



## JEFFERSON COUNTY NOXIOUS WEED CONTROL BOARD

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### BEST MANAGEMENT PRACTICES

#### Spotted Knapweed (*Centaurea stoebe*) (Family—*Asteraceae*—Sunflower Family)

**Legal Status in Jefferson County:** Spotted knapweed is a Class B Noxious Weed (non-native species designated for control by State Law RCW 17.10). Washington State and the Jefferson County Noxious Weed Control Board require property owners to control and prevent the spread of spotted knapweed on private and public lands throughout the county. State Weed Law defines control as *to prevent all seed production and to prevent the dispersal of all propagative parts capable of forming new plants.* (See WAC 16-750-003). State quarantine laws prohibit transporting, buying, selling or offering spotted knapweed for sale or distributing plants, plant parts or seeds.



### BACKGROUND INFORMATION

#### History and Impacts

- Spotted knapweed is native to Central, Eastern and Southeastern Europe and is thought to have been introduced into the United States from Asia Minor or Germany as a contaminant in alfalfa seed. Sources indicate its presence on Vancouver Island as early as 1893. It was first observed in Washington in 1923 in the San Juan Islands. Before it was considered to be a serious weed, it was spread in domestic hay and by human activities.
- Spotted knapweed has invaded rangeland throughout the western United States and Canada.
- This weed rapidly colonizes disturbed areas, but is also capable of invading well-managed rangelands and undisturbed wild lands.
- Highly invasive, spotted knapweed outcompetes native plants and forage crops. It can occupy over 95 percent of a plant community.
- Spotted knapweed infestations can increase soil surface runoff and stream sedimentation.



## Description

- Short-lived perennial growing up to 5 feet tall with a stout tap root.
- Leaves are a distinctive blue-gray color, lobed on the lower part of the plant but unlobed higher up.
- Plants start out as a rosette of deeply lobed leaves the first year, then produce flowering stems.
- The stems are upright and branched.
- The flowerheads are solitary, purple, pink or occasionally white and they bloom from June to October.
- The bracts at the base of the flowers have a soft fringe and a black spot at the tip. The black spot may not be present on white-flowered plants.
- The seeds are black or brown, about 0.1 inch long with a short pappus.

## Habitat

- Spotted knapweed grows mainly on disturbed, dry sites such as roadsides, industrial sites, gravel pits and abandoned railroads—all places from which seed can easily be dispersed.

## Reproduction and Spread

- Reproduction is mostly by seed. The seeds are too heavy to be distributed very far by wind alone; they fall to the ground within a few feet of the plant. Vehicles, livestock or contaminated hay or gravel often disperse seed over longer distances.
- Each plant produces an average of 1,000 seeds, which remain viable for seven years.
- It is short-lived perennial, growing from a woody root crown that can re-sprout if it is damaged or mowed.

## Local Distribution

Large infestations of spotted knapweed occur on Cape George, Discovery and Four Corners Roads.. Other smaller sites are scattered throughout the county

## CONTROL INFORMATION

### Integrated Pest Management

- The preferred approach for weed control is Integrated Pest Management (IPM). IPM involves selecting from a range of manual, mechanical, chemical, cultural and biological control methods to match the management requirements of a specific site. The goal is to maximize effective control and to minimize negative environmental, economic and social impacts.
- IPM means using an adaptive approach. Control methods should reflect the available time, funding, and labor of the participants, the land use goals, and the values of the community and landowners. Management will require dedication over a number of years, and allow for flexibility of methods used as appropriate to the current situation.

## Planning Considerations

- Survey area for weeds, set priorities and select best control method(s) for the site conditions.
- Small infestations can be effectively dug. Isolated plants should be carefully removed in order to stop them from infesting a larger area.
- For larger infestations, the strategy will depend on the land use of the site. Specific suggestions are given later in this section.
- Persistence is necessary. Plan to revisit the site to control plants that have survived initial control efforts.
- Control practices in critical areas should be selected to minimize soil disturbance and reduce the potential for erosion. Minimizing disturbance also avoids creating more opportunities for germination of weed seeds.
- If the control site requires extensive clearing or grading, or is located near a shoreline, steep slope, stream, or wetland, contact the Jefferson County Department of Community Development to find out whether or not a permit may be necessary.
- Because spotted knapweed is a state-listed noxious weed, control (both manual and chemical) in critical areas is allowed as long as the landowner consults with the Jefferson County Noxious Weed Control Board and follows their guidelines.

