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Spotted Knapweed Extent and Control at Goat Creek in the Frank Church River of No Return Wilderness

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Abstract

Spotted knapweed (Centaurea maculosa) is an introduced species to the Pacific Northwest, and a competitor with native species. This study assessed 1) the extent of the spotted knapweed infestation at the Goat Creek site in the Frank Church River of No Return Wilderness and 2) the effectiveness of hand-pulling weeds as a control method. Transects were established at the site in June of 1999. Stem densities and the occurrence of associated species were observed within 0.1 meter plots along these transects. Species richness and the frequency of several species were inversely related to spotted knapweed stem density, suggesting that spotted knapweed invasion is capable of altering plant community composition. Though this study needs to be continued and evaluated over a longer time span and in other areas, there seems to be sufficient evidence to illustrate spotted knapweed's disruptive potential throughout grassland communities in this region.

Introduction

Spotted knapweed (*Centaurea maculosa*) is a non-native forb that was probably introduced to North America as a contaminant of hay or alfalfa seed from Eastern Europe or Asia in the early 1900's. It appears best suited to range dominated by bluebunch wheatgrass, needleandthread or Idaho fescue, and in woodland dominated by Ponderosa pine or Douglas fir. Spotted knapweed is also adapted to a wide range of environmental conditions. Plants have been observed from 1,900 to over 10,000 feet in elevation, and in precipitation zones ranging from eight to more than eighty inches annually. Its' success lies in its ability to outcompete native plants for nutrients and water. Spotted knapweed infestations cause soil erosion, decrease biodiversity, and reduce forage for wildlife,

This study was implemented in the Frank Church River of No Return Wilderness, along the Big Creek trail at Goat Creek. It was a cooperative project by University of Idaho's Taylor Ranch and Krassel District of Payette National Forest, with field assistance provided by Salmon-Challis National Forest. The area being studied was once a thriving bluebunch wheatgrass community surrounded by forests of primarily Ponderosa pine and Douglas Fir. The objective of this study was to thoroughly map out the infested area, measuring both extent and density of the spotted knapweed. The study also focused on controlling the spread of the knapweed by hand-pulling the weed along the trail and the perimeter.

Methods and Materials

This study was conducted from June 6 to August 6. The Goat Creek site is approximately 4.7 acres (680' x 130' on the west side and 300' x 350' on the east side) and consists of a spotted knapweed stand grading into primarily native bunchgrass surrounded by stands of Douglas Fir and Ponderosa Pine. With the exception of Big Creek trail, no human-related substrate disturbance was evident at the site.

Sampling Procedures

Initially, an east-west line was determined from the intersection of Big Creek trail and the center of Goat Creek. Markers were placed at six-meter intervals along this baseline. Transects were then laid from these markers; north to the talus slope and south to Big Creek.

Daubenmire plots (20cm x 50cm) were used at three meter intervals along transect lines to document the presence or absence of knapweed. Within every twelve Daubenmire plots one plot was randomly selected and the total number of knapweed root crowns counted, in order to estimate total population density. Knapweed density was determined by calculating the mean density of knapweed in random plots. Transect lines with plots were mapped and a perimeter drawn around knapweed plots. The size of the knapweed infestation was determined by the number of plots within the perimeter of the mapped area. Each plot represented an area of 3 m x 6 m.

Control Methods

A two-meter border was marked from the center of the trail on each side, spanning the complete length of the infestation. All knapweed plants within this 4-meter swath were pulled and removed using garden digging tools. Care was given to remove the entire root so as to avoid regrowth from the rhizomes. Gloves were worn to avoid the possible carcinogenic effects of the knapweed plants. Spot sites were also removed along the edge of Big Creek, in order to minimize potential seed spread via the waterway. Knapweed was piled and burned on site.

