

and problems associated with this plant are increasing. Research and educational programs are needed to help ranchers manage perennial broomweed infestations more effectively.

### Literature Cited

- Correll, D.S., and M.C. Johnston.** 1970. Manual of the vascular plants of Texas. Tex. Res. Foundation. Renner, Tex. 1,881. p.
- Dollahite, J.W., and W.V. Anthony.** 1956. Experimental production of abortion, premature calves, and retained placentas by feeding a species of perennial broomweed. Tex. Agr. Exp. Sta. Prog. Rep. 1884.
- Dollahite, J.W., and W.V. Anthony.** 1957. Poisoning of cattle with *Gutierrezia microcephala*, a perennial broomweed. J. Amer. Vet. Med. Assoc. 130:525-530.
- Dollahite, J.W., and T.J. Allen.** 1959. Feeding perennial broomweed to cattle, swine, sheep, goats, rabbits, guinea pigs and chickens. Tex. Agr. Exp. Sta. Prog. Rep. 2105.
- Matthews, Frank P.** 1936. The toxicity of broomweed (*Gutierrezia microcephala*) for sheep, cattle and goats. J. Amer. Vet. Med. Assoc. 88:56-61.
- McDaniel, Kirk C., R.D. Pieper, and G.B. Donart.** 1982. Grass response following thinning of broom snakeweed. J. Range Manage. 35:219-222.
- Ragsdale, B.J.** 1969. Ecological and phenological characteristics of perennial broomweed. Ph.D. Diss., Tex. A&M Univ., College Station.
- Texas County Statistics.** 1984. USDA Bulletin 223, Austin, Tex.
- Ueckert, D.N.** 1979. Broom snakeweed: Effect on shortgrass forage production and soil water depletion. J. Range Manage. 32:216-220.

## Knapweed Infestation

Darcy A. Yule

Spotted knapweed is a rangeland pest of south and central British Columbia and of the northwest United States. The plant has invaded rangelands in an overgrazed condition and areas of soil disturbance. Fortunately, knapweed has never gained a foothold on the forested rangelands of west central B.C. (Prince George to Prince Rupert). Periodically, however, small infestations have been observed along the main highway (#16) and railway corridors. These infestations have been identified and eradicated, using picloram, as quickly as possible by the Provincial Ministries of Highways or Agriculture, Regional Districts (counties), or the Canadian National Railway (C.N.R.).

Mrs. E.R. Jaarsma, an adjacent ranch owner, first reported an infestation of spotted knapweed at the Barrett Station C.N.R. siding in the fall of 1983. This siding is located 5 miles west of Houston, B.C., on District Lot 712, CR5. At the time of discovery, all stages of knapweed development—dead mature, rosette with stems, and rosette—were present.

Knapweed can over-winter as a rosette or as seed. In the following year, the plant may produce one or two flowering stems. However, in future years as the plant matures, a bushy, multi-stemmed plant develops.

Based on knapweed's development habits and the initial discovery year (1983), the time of initial seed introduction had to have occurred prior to or during the 1981 growing season. Thus, at the time of this study (July 1984), the infestation had begun its fourth growing season. There was an interest in assessing the rate of spread of knapweed in terms of the area covered since initial infestation.

