

Cattle Grazing Impacts on California Coastal Prairie and Associated Wildflowers over a Broad Geographic Range

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Grey Hayes presented work done as part of his doctoral dissertation at the University of California, Santa Cruz, in the Department of Environmental Studies. Grey acknowledged that Karen D. Holl was his major professor at the University and co-author of the published work presented here.

Most people have the preconception that grazing harms biodiversity, however the results of this study suggest otherwise at least with native annual wildflowers. The study was done on California coastal prairie ecosystems that range from the Channel Islands in Southern California to Southern Oregon. The California coastal prairie ecosystem is different from inland grasslands because the habitat is moderated by summer fog, which is an important driving influence related to the fact that California coastal prairies have demonstrated to be the most diverse grassland ecosystem in North America, and (related to Dr. Prevanza's previous presentation) diversity may create more animal health and choices, providing more choices than any other grassland system in North America. Sadly, this ecosystem is also the most urbanized major habitat type in the United States; 24% of California Coastal Prairie has been lost to urban sprawl.

Grey Hayes began the project after a number of botanists suggested that he look into the disappearance of annual wildflowers on California coastal prairies with conservation work being done on the coast. Over the last 20–30 years one quarter of the coastline has been set aside in conservation status. Once lands are set aside, the removal and cessation of livestock grazing is often implemented. Now annual wildflowers, many of which are rare and endangered, are found commonly more on private lands adjoining conservation lands. The objective of this work was to investigate this pattern.

Despite the uniqueness of California coastal prairies with their huge abundance of wildflowers and forbs, most studies have focused on the grasses; both native perennial species and exotic annual grasses. One study done by Heady 1956, included a series of photographs with varying degrees of residual dry matter. The study indicated that with heavy litter there is an abundance of non-native annual grasses and also a taller canopy. When litter was removed the photographs showed several native wildflowers. These results were the impetus for the utilization of residual dry matter standards to maintain grassland productivity.

The resulting hypothesis of this study is that cattle grazing increases the diversity and abundance of native forbs by several mechanisms; decreased vegetation height, decreased litter depth, and an increase in bare soil. The sites for the study consisted of paired plots in proximity and having

similar slopes less than thirty percent, soils, and aspects. The sites must have been grazed only by cattle. The ungrazed sites must have been ungrazed for at least five years, and, because after 15–30 years ungrazed California coastal Prairies almost all turn to coastal scrub, the study targeted ungrazed sights that hadn't been ungrazed for more than 25 years. Access was another important and challenging aspect of sight selection. Several sights were selected along the California coast ranging from as far south as the Mount Diablo nuclear power plant in the South to just north of Fort Bragg in Westport.

Each sight included five 50 meter transects. Line transect data was collected at one meter intervals. Any species touching a pin lowered through the canopy was recorded, if none were touching it was reported as bare ground; this method yielded data pertaining to bare soil and dominant plant community composition. At five meter intervals along the transects vegetation height and litter depth were reported and soil samples collected for analysis. Since this study focused on annual wildflowers that are rare, researchers also centered a one meter wide belt transect on each line transect and looked for annual wildflowers. When found they recorded aerial cover, species, and in center litter depth and vegetation height were measured.

After two years of data collection in 2000 and 2001 the results demonstrate several important trends. First, annual forb species richness and cover increases significantly with grazing on the California coastal prairie sights analyzed. Other results pertaining to species richness guilds indicate that exotic annual grass trends higher on grazed sights, exotic annual forb richness is also higher on grazed sights, and that native perennial grass and native perennial forb richness trends higher on ungrazed sights.

The soil samples gathered at five meter intervals along the transects were analyzed as composites and compared with the characteristics of the paired site. The pH, organic matter content, total kjeldahl nitrogen, cation exchange capacity, and phosphorous, potassium, calcium, and magnesium concentrations in the soil were found to be the same under grazed and ungrazed sites.

As expected, the ungrazed sights demonstrated significantly deeper litter and taller canopies, and less bare ground compared to grazed sites. A regression analysis was done to compare litter and canopy with and without annual forbs and demonstrated that vegetation height is a very important variable pertaining to native annual forbs.

Several meaningful conclusions can be drawn from this study. First, grazing increases native annual forb diversity and abundance in California coastal prairies. This may be due to decreased vegetation height and litter depth. Grasses show mixed responses to grazing. Exotic forb abundance increases with grazing. Finally, native perennial forb abundance decreases with grazing; this is probably due to native coastal scrub incursion.

Some land management recommendations resulting from this study are that grazing should be considered as a management tool in mesic grasslands, and that disturbance regimes should be varied across the landscape.

Several other studies around the world that have looked at the same trend show a shift from perennial to annual species with grazing can benefit forb species richness. Studies cited and their locations are included in the PowerPoint presentation given at the symposium.

Finally, Grey Hayes posed the question that maybe we should expand on the idea of residual dry matter minimums already in place, and consider implementing maximums as well. He asked managers and planners to consider the following question when conserving native annual wildflowers: What about vegetation height guidelines?