Results and Discussion

This study was the first of its kind at the Goat Creek site and further monitoring must be done in order to realize its impact. Preliminary observations in early August showed that new root crown growth was beginning within the picked areas. Hand pulling is very labor-intensive and disturbs the soil, thus creating new sites for this pioneer species. In dry soils it is difficult to remove the entire root, which allows the weed to resprout from the rhizome. While an average spotted knapweed plant produces about 1,000 seeds annually, up to 18,000 seeds can be produced. This means that as few as 100 plants per acre can produce more than one million seeds. Wind dispersal of seed results in movement of seed up to one meter from the

plant. Knapweed seeds may also remain viable within the soil for a number of years, compounding the difficulty of control efforts. Considering its prolific nature, it seems unlikely that hand pulling alone will control the weed.

Conclusions

Both prevention and eradication will be necessary to control the spread of spotted knapweed within the Frank Church River of No Return Wilderness. Preventive measures include steps to reduce the transport of seed into the area by requiring weed-free feed for stock animals and eradicating weeds at trailheads and airstrips. A comprehensive campaign to inform users about the danger of exotic weeds must also be followed.

In conjunction with this preventive strategy, eradication of existing knapweed sites must be prioritized. Strategies in wilderness areas are limited to hand pulling, biocontrols, and perhaps small-scale spraying using backpack or pack mule mounted sprayers.

Some of the herbicides registered for use on spotted knapweed include: Tordon (picloram), Banvel, Clopyrolid, and 2,4-D. Herbicides are most effective when applied at the rosette stage, when the weeds are expending food supplies to produce leaves, making them vulnerable to herbicide applications. Many wilderness user groups question the use of herbicides in wilderness areas. The question is whether, in balancing risks, spraying or not spraying is more detrimental. It seems reasonable to assume that spraying small areas with relatively short-lived herbicides will have fewer costs and environmental impacts than the permanent displacement of large areas of native vegetation by exotic species.

Biocontrols might slow, but will not prevent the spread of weeds. If these insects stopped all seed production it would adversely affect their own survival. In conjunction with other control methods, however, biological controls can provide an environmentally safe, self-perpetuating, selective, and economical tool in the fight against exotic weeds. Some USDA approved insects that may be utilized for knapweed control are: *Sphenoptera jugoslavica* (a root beetle), *Cyphocleonus achates* (a root weevil), *Agapeta zoegana* (a root moth), *Metzneria paucipunctella* (a seedhead attacking moth), *Urophora affinis* and *U. quadrifasciata* (two seed head flies), and *Larinus minutus* and *L. obtusus* (two seed head weevils). By themselves, it is doubtful whether one organism would exert enough pressure on the plant population to provide any significant control. However, as a complex of biological agents, the effect should be enhanced. Caution must be used with biocontrols, however, since there is always the risk of unexpected consequences when a new organism is released into the environment. Reseeding disturbed sites with fast growing native grasses will help prevent spotted knapweed from re-establishing.

Successful control of knapweed in the Frank Church wilderness may require cooperation between user groups and the U.S.F.S. Backpackers and horsepackers must be educated about the damaging effects of knapweed and encouraged to pull out the odd weed found on trails or around campsites. Outfitters could

become licensed herbicide applicators, responsible for weed control in the areas they use. The loss of big game habitat resulting from knapweed infestation should be adequate incentive for participation by outfitters. Even small subsidies or other financial incentives would be cost effective when weighed against the costs of sending U.S.F.S. staff down miles of trails on foot or horseback for days or weeks at a time.

The Wilderness Act states that wilderness should be "managed to preserve natural conditions." In order to preserve a healthy ecosystem in the Frank Church wilderness, weeds must be kept out. The process needed to solve the weed problem must be comprehensive and focus on prevention as well as control: prevention measures will reduce the rate of spread rather than eliminate weeds; control must be a long-term, multi-year and multi-faceted proposition with the goal of completely eradicating existing populations of weeds. The spread of exotic weeds through wilderness threatens one of the fundamental reasons for preserving wilderness: to maintain biological diversity in an increasingly homogenized world. Steps must be taken to eliminate this problem before it spirals out of control.