



Benefits of Cattle Grazing for Fuels Reduction and Fire Safety

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Wildfires in California

- Increasing in frequency and severity
- Since 2013, an average of >900,000 acres have annually
- Result in loss of life, impaired air quality, loss of structures, and loss of forage
- Models predict more frequent and severe wildfires



CAL FIRE



Incidents



About Us





Rangeland Fires



Cattle Grazing Reduces Fine Fuels

- Park Districts, Water Districts, Habitat Conservation Plans, and regional policy groups recommend cattle grazing for fuels reduction
- So what is the effect of cattle grazing on rangeland fuel loads? How might this affect fire behavior across the state?



Fuel Reduction



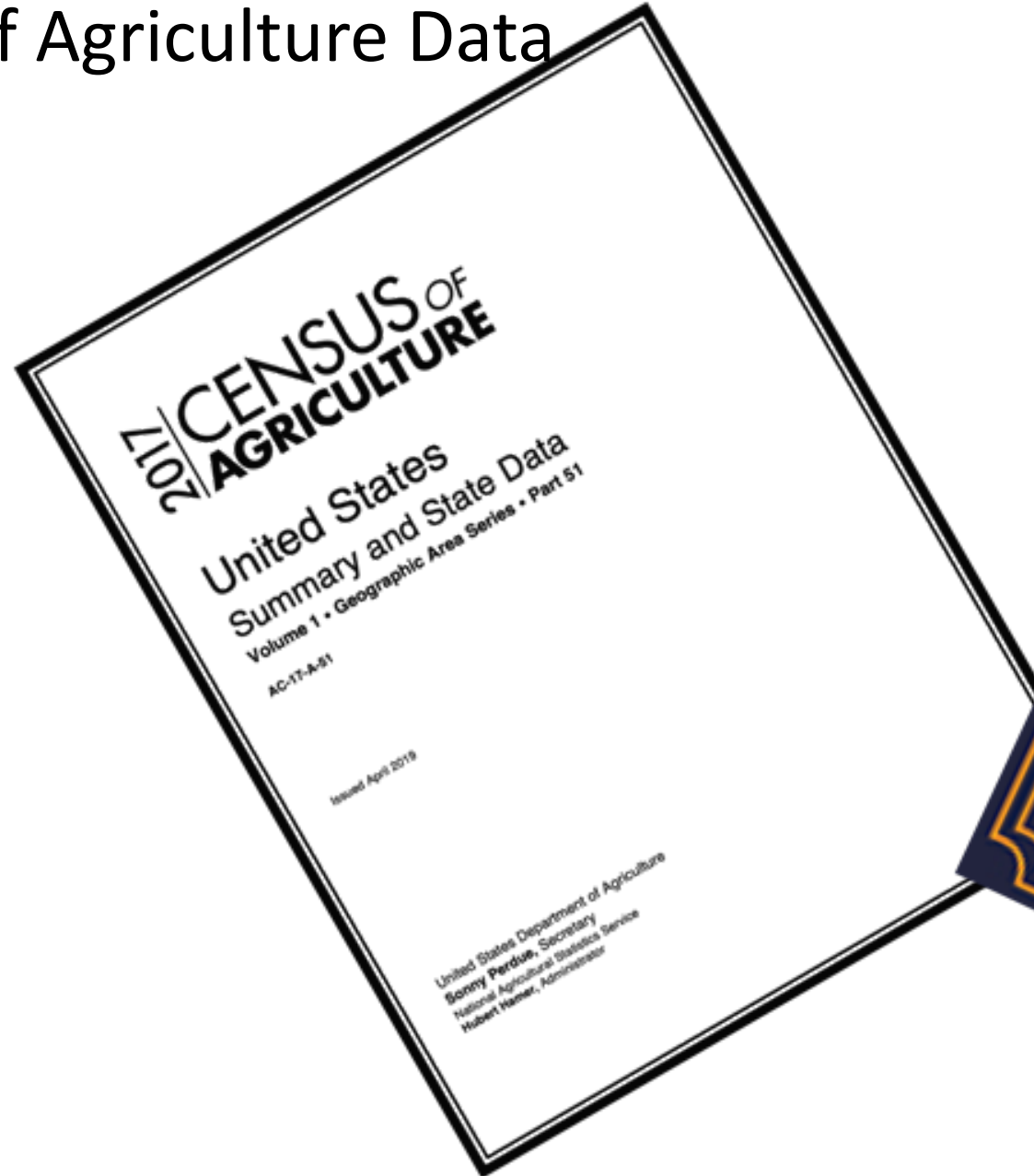
Ungrazed



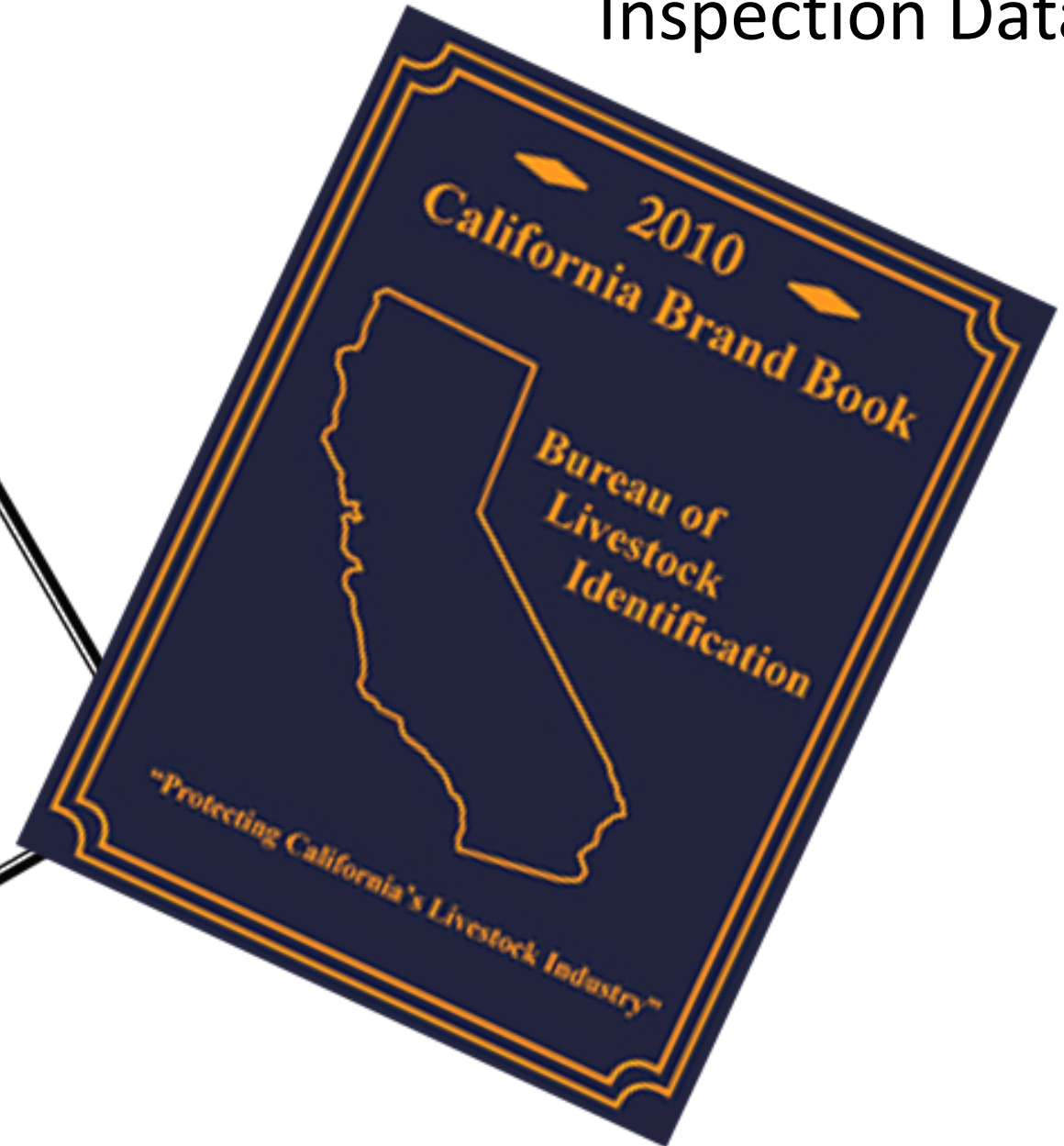
Grazed

To What Extent do Cattle Reduce
Fuel Loads Across the State?

