

Cattle Grazing Across The Nature Conservancy in California's Conservation Estate

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There is a 300-year+ cattle and sheep grazing legacy in California, from the Rancho era continuing to the present day. The Nature Conservancy has a long history in California and across the western United States in using cattle grazing for conservation purposes. In California alone, the Conservancy works across ~400,000 acres of grazed lands (hereafter, grazed conservation estate), including both fee and conservation easement lands (Figure 1).

Currently, the major goals of the Conservancy's cattle grazing program in California are to:

- Increase plant and animal diversity
- Reduce catastrophic fire risk
- Maintain and influence voluntary relationships with the commercial grazing sector, which controls management of far more acreage than TNC could ever hold in fee

Across our grazed conservation estate, including at the ~25,000-acre Jack and Laura Dangermond Preserve, ~81,000-acre Randall Preserve, and ~140,000-acre Lassen Foothills/Dye Creek Preserve (Figure 1), the Conservancy is using conservative stocking rates (i.e., less than what land could support based solely on vegetation types, precipitation, and soil types) together with rotational grazing strategies that move cattle through fenced pastures; rotations are based on monthly and annual assessments of forage (feed) condition, herd health, and climate/precipitation (e.g., see Butterfield et al. 2020). On our grazed conservation estate, annual monitoring of grazing practices has largely relied on end-of-the-season measurements of minimum levels of residual dry matter (RDM), which have been shown over the past 70+ years in California grasslands and oak woodlands to have a strong relationship to reducing soil erosion, maintaining forage productivity, reducing non-native grass biomass to support native grasses and forbs, and maintaining the structural habitat necessary for many native wildlife (Bartolome et al. 2006). In the 2022 monitoring season, Conservancy staff used a combination of on-the-ground RDM monitoring at the end of the grazing season combined with remote sensing data and analytics available on RDMapper/Rangeland Lens, a remote sensing-based web tool that tracks changes in forage production across the season (Butterfield et al. 2013, Tsalyuk et al. 2015, Ford et al. 2017).

There are many perspectives of the role of cattle grazing in California and across the western United and the introduction and eventual dominance of new nonnative species of annual grasses and forbs during European settlement (Barry et al. 2006, Bartolome et al. 2014). While these perspectives and discussions are interesting and provide insight, the fact remains that non-native, annual grasses now dominate western grazed lands in California, and that cattle grazing is necessary to reduce their cover and density, so that native forbs and grasses can grow and recruit. Studies supporting this conclusion cover a diversity of ecosystem types including mesic grasslands/coastal prairie (Hayes and Holl 2003), vernal pools/seasonal wetlands (Marty 2005, Marty 2015), serpentine grasslands (Weiss 1999), annual grassland/oak woodland (Gennet et al. 2017), and dry grasslands (Germano et al. 2012). In a recent meta-analysis of 14 grazing studies in California grasslands, Stahlheber and D'Antonio (2013) concluded that cattle grazing enhanced native forb (i.e., wildflowers) richness and native grass cover, but also led to an increase in the cover of exotic forbs.

This meta-analysis demonstrates what we see across our conservation estate anecdotally – that cattle grazing, like other management tools, is not one size fits all. It can help native plant and animal biodiversity if done in certain ways or diminish these same values if done in others, especially in more “fragile” systems, including desert grasslands, where productivity is lower and plant and soil crust communities are more sensitive to overgrazing (Hall et al. 2005). And the impacts of a changing climate are making it even more important to deliberately plan, monitor, and adapt grazing programs each year. In developing cattle grazing prescriptions for managing native biodiversity across its grazed conservation estate, The Nature Conservancy in California’s goal is to engage experienced rangeland managers and ranchers as well as academic and other grazing partners, when possible, to help develop and implement cattle grazing across diverse and varied landscapes across California (e.g., Butterfield et al. 2020).

The Nature Conservancy in California has a history of not only using cattle as a management tool, but also removing cattle from its conservation lands, from the Vina Plains/Lassen Foothills in Tehama County to the Carrizo Plain in San Luis Obispo County to the Santa Rosa Plateau in Riverside County and of course Santa Cruz Island. In the case studies that follow, the hypothesis was that by removing cattle, native plant and animal biodiversity would increase.

