



SPOTTED KNAPWEED

Centaurea stoebe (also *C. maculosa* or *C. biebersteinii*)

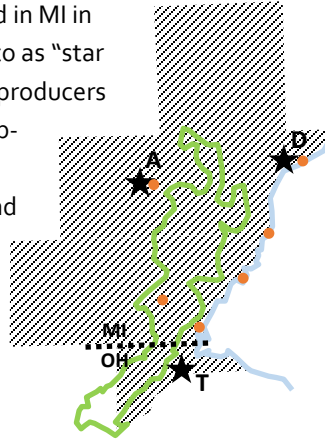


TARGET

This Best Management Practice (BMP) document provides guidance for managing Spotted Knapweed in the Oak Openings Region of Northwest Ohio and Southeast Michigan. This BMP was developed by the Green Ribbon Initiative and its partners and uses available research and local experience to recommend environmentally safe control practices.

INTRODUCTION AND IMPACTS— Spotted Knapweed (*Centaurea stoebe*) is native to Eurasia and was accidentally introduced to North America in the 1890s by seed or soil contamination. Spotted Knapweed (or “S. Knapweed”) was first found in MI in 1911 and in OH in 2008. Often referred to as “star thistle”, it has become prized by honey producers as a nectar source for their bees. S. Knapweed is now widely distributed in North America and is found throughout OH and MI.

The Midwest Invasive Species Information Network (MISIN) has over 80 reports of S. Knapweed (orange dots) in or within 5 miles of the Oak Openings Region (OOR, green line). It is currently found in 6 of the OOR’s 7 counties and is present in many natural areas. S. Knapweed has demonstrated the ability to establish and spread in both healthy and disturbed habitats of the OOR (see habit section).



S. Knapweed has many characteristics that contribute to its classification as an invasive, pest species. It produces copious amounts of seed and can rapidly colonize disturbed sites. It begins growing in early spring, allowing it to quickly gain advantage over native plants. In addition to limiting the light and nutrients available to native species, it also suppresses growth through allelopathy – the release of germination or growth inhibiting compounds into the soil. The produced compound, (-)-catechin, can remain in the soil for extended periods, creating additional restoration challenges.

S. Knapweed severely degrades the quality of habitats in which it becomes established. Through symbiotic association with a fungus found in the soil, S. Knapweed can divert carbon from otherwise competitive grass species. Its invasion can also increase surface water runoff and soil erosion, and reduce nesting habitat for some songbird species.

SIMILAR SPECIES—S. Knapweed is similar in appearance and habit to other members of its genus, including Diffuse Knapweed (*C. diffusa*), Russian Knapweed (*C. repens*), Short-Fringed Knapweed (*C. nigrescens*), Black Knapweed (*C. nigra*), Brown Knapweed (*C. jacea*), and Bachelor’s Button (*C. cyanus*). None of these species are native to the United States and all can be treated with the control methods outlined here.

S. Knapweed can be distinguished from other knapweeds by its stiff, black-tipped bracts, located below the petals and giving the flower its “spotted” appearance. It may also be mistaken for any number of

thistle species (*Carduus* or *Cirsium* spp., native and non-native), but is easily set apart by its lack of spines.

HABITAT—S. Knapweed prefers full sunlight and dry, light to coarse textured soils, but can grow in a wide range of conditions. It is tolerant of moist habitats, but does not often persist in the shade. In the OOR, S. Knapweed has been found on sand dunes, at the edges of floodplains and streams, near vernal pools and ponds, and along roads and ditches.

IDENTIFICATION—**Habit:** Biennial or short-lived perennial forb. Grows as a rosette for 1-4 years before bolting, becoming bushy and up to 5’ tall. Average life span of 3-4 years but can live 9+ years.



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Leaves: Prostrate rosettes have 5-12 deeply lobed leaves up to 8” long and 2” wide. On bolting plants, leaves are alternate, becoming smaller and more linear as they approach the ends of the stems. Leaves are blue-green to silver-gray and covered with short interwoven hairs.

Stems: One or more. Highly branched, slender, and hairy. Stiff and bluish/grayish-green. May have green or purple stripes. Remain erect after drying.

Flowers: Pink to purple and around 1” in diameter with 10-15 ray flowers. Resemble thistles. Usually solitary at the ends of stem branches. Oval bracts are stiff and tipped with a black spine-like fringe.



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Seeds: Oval achenes, 1/8” long with a short, tufted pappus. Black to tan with pale vertical lines. Notched on one side of base. Protected by a thick, durable pericarp.

Roots: Long, sturdy taproot with lateral roots. Can extend >80 cm deep.