2017 USDA Census of Agriculture Data

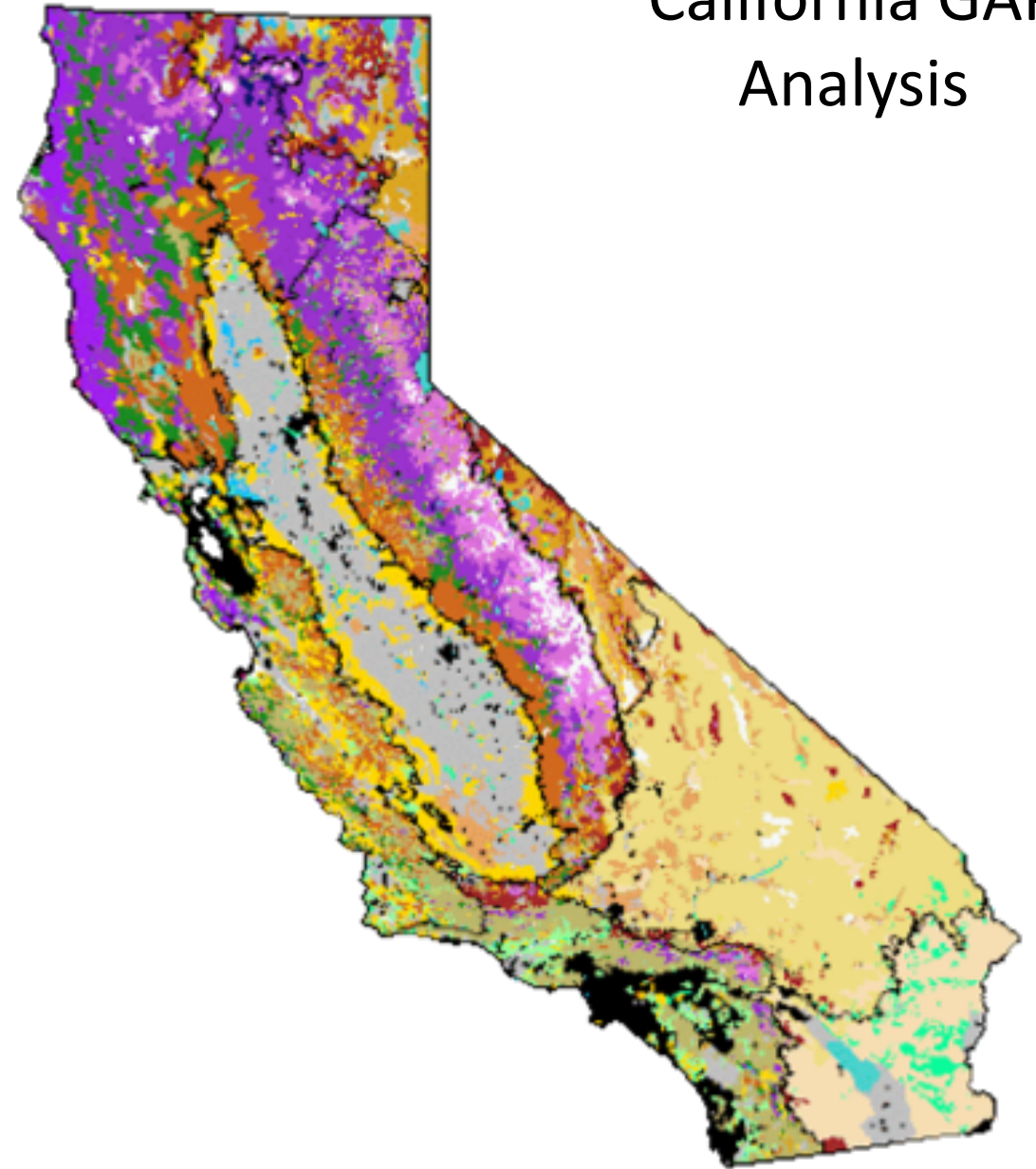


2017 Brand Inspection Data



County Crop Reports

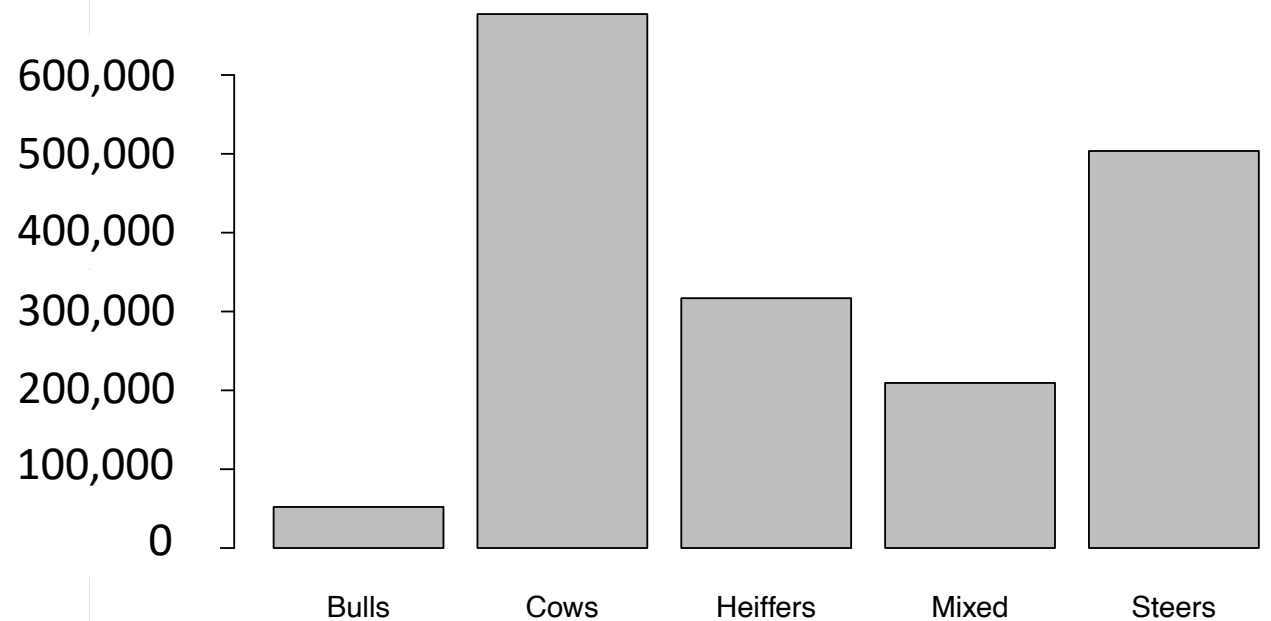
California GAP Analysis



State-Wide Results

- ~1.8 million head of beef cattle were in California in 2017 (not including those on feed)
- > 6 million tons of forage removed by cattle across the state in 2017
- Grazed rangeland acreage from crop reports was >20 million acres
- Total Rangeland acreage from GAP analysis was ~58 million acres
- ~38 million acres of rangeland were not grazed in 2017

