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Sustainable Livestock Grazing in New Mexico

ABSTRACT

For decades, the impact of domestic livestock grazing on rangelands in the Southwest has been debated by scientists, land administrators, ranchers, those with environmental concerns, and others, but the debate has become more focused in recent years. The important ecological questions related to grazing impacts are difficult to address because they require long-term studies and lack the control necessary to isolate the influence of different environmental factors. This paper is based on three relatively long-term data sets, two from desert grassland in southern New Mexico (the New Mexico State University College Ranch and the Jornada Experimental Range) and one from shortgrass vegetation in south-central New Mexico (Fort Stanton). These data indicate that herbage production varied over the years under conservative cattle grazing, but exhibited no obvious downward trend for periods approaching 50 years. Herbage production declined during drought, while responding to favorable precipitation following droughts. These studies indicate that moderate cattle grazing in the Southwest is sustainable and that climate often exerts a controlling influence that can obscure other environmental influences.

INTRODUCTION

Livestock were introduced into the southwestern United States in the 1500s when early Spanish explorers moved north from Mexico. The impact of these early herds was probably minimal, but during settlement of the West after the Civil War, livestock numbers accelerated. In many cases early livestock operators greatly overestimated the capacity of the arid rangelands to support livestock. In New Mexico, sheep numbers peaked about 1880 and cattle numbers in 1890 and again in 1920 (Schickedanz, 1980). Early observers became concerned about the damage that large herds of livestock were having on range vegetation and soils. Wooton, an early New Mexican botanist, warned in 1908 that "Examination of the range shows it to be run down and not nearly as productive as it might be and as it once was." Partially in response to concerns of heavy livestock

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grazing, large areas were incorporated into the Forest Reserve system in 1905 (now national forests) and eventually came under control of the U. S. Forest Service. The remaining public land was placed under jurisdiction of the Bureau of Land Management (originally called the Grazing Service) in 1934. Krueger (1988) calls the time until the 1950s the period of adjustment, and the period during the 1950s and 1960s the period of applied technology. Livestock grazing was accepted during these periods as one of the legitimate multiple uses of public lands.

During the 1970s the environmental movement gained major prominence and livestock grazing on public lands became a focal point of environmental concern. The NRDC lawsuit, the "Sagebrush Rebellion" and other incidents were manifestations of conflicts between those who supported livestock grazing and other who supported other uses of public lands (including no commercial uses). More recently the focus has been sharpened, with several groups and individuals calling for the end of grazing on public rangelands. TV shows, books, articles and other means have been used to sway the public view of the damage livestock grazing has inflicted on rangeland. Among the views expressed in some of these arguments is that livestock grazing is not sustainable on fragile arid rangelands. Information from long-term research involving livestock grazing is scarce. Often funding is not available to support such data collection. These data are significant only after they have been collected for a decade or longer. Three such data sets are available in New Mexico. This paper presents an analysis of these three data sets as they apply to the question of the sustainability of livestock grazing on New Mexico ranges.

STUDY AREAS

The three data sets were collected from the Jornada Experimental Range and the New Mexico State University College Ranch in southern New Mexico, and the Fort Stanton Experimental Ranch near Capitan in south-central New Mexico. Vegetation on the Jornada and College Ranch are typical of desert grassland and shrubland covering much of the Southwest. Major plant species include black grama (*Bouteloua eriopoda*), mesa dropseed (*Sporobolus flexuosus*), and three awns (*Aristida* spp.) among the grasses. Mesquite (*Prosopis glandulosa*) and creosotebush (*Larrea tridentata*) are abundant shrubby species. Many forb species are also present depending on seasonal precipitation patterns. Blue grama (*Bouteloua gracilis*), wolftail (*Lycurus phleoides*), sideoats grama (*Bouteloua curtipendula*) and several other grass and forb species are important components of the shortgrass vegetation at Fort Stanton.

Early phases of the Jornada studies were reported by Paulsen & Ares (1962) while those for the College Ranch study were reported by Beck (1978). Both have been supplemented with more recent information. Data from Fort Stanton have been reported by Pieper, Donart, Parker, and Wallace (1978), Parker, Donart, Pieper, Wallace, and Wright (1987), Pieper, Parker, Donart, Wallace, and Wright (1991), and White, Pieper, Donart, and White Trifaro (1991).

All three data sets were selected because each represented conservative cattle grazing under specified conditions. The study pastures on the College Ranch and Fort Stanton

were grazed yearlong, while grazing on the Jornada occurred in late fall and winter after most herbage growth in the fall had ceased. Utilization of the pasture on the College Ranch averaged less that 25% of the current herbage production (Beck 1978) while that on the Jornada averaged about 40% from 1939 through 1953 (Paulsen & Ares 1962). On Fort Stanton, conservative grazing involved adjusting stocking level to allow 250 to 300 kg/ha of herbage residue left at the end of the grazing year in early June (Pieper et al. 1978, 1991).

