

Pest Management – Invasive Plant Control

Leafy spurge (*Euphorbia esula*)

Conservation Practice Job Sheet

MN-797



Leafy spurge (*Euphorbia esula*) Norman E. Rees, USDA, Agricultural Research Service



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Leafy Spurge

Leafy spurge is a long-lived, deep rooted perennial forb adapted to many habitat types from riparian to dry hillsides. It is native to Europe and Asia, and was most likely introduced into North America in the early 1800's through contaminated grains. It has a series of characteristics that allow it to aggressively compete with native plant communities and to survive control methods. Controlling this plant is expensive. Over the last 60+ years, millions of landowner and taxpayer dollars have been spent annually to manage this weed.

Habitat

Leafy spurge grows in diverse environments from dry to sub-humid and from subtropic to subarctic. It establishes more readily in disturbed soil, and is primarily found in untilled, non-cropland habitats such as abandoned cropland, pastures, rangeland, woodland, roadsides and waste areas. Today it is estimated to occupy 2.5 – 3 million acres throughout North America.

Description

Leafy spurge has an erect stem that can be simple or branched and grows to a height of 3 feet or taller with smooth stems and showy yellow flower bracts. Mature plants generally grow in clumps. It is characterized by plants containing a white milky sap and flower parts in three's. The flowers are very small and are borne in greenish-yellow structures surrounded by yellow bracts. Clusters of these showy, yellow bracts open in late May or early June, while the actual flowers do not develop until mid-June. Stems frequently occur in clusters from a vertical root that can extend many feet underground. The leaves are small, oval to lance-shaped, somewhat frosted and slightly wavy along the margin.

Leafy spurge reproduces readily by seeds that have a high germination rate and may remain viable in the soil for at least seven years. Its seed capsules open explosively, dispersing seed up to 15 feet from the parent plant and may be carried further by water and wildlife. Leafy spurge also spreads vegetatively via

root buds at a rate of several feet per year. The root system is complex, can reach 15 or more feet into the ground, and may have numerous buds which grow into new shoots.

Ecological Threat

Since its introduction, leafy spurge established quickly. Vegetative re-growth from buds on spreading roots and rhizomes enables leafy spurge to form dense colonies and create large monocultures that reduce forage production and quality, native plant abundance, and lessen the biological diversity of many North American grassland ecosystems. It is toxic to most native and domestic grazing animals and is documented to cause irritation to the mouth and digestive tract of cattle and horses. These species avoid feeding in or near leafy spurge infestations. As the amount of spurge increases, the amount of high quality forage for grazing animals and the amount of quality habitat for indigenous plant and animal species decreases.

Control

Leafy spurge is difficult to control. Its extensive root system has vast nutrient stores that let it recover from control attempts. Best results are achieved by combining control methods in to a system over four to five years. After that time, infestations must be monitored for recurrence and a maintenance program adopted. **A successful control program requires a well planned strategy with consistent and timely follow-through.**

Cultural Control

Vigorous grass growth is an important aspect of leafy spurge control. Over-grazing stresses grasses and makes them much less competitive. Some perennial grass species can effectively compete with leafy spurge and provide control. The most competitive grasses include wheatgrass, wildrye and smooth brome. Control of leafy spurge prior to seeding grasses is important. Glyphosate or glyphosate plus 2,4-D should be applied once or twice during June and July. This treatment will reduce leafy spurge vigor and controls other weedy species. The grasses can then be seeded in late summer or early fall. Grasses seeded into tilled land have competed better with leafy spurge than those seeded using no-till. Cultivation probably helped to control leafy spurge while the grasses became established.

Mowing has been ineffective for reducing leafy spurge infestations, but may result in uniform

regrowth that allows a more timely herbicide treatment. Mowing will reduce seed production if repeated every two to four weeks during the growing season. Leafy Spurge should be allowed to regrow at least three to five weeks after mowing before an herbicide application. Mowing can also cause damage to the above ground portions of the plant and can inhibit more aggressive root bud development and lateral root and shoot growth, thus causing stands of spurge to become denser and more competitive.

Depending on the size of the infestation, mowing can be labor intensive and costly with little desirable results.

The use of multiple species grazing has shown some promise in the Midwest and upper Great Plains. Sheep and goats will readily graze on spurge plants. Grazing alone will not eradicate leafy spurge but will reduce the infestation, slow the spread of the weed, and allow grasses to be grazed by cattle and horses. Grazing should be started early in the spring when the plant first emerges. On large infestations, pastures should be divided so animals can be regularly rotated and the entire infestation grazed in a timely manner.

Sheep and goats are best suited to control on large infestations, or along waterways and tree areas where chemical control is restricted or cost is prohibitive. North Dakota State University research has shown that grazing leafy spurge with goats followed by a fall applied herbicide treatment provided better control than either method used alone. The goats were allowed to graze until mid-August, and then removed to allow 3 to 4 inches of leafy spurge regrowth. Then Tordon plus 2,4-D was applied at 0.5 plus 1 pound per acre (1 quart plus 1 quart of a 4 pound-per-gallon concentrate) in mid-September. Leafy spurge density was reduced over 95 percent when this program was followed for three consecutive years.

Research by ARS in Idaho suggests goats are better than sheep for controlling leafy spurge. However, goats are more difficult to manage and market than sheep and generally must be kept in a barn during severe winter weather. Which animal to use will depend on a land managers specific conditions and markets.