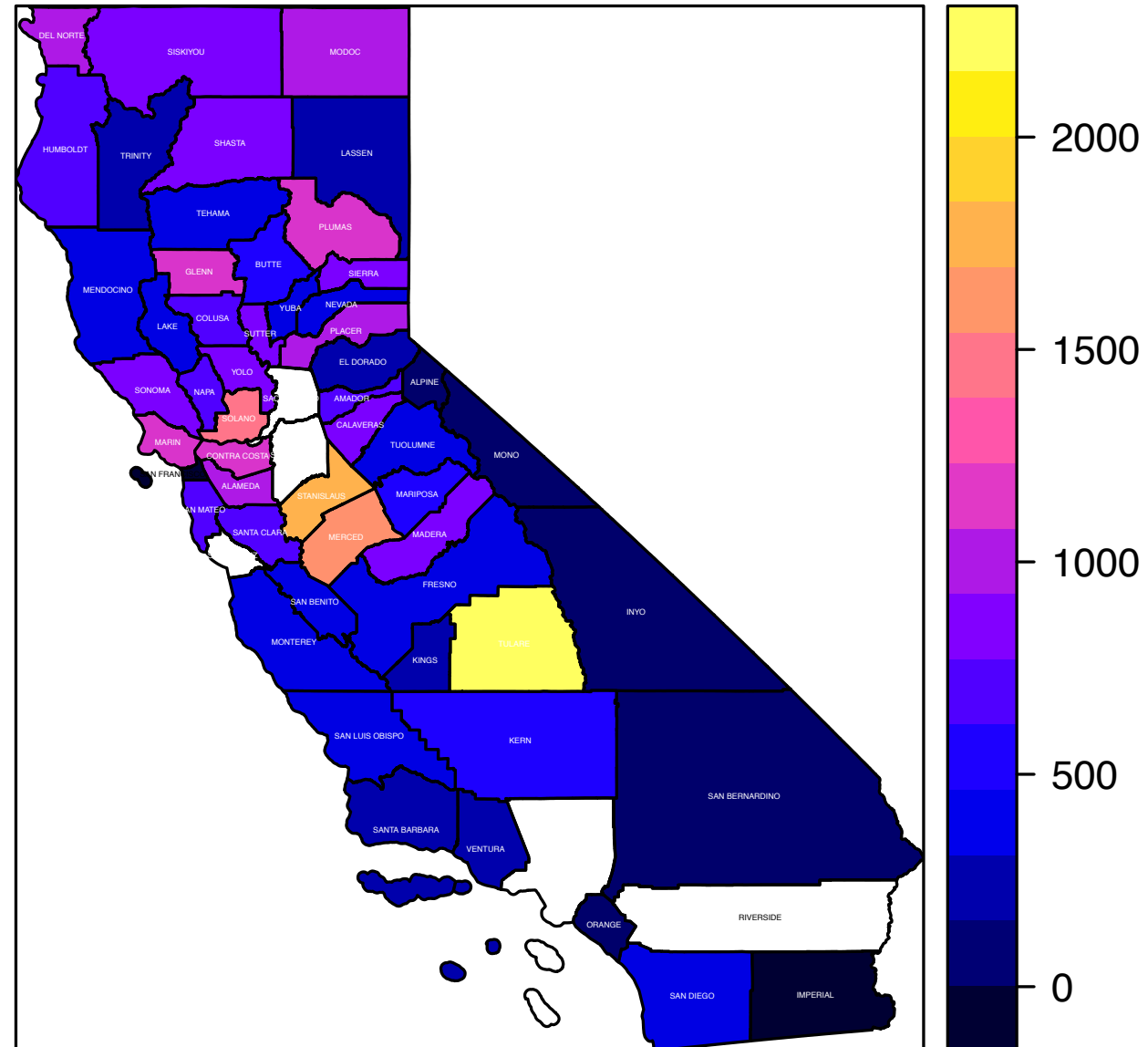
Number of Beef Cattle By Class



County Results

- Average fine fuel removal of 650 lbs/grazed acre
- Fuel removal varied between 0 lbs/acre in Imperial County to ~2200 lbs/acre in Tulare County
- Generally higher in Central Coast, Sierra Nevada foothills, northern counties
- Generally lower in desert and southern CA counties
- Blanks reflect missing data

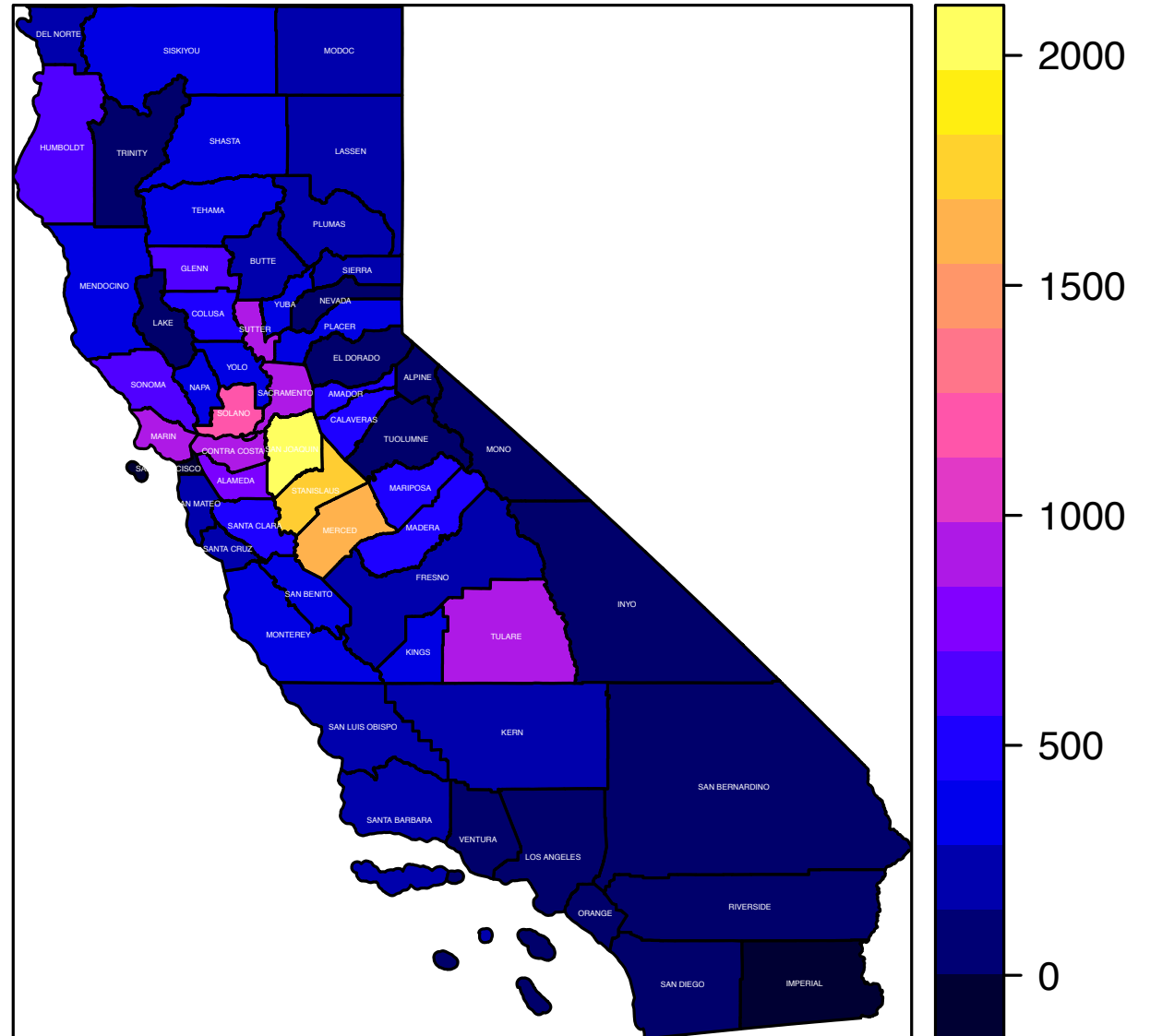
Pounds of fuel removed per GRAZED rangeland acre



