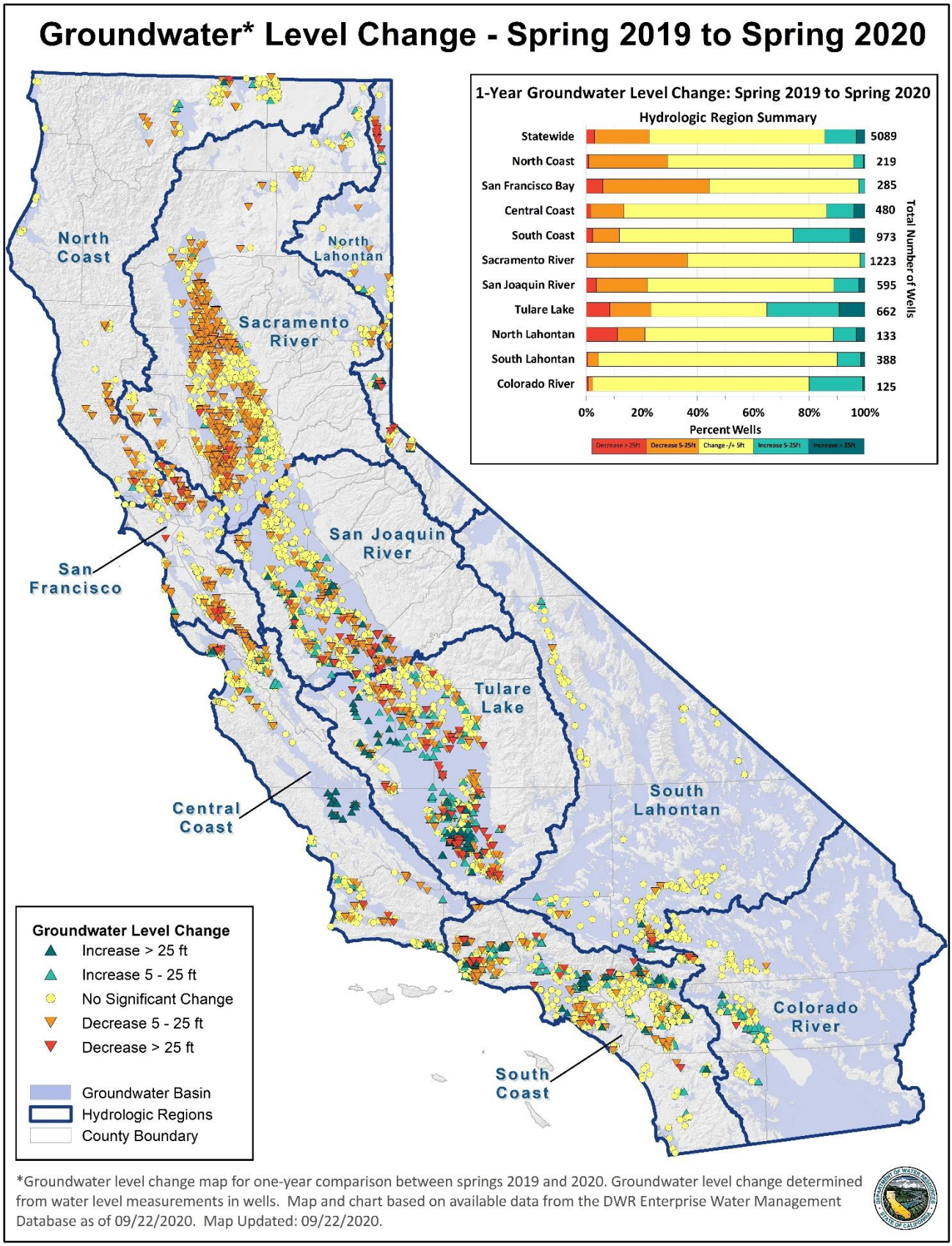


Figure 2: Statewide and Hydrologic Region groundwater level change map for one-year period between 2019 and 2020. Map and charts based on available data for the DWR Water Data Library as of 09/22/2020.

