

source available. That reality interested her since they were *potential* adversaries.

It takes people to improve land. We already have more laws and technical information than we need. Time is not on our side in the struggle to solve problems on the public

land. But the time is right for more people-to-people alliances where land owners, environmentalists and federal agency folks work cooperatively to produce action on the ground. Plain folks can make a difference, and we need to do it now.

Chihuahuan Desert Rangeland, Livestock Grazing, and Sustainability

Jerry L. Holechek

Livestock grazing on public lands has become one of the most controversial natural resource issues in the western USA. Some environmental groups are advocating complete elimination of livestock grazing on federal lands. Ranchers contend that grazing is a long-standing traditional use of these lands necessary to maintain the health of local economies. In some cases, both groups have taken extreme positions that avoid the real issue, which has to do with degree. There is substantial historical and present day evidence that shows unmanaged livestock grazing is very destructive of soil, plant, water, and wildlife resources. However, many excellent long term studies are also available that show controlled livestock grazing using sound range management principles will sustain and in many cases improve these same resources. Failure to distinguish properly controlled from poorly controlled livestock grazing is the major reason for the conflict between ranchers and environmental groups. It is important to recognize that practically any land use, when unmanaged, leads to resource destruction. This applies to mining, logging, farming, wildlife grazing, and recreation as well as livestock grazing.

Importance of Stocking Rate

Control of stocking rate is the main tool for making livestock grazing sustainable. Proper stocking rate refers to the number of animals that can graze a piece of rangeland over time without degrading the soil and vegetation resource, and will improve poor condition areas. The most controversial issue in setting stocking rates has been the degree of use which the major forage plants can withstand. For many years, ranges throughout the USA have been commonly managed on the basis of take half and leave half. This guideline works fine for the higher rainfall prairie and southern pine range types. This criterion has proven disastrous for the arid, desert rangelands of the Intermountain West. Precipitation drives plant recovery after grazing. Due to lower frequency and amount of precipitation, plants in desert areas produce less total tissue, and regeneration of leaves after grazing is much slower than in the humid areas. This necessitates a lower utilization level for the desert areas.

Though generally not recognized, vegetation degradation by overgrazing occurs more quickly and recovery is

Table 1. Average forage and poisonous plant production (lbs/ac) (1988 & 1989) on good condition—moderately grazed and fair condition—heavily grazed Chihuahuan desert rangelands near Las Cruces, New Mexico¹.

	Good condition—moderately grazed pastures ²	Fair condition—heavily grazed pastures ³
Grasses		
Black grama	271	28
Mesa dropseed	120	6
Threeawn	110	13
Other grasses	39	108
Total	540	155
Palatable forbs		
Croton	20	5
Buckwheat	5	6
Globemallow	3	5
Other forbs	4	3
Total	32	19
Poisonous plants		
Redroot pigweed	94	189
Silverleaf nightshade	0	1
Silverleaf nightshade	1	2
White margin euphorbia	1	1
Other poisonous plants	2	24
Total	98	217

¹Source: Tembo 1990.

²Grazed to remove about 30% of perennial grass production.

³Grazed to remove about 50% of perennial grass production.

much slower for desert compared to humid ranges. As an example, in the shortgrass country of northeastern New Mexico, which receives 12–16 inches average annual rainfall, vegetation recovery from severe overgrazing is almost always reversible and requires less than 10 years. However, in the Chihuahuan desert areas of southern New Mexico which receive 8–11 inches annual average precipitation, recovery of forage species after severe degradation has been almost nonexistent even after 20 or more years of complete rest. A much more conservative livestock grazing strategy is required to sustain the southwestern ranges than for those in the northeastern part of the state.

Long-term studies from the College Ranch and the Jornada Experimental Ranges located near Las Cruces show that livestock grazing is sustainable in the Chihuahuan desert, provided that the stocking rates used remove, on the average, about one third of the perennial grass

Table 2. Cattle production characteristics on the good condition—moderately grazed—College Ranch pastures and the average for medium sized (250 AU) Chihuahuan desert ranches in New Mexico.

	for Chihuahuan College Ranch ²	Average Desert ranches ¹
Acres/Animal Unit	140	160
Calf crop, %	80	75
Calf weaning wt, lbs	460	420
Death losses, %	1.0	3.5
Supplemental feed cost per animal unit, \$	10.63	29.86
Health care and pregnancy testing, \$	9.50	4.85
Beef Production/acre (lbs)	0.55	0.47
Return per acre, \$	0.75	0.32

¹Based on Torell et al. 1989.

