Drought & Stocking Rate Effects on Forage Yield from Western SD Rangelands

by Alexander Smart, South Dakota State University

Rangelands are comprised of natural vegetation and are extensively managed. A large portion of western South Dakota rangeland is comprised of an overstory of cool-season grasses (i.e. western wheatgrass, green needlegrass) and an understory of warm-season grasses (i.e. blue grama, buffalograss). The amount of precipitation in semi-arid environments is the main factor that determines forage production. Many western SD counties receive < 17" of annual rainfall with 75% occurring April-October. Responses from fertilizing are limited due to lack of precipitation.

Pastures are often managed as large units (>160 ac) since fencing and water development are cost prohibitive. Regrowth is limited to spring; majority (90%) of forage is produced by July 1. Most of practiced grazing systems are continuous season-long grazing or simple rotational grazing with < 8 pastures. Continuous grazing at the appropriate stocking rate provides the highest animal gains and gain/ac. Rest or deferred rotational grazing systems are initiated to achieve goals such as improving grazing distribution, improving range condition, and providing nesting cover for wildlife.

Stocking rate is key to properly managing rangeland resources. Pastures at SDSU's experiment station (75 mi. east of Rapid City), heavily stocked for 15 years, produced only 58% of those lightly stocked (Table 1). Moderately grazed pastures produced 72% of lightly grazed pastures. Heavier stocking rates shift plants to shorter, more grazing resistant species (i.e. blue grama, buffalograss) that are less productive than mid-grass species.

Amount of precipitation can have a profound interaction with stocking rate effects. How do different plant communities respond to drought? In western SD, spring precipitation (April+May+June) is an important predictor of annual forage yield. In lightly stocked pastures, spring droughts reduced annual forage yield by 21%, while reducing forage yield in moderately grazed and heavily grazed pastures by 27 and 34%, respectively (Table 1).

Table 1. *Forage yield from pastures stocked May-Nov. at light/moderate/heavy stocking rates during years with spring-droughts (<5.7", <75% of normal) and no spring-droughts (>5.7") from 1945-1960 at Cottonwood Range and Livestock Station near Phillip, SD.*

Spring Precipitation (April-June)[2]			
Stocking Rate[1]	**Spring-Drought**	**No Spring-Drought**	**Mean[3]**
	---------- lb/ac ----------		
Light	1590^{ab}	2000^{a}	1800^{j}
Moderate	1100^{bc}	1510^{b}	1300^{k}
Heavy	840^{c}	1280^{b}	1050^{k}
Mean[4]	1180^{y}	1600^{z}	

[1]Stocking rates for light, moderate, and heavy grazing were 0.25, 0.40, 0.60 AUM/ac.
[2]Means within a row and column followed by a,b,c are significantly different (P<0.10).
[3]Means within a column followed by j,k are significantly different (P<0.10).
[4]Means within a row followed by y,z are significantly different (P<0.10).

The manager of rangeland resources choosing to stock at heavier rates is in a tighter spot when drought occurs than one choosing lighter rates. Residual forage carryover from lightly grazed pastures may provide a benefit of available forage during a drought that would not be available in heavily grazed pastures.

In summary, semi-arid environments are limited by rainfall and not as much in fertility. Most western rangelands are comprised of native plant communities sensitive to degradation from stocking rates utilizing more than 50% of the annual forage production. Spring droughts in western SD can reduce available forage in heavily grazed pastures more than lightly grazed pastures. Lighter stocking rates can improve range conditions, enhance range health, and be a favorable economic position for livestock production.