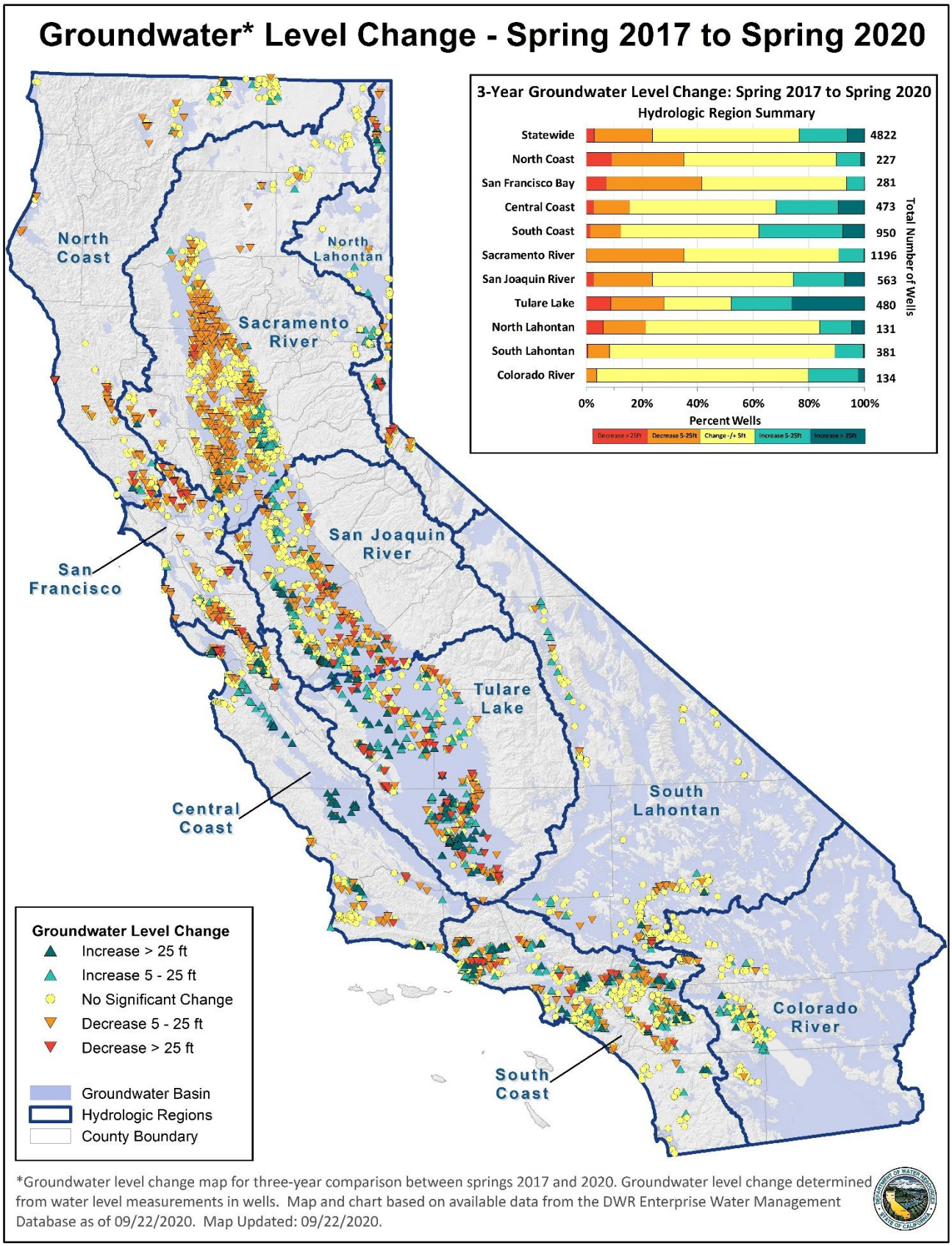


Figure 3: Statewide and Hydrologic Region groundwater level change map for three-year period between 2017 and 2020. Map and charts based on available data for the DWR Water Data Library as of 09/22/2020.