## Early Detection and Prevention

- Prevention is the key to weed control. Watch for spotted knapweed near known infestations. The blue-gray leaf color is quite distinctive and makes it relatively easy to spot year round.
- It is even easier to find once it flowers in **July**. Monitor roadsides, waste and disturbed areas, pastures, rangeland, and trails for new infestations.
- Small infestations and individual plants can be effectively hand-pulled or dug. Uprooting one plant can prevent thousands of new seedlings.
- Prevent plants from spreading away from existing populations by washing tools and boots and cleaning animals that have been in infested areas.
- Clean mowing equipment carefully before moving to un-infested areas.
- Off-road vehicles create disturbances and carry weeds. Clean off-road equipment and avoid driving in infested areas.

## Manual

- Spotted knapweed plants have a tap root that can be pulled or dug relatively easily, especially when plants are small.
- Try to pull or dig plants before they flower and to dig out as much root as possible. This is easiest when the soil is loose or wet.
- If plants are removed when in flower or even in bud, be aware that they will form viable seeds after they are pulled, so clip seed or flower heads and carefully bag and dispose of them.
- Cutting and bagging flower heads without removing the plants complies with the law and can buy time for more effective control.
- Return to the same location in the following spring and summer to remove plants coming up from seeds already in the soil or growing from root fragments and continue to monitor the area for several years.

## Mechanical

- Mowing, will **not** control spotted knapweed effectively. Plants have large, woody root systems that store considerable food reserves and mowed plants will send up new shoots after mowing.
- Mowed plants respond by becoming lower growing, more branched, and with more bulky, spreading roots. Plants can still re-sprout, flower and set seed in the same season they are mowed. If you do mow, be sure to clean mowers to prevent spreading seeds to uninfested areas.
- A single plowing may increase spotted knapweed cover, however, on productive agricultural sites, an intensive management program that combines cultivation and annual crops may effectively control spotted knapweed.

## Biological

- Biological control is the deliberate introduction of insects, mammals or other organisms which adversely affect the target weed species, reducing the population and reproductive ability of the weed. Biological control is generally most effective when used on large infestations or in areas where it is difficult to use other control techniques. Any biological control plan needs to incorporate another non-chemical control method since the goal is to prevent seed production.
- Biological control can take many years to have a significant impact on an infestation. Population density and the number of flowering plants can be greatly reduced but eradication is not possible with biocontrol.
- Any biological control plan needs to incorporate another non-chemical control method if the goal is to prevent all seed production.
- The seed-feeding weevils, *Larinus minutus*, (most often used for diffuse) and *L. obtusus* (most often used for spotted) and the root-mining weevil, *Cyphocleonus achates* are the primary biocontrol agents used. Studies demonstrate that the combination of these species can be very effective in reducing knapweed populations in Montana. In eastern Washington, *L. minutus* has been effective in reducing weed infestations when adults build to outbreak populations and feed heavily on above-ground foliage and larvae attack flowering plants and reduce seed production. The combination of biocontrol and droughts in eastern Washington was likely important to the observed knapweed reductions.
- *Bangasternus fausti*, a seed-feeding weevil, is smaller, has a blunt snout and emerges earlier in the season than the *Larinus* beetles. It appears to co-exist with *Larinus* and may attack the earlier flowering plants that are missed by *Larinus* beetles.
- *Chaetorellia acrolophi* and *Terellia virens* are two relatively new seed-feeding flies. Because of the effectiveness and easy establishment of the *Larinus* beetles, the flies are not commonly used. However, at cool wet sites, where *Larinus* beetles do not readily establish, they are an important alternative option.
- The root-mining beetle, *Sphenoptera jugoslavica*, is fairly widespread in eastern Washington but its effectiveness has not been fully assessed.
- The seed-feeding moth, *Metzeneria paucipunctella*, is rarely redistributed in Washington because it attacks other biocontrol agents within the seed head and are subject to mortality from mice and parasitoids.
- The seed-feeding flies *Urophora affinis* and *U. quadrifasciata* are no longer distributed as biocontrol agents. They are found at almost every site and are considered ineffective.