SKW Timeline	J	F	M	A	M	J	J	A	S	O	N	D	
Life History	Dieback/Dormant		Germination / Emergence		Growth/ Bolting	Flowering			Fruiting /Germination			Dieback/ Dormant	
Cutting Only					Mow								
Foliar Spray				Treat before flowering		Treat Rosettes							
Biological Control						Biocontrol							
Hand Pull	Appropriate at any time, if conditions allow. Best before flowering. Repeated efforts needed.												
Grazing			Palatable										
Prescribed Fire				Burn annually									

REPRODUCTION AND DISPERSAL—Reproduction of *S. Knapweed* occurs solely by seed. A single plant can produce tens of thousands of seeds annually, and seeds can remain viable in the soil for over 7 years! Most seeds fall within 3-4' of their parent plant, but *S. Knapweed* seeds can be dispersed by wind, water, wildlife, humans and equipment. **Thoroughly cleaning equipment is a critical prevention measure for *S. Knapweed* in the OOR. Land managers should consider incorporating pre- and post-project equipment-cleaning into contracts.**

REPORTING—Identified as a Target species in the OOR. Reporting *S. Knapweed* is essential for its control. *S. Knapweed* is easy to identify year round, but easiest to identify when it is flowering. Report SKW at www.misin.msu.edu and to the county or local CWMA or CISMA.

CONTROL—The best control is integrated control. Management plans should focus on the prevention of seeding followed by chemical damage to the plant where conditions permit the use of herbicides. Annual follow-up is essential in the treatment of *S. Knapweed*, and monitoring should include an area of at least 20' around the original patch.

Chemical: The following recommendations have been compiled from groups working in MI, CO, MT, WA, OR, WI, MN and Canada. It is the responsibility of the applicator to ensure compliance with herbicide labels and regulations when planning chemical treatment. Follow-up treatments should take place six weeks after cutting or initial application.

Foliar Spraying—Best for large, dense populations or as follow-up after cutting. Less effective when plants are stressed by drought or leaf damage. Herbicides should be used with 0.5-1% of an appropriate non-ionic surfactant (e.g. Cygnet Plus®, LI-700, etc.). Consider rotating herbicides to prevent development of resistance.

Mechanical: Hand pulling /digging is the recommended method of mechanical *S. Knapweed* removal, as it removes the entire plant and can be accomplished year-round. As *S. Knapweed* can re-sprout from

Herbicide	Trade Names	Conc.
Glyphosate	Aquamaster®, Rodeo®, Roundup®	
Triclopyr	Garlon 3A® or 4 Ultra®, Pathfinder®	
Aminopyralid	Milestone®	3-5%
Clopyralid	Transline®, Stinger®, Reclaim®	1-3%
2,4-D	(Several manufacturers)	5-10%
Clopyralid + 2,4-D	Curtail®	1-3%
Clopyralid + Triclopyr	Redeem®	1-3%
Dicamba	Banvel®, Vanquish®, Clarity®	1-3%
2,4-D + Dicamba	Weedmaster, Weed-B-Gon	3-5%
Triclopyr + 2,4-D	Crossbow	

root fragments, care must be taken to extract the entire taproot. **Because all knapweeds contain carcinogens, and *S. Knapweed* can cause skin irritation, gloves and long sleeves are recommended when pulling.** Mowing can be an effective way to delay flowering, but cut plants can re-sprout and flower in the same season. Studies in Canada and MT found that a single mowing at bud stage or flowering stage can reduce the number of seed-producing plants by 77-90%, adult plant density by 85%, and seed germination by 79%. Do not mow plants that have gone to seed. Cutting stems to the ground and covering the infested area in thick plastic or geotextiles is labor and cost intensive, but can effectively control *S. Knapweed* if left in place for several growing seasons. *S. Knapweed*'s stiff stems could pierce plastic sheets, so covered areas must be monitored frequently. Tilling is generally not recommended at depths less than 7". In all mechanical removal scenarios, ensure you clean your equipment and dispose of all plant material appropriately (see Disposal below).

Biological: Some 13 species of insect are available as biological control for *S. Knapweed*, including flies, weevils, moths and beetles that target seed-heads or roots. In MI, the seed-head flies *Urophora affinis* and *Urophora quadrifasciata*, the root feeding weevil *Cyphocleonus achates*, and the flower weevils *Larinus minutus* and *Larinus obtusus* have been approved and utilized. Biological control is only suited for large populations of *S. Knapweed*. Impacts of biocontrol programs may take 3-5 years to show, and depend upon well-established populations of agents. Eradication is not possible with biocontrol alone. Sheep, goats and cattle will eat *S. Knapweed* in early spring, but do not prefer it—the plant has low palatability when in flower.

Prescribed Fire: Fire yields mixed results when it comes to control. *S. Knapweed* does not carry fire well, so other fuels must be present in established stands for fire to be effective. Fire may stimulate crown re-sprouting and seed germination, but can also encourage the establishment of competing native vegetation and increase the effectiveness of subsequent herbicide treatments.

DISPOSAL

If no flowers are present: pulled or dug plants can be left on site if roots are not in contact with the soil. If flowers are present: plants should be incinerated or sealed in plastic bags for disposal. Do not remove soil from invaded sites unless it is being disposed of in a landfill. **DO NOT COMPOST** Updated: Summer 2019

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