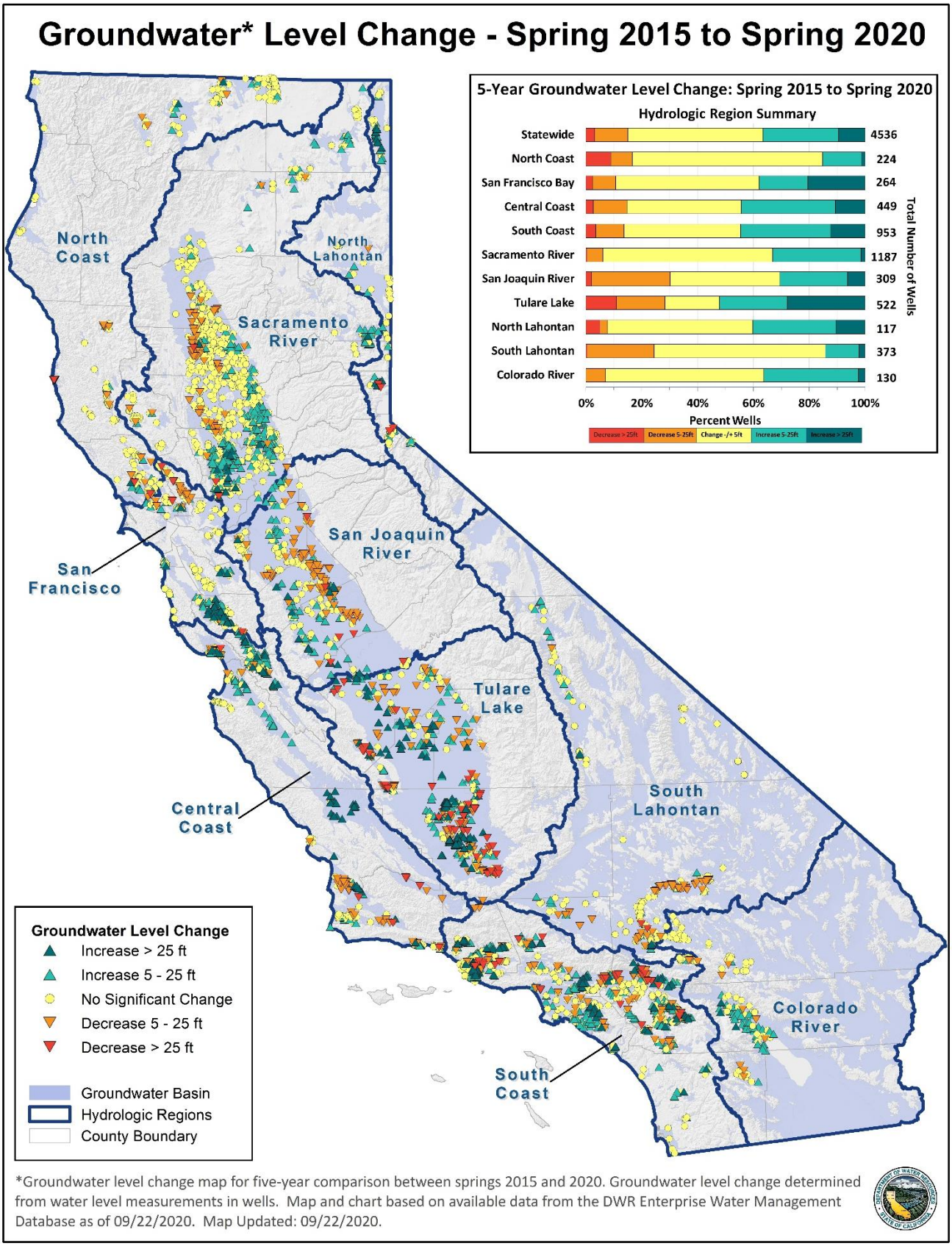


Figure 4: Statewide and Hydrologic Region groundwater level change map for five-year period between 2015 and 2020. Map and charts based on available data for the DWR Water Data Library as of 9/22/2020.

