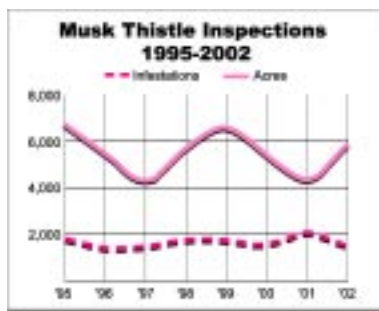


Weed Awareness

Musk Thistle Management Strategy

To successfully fight weeds, you need to know as much as possible about each weed. Then you need to develop a strategy to manage that weed.

Musk thistle (*Carduus nutans*) is usually thought of as a biennial, germinating one year, usually in the fall, overwintering and flowering the next year. When there is a long enough cool period in the spring, some musk thistle plants will act as annuals by germinating in the spring and flowering in early summer. Musk thistle spreads only by seed. One seed head can produce over 1,000 seeds. The seeds can remain viable in the soil for ten years. The key to managing musk thistle is to prevent all plants from going to seed.



The acres of musk thistle found by inspections the past eight years have fluctuated from about 4,300 acres to about 6,500 acres. The number of infestations found has remained more constant from about 1,500 to 2,000. This would indicate that the noxious weed infestations

occur in the same sites year after year but size of the infestations vary considerably due to climatic conditions. Good moisture conditions in the fall, like we received in the fall of 2002, favor the germination of musk thistle seeds near the soil surface at these sites. These plants will flower the next spring if the plants are not controlled that fall or the next spring.



Musk thistle rosette

Control Steps

1) Scout the areas with past infestations in late September and early October for seedlings and rosettes. A seed bank has built up in the soil at these sites. These seeds will remain viable for eight or more years waiting for the right conditions to germinate.

2) It is most effective to treat the entire area with herbicides in order to control all the small seedlings and rosettes and seedlings that have not emerged. Spot control of these sites usually results in a lot of escapes since not all the plants are observed and some plants germinate later.

3) Use 2,4-D as a contact herbicide along with a herbicide that will add to the effectiveness of killing the plants present but also have residual that will kill later germinating plants. Some of the herbicides that will provide residual control are Escort

(www.dupont.com/ag/vm/products/escort.html), Tordon 22K, Vanquish, Banvel and Telar (www.dupont.com/ag/vm/literature/h87276.pdf).

4) Scout these fall treated areas in March and April for escapes and new plants.

5) Provide control prior to bolting of the flower stem in May. Use 2,4-D along with a residual herbicide.

6) Scout these areas weekly and provide needed follow-up control until July. Be alert to the musk thistle plants acting as annuals due to a cool spring.

Remember, the best approach to control musk thistle is to scout and treat areas with past infestations (these areas have built up a seed bank in the soil) in the fall and spring. Provide treatment in the spring prior to bolting and always scout treated areas for escaped plants. Only one plant going to seed can contribute thousands of seeds to the seed bank.

Mechanical Control

Severing the root of musk thistle a couple of inches below the soil surface will kill the plant. The entire root does not have to be removed.

Hand cutting or mowing has to be done at weekly intervals to be effective.

Fire has not proven to provide effective control. The plants survive prescribed burning, but can be easily found and controlled by other means after the burn.

Biological Control

Musk thistle head weevil (*Rhinocyllus conicus*) is an introduced biocontrol species wide spread in Lancaster County. They are reducing the number of viable seeds being produced, but do not provide complete control by themselves. You can learn more about

biological control by visiting Cornell University Web site at www.nysaes.cornell.edu/ent/biocontrol/weedfeeders/wdfdrtoc.html

Prevention

Infestations occur where there is a seed bank in the soil and the conditions are right for germination and survival. Healthy vegetation provides competition and minimizes the survival of musk thistle seedlings.

Care should be taken not to spread seeds from infested sites or to use forage or seeds that are contaminated with noxious weed seeds. Equipment should be cleaned before leaving an infested site if it is possibly contaminated. Only weed-free certified forage and seed should be used.

Reference: You can find much more information on musk thistle by looking at *The Nature Conservancy Element Stewardship Abstract for Carduus nutans* at: <http://mcweeds.ucdavis.edu/esadocs/documnts/cardnut.pdf>

Spot Treatments

For hand sprayers used for spot treatments, add 1-1/2 tablespoons of herbicide per gallon of water for each one quart per acre required broadcast. Apply to 1,000 square feet. Application amounts are dependent upon spray pressure, walking speed during treatment, and tip size. For powered handgun applications, mix broadcast rate in 100 gallons of water.

NOTE: Wettable powder herbicide rates would be determined by the same procedure; however, since volume or density of wettable powder herbicides varies, the calculated rate per 1,000 square feet, should be carefully measured by weighing on a precision scale.