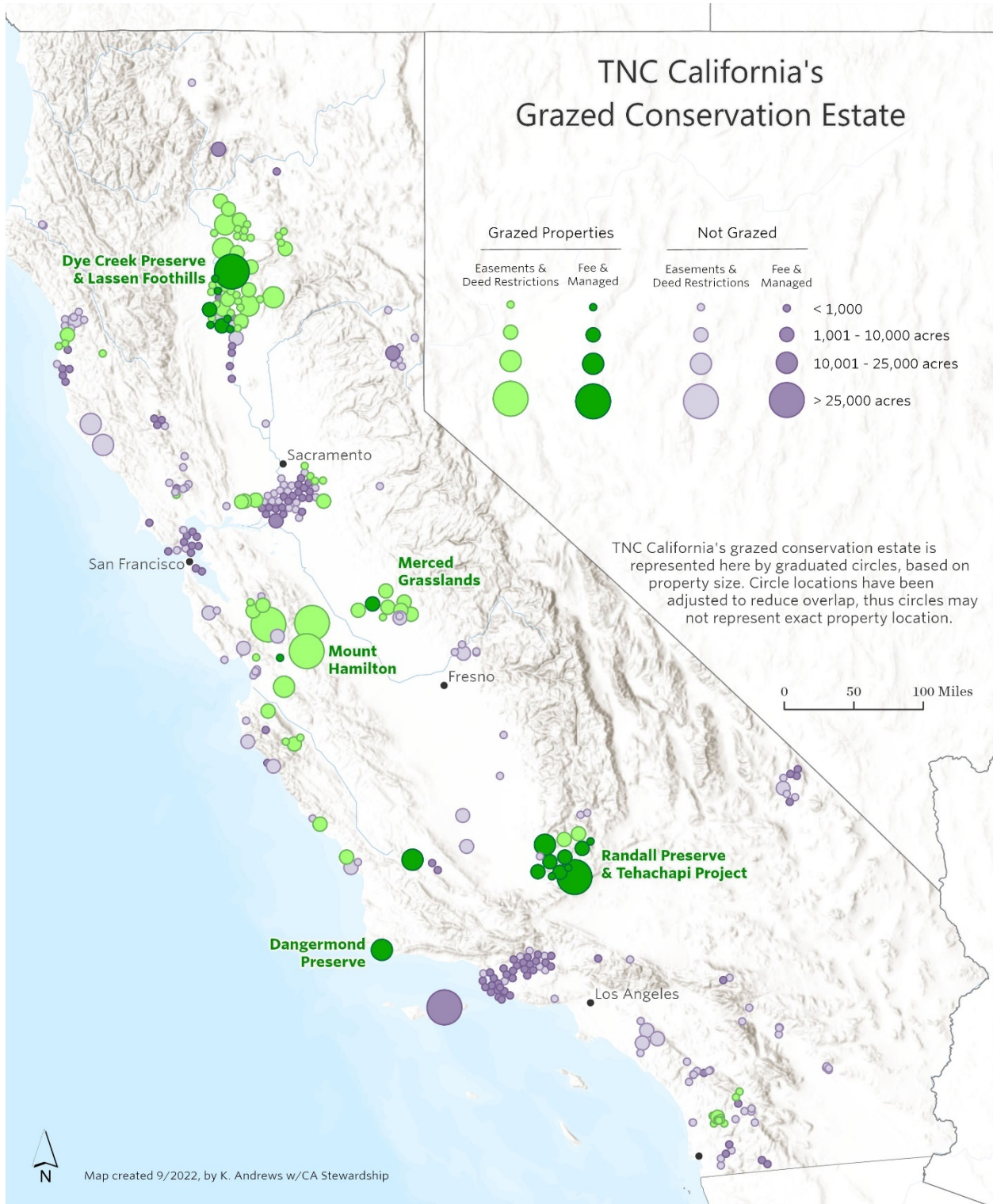
- In some situations, this hypothesis was not supported such as at the Vina Plains Preserve in Tehama County, where native biodiversity values in this vast vernal pool landscape declined when cattle were removed (Barry 1995, Barry 1998). Cattle grazing has since been reestablished and native species in these vernal pool complexes have rebounded. A controlled experiment in the Cosumnes watershed from 2000 – 2003 strongly supported the conclusion that removal of grazing was responsible for the observed decline in vernal pool biodiversity (Marty 2005).
- At other places, such as the Carrizo Plain, cattle were removed and native biodiversity and habitat was maintained and improved (Christian et al. 2008) because of the presence of another native keystone grazing species, the endangered giant kangaroo rat. Giant kangaroo rats at the Carrizo Plain – where they have their largest population anywhere in California – are unique across California’s grazed ecosystems in that they can graze down a similar amount of grass biomass as a cow (Prugh and Brashares 2011), so essentially serve the same ecosystem functioning role. Giant kangaroo rats are endemic and restricted to the San Joaquin Desert (Germano et al. 2011), so the possibility to translocate or introduce them to new lands to serve this grazing role is geographically limited. Other smaller kangaroo rats found more generally across California do not graze at these same levels as the giant kangaroo rat.
- At the Santa Cruz Island Preserve, the removal of non-native grazers (primarily feral sheep) focused on restoring native shrublands (Van Vuren 2014). Santa Cruz Island was not a grassland ecosystem before sheep (and goats) were introduced in the 1850s, so conservation goals after sheep removal did not include using conservation grazing approaches to manage non-native grasses and increase native grasses and forbs in grassland ecosystems. Instead, when sheep were removed from Santa Cruz Island, from 1981 to 2001 (Schuyler 1993, Faulkner and Kessler 2011), the Conservancy allowed the ecosystem to be converted from an unnatural denuded non-native grassland to one again dominated by native shrubs (Yelenik 2018, Van Vuren and Bowen 2012, Van Vuren 2014, Beltran et al. 2014). A similar scenario played out in the 1990s to current day across lands owned and managed by the Conservancy in Orange County, where shrublands have rebounded in such levels that now conservation practitioners are concerned their density and cover is too high (Principe, personal communication, 2022). Across most of

