

DEM Hazard Assessment Discussion: Drought

April 8, 2021

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Purpose

Assess potential threat of a significant drought in CY2021. Identify potential response shortfalls and corresponding emergency management preparedness actions that could be implemented in 2Q 2021 for the Sonoma County Operational Area. Note: this is a preliminary assessment – additional situational awareness information can be expected to be developed and communicated by state and local water agencies once they begin drought response efforts.

Background¹

Defining drought is based on impacts to water users. California is a big state and impacts vary with location. Hydrologic conditions causing impacts for water users in one location may not represent drought for water users in a different part of California, or for users with a different water supply. Individual water agencies may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

Drought is a gradual phenomenon, occurring slowly over a period of time. Storage, whether in surface water reservoirs or in groundwater basins, buffers drought impacts and influences the timing of when drought impacts occur. A single dry year isn't a drought for most Californians because of the state's extensive system of water infrastructure and groundwater resources buffer impacts.

Drought impacts are felt first by people most dependent on annual rainfall – such as ranchers using dryland range or rural residents relying on wells in low-yield rock formations. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Provisions of California's Emergency Services Act have been used to declare a statewide drought emergency for only two of our droughts, the 2012 to 2016 event and its immediate predecessor in 2007-09.

A full historical assessment of drought events in Sonoma County can be found in the Hazard Mitigation Plan.

Current Situation

California is entering a second year of drought. The 2020-21 winter produced significantly less-than-average precipitation across the state. As of April 6, 92.6% of California is in moderate to exceptional drought conditions (23% - moderate, 34.3% - severe, 30% - extreme, and 5.3% exceptional). Last year at this time only 43.3% of the state was under moderate and above

¹ California Dept. of Water Resources, *Defining Drought*, at <https://water.ca.gov/drought>

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drought conditions, with nearly all of that in the moderate category and none in the extreme or exceptional categories. ²

- As of April 15, Santa Rosa is at 32% of normal precipitation for the 2020-21 winter season.³
- Precipitation levels in the Sierras are approaching the record set in the 1976-1977 drought
- Sierra snowpack water content is at 36% of normal.⁴
- Sierra river flows are lower than those seen in the 2014-15 drought event. Locally, releases into the Russian River from Lake Mendocino have been reduced to a minimum (25cfs) while Warm Springs dam remains at 65cfs – this may be reduced via emergency action.
- Reservoirs are at levels lower than 2013/14 drought: Lake Sonoma is at 62% of supply capacity and Lake Mendocino is at 43% of target capacity for this time of year. The reservoirs are expected to reach historically low levels by October 2021. ⁵

The weather patterns that result in drought may also bring significantly higher temperatures with low overnight recovery. In 2020, August and September heat waves produced record high temperatures. Heat generally increases demand for water. Heat also accelerates loss of water through evapotranspiration (evaporation of moisture from soils/bodies of water and vegetation transpiring moisture into air).

Threat Assessment

Drought produces significant and long-term social, economic, and infrastructure impacts. The severity of the drought is a factor of both intensity of the reduction in precipitation and duration. Potential cascading impacts of drought include⁶:

- Wildfires
 - Potentially increased number of Red Flag fire condition events.
 - The low snowpack means a shorter runoff season, which means fuels for wildfires will dry out sooner making for a longer wildfire season
 - Trees and brush are stressed and becoming more susceptible to wildfires or dying off altogether and becoming direct fuel for wildfire
 - The low rainfall also means some stock ponds, unless they have a natural spring source, may start shrinking potentially even drying up. This means water has to be transported in via trailer for the livestock and potentially impacts availability of local water sources for firefighting
- Energy
 - Potential for earlier onset and increased frequency of PSPS events due to low fuels moisture levels
 - Threats to hydroelectric power supplies as water levels in reservoirs drops and stream flows decrease
 - Other types of electricity generation also have a reliance on water
 - Potential for reduced output at geothermal fields (ex. Geysers)
- Effects on the Land & Environmental Conditions

² USDA, *U.S. Drought Monitor*, at <https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx>

³ Ibid

⁴ Ibid

⁵ Sonoma Water, Current Water Supply Update, April 15, 2022 at <https://www.sonomawater.org/current-water-supply-levels>

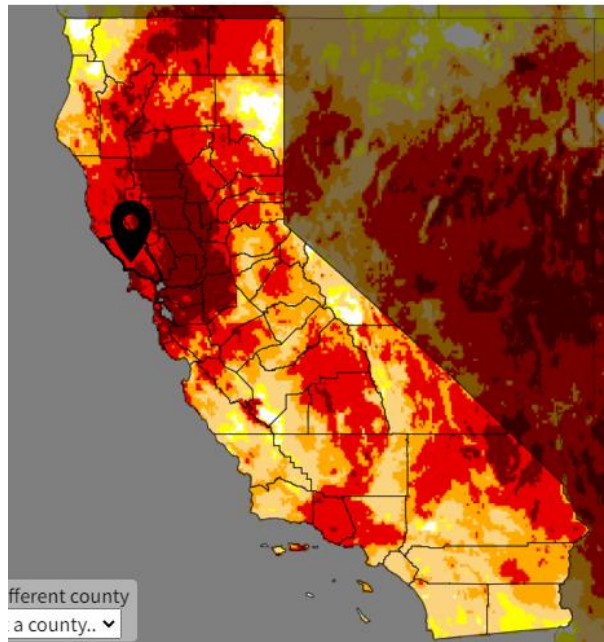
⁶ California Resiliency Alliance, Drought Outlook Brief, April 14, 2021.

