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## Diffuse and spotted knapweed: biology and management

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### Quick Facts

Diffuse knapweed, *Centaurea diffusa*, is a biennial, or occasionally an annual or short-lived perennial that reproduces and spreads solely from seed.

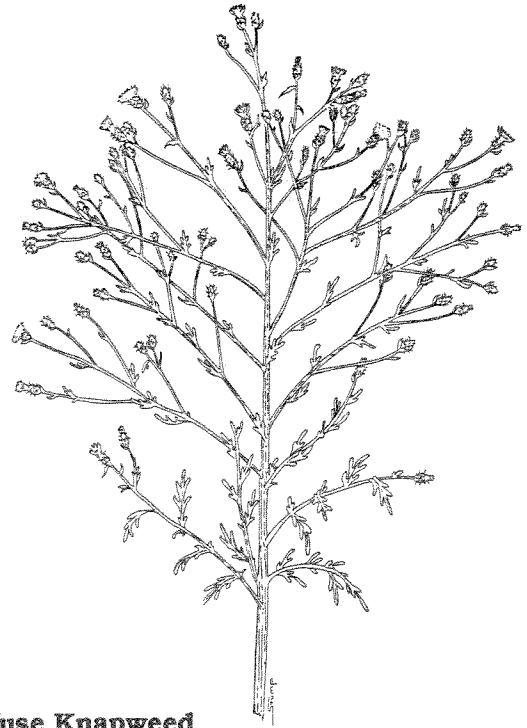
Spotted knapweed, *Centaurea maculosa*, is a short-lived, non-creeping perennial that reproduces from seed and forms a new shoot each year from a taproot.

Diffuse and spotted knapweed are readily controlled with herbicides, however, unless cultural techniques are used, the weeds will reinvade.

### Description

**Diffuse knapweed** (*Centaurea diffusa*) is a biennial, or occasionally an annual or short-lived perennial. It reproduces and spreads from seed. The plant develops a single shoot 1 to 2 feet tall, that branches toward the top. Rosette and lower shoot leaves are finely divided; leaves become smaller toward the top of the shoot and have smooth margins. Numerous solitary flower heads occur on shoot tips, and are about 0.13 inches in diameter and 0.5 to 0.67 inches long. Flower color usually is white but may be purplish. Involucre bracts are divided like teeth on a comb and tipped with a slender spine that makes them sharp to the touch. Sometimes the bracts are dark-tipped, or "spotted", like spotted knapweed but the long terminal spine differentiates diffuse from spotted knapweed.

**Spotted knapweed** (*Centaurea maculosa*) is similar in appearance to diffuse knapweed with some notable exceptions. Spotted knapweed is a short-lived, non-creeping perennial that reproduces from seed (primary means of spread) and



**Diffuse Knapweed**

forms a new shoot each year from a taproot. The weed produces one or more shoots that are branched and 1 to 3 feet tall. Rosette leaves can be

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<sup>1</sup>K. George Beck, Colorado State University Cooperative Extension weed specialist and associate professor, weed science and plant pathology (1/94). Some recommendations change regularly, please contact your Colorado State University Cooperative Extension office for current recommendations.

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6 inches long and deeply lobed. Leaves are similar to diffuse knapweed. Lavender to purple flowers are solitary on shoot tips and about the same size as diffuse knapweed. Involucre bracts are stiff and black-tipped; the tip and upper bract margin have a soft spine-like fringe and the center spine is shorter than others.

### Phenology, Biology and Occurrence

**Diffuse knapweed** seeds germinate in spring or fall. Seedlings develop and survive the first growing season as a rosette. Rosettes resume growth early in their second spring, bolt in May to June, set seed in June and July, and die.

Occasionally, diffuse knapweed will germinate and set seed in the same year, growing as an annual, or produce a new shoot the year following seed production, growing as a short-lived perennial.

Diffuse knapweed is native to degraded, non-cropland (waste places) and seashores from southern Europe to north central Ukraine. It generally is found on dry, light, porous soils in Europe. Diffuse knapweed appears to occupy similar areas in the U.S. Diffuse knapweed will not tolerate flooding or shade and thrives in the semi-arid west (generally in 9 to 16-inch precipitation zones).

Environmental disturbance (e.g. overgrazed pastures or rangeland, roadsides, rights-of-ways, gravel piles, etc.) promotes invasion.

