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Managing Diffuse Knapweed

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Diffuse knapweed (*Centaurea repens*), a member of the sunflower (*Asteraceae*) family, is a noxious weed in Nevada that was introduced from Eurasia. It was reported in 1989 that 3.1 million acres of land in the western United States was infested with diffuse knapweed. Since then, it has rapidly increased its range. This weed is currently invading Nevada's pastures and rangelands, with great environmental and economical costs.

Identification

Diffuse knapweed is a biennial or short-lived perennial. Its seedlings have finely divided leaves covered with short hair (Fig. 1). Diffuse knapweed grows as a basal rosette during the first year and produces a heavily branched stem in the second year.



Figure 1. Diffuse knapweed seedling.

Diffuse knapweed grows one to three feet tall from a deep taproot (Fig. 2). The numerous spreading branches produced from the rough, erect stems give the plant a spherical shape and the ability to travel like tumbleweed when broken off.

The leaves at the base of the stem are formed on short stalks and are deeply



Figure 2. Diffuse knapweed plants grow one to three feet tall with numerous spreading branches.

divided into lobes on both sides of the central vein. The stalkless stem leaves become smaller and less divided toward the top of the stem.

Diffuse knapweed flowers from June to September. The flower heads are urn-shaped and grow singly or in clusters of two or three at the ends of branches. Flowers are usually white, but are sometimes pink or lavender with colored spots on the bracts. The surrounding bracts are yellowish green and divided like the teeth of a comb (Fig. 3). They have a beige or brown margin, noticeable veins, and a characteristic

longer, spreading spine at the tip. The large central bract tips are upright and not recurved as in squarrose knapweed.

The plants produce beige to dark brown seeds that set from July to October. The seeds are about 1/8-inch long and have a plume of bristle-like hairs at one end.



Figure 3. Diffuse knapweed flower bracts have yellow spines.

Habitat

Diffuse knapweed flourishes in the semiarid west and is found in Washoe and Douglas counties in Nevada. Its early spring growth makes it a tough competitor for soil moisture and nutrients for plants that germinate later. It readily grows on any disturbed soil in a wide range of environments, and is commonly found in overgrazed pastures or rangeland, roadsides, rights-of-way, waste areas, gravel piles, and other disturbed sites.

Diffuse knapweed can grow on a wide range of soils, but grows best on well-drained, light-textured soils. It is less competitive on shallow soils and very coarse-textured soils, but it prospers on these locations when disturbance eliminates other vegetation. It requires less rainfall than spotted knapweed which is otherwise quite similar. It will not tolerate dense shade, flooding, or poorly drained soils.

Impact

Soil disturbance significantly enhances the rate of spread and final density of a diffuse knapweed infestation. This allows diffuse knapweed to invade an extensive range of habitats. This highly competitive

plant causes many environmental and economic losses. It reduces biodiversity and increases soil erosion while decreasing the beauty and appeal of recreational lands, posing wildfire risks, and replacing wildlife and livestock forage on rangeland and in pastures. Economically, diffuse knapweed reduces forage production and land values, while increasing production costs of weed control for ranchers and increasing the cost of roadside maintenance.

Diffuse knapweed reproduces solely by seed. The seeds are spread by vehicles or when the plant detaches at the base and travels like tumbleweed in the wind. Seeds are distributed long distances because they are dropped gradually from the heads. Plants and seeds are also carried in rivers and irrigation systems and may be dispersed on the coats of wildlife and livestock.

Management Methods

Prevention: Because knapweeds reproduce by seed, it is important that the spread of their seed be limited as much as possible. Do not drive vehicles or move livestock through infested areas. As many as 2,000 seeds may be caught underneath a vehicle after driving through just one patch of knapweed, and up to 10% of those can still be on the vehicle ten miles down the road. If you drive through an infested area, be sure to thoroughly clean the underside of your vehicle.

Livestock and wildlife will generally not graze diffuse knapweed because of its bitter taste unless forced to for lack of other feed. Do not graze livestock after flowering when the seeds have developed. Always use hay that is free of knapweed seeds. Detect and eradicate weed introductions early, minimize soil disturbance, and contain neighboring infestations. It is essential to control outlying plants before attacking larger populations. Revegetation of controlled or disturbed sites may help prevent reinvasion.

Mechanical Control: Careful and continual hand pulling or digging can control small infestations or scattered diffuse knapweed plants if enough of the taproot is

removed to prevent sprouting. It is easiest to pull the plants when the soil is wet. Plants with seeds should be securely bagged and disposed of in a landfill or in a hot fire.

Mowing will reduce diffuse knapweed seed production, but it will not control an infestation. It can also reduce weed competition during establishment of newly-seeded grass.