California's grasslands, type conversion to shrublands would not be seen with the same positive light, because it would likely lead to large losses in native grass and forb diversity, and an increase in the potential for more frequent and severe wildfires.

The Conservancy uses many different approaches to grazing depending on the ecosystem type, the conservation goals for the property, and the overall productivity of the land. Variables we manipulate to meet these varied goals include duration and seasonality of grazing, size class/type of cattle, and stocking density. In general, the Conservancy's main goal for all grazing programs is to maintain a sustainable – both environmentally and financially – operation that serves as the primary tool to manage for biodiversity values (e.g., reduce non-native grass biomass accumulation to allow for greater cover of native grasses and forbs), recognizing we have few, if any, other options for landscape-scale land management. More than 75 years of grassland and oak woodland research in California suggests that removing cattle grazing from most ecosystems would lead to a loss in native biodiversity values (e.g., Bartolome et al. 2014). We must continue to evaluate landscapes individually to identify ones where native grazers, such as giant kangaroo rats, can maintain conservation values. Increasingly, cattle grazing is also being used as a management tool to reduce fuel loads and the threat of catastrophic fire. Recent studies in California have shown that moderate levels of grazing can allow for easier control and management of fire (Ratcliff et al. 2022, Siegel et al. 2022).

Allowing cattle to graze across Conservancy lands requires maintenance of thousands of miles of roads and fence and extensive water delivery systems. Without cattle grazing and the ranchers that run these cattle, these water systems would likely not be maintained and would start to fail, greatly limiting water availability to wildlife. We have seen this play out over the last 25+ years at the Carrizo Plain National Monument. As cattle were removed from the Carrizo Plain, water systems deteriorated, leaving more than 200,000 acres of the Carrizo Plain National Monument without water for wildlife. This loss of water is hypothesized to have had a dominant role in the reduction of the pronghorn population at the Carrizo Plain. Climate change and unsustainable water management is further exacerbating the issue of water availability for wildlife as natural water systems (seeps and springs) are drying out earlier in the year (and some never filling/running). Human-made water systems, like we see on our grazed conservation estate, may be a crucial piece of maintaining water for native wildlife in the future. And having ranchers maintain these systems (as well as the fences and roads and other infrastructure, including non-permanent electric fencing and portable troughs) as part of grazing leases may be the only feasible and economic way for the Conservancy to do this at scale (i.e. more than 400,000-acre grazed conservation estate).

Figure 1.



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