Can Targeted Sheep Grazing Suppress Sulfur Cinquefoil?

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IMPACT STATEMENT

Targeted sheep grazing during late June or mid-July can effectively suppress sulfur cinquefoil, a major noxious weed on rangelands of northwestern USA and southwestern Canada. Sheep nutrition is optimized by targeted sheep grazing applied in mid-July.

SUMMARY

We investigated whether targeted sheep grazing could suppress sulfur cinquefoil in a rangeland field experiment in northwestern Montana. We evaluated targeted sheep grazing with and without protein-energy supplementation during late-June and mid-July. Sheep readily consumed sulfur cinquefoil stems, leaves, flowers, and developing seed heads, with or without supplementation. Sulfur cinquefoil comprised the largest proportion of sheep diets during both late June and mid-July, averaging 46% of sheep diets. Supplementation did not improve dry matter intake of sulfur cinquefoil, nor did supplementation improve the nutritive quality of sheep diets. We also documented that 1) targeted sheep grazing achieved heavy use of sulfur cinquefoil (67%) while keeping use of desirable perennial grasses light to moderate (18-41%); 2) targeted sheep grazing reduced viable seed production of sulfur cinquefoil by 97% in June-grazed pastures and 95% in July-grazed pastures; and 3) targeted sheep grazing reduced sulfur cinquefoil yield the next summer by 41% in June-grazed pastures and 47% in July-grazed pastures, without decreasing yield of desirable perennial grasses. We conclude that supplemented or nonsupplemented targeted sheep grazing applied in either late June or mid-July can effectively suppress sulfur cinquefoil. Sheep nutrition was optimized by targeted sheep grazing applied in mid-July.

INTRODUCTION

Sulfur cinquefoil (*Potentilla recta*) is a non-native, perennial noxious weed that currently infests large amounts of rangeland in the northwestern United States and southwestern Canada. The plant also has likely avoided detection in many North American rangelands because it is similar in appearance to native plants that grow in similar places, particularly slender cinquefoil (a.k.a., Northwest cinquefoil; *Potentilla gracilis*). Sulfur cinquefoil can invade forests, grasslands, shrublands, and riparian areas throughout the western United States and western Canada. Sulfur cinquefoil displaces native plants, decreases biological diversity, and reduces desirable forage for livestock and wildlife. Sulfur cinquefoil is especially worrisome because it can invade relatively undisturbed areas. In some places, sulfur cinquefoil outcompetes other noxious weeds such as spotted knapweed (*Centaurea stoebe*), yellow star-thistle (*Centaurea solstitialis*), and leafy spurge (*Euphorbia esula*) (Rice 1999).

Few options currently exist for suppressing sulfur cinquefoil on rangelands. Sulfur cinquefoil is closely related to domestic strawberries and native plants, making it a poor candidate for biological control with insects (Duncan et al. 2004). Prescribed fire is ineffective (Lesica and Martin 2003), and herbicides have provided only mixed results. Picloram herbicide is usually, but not always effective, and retreatment is necessary every 3 to 5 years (Duncan et al. 2004). Fortunately, our previous research demonstrated that hand-clipping sulfur cinquefoil when it is flowering or in its early seedset stage can significantly suppress the yield and viable seed production of sulfur cinquefoil (Frost and Mosley 2012).

Targeted sheep grazing is a potential tool for defoliating sulfur cinquefoil on rangelands. However, sulfur cinquefoil is generally considered unpalatable to livestock. Another potential limitation is that sulfur cinquefoil contains tannins, plant toxins that in high concentrations can impair livestock nutrition. Protein and energy supplementation may be a practical, cost-effective way to enable livestock to consume tannins without suffering adverse effects. Supplementation can help supply the protein and energy needed by livestock to detoxify tannins and limit their absorption (Villalba et al. 2002).

PROCEDURES

Our field experiment was located on a rangeland terrace adjacent to the Flathead River near Polson, MT. The study occurred within a heavy infestation of sulfur cinquefoil in which sulfur cinquefoil comprised 49% of the plant community. We constructed 30 small pastures and applied targeted sheep grazing during 2 years. Each year, 12 pastures were grazed by yearling ewes, with 6 of the pastures grazed when sulfur cinquefoil was in the early flowering stage (late-June treatment) and 6 pastures grazed when sulfur cinquefoil was in the late flowering-early seedset stage (mid-July treatment). Consequently, we applied targeted sheep grazing each year before most sulfur cinquefoil plants had produced viable seeds. Three other small pastures per year were not grazed by sheep (control treatment).

Each year, sheep in 3 of the 6 late-June treatment pastures and sheep in 3 of the mid-July treatment pastures were fed supplemental protein and energy. A barley-based commercial sheep pellet (18% crude protein, 77% total digestible nutrients) was hand-fed daily during late morning at a rate of 0.5 lbs. per ewe.

We measured forage intake, botanical composition and nutritive quality of sheep diets, and forage utilization in the sheep-grazed pastures. In all sheep-grazed pastures and ungrazed control pastures, we collected seed-heads from sulfur cinquefoil plants immediately before seed dispersal in late July. In the laboratory, we counted sulfur cinquefoil seeds and tested them for viability. In all pastures we also measured plant yield during mid-July of the year after grazing treatments were applied.

RESULTS AND DISCUSSION

Sheep readily consumed sulfur cinquefoil stems, leaves, flowers, and developing seed heads, with or without supplementation. Sulfur cinquefoil comprised the largest proportion of sheep diets during both late June and mid-July, averaging 46% of sheep diets. Supplementation did not improve dry matter intake of sulfur cinquefoil, nor did supplementation improve the nutritive quality of sheep diets. Nutritional requirements for maintenance of yearling range ewes were exceeded during June and July, but nutritional requirements for maintenance plus growth of yearling range ewes were satisfied during July only.

Targeted sheep grazing achieved heavy use of sulfur cinquefoil (67%) while keeping use of desirable perennial grasses light to moderate (18-41%), and targeted sheep grazing reduced viable seed production of sulfur cinquefoil by 97% in June-grazed pastures and 95% in July-grazed pastures. Targeted sheep grazing also reduced sulfur cinquefoil yield the next summer by 41% in June-grazed pastures and 47% in July-grazed pastures, without decreasing yield of desirable perennial grasses.

Sheep do not need to be confined to a corral before moving to a new area if targeted grazing occurs during the early flowering stage (late June) when sulfur cinquefoil plants have not yet produced viable seeds. However, some viable seeds may be present in the seed heads of sulfur cinquefoil when an infestation is judged on whole to be in the late flowering-early seedset stage. Sheep that graze sulfur cinquefoil infestations during the late flowering-early seedset stage should be kept in a corral for at least 3 days to prevent transporting viable sulfur cinquefoil seeds to other areas (Frost et al. 2013).

We conclude that supplemented or nonsupplemented targeted sheep grazing applied in either late June or mid-July can effectively suppress the yield and viable seed production of sulfur cinquefoil. Sheep nutrition and sulfur cinquefoil dry matter intake will be optimized by targeted sheep grazing applied in mid-July. Given that most sulfur cinquefoil plants (> 85%) in untreated infestations do not live longer than 5 years (Perkins et al. 2006), and given that only 18% of sulfur cinquefoil seeds in the soil seedbank survive from one year to the next (Kiemnec and McInnis 2009), targeted sheep grazing that dramatically reduces sulfur cinquefoil viable seed production for 5 or more consecutive years should significantly suppress sulfur cinquefoil infestations. Complete details of our study are published in Mosley et al. (2017).

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