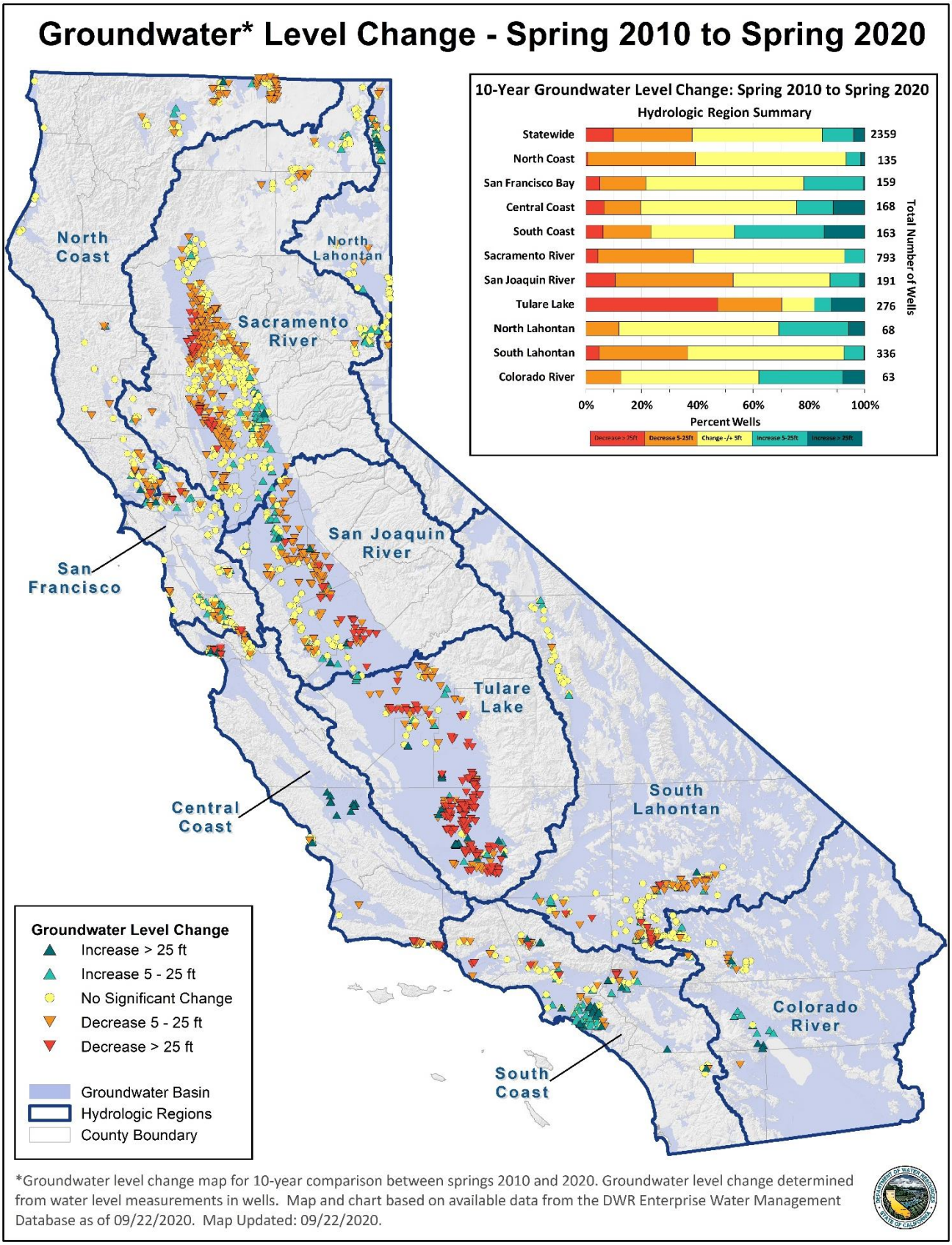


Figure 5: Statewide and Hydrologic Region groundwater level change map for 10-year period between 2010 and 2020. Map and charts based on available data for the DWR Water Data Library as of 09/22/2020.

