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# Association for Arid Lands Studies

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SOME POTENTIAL INFLUENCE OF THE CONSERVATION RESERVE PROGRAM  
ON NATURAL COMMUNITIES IN SEMIARID NORTHERN AND CENTRAL  
CALIFORNIA RANGELANDS.

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# SOME POTENTIAL INFLUENCES OF THE CONSERVATION RESERVE PROGRAM ON NATURAL COMMUNITIES IN SEMIARID NORTHERN AND CENTRAL CALIFORNIA RANGELANDS

## INTRODUCTION

The Conservation Reserve Program is a voluntary program for retiring some of the most erodible land in The United States. Farm land characterized by severe erosion is eligible. Severe erosion means a rate more than three times the "tolerable" rate of soil erosion (defined as the rate at which natural processes can replace the lost soil and still maintain the soil's productivity). Soils eroding at more than two times faster than the "tolerable" rate are also eligible if the field contains serious ephemeral and gully erosion. Participants in the program receive half the cost of establishing grass or trees and an annual rental payment on land accepted into the ten year program. No grazing, cutting of hay, or commercial harvest of any wood product is allowed during the life of the contract.

## PRESENT COMMUNITY RELATIONS

Present range and woodland communities in the northern and central California interior have evolved over time to thrive in the climatic extremes of the interior valley and foothills as well as to different land use and management practices. Mean maximum and minimum temperatures vary between summer highs in the 90's and winter lows in the 30's. Annual rainfall can average 20 inches with most occurring during late autumn to early spring and with very little precipitation from June through August.

The semiarid climate coupled with land use practices restricts the diversity of plant and animal communities. Dominant vertebrate fauna include reptiles, a respectable array of seasonal and resident avifauna, and mammals, dominated by rodents, which by virtue of their numbers impact forage production both ecologically and economically. The reproductive and foraging cycles of many of these animals are adjusted to weather patterns which also determine the availability of food and cover for them and their predators. The Pacific rattlesnake, for example, is mainly crepuscular and nocturnal. The time of entrance into and emergence from hibernation depend on weather conditions. Ordinarily, no rattlesnakes are to be seen during the winter months. Peak abundance is reached in late spring about the time the active squirrel population reaches its annual peak, about two to three per acre, with a high proportion of young

of a size suitable to be eaten by snakes. Rattlesnakes must annually consume a prey weight of at least double their own weight. Ground squirrels and cottontail rabbits make up 85 percent of this predation(Fitch, 1948).

Rabbits seek out annual grasses and broadleaf herbs which dominate the annual grasslands. During the summer dry season, diet includes stalks and seed heads of fescue, lupine, tarweed, clover, and turkey mullein leaves(Fitch, 1947). Rabbits, particularly cottontail, bear the brunt of predation from most of the larger mammal, raptor, and snake predators present and the relative availability of alternative prey such as ground squirrels, wood rats, pocket gophers, and kangaroo rats.

The kind of food consumed by the rodent population differs according to season and locality. Grass is taken throughout most of the year but in relatively small quantities. In late fall and early winter, most of the common annual species can be grazed. Where perennial grasses are present, observations suggest there is limited utilization by these animals. Although legumes are the most prevalent in ground squirrel diet in March and April, nonlegume forbs are the major part of the year round diet. Broadleaf filaree is often the most important food source on California annual rangeland, and in one stage or another, is used throughout the year(Fitch, 1948, Fitch and Bently, 1949, Schitoskey and Woodmansee, 1978). The establishment of this exotic plant has played a key role in supporting high populations of California ground squirrels. Fifty grams of green filaree is an average daily ration and may comprise as much as 90 percent by weight of all food eaten. Soft chess can comprise 10 to 20 percent of the herbaceous cover consumed but is not preferred or eaten most of the growing season. Studies have shown that squirrels will feed upon tarweed and acorns when more preferable foods are absent. Use of tarweed stops as soon as new green growth is available in the fall.

Cattle consume smaller amounts of legumes in February and March, while legumes comprise 30 to 40 percent of the ground squirrel's diet at this time of year(Schitoskey and Woodmansee, 1978). Leaves are an important food source, principally during the late spring months, on the San Joaquin Experimental Range in the Central Valley. As the growing season progresses, rodents become more selective and begin to take flowers and seed, moving to leaf and stem material as the dry season advances(Fitch and Bently, 1949). Diets of cattle and ground squirrels generally are not similar at the San Joaquin Valley Experimental Range(Schitoskey and Woodmansee, 1978).

Use of stored acorns by ground squirrels has been observed for nearly every month of the year, slackening significantly during the late spring when green material is at its peak production. By the end of July, a substantial portion of the stored acorn crop may have been used. In October, when acorns are present in greatest abundance(about 13 pounds per tree) and have been ripened, ground squirrel activity is to

a large extent devoted to laying up caches, the only natural food regularly cached(Duncan and Clawson, 1980). In January, squirrels recover cached acorns.

Field studies of the California valley quail on annual rangelands show similar seasonal and weather related patterns(Glading 1940, Fitch 1948, Shields and Duncan 1966). Much of the mast taken by quail is that discarded by squirrels. There is a strong relationship between the availability and use by quail of acorn. When acorns are available, quail readily use them. In some dry years, broadleaf filaree has been observed to be the dominant ground cover and the seed is used. During wet years, seed of filaree, turkey mullein, and clover make up much of the diet. Turkey mullein makes most of its growth after other annuals have matured and does best when soil remains moist later into the year. During wet years it often ranks second only to legume seeds in the diet of valley quail and mourning dove(Glading, 1940, Wilkinson, 1953, Duncan, 1976).