Vegetation standing crop of warm-season species was determined at the end of the growing season by estimating herbage weight, clipping herbage in small quadrats, or both. Sampling intensity and size and shape of quadrats was not uniform for the three studies, but the data are useful for this analysis as comparisons among study sites were not made.

RESULTS

Jornada Experimental Range

The severe drought in southern New Mexico during the early 1950s is reflected in low herbaceous biomass values from 1951 to 1961 (Fig. 1). Herbage yields were relatively low until 1977. More detailed evaluation of the drought showed that drought influences were more pronounced on deep sandy soils than on shallower soils (Herbel et al. 1972). Herbage production during the seven years before the drought (1941-46) averaged 538 kg/ha but only 122 kg/ha for the drought years (1951-57). A two-year drought when herbage production was less than 50 kg/ha also occurred in 1982 and 1983. However, herbage biomass increased in 1984 and remained relatively high through 1988. The overall pattern for the Jornada was high herbage production during the 1940s, low production during the drought years until 1977, and high again until 1988 (except for 1979-80 and 1982-83). Yearly variation was high during this 48- year period with no pattern discernible.

College Ranch

Yearly variation in herbage production was also high on the College Ranch (Fig. 1). The period from 1978 through 1984 was relatively dry, with seasonal precipitation (July through September) averaging only 12.2 cm (Fig. 2). From 1985 to 1991 seasonal precipitation averaged over 18 cm. Herbage standing crop likewise increased from 198 kg/ha (1978- 1984) to 380 kg/ha during the next seven years. Over 35% of the variation in herbaceous standing crop during the 25-year duration of the study can be explained by seasonal precipitation, indicating that precipitation is directly related to herbage production. Valentine (1971) also showed that desert grassland vegetation would recover from drought with various levels of dormant-season grazing by cattle.

Fort Stanton

A severe drought occurred on Fort Stanton during 1973-74 when less than 21 cm of precipitation fell each year during the growing season (June–September) (Pieper et al. 1991). These drought conditions were reflected in herbage production of only 354 kg/ha during 1974 (Fig. 1). Precipitation was much higher during the years following 1974, and herbage production increased over 80 kg/ha per year during this period. Earlier studies had indicated that herbage production was closely related to seasonal precipitation without livestock grazing (Pieper, Montoya & Groce, 1971). The only discernible trend at Fort Stanton was an increase in herbage standing crop after 1974 under the same type of conservative livestock grazing.

DISCUSSION

Data showing a lack of decline in total herbage standing crop without considering the species composition of the standing crop cannot be used alone to demonstrate sustainability of any grazing strategy. On the College Ranch average mesa dropseed biomass increased from 45.5 kg/ha (1967–76) to 163 kg/ha in the late 1980s (1984-89). Black grama also showed a modest increase during this same period. Ibarra Gil (1975), Atwood (1987) and Herman (1988) evaluated areas protected from grazing on the College Ranch and the Jornada and found inconsistent differences between vegetation protected from grazing and that subject to cattle grazing. Apparently length of time it was protected from grazing, small mammal and rabbit influences, soil type, vegetation, and precipitation patterns all influenced grazed and protected vegetation. Conservative cattle grazing undoubtedly has some influence on species composition, but often the changes are too subtle to measure on rangeland with all its variation. On Fort Stanton basal cover of blue grama, wolftail and forbs increased following the drought period (1973-74) and appeared to become stabilized somewhat by 1985 (Pieper et al. 1991 and White et al. 1991).

Arid and semiarid rangelands are notorious for highly variable precipitation and frequent droughts. During the studies reviewed here, annual precipitation was not as variable as standing crop (Fig. 2.), but differences in seasonal distribution of precipitation can have significant impact on the vegetation. Rangeland at Fort Stanton experienced a severe short-term drought during the 1970 dormant season and the 1971 early growing season . Over 50% reduction of blue grama basal area occurred during this drought (Pieper & Donart 1973). Droughts are great equalizers influencing vegetation drastically whether or not it is grazed by livestock. Such subtle shifts is precipitation can have profound influences on vegetation and contribute substantially to annual variation in herbage biomass and species composition.

CONCLUSIONS

Results from studies reported in this paper indicate that desert grassland and shortgrass vegetation in New Mexico is variable over time under cattle grazing. No consistent trend was observed except at Fort Stanton where cover and herbage biomass decreased during

the drought but increased following drought. Vegetation varied largely in response to amount and distribution of precipitation.

Some people consider *any* livestock grazing as overgrazing. No one debates the fact that heavy grazing intensity (either excessive animals or fewer animals for a longer time period) can result in reduced plant cover and biomass and increased soil loss (Pieper 1991). However, results presented here indicate that conservative grazing is sustainable within the time frames of the data sets, the longest of which was nearly 50 years (at the Jornada) and agree with the analysis of Holechek (1991).

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