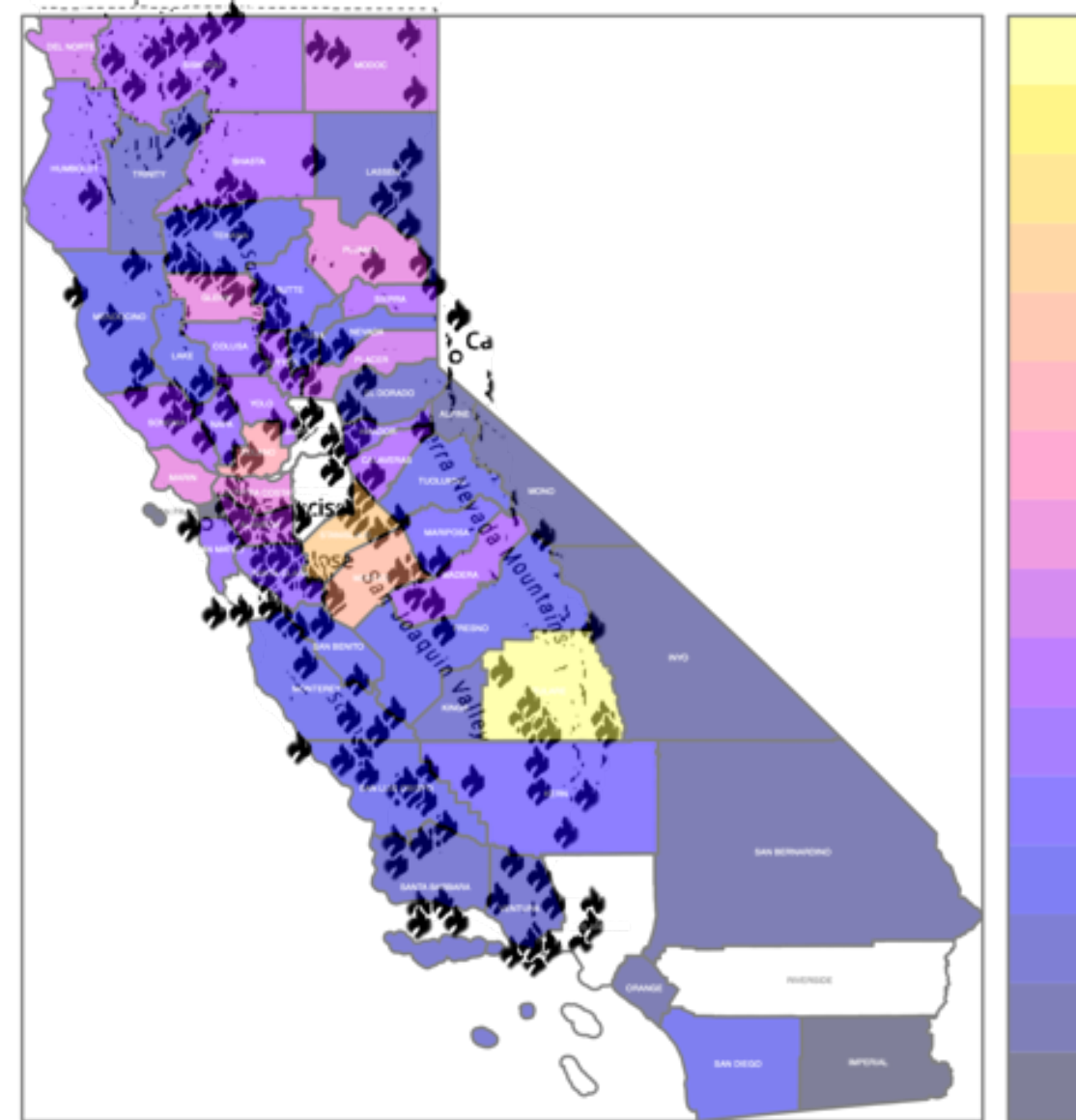
County Results

- Average fine fuel removal of 290 lbs/acre (for all rangelands)
 - much lower than 650 lbs/acre on grazed rangelands
- Similar trends across state:
 - Higher in central coast, central valley, and northern California
 - Lower in deserts and southern California