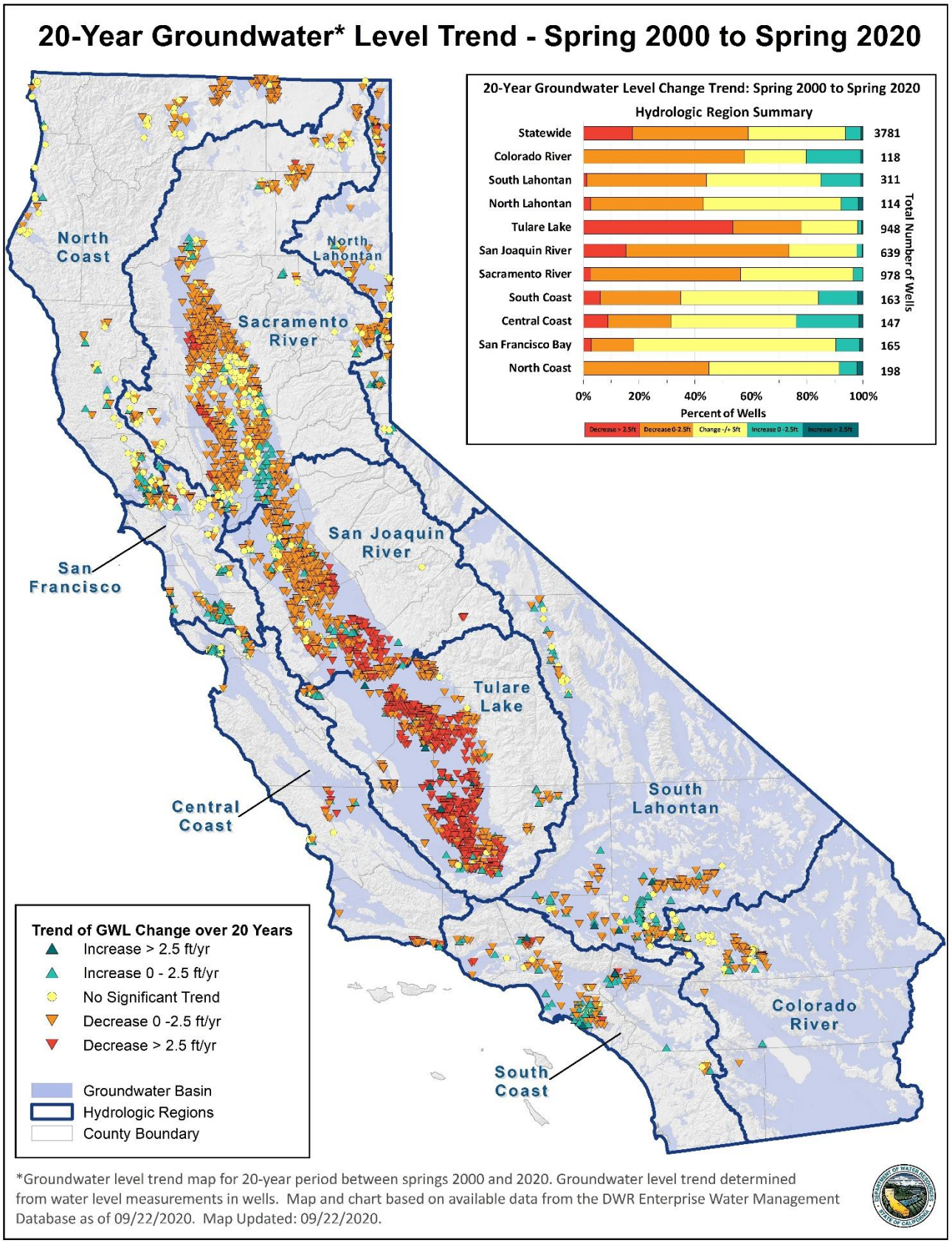
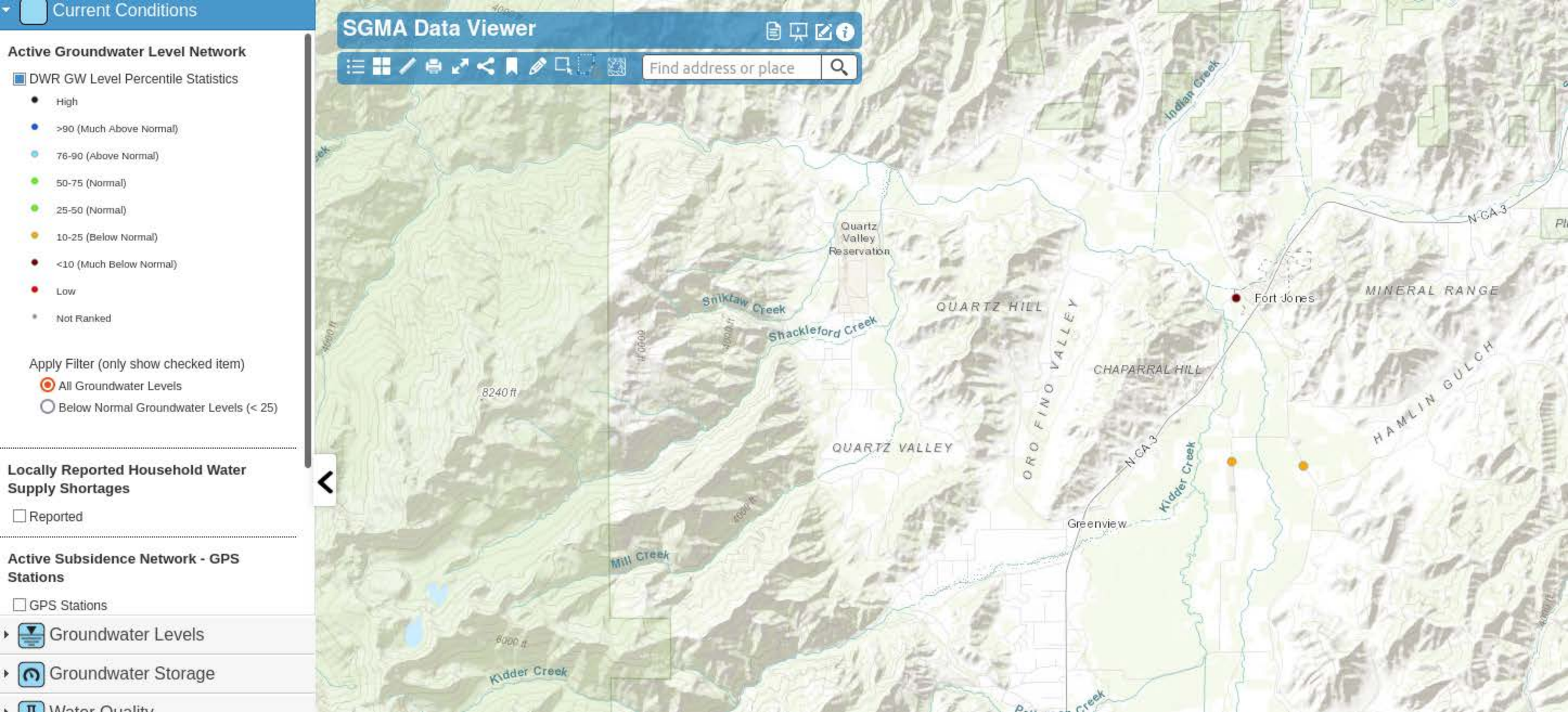


Figure 6: Statewide and Hydrologic Region groundwater level trend analysis map for Water Years 2000-2020. Map and charts based on available data for the DWR Water Data Library as of 09/22/2020.


SGMA Data Viewer
Find address or place
Current Conditions
Active Groundwater Level Network
DWR GW Level Percentile Statistics
High
>90 (Much Above Normal)
76-90 (Above Normal)
50-75 (Normal)
25-50 (Normal)
10-25 (Below Normal)
<10 (Much Below Normal)
Low
Not Ranked
Apply Filter (only show checked item)
All Groundwater Levels
Below Normal Groundwater Levels (< 25)
Locally Reported Household Water Supply Shortages
Reported
Active Subsidence Network - GPS Stations
GPS Stations
Groundwater Levels
Groundwater Storage
Water Quality
Quartz Valley Reservation
Sniktaw Creek
Shackleford Creek
QUARTZ HILL
ORO FINO VALLEY
CHAPARRAL HILL
QUARTZ VALLEY
Fort Jones
MINERAL RANGE
HAMLIN GULCH
Indian Creek
N-CA-3
Kidder Creek
Greenview
Mill Creek
8240 ft
6000 ft
4000 ft