SPOTTED KNAPWEED
(Centaurea maculosa)

**Description:** Spotted knapweed is a member of the Asteraceae or sunflower family. Spotted knapweed can grow 1 to 3 feet tall. Basal rosette leaves are borne on short stalks and grow up to 6 inches long. Rosette leaves are deeply divided into lobes on both sides of the center vein. Spotted knapweed stems can have more than one stem and are branched on the upper half. Stem leaves are alternate, sessile, and have few lobes, or they are linear and entire, and are smaller toward the uppermost part of the stem. Flower heads are born solitary or in clusters of two or three and are found at the branch ends. Flower heads are ovate to oblong and are pinkish-purple or, rarely, cream colored. Bracts of the plant surround the flower head and are yellow-green to brown in color. The center spine of the bracts is shorter than the lateral spines. Spotted knapweed has obvious longitudinal veins and black-tipped bracts that give the flower head a spotted appearance. Spotted knapweed seeds are brown to black in color, oval in shape, about 1/8 inch long, and tipped with a tuft of bristles.

Spotted knapweed is considered a noxious weed under North Dakota state law, thus landowners are required to eradicate or control the spread of the plant.

**Plant Images:**

*Flower head*

**Distribution and Habitat:** Spotted knapweed is native to Eurasia. The plant commonly infests disturbed areas such as roadsides, railroad tracks, trails, construction sites, overgrazed land, and waterways. Spotted knapweed is adapted to a range of habits and soil types, but is especially well suited to semi-arid sites. The plant can form dense stands on moist, well-drained soils including gravel areas, and dry sites where summer precipitation is supplemented by runoff.
**Life History/Ecology:** Spotted knapweed is a deeply taprooted, rosette-forming plant that is a biennial or short-lived perennial. The plant reproduces solely by seeds. Some reports have stated that spotted knapweed is also able to send lateral shoots below the soil surface that can form rosettes adjacent to the parent plant. Seeds germinate in the fall or early spring when temperature and moisture are suitable. Seedlings develop into rosettes and then into a bolt by early May. Rosettes that do not form into a bolt die back to the root crown to overwinter. Spotted knapweed can produce one to six stems with flowering buds forming in early June. Flowering occurs from June through August in North Dakota. Each spotted knapweed plant can produce an average of 1,000 seeds per plant. Site conditions and precipitation during the growing season have the greatest effect on the number of seeds produced per year. A greater number of seeds are produced during wet years. Seeds may remain viable in the soil for more than five years.

An allelopathic compound, cnicin, has been isolated from spotted knapweed leaves and shoots. However, the aggressive and competitive nature of the species may be more important than allelopathy in determining spotted knapweed success.

**History of Introduction:** Spotted knapweed is native to central Europe and east to central Russia. The plant was introduced into North America in the late 1800s as a contaminant of alfalfa or clover seed. Spotted knapweed may also have been introduced through soil used as ship ballast. The plant is found throughout the western United States and Canada. Between 1980 and 1999, spotted knapweed rapidly invaded every county in Washington, Idaho, Montana, and Wyoming. In North Dakota, spotted knapweed has been reported in McHenry, Burleigh, Emmons, Barnes, Stark, Slope, Adams, Nelson, Kidder, Logan, Mountrail, Golden Valley, Billings, Ward, McKenzie, Morton, Cass, Bowman, Burke, Divide, Griggs, Hettinger, McLean, Mercer, Rolette, Towner, Stutsman, and Williams counties.

**Effects of Invasion:** Spotted knapweed is an aggressive species that can reduce livestock and wildlife forage once established. The plant also increases surface water runoff, soil erosion, and stream sedimentation.

**Control:**
Prevention and early detection are important approaches for spotted knapweed management. The most cost effective management strategies for spotted knapweed control are to prevent infestations from spreading onto adjacent rangeland, minimizing soil disturbance, and developing or maintaining a healthy, desirable plant community that meets other land-use objectives. Several management techniques should be integrated to shift spotted knapweed infested plant communities to more desirable, productive plant communities. Areas should be monitored for several years because seeds of spotted knapweed can remain viable in the soil for five or more years.

*Mechanical* - Small patches of spotted knapweed can be removed by digging or hand pulling. The entire plant should be removed before seeds are produced. Cultivation has had contradictory results on spotted knapweed control. In one study, cultivation eliminated spotted knapweed and encouraged subsequent vigorous grass growth. In another study, a single cultivation increased spotted knapweed density over the control area, but reduced spotted knapweed biomass one year after treatment. Long-term effects of mowing on spotted knapweed populations is unknown. In one study, mowing spotted knapweed at the flowering stage or both bud and flowering stages reduced the number of flowering stems in an area and the percent germination of seeds produced. Further research is needed to determine the effects of mowing for spotted knapweed control. Prescribed burning may reduce spotted knapweed infestations. In one study in Michigan, annual spring prescribed burns reduced spotted knapweed infestations and increased the competitiveness of the native, desirable species. After three consecutive years of burning,
spotted knapweed was reduced enough to control populations by hand-pulling individual plants. However, others reports suggest that prescribed burns will not successfully control infestations because fires will usually not be hot enough to eliminate all of the viable seeds in the soil or be able to prevent root crowns of the plants from resprouting. Burning prior to herbicide application may be effective by increasing the efficacy of the herbicide and stimulating new growth of competitive species.

**Chemical** - A number of herbicides are available for control of spotted knapweed. Picloram, dicamba, and products that contain clopyralid can be used to control small infestations. On pasture and rangeland, picloram can control spotted knapweed for two to three years due to the residual control period of the herbicide. Herbicide application is optimum when the plant is in the rosette growth stage in the fall or in the bolt to bloom stage in the spring. Dicamba or a combination of dicamba and 2,4-D can provide good spotted knapweed control, but for long-term control, an annual follow-up treatment may be necessary. Optimum herbicide application timing is when the knapweed is in the bud to bloom stage. Clopyralid also provides good control of spotted knapweed. Control is greatest when herbicides are applied in the fall or in the early spring when the plants are in the rosette stage.

Contact your local county extension agent for recommended use rates, locations, and timing.

**Biological** - A variety of natural enemies have been released as biological control agents for spotted knapweed. Most of the control techniques attempt to reduce seed production of the plant by using insect larvae to damage the root, shoot, leaf, or flower. Two seedhead-feeding flies, *Urophora affinis* and *Urophora quadristriata*, are well-established on spotted knapweed. A root moth, *Agapeta zoegana*, and a root weevil, *Cypholeon achates*, damage roots of spotted knapweed. *Pterolonche inspersa* and *Pelochrista medullana* have also been released for spotted knapweed control. However, biocontrol agents have not been introduced in North Dakota at this time.

In addition, *Sclerotinia sclerotiorum* is a common soil fungus that infects spotted knapweed. *Pseudomonas syringae* pv. *syringae* has also been reported to infect the plant.

Low to moderate levels of grazing by cattle, goats, and sheep have been observed on spotted knapweed. Spotted knapweed can tolerate defoliation, but severe defoliation will reduce root, crown, and aboveground growth. Livestock tend to graze spotted knapweed more in the spring and early summer when plants are green and actively growing in the rosette and bolt growth stages.

**References:**


Spotted knapweed and flower head photograph courtesy of Washington State Noxious Weed Control Board.

Rosette photograph courtesy of North Dakota State University, NDSU Extension Service

Young plant photograph courtesy of T. Breitenfeldt, Montana War on Weeds (mtwow.org)