- Land subsidence due to pumping of ground water, which can in turn affect what areas are susceptible to flood
- Water temperature in streams and lakes may become higher and oxygen levels lower leading to algae and bacterial growths
- Shrinking of soil moisture can erode roads faster
- Potential for significant or extreme heat events
- Water Quality
 - Falling water tables can also affect water quality especially for the more rural communities, some of which are already dealing with poor water quality issues
 - Drought conditions can also affect the pH levels of water, which for jurisdictions that don't treat water for pH before it goes into the pipes to customers, can eventually affect the pipes leading to either corrosion and/or contaminants leaching into the water.
 - As water levels get lower the concentration of salts, minerals, and chemicals in the water increases.
 - Some residential and agricultural wells will run dry
 - Reduced flow levels in rivers and aquifers can allow saltwater to move inland and possibly contaminate water supplies
- Air Quality
 - Drought conditions can also cause more dust particles to become airborne, which can lead to or exacerbate poor air quality and create health concerns
- Disease
 - In the extreme drought areas there tends to be an increase in West Nile Virus outbreaks
 - Drier conditions can increase reproduction of the fungus found in soils that leads Valley fever (coccidioidomycosis)
 - Potential for increased asthma and allergies
- Economy
 - The agricultural sector, which has a high reliance on water, can be hard hit due to the droughts impacts to crops and livestock and/or through rising water prices. May need to import hay and feed
 - Water conservation efforts, while good, have fiscal consequences for water utilities.
 - Lower river flows and lake levels will affect tourism and recreation, reducing or shifting it to other activities and areas.
 - Potential for food shortages and rising food costs ⁷
 - Potential pressure on housing and social services due to climate migrants or "climate refugees" from elsewhere.⁸
 - Economic impacts (job losses, reduced consumer spending) in a 30% water shortage drought for Marin and Sonoma counties could approach \$5B⁹

⁷ Climate Ready Sonoma, http://scta.ca.gov/pdf/Climate%20Ready_Hazards_Vulnerabilities.pdf

⁸ Climate Ready Sonoma County, http://scta.ca.gov/pdf/Climate%20Ready_Hazards_Vulnerabilities.pdf

⁹ Robert Eyler, Economic Impacts of a Water Shortage in Sonoma and Marin Counties: Update, 2009



Long-term drought indicator models blend. ¹⁰
 (Sonoma County = Extreme and Exceptional Drought)

Potential Emergency Management Gaps

In the summer of 2021, the drought may challenge emergency management and public safety systems in several areas:

1. Concurrent hazards response (drought, wildfire, PSPS, heat, COVID-19)
2. Public Information if public perception of the threat changes significantly
3. Drought response planning

Potential DEM Preparedness Actions for 2Q 2021

1. Support development of Drought governance/management body – ex. Drought Task Force
 - a. Management, technical coordination and staff support
 - b. Public Information via SoCoEmergency.org
2. Support proclamations process and damage reporting (Initial Damage Estimates, PDAs)
3. Assess Staff Duty Officer program capacity to support increased frequency of PSPS and Red Flag events
4. Assess potential to access resources via CDAA or FEMA PA
5. Prepare to support community outreach, information, and preparedness efforts
6. Reassess Concurrent Hazards Annex to determine if current approaches and resources are sufficient
7. Assess potential impacts of continued drought into 2022

¹⁰ <https://www.drought.gov/states/california/county/sonoma>

Potential Drought Task Force priorities:

- Public Safety
- Health and Medical
- Agriculture
- Economic

References

- DEM files in S: folder S:\DEM\2. Emergency Coordination\Plans & Guidance\Drought 2021
- California Dept. of Water Resources <https://water.ca.gov/Water-Basics/Drought>
- NWS CA-NV RFC <https://www.drought.gov/drought-status-updates/drought-status-update-california-nevada-0>
- USGS Russian River Drought Project https://www.usgs.gov/centers/ca-water/science/coping-drought-russian-river-watershed?qt-science_center_objects=0#qt-science_center_objects
- McCarthy, Michael. *The Man Who Made It Rain*, 2006.
- Cook, Benjamin. *Drought: An Interdisciplinary Perspective*, 2019.