#### THE EXCLUSION OF GRAZING

The intensity of grazing, kind of livestock grazed, botanical composition, soils, topographic features, weather, and climatic patterns must all be considered when relating vegetation changes to the exclusion of grazing. Intra- and interspecific plant competition is often ignored. Plant populations may decrease if competitors are better adapted to density-dependent factors such as shade. Frequency and the intensity of grazing also affect the ability of an initially minor component of a plant community to express itself. The same is true of the recruitment of infrequent plants. For example, grazing may exert an indirect adverse influence on some foliose lichen species through changes in humidity incurred by intense utilization of the groundcover. Reduction of the herbaceous undergrowth by grazing has the effect of reducing humidity in oak savanna stands thereby influencing lichen species composition on the bark of oak trees(Porter, 1980).

Studies have shown that when completely protected from grazing and where no reseeding occurs, the annual grassland tends to progress for an indefinite period of time through annual grass stages to become dominated by taller grasses such as ripgut brome and slender oatgrass. Clover and broadleaf filaree are reduced, except on shallow soils and around the margins of brush plants(Howard and Childs, 1959). Woody plants such as wedgeleaf ceanothus also increase.

Plants like turkey mullein, an important valley quail and mourning dove food, decline.

Nutrients of principal interest in annual grasslands are nitrates and phosphates. Results of studies to determine nitrogen and phosphate budgets show that where grazing has been excluded for three or more years, not only do grasses dominate with increasing levels of residual dry matter, but productivity declines when compared to adjacent lightly to moderately utilized areas (Woodmansee and Duncan, 1980). Input of nitrogen from symbiotic fixation (legumes) not only stimulates production and forage quality during the growing season, but also constitutes a nutrient source for the next season. Nitrogen availability influences shifts in vegetative composition, increasing grasses and nonleguminous forbs at the expense of legumes. With grazing excluded, the development of a dense canopy dominated by grass species occurs where reduced light penetration suppresses legume growth (density-dependent factor), and ultimately, much of the biological fixation of nitrogen in litter decomposition. In contrast to phosphorus, nitrogen is an open cycle and its decrease from plants and plant residue can represent a real loss from the ecosystem as plant communities exhibit shifts in species composition (Woodmansee and Duncan, 1980).

Plant succession is a timely, orderly sequence in the establishment of the kinds of plants that occupy a site after a period of disturbance. Where grazing is excluded, these species will usually increase, sometimes 20 to 25 percent over a period of ten years, providing good cover conditions for birds such as quail, but little food. In areas where annual rainfall is about 20 inches, light to moderate grazing actually favors quail habitat by encouraging the growth of plant species such as turkey mullein, filaree, and subclover (Duncan, 1976, Guthery, 1986). Shifts in rodent populations also occur. California ground squirrel, Gilbert deer mouse, pocket gophers, and kangaroo rats increase, while wood rat and Gambel white-footed deer mouse numbers decline (Cockerman, 1975.) Estimated density of those species that increase could range up to a third higher in the ungrazed habitat when compared to an adjoining grazed area (Medin and Clary, 1989). These latter species prefer more open terrain, depending to a greater extent on rocks and outcrops for cover and nesting sites than more dense plant cover.

Where grazing is excluded, gophers may annually consume up to 800 pounds of forage (dry weight) per acre with populations reaching 30 to 50 per acre (Howard and Childs, 1959). Gophers and ground squirrels are active during the spring months in the upper soil layers as previously noted. They displace and mix soil while building their burrow systems, sometimes bringing an average of five pounds of air-dry soil to the surface. In heavier soils where compaction from grazing has resulted, rodent activity loosens the soil, improves porosity, increases infiltration and reduces surface erosion. On lighter, granitic soils, ten year grazing restrictions do not produce significant results in porosity improvement (Abdulaziz, 1982).

The influence of grazing exclusion in oak stands on rangeland is similarly complex. Exclusion of cattle and fire for periods over 50 years did not result in significant oak recruitment on the San Joaquin Experimental Range, although acorns are eaten by range cattle (Duncan, et al 1987). Similar results were recorded in studies conducted within Sequoia National Park (Brooks 1970, 1973). Livestock grazing, including sheep, may not be the only or the most critical cause of the absence of current or the occurrence of past successful oak recruitment. McClaran (1987) points out that slow seedling establishment in oak stands under high deer numbers and the absence of livestock has been well documented. Light grazing and reduced wildfire frequencies appear to favor blue oak establishment. Successful blue oak establishment, however, requires a combination of events including abundant acorn production, appropriate weather patterns, and reduced browsing from livestock, deer, rodents, and protection from high intensity wildfires as well as reduced levels of competition from understory plants. The exclusion of grazing will result in higher protein forage, more residual dry matter, and more seed under the oak canopy, but will likely result in a reduction of seedling recruitment. During dry years, herbaceous plants stay green longer and deer and rodents will also be attracted in higher numbers.

Average land units in the Conservation Reserve Program in northern California interior valleys probably ranges between 80 to 100 acres. Many of these areas were former croplands adjacent to rangeland. The commitment of such land use patterns to the reserve program will intensify the influence of "edge effect", or ecotones. Ecotones are usually richer in wildlife than are the interiors of adjoining plant communities. This is partly due to escape cover being quite often the most lacking of all the necessary habitat elements in areas where conventional farming and ranching has been practiced. There is also a greater diversity of plant species as food sources in ecotones.

In general, grazing exclusion on land units within these rangelands, assuming no other manipulation occurs, will result in a more complex network of trophic pathways and diverse habitats where taller grass, herbaceous plants, and more shrubs will dominate within a decade. Broadleaf herbs such as filaree and legume species important in the diet of rodents and quail populations will most likely decline. Shifts in existing plant species dominance will result in concomitant shifts within associated animal populations resulting in a community composition quite different from the present.