W•Y•O
RANGE
FACTS
MP-111.11
July 2009

Prickly pear cactus, ecology and management

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Prickly pear cactus (*Opuntia polyacantha*), frequently referred to as plains prickly pear, is a widespread, thorny, succulent plant common throughout the Great Plains. Plains prickly pear cactus has been identified as a serious impediment to livestock production on more than 5 million acres of rangeland in eastern Wyoming and eastern Colorado.

Whether to control prickly pear for livestock production might be determined by the expected returns from greater grazing capacity or better animal performance. Assuming a moderate stocking rate that did not induce cattle to graze within the periphery of the spines on cactus pads, there should be an increase in potential stocking level sufficient to return the cost of control within a few years at high levels of cactus abundance. Even at moderate stocking rates, the ability to graze without having to avoid cactus spines should increase feeding efficiency and animal gains. Regardless of economic returns, the amenity value of not having to constantly avoid prickly pear spines may be valuable to land managers.

Past research and observation suggests prickly pear populations in the northern Great Plains are regulated by fire, insects, weather, and herbivory, but not by livestock grazing. The illusion of prickly pear abundance in areas with heavier livestock grazing is due to its greater visibility after herbage removal exposes the prostrate growth of the cactus.

Prickly Pear Persistence

Prickly pear is very shallow rooted. It can survive long-term drought conditions or variable climates because it can obtain moisture from light rain showers and store the moisture in succulent pads protected by a waxy coating. Prickly pear's persistence in the vegetation of eastern Wyoming and adjacent states with northern mixed or shortgrass prairies can be attributed to a climate with variable precipitation and lack of fires. Because there are few fires to remove the spines, few herbivores will eat the pads, and dry conditions limit insect activity. Once spines are removed, the pads are palatable to many grazing animals as they are high in digestible energy. Prickly pear has been used as emergency feed for livestock in extreme drought situations of the last century. Researchers in Colorado developed a machine to harvest and remove spines. Insects feed on prickly pear pads and are more prevalent during periods of higher precipitation. Decreases in cactus abundance usually occur during years of higher precipitation.

Abundant spines on the cactus may decrease the proportion of the total herbaceous production available to both livestock and wildlife. Spines apparently limit the distance from prickly pear pads that grazers will approach, thus, prickly pear may reduce the availability of total forage production by more than 50 percent.

Prickly Pear Control Methods

There are many ways to control prickly pear. The most popular are prescribed fire, mechanical, biological, and chemical methods. Picloram herbicide is perhaps the most

effective. A prescribed fire followed by a month or more dry weather results in substantial reduction because the fire removes wax on the cactus pads and allows plants to desiccate; however, prescribed fire followed by recurrent precipitation can result in increases in cactus abundance.

Motor grader and other physical removal methods have had varying success. Cactus pads sprout in a new location when moved, so mechanical methods often just move the problem.

The most apparent benefit from prickly pear control is the assumed increase in available forage for livestock. Unfortunately, this has never been verified. A recent study in a prickly pear infested area of Converse County, Wyoming, specifically tested whether there were differences in 1) annual forage production, 2) forage quality, 3) forage utilization by cattle, 4) foraging efficiency by cattle, and 5) habitat selection by cattle between areas sprayed with picloram versus areas that were not sprayed.

Spray Treatment

The area treated was sprayed with 1-pound per acre of picloram herbicide in May of year one. Treated areas were strips in a larger, untreated pasture. In years two and three, forages were sampled in the treated and adjacent untreated areas. Cattle grazed the study pastures in the summer months, and their selection of forages and preferences for treated vs. untreated areas was compared.

Forage productivity in treated and untreated areas was determined by harvesting, drying, and weighing forage samples from plots protected from grazing. Forage quality was determined through chemical analysis for crude protein, neutral detergent fiber, acid detergent fiber, total digestible nutrients, relative feed value, and dry matter of systematically obtained forage samples from treated and untreated plots. Forage utilization (percent) was determined by harvesting residual forage from plots exposed to grazing and comparing biomass to the plots protected from grazing.

The number of cattle (cows with calves) were systematically observed in treated and untreated areas using the instantaneous scan sampling method during intervals of the three-week grazing period. Foraging efficiency was evaluated by counting bites taken per feeding station and number of steps between feeding stations. A feeding station was defined as the area grazed between the time a cow lowers her head to graze and when she took a step or raised her head. By summarizing this data as average bites per step, one can assume higher values indicate greater efficiency of foraging – assuming bite size does not change or decreases as forage becomes depleted.

Nearly all prickly pear was killed by the herbicide treatment; however, the cactus carcasses with thorns persisted even in the second year following treatment. Forage yield and quality did not change following treatment. Utilization levels of forages were also not different between treated and untreated areas. There was no obvious preference overall for the treated strips by grazing cattle, although there were shorter periods of higher use in the treated strips. The noteworthy behavioral trait that suggests a benefit of prickly pear reduction was increased grazing efficiency in the treated areas. There was a significant increase in bites per station in areas sprayed with picloram compared to areas not sprayed.

Spraying Affects Forbs

The response indicates spraying of prickly pear with picloram will significantly reduce the cactus cover in eastern Wyoming rangelands, but production of perennial or annual grasses was unaffected. There was a significant decrease in forbs on the site where picloram was applied, but, as forb cover was only 1.8 percent in non-sprayed areas and 0.7 percent in sprayed areas, there was no effect on productivity. Picloram could reduce production on forb-dominated areas. Sites where sage grouse chicks depend on forbs could be detrimentally affected by picloram treatment. Forage quality was not significantly affected by picloram.

The lack of difference in habitat selection and utilization levels was most likely the result of cactus skeletons still present in the sprayed strips. The skeletons did not decay as quickly as anticipated. The stocking level was relatively high, and utilization was only measured at the end of the grazing period. The average utilization for the two-year study was 62.2 percent in the sprayed strips and 65.1 percent in the non-sprayed strips

Foraging efficiency in both years suggested cattle expended less energy during a foraging bout where cactus was absent than where present. The second year showed a greater efficiency difference with sprayed areas having an average of 4.05 bites per step and the non-sprayed areas having an average of 2.97 bites per step compared to year one with 2.61 bites per step in sprayed areas and 2.07 bites per step in non-sprayed. The difference between the two years is probably due to the sprayed prickly pear deteriorating further by year two. There was lower utilization overall and more forage production in year two providing greater opportunity for foraging at a single feeding station.

As grazing requires a significant amount of energy from the animal, the increase in forage intake suggested by the greater bites per feeding station should translate into better animal performance where prickly pear is removed.