Pounds of fuel removed per rangeland acre (ALL RANGELANDS)

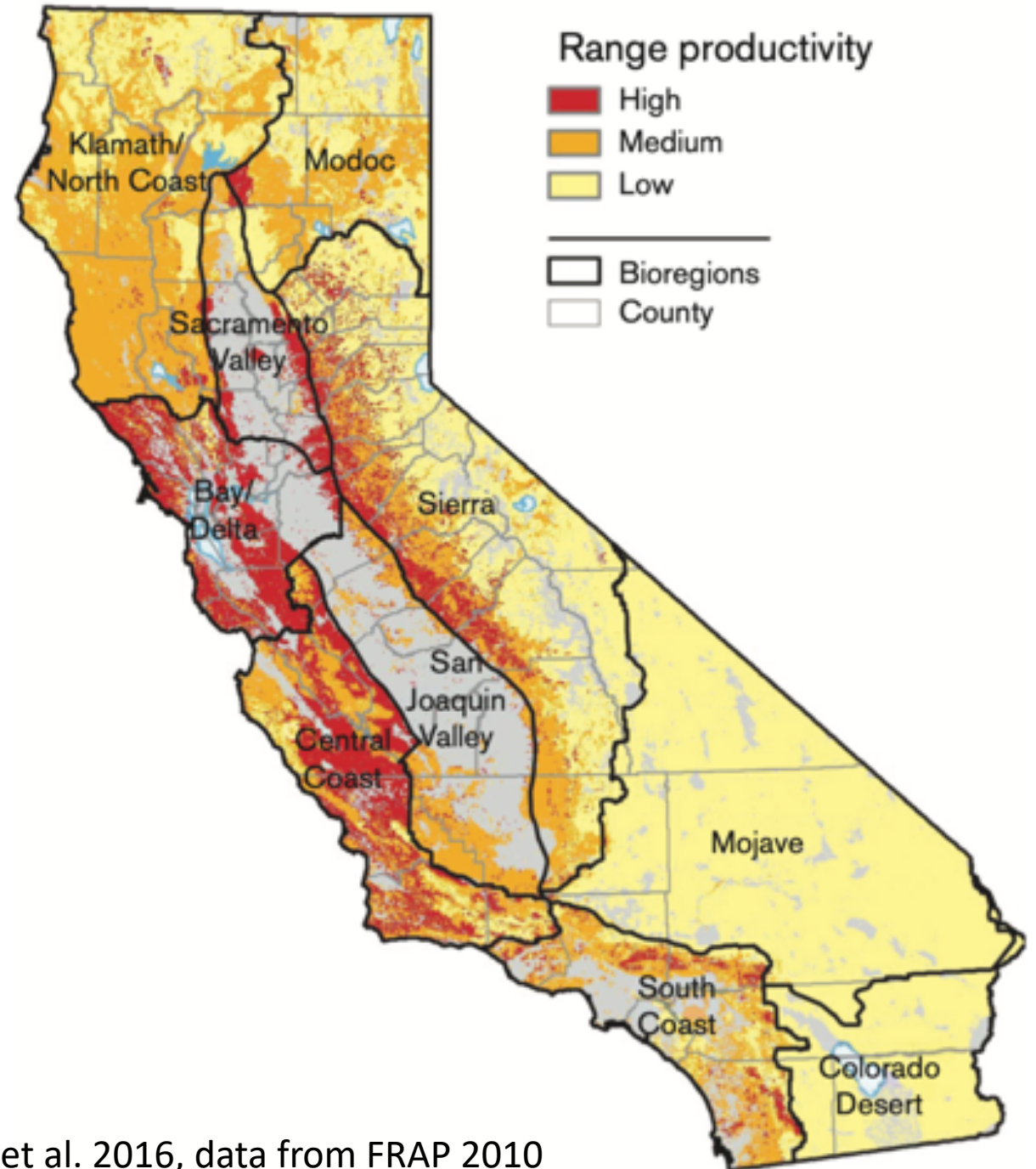


Grazing Occurs in Fire Prone Areas



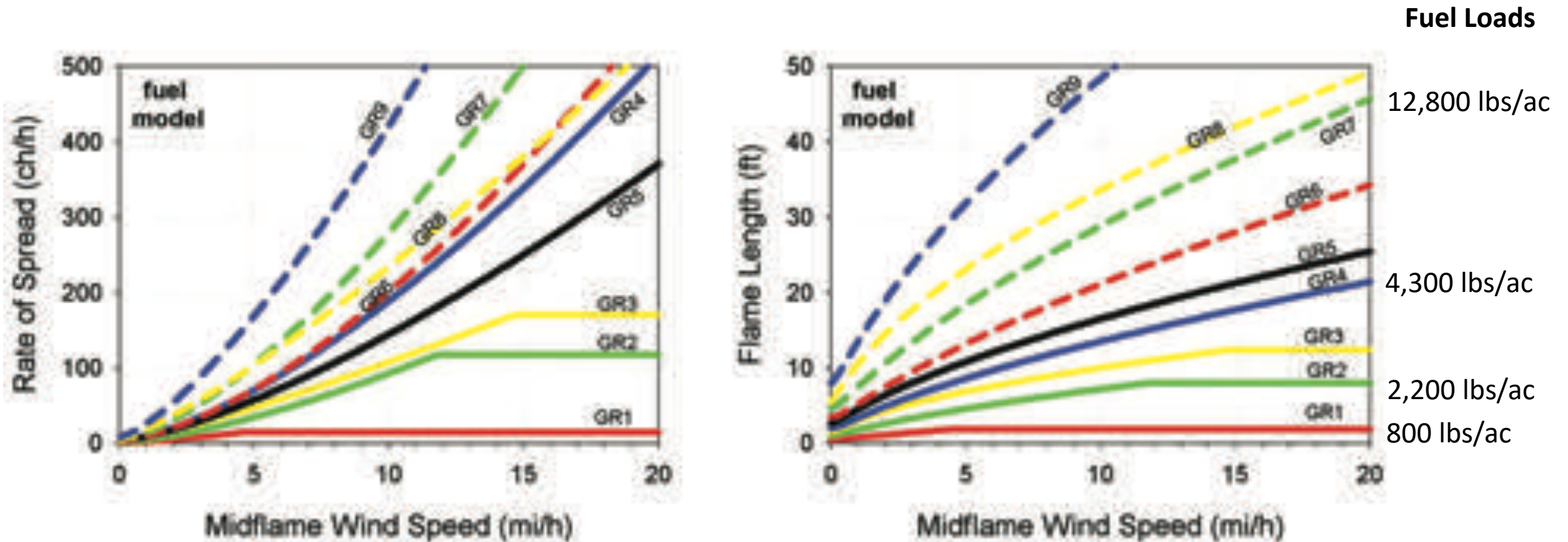
So, what's this mean for reducing wildfire risk?

- Areas with high fuels removal are also areas with high production
- What matters more is residual biomass, not how much was consumed




Spiegel et al. 2016, data from FRAP 2010

Modelled Flame Length and Rate of Spread in Grasslands with Different Fuel Loads



Residual Dry Matter (RDM) Standards



RANGELAND MONITORING SERIES

PUBLICATION 8092

Guidelines for Residual Dry Matter on Coastal and Foothill Rangelands in California

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Residual dry matter (RDM) is a standard used by land management agencies for assessing the level of grazing use on annual rangeland and associated savannas and woodlands (George et al. 1996). RDM is the old herbaceous plant material left standing or on the ground at the beginning of a new growing season. It indicates the combined effects of the previous season's forage production, breakdown over summer, and its consumption by grazing animals of all types. The standard assumes that the amount of RDM remaining in the fall, subject to site conditions and variations in weather, will influence subsequent species composition and forage production.

Properly managed RDM can be expected to provide a high degree of protection from soil erosion and nutrient losses. Applications of specific RDM standards based on a limited research base and on experience have demonstrated the effectiveness of this approach to grazing management. Because of the limited amount of research information, standards and score cards normally have to be developed using local experience and general guidelines such as those that appear in this publication. Numerous agencies have successfully applied the RDM-based method for managing grazing intensity over the past 20 years. Some examples are the Bureau of Land Management and the Natural Resources Conservation Service (BLM 1999), the National Park Service (Shook 1990), the U.S. Forest Service (USDA Forest Service 1997), and the San Joaquin Experimental Range (Frost et al. 1988).

