Ranchers benefit from long-term grazing data

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Sectioning of grazing lands can be a way to maximize forage.

Scientists studying changes in the Earth's surface rely on 40 years of Landsat satellite imaging, but South Dakota ranchers making decisions about grazing their livestock can benefit from 70 years of data gathered at the Cottonwood Range and Livestock Research Station.

Managing livestock on rangeland is a balancing act, says South Dakota State University professor Patricia Johnson, a range scientist at the SDSU West River Ag Center in Rapid City. She has been conducting research at the Cottonwood Station near Philip since 1987.

Ranchers must decide not only how many cattle to run in their pastures, but when and for how long so they can obtain good weight gains yet maintain and protect their pastures. The long-term grazing data generated at the research station give scientists and ranchers insight that a simple two- or three-year study cannot, explains Johnson. When it began in 1907, the facility consisted of one section of land focused mostly on crop and cattle research. The research shifted to range livestock production, when 2,000 acres were added in 1940.

Since 1942, researchers have measured livestock production and vegetation change across a wide range of climate conditions.

Effect of precipitation

Long-term studies show how changes in precipitation, such as drought, can affect plant community composition and production for years.

"It not just as simple as saying drought will produce this kind of vegetation and livestock production," Johnson says. "Drought can have effects not only during the drought years, but for several years following the drought."

Ag Experiment Station researcher Alexander "Sandy" Smart developed a tool to predict forage production based on factors such as precipitation. This helps ranch managers anticipate in early to mid-summer how many cattle their pastures could support and for how long. "That's very valuable for people making drought management decisions," Johnson says.

Changes in grass preferences

Since the 1950s, researchers have explored how stocking rate, which is the number of cows per acre per month, affects the mixture of native prairie grasses. These studies looked at how to set stocking rates on pastures that were historically overgrazed with the goal of "getting back good native plant communities," Johnson recalls.

A heavy, long-term stocking rate turns rangeland with midgrasses, such as western wheatgrass and green needlegrass, into one dominated by shortgrasses like buffalograss, blue grama and sedges, according to Johnson. Lighter stocking rates are needed to maintain the midgrasses in the plant community.

A team of researchers gathers data to estimate biomass utilization.

For many years, management professionals recommended that ranchers utilize light to moderate stocking rates. In the Northern Great Plains, that will result in a mixture of native grasses dominated by midgrasses, Johnson notes. However, recommendations have changed somewhat in the past 10-15 years.

"What's desirable now depends on what you're managing for," Johnson says. More plant biomass is produced with midgrasses compared to shortgrass-dominated pastures. With a relatively light stocking rate on midgrass dominated pastures, individual animal weight gains are maximized.

Shortgrass-dominated pastures, with a heavier stocking rate, typically produce lower individual animal weight gains, explains Johnson. However, the heavy stocking rate usually yields a greater total gain per acre because there are more animals per acre per month.

Many ranchers in western South Dakota maintain shortgrass-dominated pastures, which tolerate a higher stocking rate and therefore produce a higher total cattle weight gain per acre of pasture.

"On a per animal basis, the cattle don't gain as well, but there are more of them," explains Johnson. For many ranchers in this region, there has been an economic benefit from maintaining the heavier stocking rates on shortgrass pastures.

However, there is a limit to how heavily native pastures can be grazed, Johnson cautions. If the stocking rate is too heavy, the shortgrasses will disappear, weeds will increase and bare ground will be exposed–and livestock production on both a per-animal and per-acre basis will be reduced.

Differences in Watershed

The short- versus mid-grass dichotomy continues when it comes to watershed attributes—especially how much water and sediment come off these communities, according to Johnson. Shortgrass pastures absorb much less rainfall into the soil, so they shed much more water than midgrass pastures because they do so more frequently.

However, research conducted by SDSU and the U.S. Department of Agriculture at the Cottonwood Field Station showed that when enough water is applied to both types of rangeland to create runoff on the midgrass-dominated pastures, more runoff occurs on the shortgrass pastures, but both produce about the same amount of sediment.

This runoff scenario is important because all that water is moving off the rangeland, where it could be used for plant production, Johnson points out, and then drains into streams, where it scours the banks and adds silt to rivers and lakes.

The sediment-loss results of the watershed studies at Cottonwood are, however, not at all typical of other types of rangelands in the western United States, Johnson explains. Sediment losses from most rangeland in the western United States are typically greater for plant communities associated with heavier stocking rates.

"Our plant communities are really good at hanging on to the soil," Johnson says, "and our pastures don't fit the patterns that we see elsewhere." And that makes the studies conducted at Cottonwood even more valuable to South Dakota ranchers.

Provided by South Dakota State University

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