Diffuse knapweed will resprout after fire. Fire may damage the remaining desirable grasses and actually encourage knapweed infestations. Although fire is not effective in controlling diffuse knapweed, it can be used to eliminate plant debris and improve herbicide effectiveness as the regrowth will be very uniform.

Cultural Control: Very early irrigation often favors the early germination and development of diffuse knapweed to the detriment of desirable plants which develop weeks later. Avoid early irrigations in areas known to be infested with diffuse knapweed. Seeding competitive species is recommended, especially grasses to allow the use of a broadleaf herbicide. Diffuse knapweed is eliminated from row crops by cultivation.

Biological Control: The careful timing of grazing in relation to the developmental stages of the weed and surrounding vegetation is essential to accomplish the desired selectivity. Diffuse knapweed is most likely to be grazed by sheep when it is green and tender, when the associated vegetation is dry, or when it is the only plant available.

A variety of biological control agents have been released for control of knapweeds, and twelve of them attack diffuse knapweed. These species add stress to the plant which reduces seed production and the weed's competitiveness, but will be more effective if used in combination with other methods.

Two gall-forming flies (*Urophora affinis* and *U. quadrifasciata*) have been established in diffuse knapweed seed heads, but have not successfully reduced seed production or had an effect on the weed's overall population because of the

tremendous number of seeds produced per plant.

Larvae of the moth *Metzeneria paucipunctella* feed on the flowers and seeds of diffuse knapweed. Two root moths (*Agapeta zoegana* and *Pterolonche inspersa*) and a root weevil (*Cyphocleonus achates*) damage the roots of diffuse knapweed.

Larvae of a buprestid beetle (*Sphenoptera jugoslavica*) feed on roots of diffuse knapweed and weaken rosettes on hot, dry sites where there is competition from perennial vegetation. Large populations of this beetle reduce diffuse knapweed rosettes, delay reproduction, and lower seed production. This beetle is probably less damaging on cooler sites with more moisture because dry conditions benefit larval survival.

A newer agent, *Larinus minutus*, is a seed head weevil likely to be effective on diffuse knapweed because one larva can destroy an entire seed head. It has been introduced to parts of Oregon, Washington, and Idaho, and has reportedly provided excellent control in these locations. The larvae are aggressive and will kill other insects in the same seed head.

A soil fungus (*Sclerotinia sclerotiorum*) can be destructive to diffuse knapweed under certain conditions by attacking the crowns, but it has not yet been cleared as a control agent.

Contact your local University of Nevada Cooperative Extension Educator for sources of biocontrol agents or, for more information, go to www.mtweed.org/.

Chemical Control: Control of knapweeds with herbicides can be effective if used in combination with other control methods. If there is desirable grass competition in diffuse knapweed stands, a careful application of an herbicide that does not harm grasses will allow the grass to more effectively compete with the weeds. Irrigation may help encourage grass competition. Annual treatments for several years will be needed. Latent seed in the soil from previous years will germinate and reestablish the infestation if not controlled with follow-up treatments. Establishing a competitive crop or sod of a perennial grass

will enhance control of regrowth and deter the establishment of new seedlings.

Glyphosate kills knapweed plants, but will also destroy competitive grasses. If using glyphosate, apply to actively growing plants in the bud stage at a rate of 3 lb acid equivalent/acre (ae/A). Seed a locally adapted grass at least ten days after the application.

Applying Tordon® (picloram) to knapweed plants in late spring before or during flower stem elongation at a rate of 0.25 to 0.5 lb ae/A will provide up to four years control and will not damage perennial grasses. Treatment of plants in the bud stage may not prevent seed production in the year of application, but seed germination will be noticeably reduced. Tordon® is a restricted-use herbicide that must be applied by, or its application supervised by, a certified pesticide applicator.

Treating knapweed with 2,4-D will only control plants emerged at the time of application. 2,4-D should be applied in the early stage of flower stem elongation at a rate of 1 to 2 lb ae/A.

After most rosettes have emerged, but before flower stems elongate, knapweeds can be treated with 2 to 5 quarts/A of Curtail® (clopyralid plus 2,4-D amine).

Stinger® (clopyralid) or Transline® (clopyralid) can be applied to knapweeds up to the bud stage of growth. The best results will be obtained if actively growing weeds are treated. The recommended rate of application for knapweeds is 0.25 to 0.5 lb ae/A.

Summary

Diffuse knapweed is an invasive, noxious weed that should be prevented from invading lands in Nevada. It can be successfully managed over time using a variety of integrated measures, if addressed in an aggressive consistent manner using the best knowledge about available control methods.

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