²Adjusted for replacement heifer management.

production each year. With higher use rates, soil and vegetation resources undergo deterioration. On College Ranch experimental pastures, a combination of moderate stocking (removal of about 30% of the forage annually) and above-average rainfall has increased perennial grass production from an average of 160 pounds per acre in the 1970's to 270 pounds per acre during the 1980's. The desirable perennial grasses such as black grama and mesa dropseed are more prevalent now than 10 years ago while broom snakeweed and other poisonous plants have declined. In sharp contrast are adjacent, heavily stocked pastures off the College Ranch where about one half the perennial grass production has been removed annually. Here grass and palatable forb production average less than one third while the biomass production of broom snakeweed and other poisonous plants is over twice that on the moderately stocked College Ranch pastures (Table 1). Rainfall patterns and soils on the two areas are alike.

On the moderately stocked College Ranch pastures, long-term cattle productivity (pounds of meat produced per cow) has equaled or exceeded that of the best ranges in northcentral Texas and eastern Kansas. This is in sharp contrast to the average for Chihuahuan desert ranges in New Mexico where calf crops and weaning weights are much lower and death losses are higher (Table 2). Data from the College Ranch indicate that the low cattle productivity on a per animal basis in the Chihuahuan desert compared with other range types may be more related to improper stocking than to environmental constraints such as heat, insects, or terrain. The livestock production data from the moderately grazed pastures on the College Range are particularly remarkable because the mature cow herd received no protein or energy supplements except during severe drought. Economic analyses show substantially higher returns per acre on the College Range than for surrounding ranges due mainly to better cattle performance and lower supplemental feed costs.

Along with stocking rates, proper selection of cattle plays a major role in efficient beef production from Chihuahuan desert ranges. Preliminary results from studies at New Mexico State University indicate that part brah-



Moderately grazed-good condition Chihuahuan desert range in southcentral New Mexico at the end of the growing season in October. This area has a high diversity of grasses, forbs and shrubs. This range has been stocked to remove on the average about one third the forage produced by the perennial grasses. Under this type of stocking rate livestock grazing has been sustainable in the Chihuahuan desert.



Fence line contrast showing moderately grazed-good condition Chihuahuan range on left and destructively grazed Chihuahuan desert range on the right.

man crossbred cattle that are relatively small (average wt. = 861 pounds), highly fertile, and good milk producers are the most productive and efficient cattle for the Chihuahuan desert.

Although the grazing intensity on the moderately grazed College Ranch pastures is lower than on surrounding pastures, the College Ranch pastures support more cattle per section because they have over three times as much forage. Cattle numbers have gradually been increased on these pastures over the last 20 years as the forage supply has increased.

Another interesting comparison involves areas that have been ungrazed over the past 50 years, and are thought to be representative of what Chihuahuan desert rangelands were like prior to European man. Total forage production on these areas is about 20 percent lower than on the moderately grazed pastures.

Grazing Influences on Wildlife Habitat

Improved habitat for wildlife is thought to be a major benefit resulting from elimination of livestock on federally



Although nearly all forage has been removed from this Chihuahuan range in southcentral New Mexico, livestock grazing continues. Both rest and brush control are needed for recovery of this range. Unfortunately large tracts of abusively grazed public rangelands such as this one still exist in southcentral New Mexico.