REGIONAL GUIDELINES

A series of experiments conducted by H. F. Heady dating from the 1950s showed that the amount of fall RDM (or what Heady termed "natural mulch") dramatically influenced forage productivity and composition at the high-rainfall (35 in/yr, or 89 cm/yr) UC Hopland Research and Extension Center site in southern Mendocino County (Heady 1956). To determine the effects of RDM that would be representative of heavy to moderate grazing on annual rangeland at different sites, Heady established nine experimental plots in the late 1960s and early 1970s and maintained them for 3 to 5 years. They were arranged along a rainfall gradient from the North Coast (rainfall > 40 in/yr, or 102 cm/yr) along the west side of Central Valley to the driest annual rangeland in the Western San Joaquin Valley (rainfall < 7 in/yr, or 18 cm/yr) (Bartolome et al. 1980).

This study showed that RDM had a significant influence on rangeland productivity in areas with annual rainfall in excess of 15 inches (38 cm/yr), subject to the overriding controls of site conditions and annual weather. Maximum productivity within the 15- to 40-inch (38- to 102-cm) annual precipitation zone occurred with 750 pounds per acre (840 kg/ha) of RDM in fall. The effects on composition in Heady's experiment were mixed (Jackson and Bartolome 2002). However, the experimental sites constituted an incomplete representation of the annual rangeland region and were limited to flat ground without any woody plant cover. An ongoing experiment in the Sierra Foothills suggests that the range of 600 to 1,200 pounds per acre (672 to 1,344 kg/ha) of RDM maximizes both forage production and species richness (Bartolome and Betts 2003).



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California Rangelands Research and Information Center

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Table 1. Minimum RDM standards for dry annual grassland in pounds per acre (dry weight)

Woody cover (%)	RDM standard for percent slope (lb/acre)			
	0-10	10-20	20-40	>40
0-25	300	400	500	600
25-50	300	400	500	600
50-75	NA	NA	NA	NA
75-100	NA	NA	NA	NA

Note: Metric conversion: 1 lb/acre = 1.12 kg/ha.

