



Research Brief for Resource Managers

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Contact:

Jon E. Keeley
Marti Witter
Liz van Mantgem

Phone:

(559) 565-3170
(805) 370-2333

Email:

jon_keeley@usgs.gov
marti_witter@nps.gov
evanmantgem@usgs.gov

Central and Southern California Team, USGS Sequoia and Kings Canyon Field Station, Three Rivers, CA 93271

Chaparral Removal Increases Soil Moisture

McKell, C. M., J.R. Goodin and C. Duncan. 1969. Chaparral manipulation affects soil moisture depletion patterns and seedling establishment. Journal of Range Management 18: 159-165.

In the mid-20th century there was a concerted effort to find methods to convert the 10 million acres of California chaparral to grassland to increase land values, improve grazing, and reduce fire hazards. McKell and his associates believed that replacement of brush was difficult because there was insufficient soil moisture for grass establishment due to the extended summer dry period and because chaparral shrubs decreased the amount of available soil moisture even further.

In 1963, they tested the effect of chaparral on soil moisture conditions and grass seedling establishment by comparing plots at two sites in San Diego and San Bernardino Counties. Their three major plot treatments were intact chaparral (control), chaparral removed by hand-clearing, and chaparral sprayed with 2,4-D herbicide with skeletons left in place. Gypsum electrical-resistance blocks were placed at different depths to measure soil moisture every month for five years. In 1966, Harding grass and wheat grass species were seeded into the plots. Seedling establishment success was measured two years later (1968) by plant counts, height measurements, vigor ratings, and dried plant weight.

The first three years' measurements showed the effect of chaparral on soil moisture at 1' and 3' depths. The chaparral plots had much less soil

Management Implications

- Soil moisture levels in chaparral are severely depleted in a predictable annual cycle that can be lengthened or shortened by the amount and timing of rainfall.
- Removal of chaparral will initially increase soil moisture levels, but even cleared soils will still experience water depletion due to the long summer dry period. In the absence of additional maintenance, moisture levels will return to pre-treatment levels in 2-3 years.
- It is difficult to establish grasses in the undisturbed understory of closed canopy chaparral. Disturbances such as fire or mechanical clearing provide a potential window of establishment opportunity because of increased light and moisture availability.

moisture, lost it earlier in the season and stayed drier longer than the hand-cleared and chemically treated plots (Fig.2). There were typically 5 month periods or longer of low water moisture on chaparral plots; in one low rainfall year moisture levels remained low for 10 months.

McKell et al. found that treated plots without chaparral grew significantly more grass than did control plots with chaparral (Tables 1, 2). They attributed the relative success of the grasses on the treated plots to a reduced competition for water, but they could not explain the two fold increase in productivity (biomass) for all grasses at all sites in the 2,4-D plots with standing skeletons compared to the hand cleared sites.

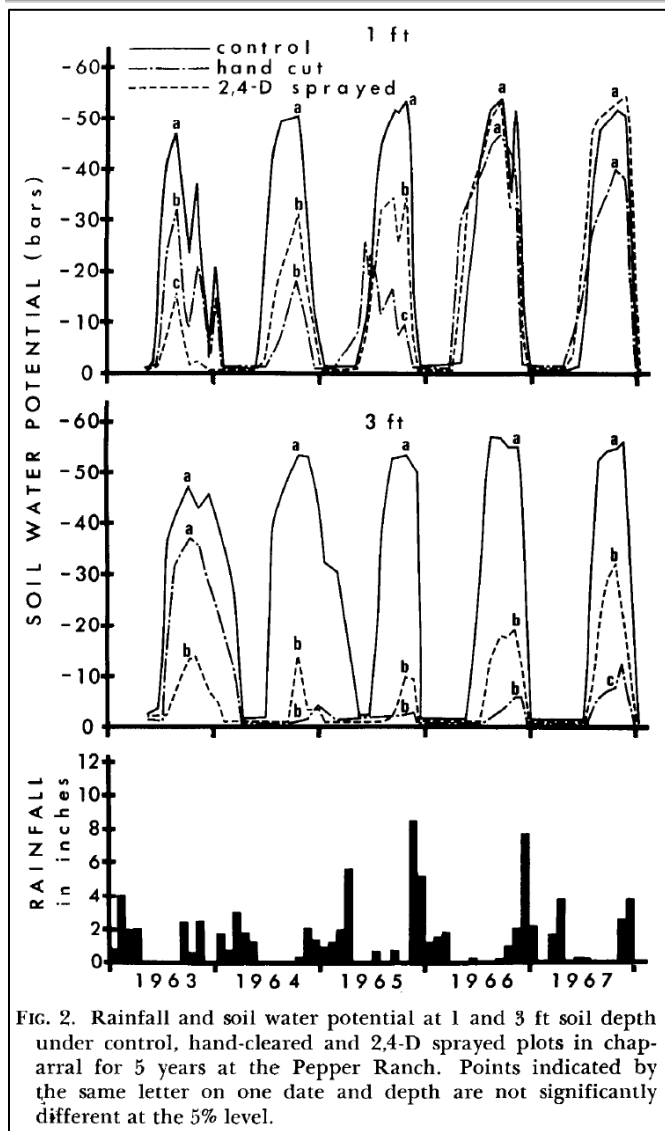


FIG. 2. Rainfall and soil water potential at 1 and 3 ft soil depth under control, hand-cleared and 2,4-D sprayed plots in chaparral for 5 years at the Pepper Ranch. Points indicated by the same letter on one date and depth are not significantly different at the 5% level.

Table 1. Establishment and yield of hardinggrass planted October 1966 in plots of treated chaparral.

Treatment	Average no. plants/plot		Yield lb/A April 1968
	January 1967	January 1968	
<i>Pepper Ranch</i>			
Cleared	57	50	2573
2,4-D	54	50	4895
<i>Oak Glen</i>			
Cleared	32	7	2980
2,4-D	34	7	5776

Table 2. Establishment and yield of wheatgrass planted April 1967 in plots of treated chaparral.

Treatment	Average no. plants/plot		Yield lb/A April 1968
	January 1968		
<i>Pepper Ranch</i> (tall wheatgrass)			
Control	6		278
Cleared	10		863
2,4-D	15		1468
<i>Oak Glen</i> (pubescent wheatgrass)			
Control	25		384
Cleared	16		1727
2,4-D	50		3109