

## **Spotted Knapweed FAQ**

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MSU researchers are using biological control of spotted knapweed combined with restoration using native nectar plants to benefit both agriculture and the environment. The goal of the MSU team is to find ways to manage landscapes to support plant communities that enhance a wide variety of public interests. Specifically, they are focused on assessing the establishment and impact of biocontrol agents on spotted knapweed in Michigan and the potential to restore native plant communities to areas formerly dominated by this invasive plant. This effort could lead to beneficial changes for people, natural resources, and the economy of Michigan.

### **What's Spotted Knapweed?**

Spotted knapweed (aka. star thistle) is an exotic plant from Eastern Europe and Western Asia that was first found in Michigan in 1911. The current scientific name of spotted knapweed is *Centaurea stoebe* L. subspecies *micranthos*, but it also appears in the literature under the names *Centaurea maculosa* and *Centaurea biebersteinii*. Diffuse knapweed, *Centaurea diffusa*, is another closely related invasive knapweed that also occurs in Michigan. Spotted knapweed is considered a noxious weed in Michigan and its distribution is prohibited. For more information:

- [http://www.michigan.gov/mdard/0,4610,7-125-1569\\_16993-11250--,00.html](http://www.michigan.gov/mdard/0,4610,7-125-1569_16993-11250--,00.html)
- <http://www.invasive.org/browse/subinfo.cfm?sub=3013>

### **Why do we care about spotted knapweed?**

Land managers consider spotted knapweed one of the most serious invasive plants in North America. Once established it is reported to release chemicals into the soil that inhibit the growth of other plants. Over time, knapweed invasions reduce the diversity native plants in infested areas, which in turn can reduce the diversity of insects, birds, and other wildlife. On highly disturbed soils like roadsides and former agricultural fields, spotted knapweed can form nearly solid, single-species stands that provide a foothold in the landscape from which it can spread into nearby areas. Cattle, deer and other wildlife avoid eating spotted knapweed which can further increase its prevalence by focusing grazing on other plants. In Michigan, spotted knapweed is a particular threat along the Great Lakes' shores where it artificially stabilizes coastal dunes and can result in a loss of biodiversity. Knapweed is also a common invader in grasslands and oak savanna habitats where it can out-compete native plants.

### **Does anyone like this plant?**

In parts of Northern Michigan people have become accustomed to seeing large fields of its light purple flowers and find it attractive. Beekeepers in Michigan value spotted knapweed for its mid to late summer flowering period, a time when few other crops are blooming. Bees forage on knapweed and the nectar they collect produces a light-colored honey marketed as "star thistle" honey. After providing pollination services to fruit and vegetable crops in the spring, some commercial beekeeping operations place their hives in knapweed infested areas of the state to take advantage of the abundant bloom and nectar flow. They consider this extra income important to their bottom line.

### **How is spotted knapweed currently managed?**

In annual crops, spotted knapweed can be managed by a combination of tillage and herbicides. On roadsides and in pastures with limited plant diversity certain herbicides can be utilized; however, they are expensive and generally not used on many acres. In natural areas where desirable plants are present, management is generally restricted to hand pulling and spot treatment with herbicides. Hand pulling is labor intensive and is most practical when infestations are not yet extensive. Irritation to skin through direct contact has occasionally been reported and gloves should be used when hand pulling plants. Prescribed fire is generally of limited use because of a lack of fuel throughout knapweed stands. Due to the difficulty and expense of managing spotted knapweed by conventional means, it continues to spread and biological control efforts have been developed.

### **What biological control agents occur in Michigan?**

In 1994, two seedhead-feeding fly species; *Urophora affinis* and *Urophora quadrifasciata* were released in Michigan by the USDA. The seedhead flies became widely distributed in Michigan where they reduce seed production but not sufficiently to result in overall control. More recently--in combination with the seedhead flies--a root feeding weevil, *Cyphlocleonus achates* and two species of flower weevils; the Lesser knapweed flower weevil, *Larinus minutus* and the Blunt knapweed flower weevil, *Larinus obtusus* have successfully suppressed spotted knapweed in western states. The root weevil and flower weevils are also established in Minnesota and Wisconsin where knapweed declines are also being observed. Beginning in 2007, the root weevil and flower weevils were permitted for use in Michigan and released in selected locations. The Lesser knapweed flower weevil has also naturally colonized parts of southwest Michigan from releases made in Indiana in 1996. For more information on the biology of knapweed natural enemies see:

- <http://www.invasive.org/weeds/KnapweedBook.pdf>
- <http://www.biocontrol.entomology.cornell.edu/weedfeedTOC.html>

### **What precautions have been taken to assure these insects are safe?**

All weed biological control agents must undergo years of rigorous testing before they are permitted for release. The most important tests are for "host-specificity." Both the flower and root weevils have been tested on over 70 plants species and are considered highly host-specific, meaning that they only feed on spotted and diffuse knapweed and a few closely related species. Michigan has no native *Centaurea* species, and related species either do not occur in Michigan, or are themselves exotic. In more than a decade of use in the Midwest, there are no reports of the knapweed biocontrol insects harming native species of plants.