In Colorado, the worst infestations occur along the Front Range in Larimer, Boulder, Douglas, and El Paso counties. Severe infestations also occur in Archuleta and La Plata counties.

**Spotted knapweed** germinate in spring or fall. Perennial plants resume growth in early spring and bolt at approximately the same time as diffuse knapweed. Flowering occurs throughout the summer into fall.

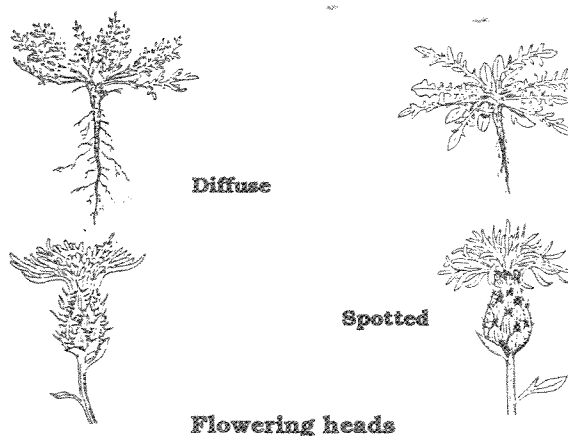
Spotted knapweed is native to central Europe where it is found in light, porous, fertile, well-drained, and often calcareous soils in warm areas. It occupies dry meadows, pastureland, stony hills, roadsides, and the sandy or gravelly floodplains of streams and rivers. Spotted knapweed tolerates dry conditions, similar to diffuse knapweed, but survives in higher moisture areas as well. Spotted and diffuse knapweed infestations often associate in Colorado.

Spotted knapweed infestations are not as severe in Colorado as diffuse knapweed. However, this weed spreads rapidly. For example, spotted knapweed was first observed in Gallatin County Montana in the 1920s, but is now found in all Montana counties investing over 4.7 million acres today.

### Management

Diffuse and spotted knapweed can be managed similarly. They are readily controlled with herbicides, *however, the weeds will invade unless cultural techniques are used.*

**Chemical control.** Several herbicides will control diffuse and spotted knapweed readily. Research conducted at Colorado State University



indicates that dicamba (Banvel) at 0.5 to 1.0 lb ai/A (0.5 to 1.0 qt) and picloram (Tordon) 0.25 to 0.5 lb ai/A (0.5 to 1.0 qt) control diffuse knapweed. Tank-mixes of Banvel plus 2,4-D (0.5 + 1.0 lb ai/A), Banvel plus Tordon (0.5 to 1.0 + 0.125 to 0.25 lb ai/A), Tordon plus 2,4-D (0.188 + 1.0 lb ai/A), clopyralid plus 2,4-D (Curtail; 1.5 + 8.0 oz ai/A) all control diffuse knapweed. These tank-mixes may save money and reduce grass injury resulting from higher use rates of a single herbicide.

Spotted knapweed and diffuse knapweed generally occupy the same areas in Colorado so the same herbicide treatments can be applied. Weed scientists at Montana State University indicate that 0.25 lb ai/A Tordon controls spotted knapweed for two to three years but, the weed will reinvade the area unless other management techniques are used.

**Cultural control.** If desirable grass competition is evident in diffuse or spotted knapweed stands, judicious herbicide application that does not injure grasses may release them to compete effectively with the weeds. Irrigation (where possible) may help stimulate grass competition in these cases. However, often rangeland or pastures are degraded (allowing knapweed encroachment) and herbicides alone will not restore the land to a productive state. Grass seeding is necessary to prevent weed reinvasion.

**Biological control.** Many insects are being evaluated for biological control of diffuse and spotted knapweeds. Researchers at Montana State University believe it will take a complex of insects (perhaps 12) to reduce diffuse and spotted knapweed populations. Two seedhead flies are available in Colorado; *Urophora affinis* and *Urophora quadri-fasciata*. The Colorado Department of Agriculture has made many releases in counties along the Front Range. These insects cause plants to produce fewer viable seeds and abort terminal or lateral flowers.

Livestock (sheep, goats, cattle) will consume diffuse and spotted knapweed. Sheep have been effective in Montana to reduce spotted knapweed seed set and release grasses from competition. Spotted knapweed is palatable to sheep and late spring to early summer grazing has been most effective for reducing seed formation where a high density of animals grazed for a short time.