Table 2. Minimum RDM standards for annual grassland/hardwood rangeland in pounds per acre (dry weight)

Woody cover (%)	RDM standard for percent slope (lb/acre)			
	0-10	10-20	20-40	>40
0-25	500	600	700	800
25-50	400	500	600	700
50-75	200	300	400	500
75-100	100	200	250	300

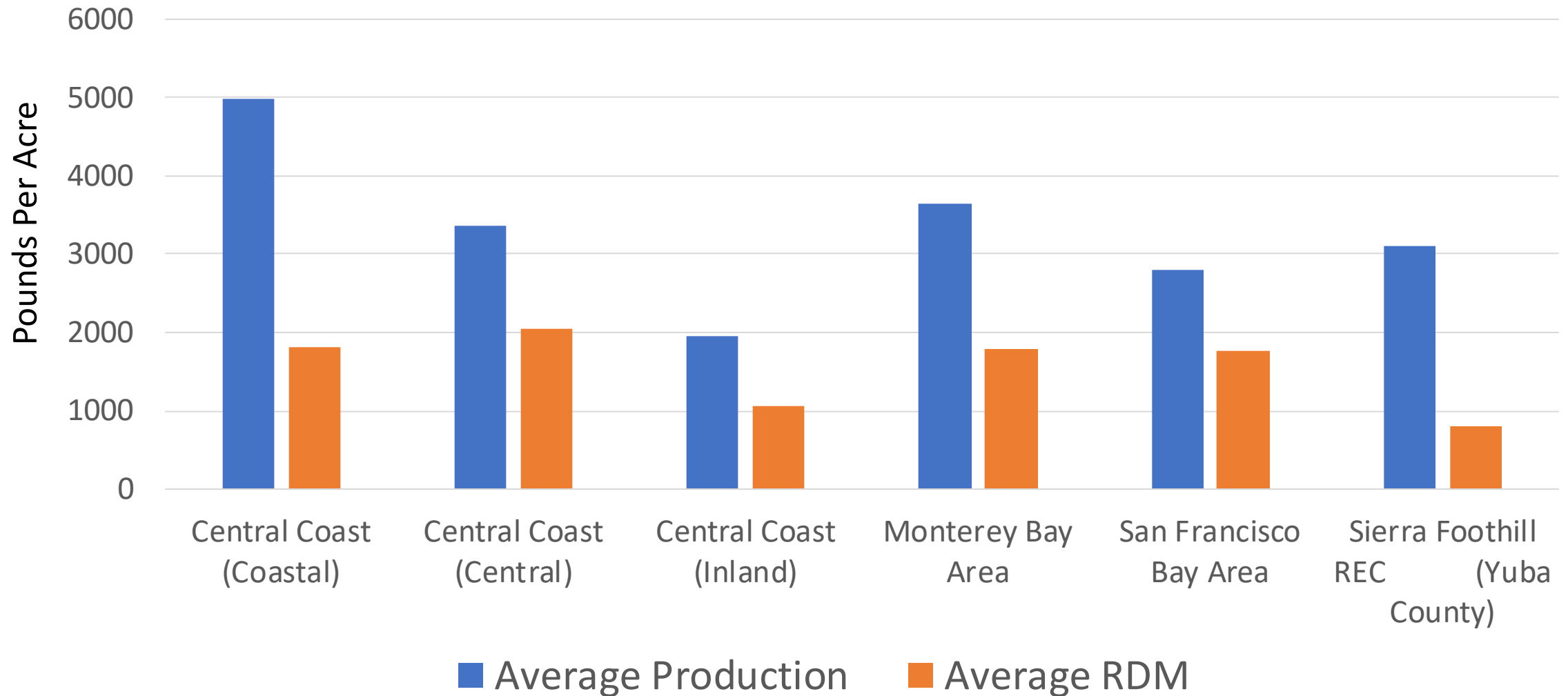
Note: Metric conversion: 1 lb/acre = 1.12 kg/ha.

Table 3. Minimum RDM standards for coastal prairie in pounds per acre (dry weight)

Woody cover (%)	RDM standard for percent slope (lb/acre)			
	0-10	10-20	20-40	>40
0-25	1,200	1,500	1,800	2,100
25-50	800	1,000	1,200	1,400
50-75	400	500	600	700
75-100	200	250	300	350

Note: Metric conversion: 1 lb/acre = 1.12 kg/ha.

Production and Residual Dry Matter (RDM) at Multiple California Sites



Conclusions

- Cattle grazing is an important tool for reducing fine fuels on grazed rangelands
- Fuel reduction rates on grazed rangelands varied by county from 0 to ~2200 lbs/acre
- These fuels were generally being reduced in more productive rangelands occurring in fire-prone areas of the state
- In counties with higher grazing pressure (>1000 lbs/acre), we would expect a change in fire behavior at many wind speeds. For reducing fire risk, fuels would ideally be <800 lbs/acre to keep flame heights <4 ft even in high wind speeds, but this may not be feasible in high production years or in areas with higher RDM standards or competing resource needs

Conclusions

- Strategic implementation of livestock grazing for wildfire risk reduction should target areas with high fire severity and high ignition risk
- We need more research to identify target levels of fuel loads or residual biomass for fuels reduction in California rangelands
- Grazing Management Plans should consider incorporating maximum RDM standards for fire safety and other natural resource goals

Thank you!

- Research team: Devii Rao (UCANR), Sheila Barry (UCANR), Luke Macaulay (UCANR), Rowan Peterson (UC Berkeley)
- Point Reyes National Seashore, NRCS, Sierra Foothills Research Extension Center, and Royce Larsen (UCANR) for production and RDM data
- Max Moritz (UCSB Bren School and UCANR) for help with fire behavior modelling
- California Cattle Council for funding this research