



COLORADO STATE PARKS
BEST MANAGEMENT PRACTICES
WEED PROFILE



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Parks Affected: Many

Diffuse knapweed
Centaurea diffusa Lam.;;
Acosta diffusa (Lam.) Sojak



Family: *Asteraceae* (Sunflower)

Other Names: spreading knapweed, tumble knapweed

USDA Code: CED13

Legal Status: Colorado Noxious List B (top ten worst)

Identification

Growth form: Biennial or short-lived perennial forb.

Flower: Flower heads are broadly urn-shaped, 0.6-0.8 inches tall, solitary or in clusters of 2-3 at the ends of the branches. Floral bracts are yellowish with a brownish margin, sometimes spotted, fringed on the sides, and terminating in a slender bristle or spine. The heads contain two types of flowers, ray flowers around the edges surrounding tubular disk flowers. The ray flowers are white, rose-purple, or lavender.

Seeds/Fruit: Seeds are light brown to black.

Leaves: Basal leaves are stalked and divided into narrow, hairy segments. Stem leaves are smaller, alternate, less divided, stalkless, and become bract-like near the flower clusters.

Stems: Stems are upright, 4-24 inches tall, highly branched, angled, with short, stiff hairs on the angles.

Roots: Taproot.

Seedling: Seedlings have finely divided leaves that are covered with short hairs.

Similar Species

Exotics: Diffuse knapweed may be distinguished from other knapweeds by the terminal spine on the floral bract.

Natives: None.

Impacts

Agricultural: Diffuse knapweed reduces the productivity of rangeland by displacing desirable forage species.

Ecological: Diffuse knapweed is a pioneer species that can quickly invade disturbed and undisturbed grassland, shrubland, and riparian communities. Once established, diffuse knapweed outcompetes and reduces the quantity of desirable native species such as perennial grasses. Diffuse knapweed has been reported to contain allelopathic chemicals, which can suppress competitive plant growth and create single species stands (Watson and Renney 1974). The densities of these stands can range from 1-500 plants/m². The replacement of native grassland with diffuse knapweed can reduce biological diversity and increase soil erosion (Sheley et al. 1997).

Human: No information available.

Keys to Identification:

- The floral bracts have yellow spines with teeth appearing as a comb along the spine margins.
- Flowers are usually white, but may be rose-purple to lavender in appearance.
- Seedlings have finely divided leaves that are covered with short hairs.



Habitat and Distribution

General requirements: Diffuse knapweed is found on plains, rangelands, and forested benchlands. It is generally found on light, dry, porous soils. Diffuse knapweed has been observed at elevations up to 8,500 feet (K.G. Beck, pers. comm.). It grows in open habitats as well as shaded areas (Watson and Renney 1974). Diffuse knapweed is not common on cultivated lands or irrigated pasture because it cannot tolerate cultivation or excessive moisture (Watson and Renney 1974).

Distribution: Diffuse knapweed is now common in the Front Range counties, and has been reported in scattered infestations from both the east and west slope of Colorado.

Historical: Native to Eurasia.

Biology/Ecology

Life cycle: Diffuse knapweed plants first form low rosettes and may remain in this form for one to several years depending on environmental conditions. Diffuse knapweed is a semelparous perennial; it grows as a rosette until it reaches a critical size, then bolts, flowers and usually dies (Thompson and Stout 1991). Flower buds are formed in early June and flowering occurs in July and August (Watson and Renney 1974). Mature seeds are formed by mid-August (Watson and Renney 1974).

Mode of reproduction: Reproduces by seeds.

Seed production: A single diffuse knapweed plant can produce up to 18,000 seeds (Harris and Cranston 1979) and a stand of diffuse knapweed can produce up to 40,000 seeds per square meter (Watson and Renney 1974). Along the Colorado Front Range, seed production of 500-1500 seeds per plant is more typical (Beck et al. 1998).

Seed bank: Seeds may remain dormant for several years.

Dispersal: Seed dispersal for diffuse knapweed is mainly by wind (Watson and Renney 1974). When the seed capsule sways in the breeze or is disturbed, the seeds fall from the small opening in top of the flower head and are distributed around the parent plant (Watson and Renney 1974). However, most of the involucre remain closed until the plant dries up, breaks off at ground level and effectively becomes a tumbleweed, allowing seeds to be dispersed over long distances (Zimmerman 1997). Diffuse knapweed stalks readily lodge under vehicles, expanding their long distance dispersal.

