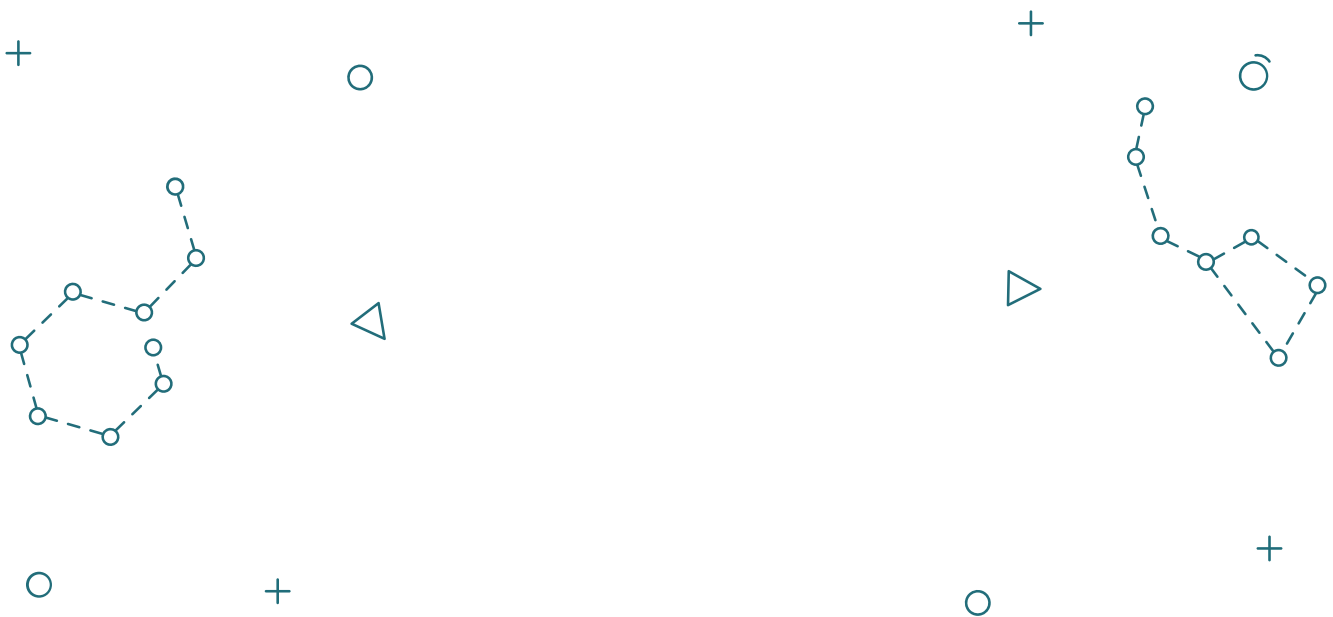


# Spotted Knapweed (*Centaurea maculosa*)



One section of our land has a large infestation of Spotted knapweed (*Centaurea maculosa*). Much like I handled the research for the [cool season grass](#) and [bindweeds](#), I did the same with this. Hopefully, this will help others who have problems with this invasive.

Spotted knapweed, *Centaurea maculosa*, was introduced to America via contaminated alfalfa and clover seed in the 1890s; it made its way to Canada in 1893. It is considered the “most problematic invasive species in North America” (Emery et al. 2005).



All the purple blooms are for 1 plant!! That's a lot of potential seeds.



This is the plant before blooming.

Aside from being an invasive species, which takes the place of native species who host our insects, spotted knapweed contributes to soil erosion, surface runoff, degradation of soil and water, reduces biodiversity, reduces wildlife habitat, and alters the ecosystem processes. Soil erosion and runoff are because the taproot and lateral root networks replace the connected systems of native plants.

While enjoying dry, disturbed sites, Spotted knapweed is not drought tolerant. In years of low rainfall, a population will decrease. Of course, there is an opposite effect in years of good moisture. This plant doesn't seem too particular about the soil types and can adapt to most any type of soil.

## **Seed Viability and Germination**

The seeds are long-lived and durable because their hulls don't easily decompose. In the soil, Zouhar (2001) found buried

seeds remain viable after 5 years. They germinate in light or dark but rarely when 2" or more below the soil surface. They germinate under a wide temperature range – from 44°F – 93°F (Schirman 1981). While the seeds might germinate under a shady canopy, the adult plants will not survive without full sun.

The seeds of spotted knapweed germinate in 3 ways and each plant can produce seeds that fit each of the categories:

- Nondormant, meaning they germinate in the dark
- Light-sensitive, meaning they need exposure to red light to germinate
- Light-insensitive, meaning they do not germinate with red light

Here's a scary fact. Schirman's (1981) study had 8 to 40 stems in a 5" hoop area, depending on the year. His research found "survival of only about 0.1% of the seed produced is required to maintain the stand at the level we observed" (Schirman 1981). Egads!! Newly established populations will expand faster than older ones (Emery et al. 2005).

