University of Idaho

Taylor Ranch Managers
Jim and Holly Akenson
208-382-4336

Taylor Ranch Field Station
HC 83
Cascade, ID 83611

October 21, 1999

Clem Pope and Patti Steiger
Krassel District
Payette National Forest
McCall, ID 83638

Dear Patti and Clem:

We have completed the 1999 knapweed monitoring and control project on Big Creek (Joint Venture Agreement, No. 12-JVA-99). Enclosed are several items from the knapweed work:

- Summary of knapweed site data (draft)
- Ken Clark's student internship report of the knapweed monitoring protocol
- Photographs of knapweed monitoring and control

We have a detailed map of the Goat Creek Knapweed site, but no way to reproduce it clearly. Did you receive a copy of Andy Klimek's report summarizing the Salmon-Challis SCA crew's work on Big Creek? His data is incorporated into this report.

Sincerely,

Holly Akenson

**GOAT CREEK KNAPWEED PROJECT**
**DATA SUMMARY 1999**

**University of Idaho Taylor Ranch and**
**Payette National Forest Krassel District**
**Joint Venture Agreement No. 12-JVA-99**

**Overview:**

Data Collection. We collected detailed information on the size and density of the Goat Creek knapweed site. The Taylor Ranch crew spent 288 hours mapping the Goat Creek site, assessing knapweed density, and pulling knapweed at Goat Creek and other sites. The Goat Creek site was measured in 2 sections: west of Goat Creek and east of Goat Creek.

West Goat Creek: Knapweed covered a 10,570 $m^2$ (2.61 acre) area. Seventy-nine percent of plots within the map perimeter contained knapweed. The 248 m long knapweed area included essentially the entire river terrace not covered by trees or shrubs. The site had a mean knapweed plant density of 106 plants/$m^2$ (~~126.5 plants/yard$^2$~~ 88.6). Knapweed density in plots ranged from 0 to 55 plants, with a median density of 8 plants per plot (80 plants/$m^2$).

East Goat Creek has not been analyzed yet.

The monitoring design was labor intensive. We may not be able to monitor more than a few large weed sites per year at this monitoring frequency. Next year we may want to assess knapweed density and extent at Soldier Bar to provide a baseline data set. We can analyze the density data collected this year to determine if we can streamline the sampling rate while still assessing vegetation changes.

Knapweed Control. The Salmon-Challis SCA crew spent 197 hours controlling knapweed and rush skeletonweed at Goat Creek and other sites. The SCA crew treated noxious weeds on a 6,886 square meter area. The Taylor Ranch crew did not document size of area treated. Weed control was prioritized along the trail at Goat Creek, at the streambank along Big Creek, around perimeters of large infestations, and scattered individual plants or small sites.

Control along the trail at Goat Creek resulted in a dramatic visual effect, since knapweed was such a dominant species. Unfortunately, when knapweed was removed it left a bare ground seed bed for new seedlings. The high density of knapweed plants along the trail resulted in a low pulling efficiency.

Other Weeds. The SCA crew documented and controlled 2 rush skeletonweed sites. Sulfur cinquefoil was tentatively identified in a wide occurrence from the NE side of Taylor Ranch to Cougar Creek. These noxious weeds had not been "noticed" previously. Canada thistle sites have not been mapped on lower Big Creek.

**Recommendations for 2000:**

Weed Surveys

- Locate and map additional noxious weed sites on lower Big Creek
- Use a GPS to determine weed site locations and extent.
- Map density and extent of knapweed infestation at Soldier Bar and Cougar Creek.
- Compare size of controlled sites in Goat Basin in 1999 and 2000.

Weed Control

- Prioritize new or small sites where weeds can be eliminated after several years of manual weed control.
- Develop a weed plan for treatment of larger infestations: Goat Creek and Soldier Bar.
- After intensive weed control, revegetate bare ground with native grasses, shrub, and forbs.
- Develop a knapweed free stock handling area with hitch rails at Soldier Bar to minimize spread of knapweed by packstock.
- Increase District manpower for noxious weed monitoring and control.

Table 1. Knapweed sites documented and treated on Big Creek in 1999.

| Site Location | UTM | Size of Infestation | | Area Treated | |
|---|---|---|---|---|---|
| | | $m^2$ | #plants | $m^2$ | % |
| Lobauer Basin | 665,880E 4,997,100N | ~30 | 5 | 30 | 100 |
| Taylor Ranch W | 668,400E 4,996,640N | | 890 | | 100 |
| Taylor Ranch E | 669,650E 4,996,450N | 10 | 30 | 10 | 100 |
| Cliff Creek Camp | 668,780E 5,000,340N | | 150 | | *100 |
| Salt Lick | 669,710E 4,996,200N | 1 | 1 | 1 | 100 |
| Pictograph | 670,210E 4,996,340N | 1 | 1 | 1 | 100 |
| Cougar Flat | 671,260E 4,996,550N | ~150 | 50 | 150 | 100 |
| Cougar Creek | 671,440E 4,996,680N | 465 | | | perimeter |
| Goat Creek W | 672,580E 4,997,030N | 10,566 | | 1,340 | 13 |
| Goat Creek E | | | | | 1 |
| Goat Creek beach | 672,540E 4,996,900N | 450 | | 450 | 100 |
| Goat Basin S | 672,720E 4,997,560N | 155 | | 155 | 100 |
| Goat Basin Camp | 672,800E 4,997,560N | 430 | | 430 | 100 |
| Administrative Site | | 1 | 8 | 1 | 100 |
| Soldier Bar | 673,460E 4,996,680N | large | | | 1 |
| Big Creek Gorge | 673,200E 4,996,800N | 64 | 15 | 64 | 100 |

Table 2. Rush Skeleton Weed sites documented and treated on Big Creek in 1999.

| Site Location | UTM | Size of Infestation | | Area Treated | |
|---|---|---|---|---|---|
| | | $m^2$ | #plants | $m^2$ | % |
| 3/4 mi. W of Cougar Cr. | | 3790 | | 3790 | 100 |
| 1/4 mi. W of Cougar Cr. | 670,970E 4,996,420N | 495 | | 495 | 100 |

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

Ken Clark, University of Idaho
Taylor Ranch Field Station
August 15,1999

**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.