Hybridization: No information available.

Control

Biocontrol: Currently, biological control agents are available but the extent to which they effectively control diffuse knapweed populations is unclear. The Division of Plant Industry's Biological Pest Control Section has five species that may be available for redistribution. These five species are *Urophora affinis*, *Urophora quadrifasciata*, *Agapeta zoegana*, *Sphenoptera jugoslavica*, *Cyphocleonus achates*. The seedhead weevil *Larinus minutus* may also become available for distribution.

Mechanical: Cutting or mowing the above-ground portion of the plant, before seed set may be an effective way to reduce seed production, but it will not eliminate the infestation. Mowing usually increases diffuse knapweed density, due to increased germination from the soil seed bank. Mowings should therefore be followed by a fall herbicide treatment (Sebastian and Beck 1999). When a diffuse knapweed plant has been cut, the rosette may live and re-bolt. Additionally, diffuse knapweed seeds can remain dormant for several years, requiring any cutting program to be repeated several times annually (spring, summer, and fall) to be effective. Mowing or fire can be used as a way to remove standing dead material such that subsequently applied herbicide will be more effective (Roché and Roché 1999.)

Pulling can be effective for knapweed control, but it must be repeated frequently. Youtie and Soll (1994) suggested hand-pulling knapweeds three times annually until the plant disappears. The first pulling is in spring when the soil is moist, allowing enough of the plant to be

Keys to Control:

- Eliminate seed production.
- Stress the plants nutrient reserves as well as the soil seed bank through persistent management.
- Re-seed infested area with desirable species and manage them to produce a vigorous stand of plants.

pulled to kill it. The second pulling in June focuses on bolted plants, with the third pulling just before seed dispersal to kill any remaining plants.

Fire: In areas without abundant native perennials, burning has been shown to be an effective control of diffuse knapweed with strong grass regrowth occurring on burned sites (Zimmerman 1997). A low-severity fire may only top-kill (not kill the root) diffuse knapweed, but a severe fire will probably kill the entire plant. Dry soil conditions associated with burns may discourage diffuse knapweed re-infestation as moisture is the limiting factor for diffuse knapweed seed germination. Re-seeding desirable species after burning helps to prevent a re-infestation of diffuse knapweed or other exotic species.

Herbicides: Several herbicides are relatively effective at controlling diffuse knapweed. Picloram is the most widely recommended (Harris and Cranston 1979). Other effective herbicides include clopyralid, dicamba, 2,4-D, and glyphosate (Beck 1997, Youtie 1997, Watson and Renney 1974). To save money and reduce grass injury resulting from higher use rates of a single herbicide, several of these herbicides can be combined (Beck 1997). Tank-mixes of picloram and dicamba (0.25 to 0.5 lb./acre + 0.125 to 0.25 lb./acre), picloram plus 2,4-D (0.188 lb./acre + 1.0 lb./acre), clopyralid (0.25 lb./acre), clopyralid+2,4-D (0.2+1.0 lb./acre) and dicamba plus 2,4-D (0.5 lb./acre + 1.0 lb./acre) all control diffuse knapweed (Beck 1997). A backpack sprayer or a wick is recommended in small areas to minimize damage to non-target plants. Herbicides should either be applied before the mature plants set seed, or to rosettes in the fall, to maximize effectiveness.

Cultural/Preventive: Prevent establishment of new infestations, and manage grazing or other land use to maintain vigorous native communities.

Integrated Management Summary

Integrated treatment of diffuse knapweed depends on each situation. Single treatments provide temporary but not long-lasting control. In grasslands where the forb component is minimal or expandable, suggested strategies include altering grazing management to promote vigorous grasses, spraying with picloram, re-seeding with competitive grass species, followed by spot treatment with picloram or hand-pulling. According to Roché and Roché (1997), the best case scenario is establishing competitive forage species that can, with the help of biological control agents and proper livestock management, maintain knapweed at low levels. The most effective method of control for diffuse knapweed is to prevent its establishment. Areas that are adjacent to known patches of diffuse knapweed should be monitored two to three times a year (spring, summer, and fall) and any new rosettes should be destroyed. Established plants or stands of diffuse knapweed can be pulled or spot treated with picloram. Burning may be an effective means of controlling diffuse knapweed in areas where seasonal or occasional fires are part of the natural ecosystem (Zimmerman 1997). Seeding desirable perennial grasses is essential to prevent weed reinvasion (Beck 1997).

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