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### MAP of BRITISH COLUMBIA



SHOWING THE  
BARRETT STATION STUDY SITE

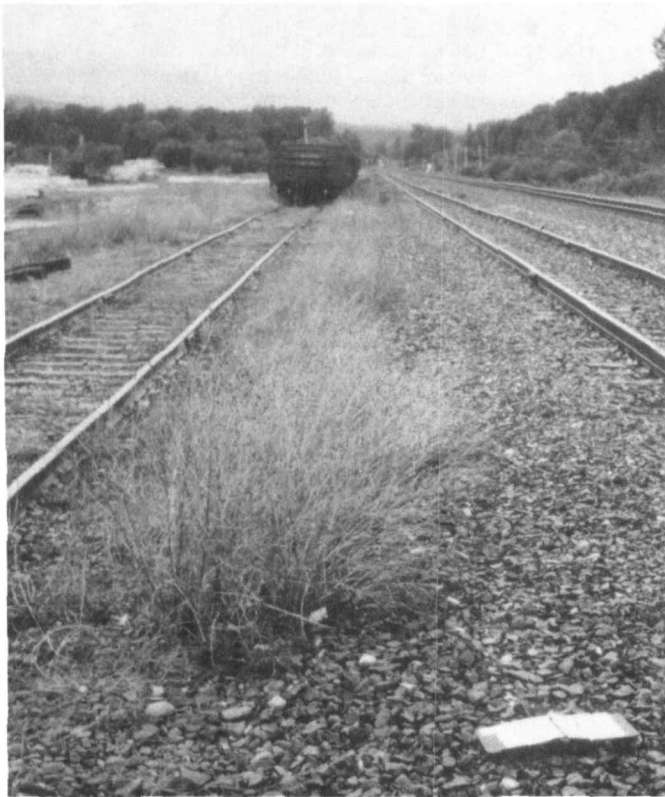
### Site Description

The Barrett Station siding is about 5 hectares in size. There are three sets of railway tracks: the main line, the primary siding, and the secondary siding. The three tracks are roughly 2 meters apart and cover a strip of land, 12 meters wide, centered in the middle of the right of way. Along the secondary siding there was a small portable sawmill which milled railway ties for the C.N.R.

The plant cover of the area varies, with native plants such as willow, fireweed, cow parsnip, wildrye, and fringed brome dominating the undisturbed area and tame grasses and legumes (Kentucky bluegrass, creeping red fescue, Timothy,

smooth brome and clover) on disturbed areas. Although not recorded as part of this project, the ground cover is estimated to be 80% to 90% on most of the area. Hayfields abut both sides of the railway right of way.

The presence or absence of knapweed is complicated by the fact that the area was treated with picloram (Tordon 10k) after discovery in 1983. Therefore, to estimate the knapweed spread, the 1984 survey of this site had to rely on both new



*Dead mature spotted knapweed plants between the primary and secondary sidings.*

plants and previous year's dead mature plants.

### Methods

The knapweed site was sampled on July 6, 1984. A simple method of locating and plotting all knapweed plants was developed. An ocular reconnaissance of the infestation was done using transects as a base to record plant sightings. This ocular/transect method allowed for total coverage of the infestation area. Twelve transects were laid out paralleling the railway tracks. These transects were spaced across the siding area from the north side (transect #1) to the south (transect #12).

Distances along the transects were measured by the use of "Topfil Hip Chain". The transects' baseline was the road crossing at the east end of the siding. Transects were measured by walking up and down the track right of way until vegetation did not permit passage or the baseline was reached.

Knapweed plants present were noted by their growth stage: dead mature, rosettes with flowering stems, and

rosettes. The number and growth stage of all knapweed plants found were recorded at the distance noted on the hip chain.

### Results

The number of knapweed plants observed and their locations were plotted on a 1 mm:1 m scale map of the siding. This map gave an overall layout of the site. The infestation could then be shown in relation to the existing ground cover.

The distribution and density of the plants were determined by each transect (lengthwise) and by 10-meter intervals across all 12 transects. For example, on transect #6 there were 27 dead mature plants, 84 rosettes with flowering stems, and 25 rosettes; on the strip of ground at 280 to 289 meters from the baseline there were 58 dead mature plants, 14 rosettes with flowering stems, and 15 rosettes.

### Discussion

Ninety-five percent of the plants found were located on areas that had some soil surface disturbance. The other five percent of the knapweed plants were on small bared areas within the larger heavy ground cover areas. Myers and Berube (1983) found that diffuse knapweed followed a similar pattern of establishment.

Off loading equipment or railway car clean-up was attributed to be the initial seed source for the infestation. This theory is supported by the evidence that the highest number of dead mature plants were found along the south side of the secondary siding. Dead mature plant frequency decreased and young plant frequency increased as one went northward from the initial infestation site. Thus, the infestation appeared to be moving across the tracks.

The infestation's lack of movement south from the initial site was attributed to the picloram application and the heavy equipment movement associated with the mill site. The herbicide applicators must have missed most of the north site of the infestation.

The initial infestation was on a .016-hectare area at the 280 to 299-meter interval along the secondary siding. This infestation began during or before the 1981 growing season. By the time of the study (fourth growing season, 1984) the infestation had expanded to an area of 0.75 hectares (220 to 429 meters across all three rail lines).

In a total context, this represents a spread rate over the two intervening growing seasons (1982, 1983) of 0.367 hectares per year. If left unchecked, the spread rate may well increase above 0.367 hectares per year as more and more plants would produce seed.

Since the 1984 study, the Barrett Station site has been treated again with picloram and all the knapweed plants were pulled up and burned.

To prevent similar infestations, care should be taken to prevent the possible transport of knapweed plants or seed in hay or on vehicles or other equipment. Proper reclamation of disturbed areas is necessary when site activity is completed.

### Literature Cited

- Myers, J.H., and D.E. Berube. 1983. Diffuse knapweed invasion into rangeland in the dry interior of British Columbia. *Can. J. Plant Sci.* 63:981-987 (Oct. 1983).