## Chemical

- Effective chemical control of biennial and perennial weeds can be achieved only with *translocated* herbicides (ones that move through the plant and kill the roots).
- If desirable grasses or other monocots (sedges, rushes or cattails) are present, use a selective herbicide (one that affects only broadleaved plants), or carefully spot-spray only the spotted knapweed.
- Herbicides should only be applied at the rates and for the site conditions and/or land usage specified on the label of the product being used. **Follow all label directions.**
- The timing of an herbicide application is critical to success. Spotted knapweed should be sprayed with selective herbicides between the time when the rosettes of lower leaves are actively growing until the plant reaches the bud stage. Perennial plants such as spotted knapweed can also be treated after flowering when the plant begins to store food in the root.
- Treated areas should not be mowed or cut until after the herbicide has had a chance to work. This can be as long as 2-3 weeks.
- For several years following treatment, monitor areas for new plants germinating from the seed bank.
- It is important to establish new vegetation after treating an area. Follow the label for the timing because some herbicides stay active longer than others.
- **If using herbicide on plants that are about to flower, the flower heads need to be removed and bagged before applying herbicide.**

For questions about herbicide use, and specific herbicide recommendations, contact the Jefferson County Noxious Weed Control Program at 360-379-0470 ext 205, or [noxiousweeds@co.jefferson.wa.us](mailto:noxiousweeds@co.jefferson.wa.us).

# SUMMARY OF BEST MANAGEMENT PRACTICES

## Small Infestations in Desirable Vegetation

- Pull plants by hand if soil is wet. Because spotted knapweed has a taproot, not the spreading fibrous roots of meadow knapweed, it is easier to control manually.
- Plants may need to be dug out if they are large or in dry compacted soil.
- If the plants are in flower, cut off and bag all flower heads because they can form viable seeds after they are cut or dug up. If there are already seeds, bag and cut off the seed heads before digging up the rest of the plant.
- OR apply appropriate herbicide to actively growing plants. (See the Chemical section of this BMP)
- Monitor site throughout growing season and remove any new plants.

## Large Infestations\Monocultures

- If enough labor is available, even large infestations can be controlled manually—see guidelines above.
- Mowing will not control knapweed. Mowing can be used if the infestation is found later in the year, to keep the plants from flowering until an approved control method can be used. Do not mow plants that have gone to seed and clean mower after cutting knapweed to avoid moving it off-site.
- Large infestations can be controlled with selective herbicides. (See the Chemical section of this BMP). Suppression of large infestations of knapweed with a selective herbicide will greatly increase grass production, which in turn increases the suppression of the knapweed.
- Promote healthy grassy areas by seeding and fertilizing.
- Pastures should be managed to promote grass and clover vigor. Avoid overgrazing and move animals when grass is still about 3 inches tall. For more information on pasture management, contact the Jefferson County Conservation District (<http://www.jeffersoncd.org/links.html>).
- Monitor for knapweed on edges of pastures and in disturbed areas along roads, fences and watering and feeding areas. Remove isolated plants before they flower.

## Riparian and Aquatic Area Control

- Focus on manual removal for small infestations if possible, and prevent seed production.
- Mowing or weed-whacking can serve in the interim until more effective control measures can be utilized.
- If manual control is not feasible, use an appropriate herbicide—see guidelines above.
- When large areas of weeds are removed, the cleared area needs to be replanted with native or non-invasive vegetation and stabilized against erosion.
- **Any herbicide application over or near water can be done only by a specially-licensed applicator using an approved aquatic formulation, and may require a permit from the Washington State Department of Ecology.**

## Road Right-of-Way Control

- Pull small infestations if possible, and prevent seed production.
- If plants are about to flower, they can be mowed until a more effective control strategy can be used.
- If manual control is not feasible, use an appropriate herbicide—see guidelines above.
- If bare spots are left, revegetate with low-growing native plants.

## REFERENCES

- Written Findings of the Washington State Noxious Weed Control Board—Spotted Knapweed. Accessed January 16<sup>th</sup> 2013 at [http://www.nwcb.wa.gov/siteFiles/Centaurea\\_stoebe.pdf](http://www.nwcb.wa.gov/siteFiles/Centaurea_stoebe.pdf)
- King County Noxious Weed Control Program—Best Management Practices—Spotted Knapweed. Accessed January 16<sup>th</sup> 2013 at [http://www.nwcb.wa.gov/siteFiles/Centaurea\\_stoebe.pdf](http://www.nwcb.wa.gov/siteFiles/Centaurea_stoebe.pdf)

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