### **How effective are the knapweed biocontrols and how fast do they spread?**

Well-established populations of the flower weevils reduce seed production, while the root weevil will stunt plants, reduce flowering, and when present in sufficient numbers can kill plants outright. In combination, all four agents can reduce the density of spotted knapweed by more than 80%. The flower weevils are good dispersers and are reported to move several miles per year while the root weevil is rather sedentary. Most reports suggest that it takes 3-5 years for these agents to show visible impacts on spotted knapweed populations.

### **What will they eat when all the knapweed is gone?**

While biological control can result in stable reductions of plant abundance, it cannot eradicate or eliminate a weed. Thus, spotted and diffuse knapweeds will likely always be a part of Michigan's flora. The benefit of using highly host-specific insects is that as the target plant declines, the insects are eating themselves out of house and home. As the target weed becomes less abundant, so do the biocontrol agents until a new equilibrium is reached.

### **I have heard that similar weevils can attack native thistles, is this true?**

The thistle head weevil, *Rhinocyllus conicus* was introduced into U.S. for biological control of nodding thistle in 1969. While never released in Michigan, it was found Lenawee County in 2008 and subsequently in Jackson and Lenawee counties in 2012 on the exotic nodding thistle. Lab experiments and a field observation in Wisconsin show that *R. conicus* can attack the native Hill's thistle. Lab experiments in Wisconsin suggest that *R. conicus* also has the potential to attack the threatened Pitcher's thistle. The Canada thistle bud weevil, *Larinus planus*, was not intentionally introduced into the US but was first recorded in Maryland in 1971. By 1985 it had spread on its own to Pennsylvania, New York and Ohio. It was later redistributed into Canada and parts of US for biocontrol of Canada thistle but never purposefully introduced into Michigan. A 2012 survey found *L. planus* widespread in Michigan on Canada thistle. The Canada thistle bud weevil is known to attack Pitcher's thistle in some Great Lakes sites. Research is underway to determine the extent and impact of this feeding on Pitcher's thistle populations.

### **Specifically what is MSU doing?**

In summer 2010, the MSU team released the knapweed root weevil and lesser knapweed flower weevil on six public land sites in Michigan and seeded the sites with high and low diversity native plant mixes in fall of 2011 to restore a nectar flow for bees. The expectation is that as knapweed declines, the native plants will fill the vacant niches and produce a comparable nectar flow. Based on their prior research, the MSU team expects to find multiple native species to fill this role. In addition to supporting managed honeybees, they hope to develop plant mixes that support native pollinators, birds and other wildlife while restoring invaded ecosystems to a more resilient and sustainable state. For more information on native plants and ecosystem services see:

- <http://nativeplants.msu.edu/>

**How could revegetation with native plants be accomplished?** The MSU team is already considering how wide-scale native plantings could be accomplished if knapweed biocontrol is successful. Early releases were confined to public lands where state and federal agencies are already actively involved in restoring native plants communities. In the future, biocontrol agents could be made available to conservation groups, land conservancies, and private landowners along with information on how to best establish native plants to achieve their goals. Private landowners can already receive assistance in restoring native plants through programs such as the USDA NRCS' Conservation Reserve Program (CRP), Wildlife Habitat Incentives Program (WHIP), State Acres for Wildlife Enhancement (SAFE) and the Michigan DNR's Landowner Incentive Program (LIP). For more information on these programs visit:

- <http://www.mi.nrcs.usda.gov/programs/>
- [http://www.michigan.gov/dnr/0,1607,7-153-10370\\_36649---,00.html](http://www.michigan.gov/dnr/0,1607,7-153-10370_36649---,00.html)

**Could these efforts benefit Michigan's economy?**

Lots of former agricultural land, particularly in northern Michigan is currently infested with spotted knapweed. Reduction of knapweed density may allow such lands to be used for haying or grazing. In the future, some of these sites may also be suitable for producing perennial grass-based bioenergy crops. Recent research at MSU shows that even modest flowering plant diversity in such crops can benefit grassland birds, increase pest control, and support a wide variety of pollinating insects, all while providing increased economic opportunities to landowners and an aesthetically pleasing land cover. In such a scenario, a wide variety of public interests are served and the land can still produce a wildflower honey crop.