Rate Per Acre to 1,000 Square Feet

1. Known facts and assumptions:

- 1 acre = 43,560 sq. ft.
- 2 pounds = 32 oz.; 1 pint = 16 oz.; 1 quart = 32 oz.
- 1 ounce = 2 tablespoons = 6 teaspoons
- Herbicide rate per acre from bulletin or label
- Hand sprayers apply about 1 gallon per 1,000 sq. ft.

2. Convert herbicide rate per acre to ounces:

- For example, 2 quart per acre = 64 oz.

3. Convert 64 ounces per acre to ounces per 1,000 sq. ft.

- $64/43 = 1.50$ oz. or three tablespoons per 1,000 sq. ft.

4. Add three tablespoons of the product to one gallon of water and apply uniformly to 1,000 sq. ft.

Leafy Spurge Management Strategy

Leafy spurge (*Euphorbia esula*) is a perennial plant ranging in size from six to 36 inches in height. A native of Europe and Asia, leafy spurge emerges early in the spring and gets a head start on other vegetation in a race for space, sunlight, nutrients and water. Prolific seed production and an extensive root system give the plant a huge competitive advantage and make consistent, long-term control difficult.

Monitoring of areas with known or potential leafy spurge infestations is critical; adequate control is possible if management procedures are implemented in the early stages of infestation, before the root system gets fully established. You can rarely achieve 100 percent eradication of spurge, but infestations can be reduced to manageable levels with the use of herbicides.

Strategy

The control of well-established leafy spurge stands must be considered a long-term management program. A landowner must develop a persistent annual program that will prevent the spread of larger stands, eliminate smaller infestations and prevent the spread of leafy spurge to uninfested areas. The extensive leafy spurge root system allows the plant to regrow from depths of 15 feet

or more for several years. No single treatment will eradicate this weed. A consistent annual treatment program can provide long-term control. Once you have achieved a high level of control, remaining isolated patches can be spot-treated, resulting in a less costly control program.

This plant spreads by underground roots and there is always a fringe area of younger plants that do not bloom. There



Leafy spurge extend roots deep into the ground as well as laterally.

are also roots underground that extend laterally beyond the younger plants. A 15-foot perimeter should be treated around leafy spurge patches to control seedlings and spreading roots. Treated patches should be watched carefully for any regrowth and/or seedlings and retreated.

Chemical Control

Currently, the three most effective herbicides are Tordon 22K, Plateau and Glyphosate (Roundup and others)

Before using any herbicide, always read and follow label

directions. Check label for permitted uses on your site.

Tordon (picloram)

Tordon has been an effective herbicide for controlling leafy spurge. Tordon applied at two quarts per acre during flowering or fall regrowth can give 75 percent or more leafy spurge control the first year after treatment. A less expensive option for leafy spurge control is repeated annual treatments of Tordon at one to two pints per acre plus 2,4-D at one quart (four pound per gallon concentrate) applied in June, during flowering, can be quite effective. Tordon is a restricted use pesticide requiring an application license to apply. Note label precautions.

Plateau (imazapic)

Plateau applied in the fall at eight to 12 ounces per acre can provide up to 90 percent leafy spurge control one year after treatment. The label recommends application from late-August to mid-October, but prior to a killing frost. Plateau should be applied with a methylated seed oil, (MSO), at one quart per acre. The addition of 28 percent UAN liquid fertilizer to Plateau plus the MSO has occasionally increased long-term leafy spurge control. Plateau is safe to use around a variety of trees, many wildflowers and legumes.

Glyphosate (e.g. Roundup)

Glyphosate (e.g. Roundup) applied at a rate of one quart per acre from mid-July to mid-September can result in 80-90 percent control of leafy spurge. Note that glyphosate is a non-selective herbicide and it will kill grasses and other desirable plants. A follow-up treatment with 2,4-D at one pint (four pound per gallon concentrate) the following year (mid-June to mid-July) is necessary to prevent seedling reinfestation.

Mechanical and Grazing

Tillage, digging, mowing and grazing will control the top growth but does not kill the roots.

Biological Control

Two Aphanthia flea beetle species have been released in Lancaster County. When their numbers get large enough, they will be redistributed to

other infestations. Flea beetles typically take several years to impact leafy spurge infestations, but the payoff can be well worth the wait. It is important to understand that flea beetles do not eliminate leafy spurge. When flea beetles work, they establish a natural balance with the weed, reducing it to a non-impact plant and tolerable member of the plant community.

Reference: TEAM and Leafy Spurge has developed a comprehensive, easy-to-read manuals on using herbicides and biological control. These manuals, "Herbicide Control of Leafy Spurge" and "Biological Control of Leafy Spurge," can be found at www.team.ars.usda.gov by clicking on Brochures, Reports & Publications.



Flea beetles have been released in Lancaster County to help control leafy spurge.