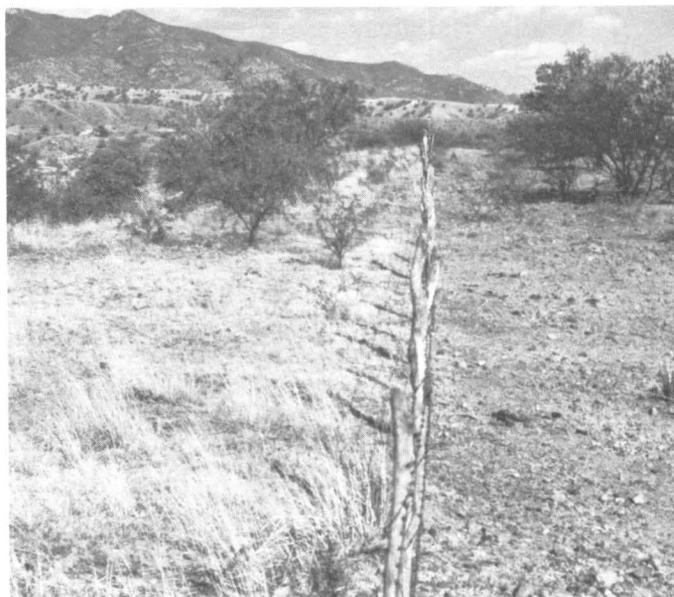
These ranges in southwestern New Mexico show the influence of stocking on soils and vegetation. A serious erosion problem is developing on the range on the left.

owned Chihuahuan desert rangelands. Studies from the College Ranch show that rabbit, quail, dove, songbird and raptor populations are higher on moderately grazed than on heavy or ungrazed pastures. Heavily grazed areas have higher rodent populations but receive little use by pronghorn compared to moderately and ungrazed areas. Quail and dove populations on the ungrazed units are much lower than those on units receiving heavy or moderate grazing. Overall, moderately grazed pastures support a higher total wildlife population and have a greater variety of wildlife species than those receiving either heavy grazing or no grazing.

The ungrazed units support a grassland with few forbs

or shrubs while the heavily grazed units are a shrubland that lacks a grass component. The moderately grazed units support a mix of grasses, forbs, and shrubs. Greater diversity in vegetation results in higher wildlife populations on the moderately grazed areas.

Through the years I've shown representatives from various environmental groups the three different types of pastures and they have consistently picked the moderately grazed pastures as being most desirable. I have found in nearly all cases they have no opposition to moderate livestock grazing when they see what it really is. This brings up the question "How much of the Chihuahuan desert in New Mexico is grazed like the moderately stocked pastures on the College Ranch?"



These Chihuahuan desert ranges in southcentral New Mexico show the influence of long term stocking rate on vegetation composition. The understory of the moderately grazed area on the left is dominated by grass while on the right the understory has been totally destroyed.



This excellent condition—lightly grazed Chihuahuan desert range in southcentral New Mexico supports a low wildlife population due to a lack of forbs and shrubs. Moderate grazing can be effective in promoting greater diversity in vegetation in these areas. However, it must be pointed out that near climax ranges like this one are far less common than abusively grazed ranges in poor condition.



This Chihuahuan desert range in southcentral New Mexico has been grazed to remove on the average about one third of the perennial grass production every year. It is in near ideal condition when livestock, wildlife, and soil stability requirements are considered.

Improving Poor Condition Ranges

Although range condition on both federal and private lands in the Chihuahuan desert has made impressive improvements over the last 50 years, we still have too much country that is being destructively managed. We also have large areas that will never look like the College Ranch even with years of complete rest because of irreversible soil loss and brush invasion. On these ranges extensive brush control as well as proper grazing management will be required before there is any major improvement.

Many modern range managers hold the belief that rotational grazing schemes can be used to sustain heavy stocking rates and at the same time overcome the effect of long-term overgrazing. However, an overwhelming body of research shows that stocking rate reductions have been far more effective than rotational grazing schemes in promoting recovery of overgrazed ranges. This is particularly true in desert areas. These studies do show that



The fair condition Chihuahuan desert range provides good quail and mule deer habitat but would provide more forage for cattle if in higher range condition. A lower grazing intensity should increase the grass components on this range.



This lightly grazed-near climax range in southcentral New Mexico supports a low wildlife population due to a lack of forbs and shrubs. Moderate cattle grazing on this range will increase vegetation diversity and create better condition for many wildlife species such as a quail, pronghorn, and quail. However it must be pointed out this type of range is much less common than abusively grazed range in poor condition.

rotational grazing schemes when coupled with moderate grazing intensities sometimes but not always give more rapid range recovery than moderate continuous grazing (Table 3). Once desert ranges are in good condition, certain rotation schemes may generally sustain about a 5 percent higher stocking rate than continuous grazing.

