

Coping With Drought on California Rangelands



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On the Ground

- Rangeland livestock producers were among the first agricultural communities affected by California's multiyear drought.
- Rancher surveys and in-person interviews have identified key strategies for coping with and adapting to drought.
- Increasing flexibility, resource valuation, and information sharing are important components of building adaptive capacity.
- Web-based communication systems have provided new tools for peer-to-peer learning, public education, and extending knowledge to larger audiences.
- Insights from managers' experiences are important for adaptation planning to enhance resilience of rangeland social-ecological systems to climate stresses.

Keywords: adaptive capacity, climate change, decision-making, livestock production, ranching, working landscapes.

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The statewide drought that has gripped California since late 2012 has had severe impacts on both agriculture and the environment. At the start of the 2015 to 2016 water year, California's largest reservoir, Lake Shasta, held just 35% of its capacity (59% of historic average).¹ Other federal Central Valley Project reservoirs were in worse shape—Folsom Lake at 18% capacity and New Melones at 11%.¹ Statewide costs have been estimated at \$2.2 billion and 17,100 jobs for the 2014

drought, and \$2.7 billion and 21,000 jobs for the 2015 drought.²

California has experienced five large-scale, multiyear droughts since 1960; however, the current event is considered the state's most severe drought in at least 500 years.³ Each year of the current drought has presented different challenges; for example, much of California received no measurable precipitation December 2013 through late January 2014 (Fig. 1).⁴ In the following year, the Sierra Nevada snowpack was just 5% of normal. As California ranching is largely dependent on rain-fed systems, as opposed to groundwater or stored water, it is very vulnerable to drought. In fact, rangeland livestock ranchers were among the first affected by the abnormally warm, dry winters at the beginning of the current multiyear drought.

In this article, we highlight lessons learned so far from past droughts, as well as California's unprecedented and ongoing multiyear drought. We draw on ranchers' perspectives and experiences, including research results from a statewide mail survey of 507 ranchers⁵ and semistructured interviews of 102 ranchers, as well as our own experiences. The mail survey (the California Rangeland Decision-Making Survey⁵) included questions on operator and operation demographics, goals and practices, information resources, and rancher perspectives. Semistructured interviews are part of a larger ongoing project (the California Ranch Stewardship Project) examining rangeland management for multiple ecosystem services.

First Impacts

California's estimated 34 million acres of grazed rangelands provide the backbone of support for many livestock commodities in the state, including cattle and calves (\$3.3 billion annually) and sheep and goats (\$92 million annually).⁶ These biologically diverse working lands also preserve open space and critical wildlife habitat. Ranchers in California's large Mediterranean climate zone are already challenged by



Figure 1. Extreme drought on California's annual rangelands (Sutter County, California). At the time of this photo (January 2014), drought conditions were extreme to exceptional for 67% of the state.⁴ Photo courtesy of T.K. Schohr.

characteristically long, hot, and dry summers during which dryland forage quality declines over the season. Escalating drought frequency and severity compound this challenge, delaying or eliminating the fall, winter, and spring rains that lead to renewed green forage. Long-term drought poses significant, cumulative challenges to sustaining ranching operations and the ecosystem goods and services they provide. Severe and widespread drought can trigger undesirable ecological shifts, which can have long-term impacts on forage and livestock production and directly threaten livelihoods of families and communities.

In 2011—immediately prior to California's historic multiyear drought—we surveyed 507 ranchers across the state to gain insight into factors driving their decision making, perspectives on effective management strategies, and use of information sources (methods and details provided in Roche et al. 2015).⁵ Many ranchers reported experiencing drought-driven impacts more severe than expected during the previous drought (median date of last perceived drought was 2009), with lost grazing capacity (77%), profit (55%), and weaning weights (44%) most severely affected.⁷ Furthermore, over 74% of the 443 ranchers surveyed before the onset of the 2012 drought indicated that a new drought would impact their operations “as severely” or “worse” than past droughts.⁷

In early 2104, record-breaking water shortfalls—resulting in a drought state of emergency—received extensive media coverage and wide public attention. However, at the onset of this now unprecedented drought, California ranchers had already been facing regionally dry conditions across the state. Between spring 2013 and fall 2014, we conducted semi-structured interviews with 102 experienced ranchers across the state. Interview participants were identified via local Cooperative Extension, and face-to-face interviews (ranging 2–6 hours in length) were conducted by the senior author.

Ranchers interviewed reported an average of 4 years out of the previous 10 years as “drought years.” Seventy-six percent of the 60 ranchers we interviewed in 2013 stated they expected to see impacts

to their operations if the then-emerging, severe drought conditions persisted into the coming year, and 35% of those interviewed expected devastating impacts to the viability of their operations if drought conditions persisted. Early in our interview process, several ranchers interviewed noted that a statewide severe drought would exacerbate the effects of earlier consecutive droughts in their regions. As one rancher stated in early 2013, “I’ve never seen one like this before—this is the worst we’ve ever experienced in our area. I hope we don’t see another one like this in our lifetime.”

Soon after, 2012 through 2014 went down in the record books as the driest 3-year period ever documented (Fig. 2). Central and southern regions of the state experienced the most dramatic impacts.⁸ For example, the San Luis Obispo County Agricultural Commissioner's Office estimated an 80% forage production loss across 1 million acres of rangeland for 2014 to 2015, amounting to more than \$7.3 million in estimated loss revenue (M. Settevendemie and R. Larsen, personal communication). At the time of interviewing, many ranchers did note the record high cattle prices differentiated the current drought from the last severe drought of the mid-1970s. One rancher stated, “Fortunately the cattle market's been really good in the last couple of years... that's been one thing that's saved us.”

Planning For and Coping With Uncertainty

California's rangelands exhibit great heterogeneity due to strong interannual weather variability, regional rainfall and temperature gradients, and local soil and topographic diversity. This tremendous variability is a constant management challenge across sites and from year-to-year within a single site, which will only be exacerbated by expected increases in extreme weather events. For example, rangeland managers generally set critical dates to make destocking decisions between 1 March and 1 April; however, in 2014, local Cooperative Extension livestock and natural resource advisors found that the proactive critical date was much earlier

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