## **Seed Dispersal**

Seeds are dispersed in a number of ways. If there is no external assistance, such as wind or wildlife, the seed will remove itself from the seedhead and land 3-4 feet from the original plants; they do not overwinter on the plant (Zouhar 2001). Often they are carried to other locations by vehicles, water, shoes, and excrement of mammals and birds. Spotted knapweed seeds can remain viable 7-10 days after they are eaten by deer (Zouhar 2001).

## **Facts about Spotted Knapweed**

- Short-lived perennial or biennial, living up to 3-9 years – this duo-classification is because the plant can live as a rosette for years before completing its life

cycle or it can take only a single year. It's plant specific.

- Stout taproot generates lateral shoots creating a fibrous mat of roots that can extend for several feet



There are 29 stems for this 5" diameter plant.



The longest lateral root is 6 1/2" on this particular plant.



This taproot is 12 1/2" long.

- Plants regrow from the bud/root crown – this must be killed in order to kill the plant



You can see how the root crown has expanded.



A close up of one of the root crowns in this expanded plant.

- Produce 1,000 – 20,000 seeds per plant per year; precipitation is a major factor in this (NRCS, Sheley et



al. 1998)

- About 90% of seeds are viable; can remain viable in the soil for 5-8 years
- Have spring and fall growth periods
- Older plants can have multiple rosettes and multiple blooming stems
- Is in the Asteraceae family
- Allelopathic – leaves and shoots exude cnicin.

## **Control based on Studies**

Control of spotted knapweed requires management techniques tailored to all the plant's life stages. No single treatment is the "magic bullet" but rather a combination of treatments needs to be part of the protocol. Two researchers found that knapweed would "increase to untreated level by the 6th year after single herbicide treatments" (MacDonald et al. 2013).

## **Herbicides**

The brand Progeny has provided an effective treatment. We use a 3% solution (8 oz for 2 gal of water) and foliar spray. We have also effectively used a 20% solution (64 oz for 2 gal of bark oil).

## **Hand pulling**

Hand pulling is necessary for mowing and herbicide treatments to be effective but is not sufficient on its own. A "substantial" reduction of spotted knapweed was made after three years of hand pulling coupled with mowing or herbiciding (MacDonald et al. 2013). It is imperative that when pulling that the root crown and top 3" of the taproot is removed (Panke et al. 2012). If there are flowers present at the time of pulling, these plants need to be removed from the site as they can continue to produce viable seed (Panke et al. 2012).

Spotted knapweed has also been known to cause skin

irritations in some folks; be sure to wear the proper protection on your hands, arms, and legs. Hand pulling can stir up seeds in the soil and cause germination. One would want to recheck the area in the same growing year.

## **Mowing**

The season of mowing is important. Mowing during the bud or flowering stage reduces the number of plants and reduces seed germination (Rinella et al. 2001). A single mowing when the plant was in bud or bloom was ineffective; two years of fall mowing did not have much effect but three years of fall mowing decreased the adult population (MacDonald et al. 2013, Rinella et al. 2001). There is no data available on how many years of mowing is needed to control an infestation (Panke et al. 2012).

## **Burning**

Burning was the least effective regardless of other treatments used. Stands of spotted knapweed do not carry fire well (Emery et al. 2005). The fire needs to be hot enough to kill the root crown. According to Sheley and colleagues (1998), fires may actually create the environment where spotted knapweed can thrive rather than knocking it back. A literature review found that "in 80% of the studies prescribed burning either increased or had no effect on" knapweed (Emery et al. 2005).

Those who did burn found it requires a very specific timing, frequency, and sufficient fuel loads (MacDonald et al. 2013). Early spring burns were ineffective and fall burns increased germination success. Summer burns when flowering would reduce an infestation if the fire is hot enough. MacDonald and colleagues' (2013) learned there were more seedlings after a fire that burned at less than 320°F, which this research considered a low-intensity fire. If there was a small patch, possibly a handheld propane torch would produce an intense enough fire to kill the plant. Annual summer burns were the

most effective but it's difficult to get the proper fuel loads to create a hot enough burn with annual burning and annual burns have substantial collateral damage to native biota. Alternating burn years increases plant's reproduction.

## **Grazing**

Grazing can have a negative effect on the plant. The rosettes are tasty and nutritious but are low growing making it difficult for cattle to eat. Second-year plants are fibrous and not very tender. Sheep are the more appropriate grazers as they eat the first- and second-year plants without issue (Sheley et al. 1998). I found no studies that quantified this success.

## **Biological Control**

Biological control seems to be well known for this plant but, I am skeptical of introducing insects that are not native to this area. One study shows after the release of several species, the seed output was reduced and roots were damaged but the density of the plants were not altered (Rinella et al. 2001). There are 12 known insects species that are used for biocontrol; their purpose is to stress the plant with the hope the surrounding native plants can outcompete it (Sheley et al. 1998). Caution is urged in using biocontrol as it means introducing a non-native insect. As I'm fond of saying, two non-natives don't make a native.

## **Resources**

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