Brush Control Versus Rotational Grazing

On poor condition ranges infested with unpalatable shrubs and weeds, money invested in brush control will give much higher and quicker rates of return than money spent on building fence for a rotational grazing scheme. Controlling mesquite, creosotebush, snakeweed, and other undesirable shrubs has consistently doubled or tripled forage for livestock and wildlife within two or three years after treatment in the Chihuahuan desert. In contrast, rotational grazing schemes seldom increase forage pro-



Moderately grazed good condition Chihuahuan desert range in southcentral New Mexico in late June just before the growing season. This range shows a patchy appearance which is typical of properly grazed ranges at the end of the dormant season.

Table 3. Average forage production, and beef production for a 24-year study comparing best pasture rotation and continuous grazing systems under moderate stocking rates in southcentral New Mexico.

	Continuous	Best pasture
Forage production (lbs/ac)	140	132
Cows weaning calves (%)	80	84
Average calf weaning wts (lbs)	473	453
Beef production (lbs/ac)	0.57	0.52

Source: Beck 1978, Beck et al. 1987.

duction by 10 percent even after 10- to 20-year periods. Under present economic conditions herbicides are the most effective method for controlling brush. However, even with herbicides, risk involved in brush control is high and monetary returns are often unfavorable. This leaves stocking rate as the primary tool for managing Chihuahuan desert ranges.

Spacing of Watering Points

Watering point location and distribution have great impact on both livestock production and wildlife populations in the Chihuahuan desert. Under most conditions optimal spacing of watering points when cost, livestock performance, range condition, and wildlife are considered is about two miles apart. Limited research shows a major reduction in cattle performance when they are forced to walk over 1 mile between water and feed. Under moderate stocking rates forage utilization is about twice as heavy in the zone 0-1 mile from water compared to the 1-2 mile zone. Beyond two miles cattle use of forage is almost non-existent. Rotation of access to watering points is one of the most practical ways to improve forage productivity on desert ranges. On the Santa Rita Experimental Range in Arizona, rotation of access to watering points nearly doubled the yield of perennial grasses compared to nearby ranges without watering point rotation.

Current studies show that areas within a half mile of livestock watering points support wildlife populations that are over twice that of areas more distant from water. Mourning doves and scaled quail, two of the most important gamebirds in the Chihuahuan desert, have signifi-



This Chihuahuan range in south central New Mexico has lost all its understory and much of its soil due to a long history of destructive grazing. Both brush control and rest will be needed to improve this range.

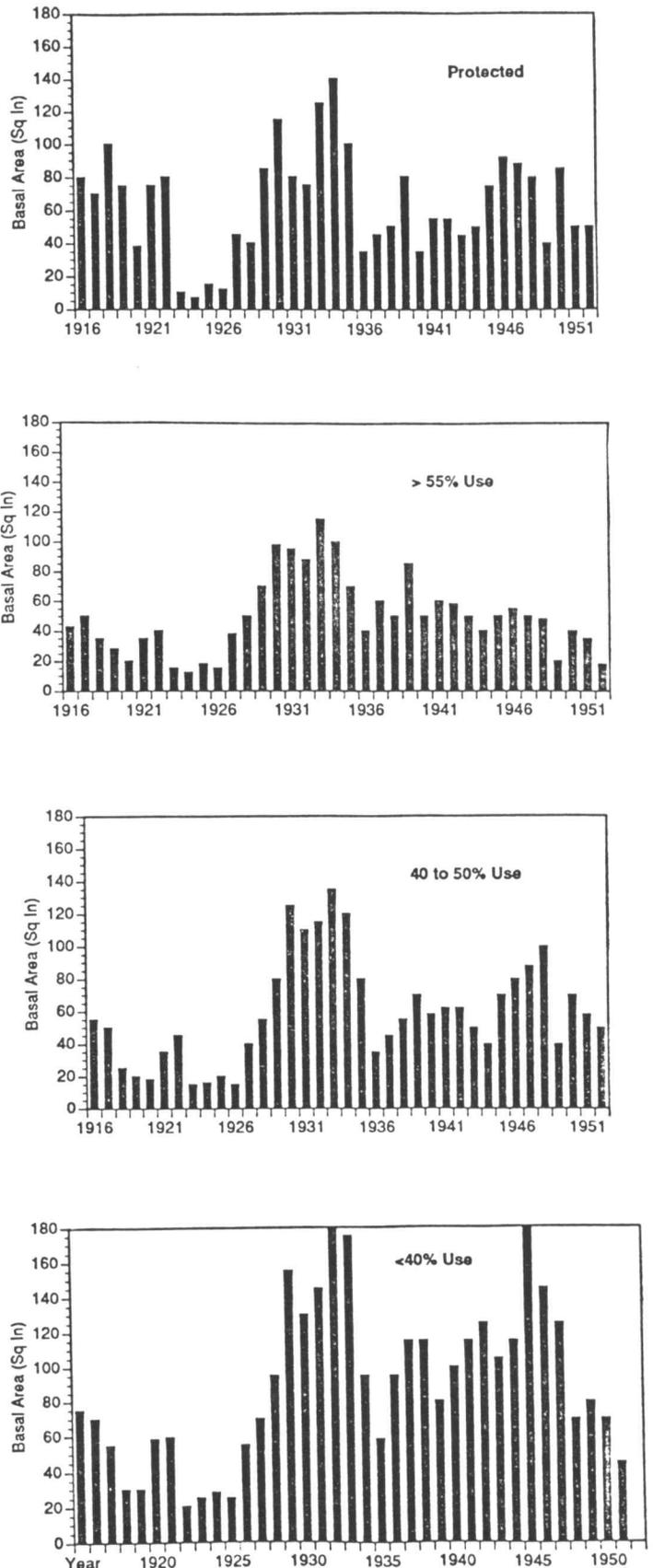


Fig. 1. Basal area of black grama protected from grazing and at three intensities of grazing on the Jornada Experimental Range, southern New Mexico, 1916-1953. Source: Paulsen and Ares, 1962.

cantly benefitted from the increased number of watering points associated with livestock grazing. The perching sites associated with corrals and higher food plant availability as well as the water all explain the attractiveness of these areas to doves and quail.

Range Improvement and Long-term Rest

A belief widely held, particularly by environmentalists, is that long-term rest gives more rapid recovery of deteriorated ranges than will occur under light to moderate grazing intensities. A few years of rest or deferment can be effective and useful to initiate the recovery of overgrazed ranges. However, studies from the Chihuahuan desert show long-term recovery occurs as soon if not more rapidly under light to moderate grazing as under complete rest. Limited grazing removes excessive accumulations of herbage that can be detrimental to plant health and productivity. Excessive amounts of herbage cause shading of the younger and more photosynthetically active leaves. The older leaves transpire moisture that could otherwise be used by the younger, more efficient leaves. Excessive accumulation of standing dead material chemically and physically inhibits new growth, and can provide habitat for insects and diseases that weaken or kill the plant. Long-term studies from the College Ranch and Jornada Experimental Ranges have shown long-term persistence and productivity of black grama was better under moderate (conservative) grazing than under no grazing at all (Fig. 1).

Present Problems and Solutions

Unfortunately, in recent years there's been a tendency for range professionals to emphasize rotational grazing schemes over stocking rate adjustments as a tool for recovery of degraded desert ranges. Considerable area still exists in New Mexico and elsewhere which is being destructively grazed. This is one reason why some environmental groups are making so much noise. From my point of view, livestock grazing should continue on public lands in the Chihuahuan desert. However, range professionals need to place more emphasis on identifying those ranges being destructively grazed and correct the situation by balancing animal numbers with the forage supply using scientific range management principles. Prevention of degradation of good condition ranges is much cheaper than reclamation of those ranges that have been destructively grazed.

One serious problem we have on public ranges is that good stewardship is not rewarded. A potential approach to this problem is to assign lower grazing fees to those ranchers who apply sound range management practices and have their ranges in an upward trend or maintain them in good condition.

Good condition range, in which about 60 percent of the climax vegetation remains, maximizes diversity in plant

and animal species. This type of plant community provides adequate plant cover to maintain soil stability. Good range condition optimizes forage quantity and quality for livestock, and it can be sustained under proper stocking.

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