Prescribed Burning

Prescribed burning does not increase long-term control with herbicides but does have some benefits for a complete management program. Prescribed

burning can increase visibility of leafy spurge plants and improve detection of small plants and seedlings, especially in wooded areas. Burning also improves spray coverage by eliminating old stems and ground litter. Fire in combination with herbicides may reduce leafy spurge seed viability. Fire following reductions in leafy spurge infestation due to herbicide treatments or biological control has produced positive results. Fire seems to promote the re-establishment of desirable vegetation that competes vigorously with leafy spurge seedlings or new shoots that emerge following the burn.

Chemical Control

Herbicides are the most widely used treatment for leafy spurge, but they have had varying degrees of success suppressing the plant long-term. Herbicide treatments vary according to the size of the area being treated and the stage of infestation by the plant. Early detection of spurge patches has shown to be the most promising when considering chemical control. Herbicides have been a great tool for attacking newly formed infestations before they begin to spread and increase in density. The larger the infestation, the more difficult and expensive it is to manage. To successfully combat leafy spurge with herbicides it commonly takes several years of application. Due to the need for annual application and the costs associated with that, it is expensive to apply on large expanses of pasture.

It also poses many environmental concerns. Some herbicides used are highly persistent in the environment after application and can cause severe injury to non-target trees and shrubs along pastures and field edges. In most cases, chemical management is used as a part of a larger integrated management plan.

There are a number of products labeled for spurge control in Minnesota. Picloram (Tordon) is the most effective herbicide for leafy spurge control. Treat large, readily accessible areas with 1 quart/acre for three to four consecutive years. Picloram may be tank-mixed with 2,4-D to provide adequate control. Apply 1 to 1.5 pints of Picloram with 1 to 1.5 quarts / acre of 2,4-D. Picloram + 2,4-D, and Dicamba (Banvel/Vanquish/Clarity) are most effective when applied in spring when true flowers (not just the bracts) emerge. Apply Dicamba at 2 quarts/acre for three consecutive years. Fall application to regrowth is also good timing for these herbicides. Often control

is not very good in the first year but when this application is made for three to five consecutive years, leafy spurge shoot control is generally 80 to 90 percent controlled. At that time, a maintenance schedule that uses low rates of these chemicals as needed can be used to keep infestations under control.

Note: Avoid using soil-active herbicides such as Tordon or Vanquish/Clarity near windbreak plants or other desirable woody vegetation. Plant injury or death can occur.

Glyphosate (roundup) is most effective when applied sequentially (1.0 quart per acre) at one month intervals, coupled with fall grass seeding.

Important Note

Mention of specific pesticide products in this document does not constitute an endorsement. These products are mentioned specifically in control literature used to create this document. Tordon 22K is listed a restricted use pesticide in Minnesota.

By law, herbicides may only be applied as per label instructions. **Follow all label instructions when applying pesticides** including “grazing and re-entry level restrictions” and application site restrictions (is the product labeled for “the application site” you are considering?).

Most of the products listed are not acutely toxic but have high potentials to move off-site via leaching or runoff under certain conditions. Off-site movement potential can be minimized by avoiding over-spraying or application to the point where products are reaching or dripping onto the ground.

Recommendations provided in this publication were current at the time of development, but herbicide labels change frequently. Obtain and read the product label, and follow the directions on that document for conditions at the time of herbicide use.

Biological Control

Biological control, using host-specific natural enemies collected in leafy spurge’s native range, is the primary method for successfully managing large stands of this weed. Since 1989, seven host-specific insect species have been established, harvested and redistributed in Minnesota as part of an intensive state-wide collaborative biological control program. These agents include a stem-and root boring beetle (*Oberea erythrocephala*), a gall midge (*Spurgia esulae*), and

five flea beetle species (*Aphthona* spp.) that feed on both root and foliar tissue. The flea beetles alone are responsible for suppressing significant amounts of leafy spurge on many acres throughout the state.

The Minnesota Department of Agriculture has developed strong partnerships with a number of agencies and private landowners to promote the use of biological control for leafy spurge management throughout the state. Cooperators collect biological control agents from established field sites and redistribute them to infested sites. Cooperators are also responsible for submitting data back to the MDA regarding the numbers they collected, the location of that collection, and the area where the agents were redistributed. Site monitoring data is also requested of participating cooperators in subsequent years following a release to track successes throughout the state. Visible signs of spurge reduction do not generally occur for at least a couple of years. Leafy spurge biological control works well at almost all sites. It is reliable and cost effective, but can take many years for visible results. This is particularly true for large sites. It works well within an integrated weed management program that includes herbicides, multi-species grazing, vegetation management, mechanical and cultural controls. However, recognizing the importance of the bioagents and their requirements is a must for a sound integrated management plan to be developed.

Participation in the leafy spurge biological control program is simple and biological control agents are provided free of charge. Contact your local County Agricultural Inspector or the MDA Seed and Noxious Weed District Staff Personnel.

Information and Recommendations compiled from:

[Minnesota Department of Natural Resources web site:
http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/leafyspurge.html](http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/leafyspurge.html)

[Minnesota Department of Agriculture web site:
http://www.mda.state.mn.us/weedcontrol/lsmodule](http://www.mda.state.mn.us/weedcontrol/lsmodule)

[National Park Service, Plant Conservation Alliance web site:
http://www.nps.gov/plants/alien/facts/](http://www.nps.gov/plants/alien/facts/)

Gwendolyn Thunhorst, The Nature Conservancy, Arlington, VA
Jil M. Swearingen, National Park Service, Washington, DC

[Team Leafy Spurge Web Site:](http://www.team.ars.usda.gov/v2/leafyspurge.html)

www.team.ars.usda.gov/v2/leafyspurge.html

[Minnesota Department of Agriculture Weed IPM Project Web Site:](http://www.mda.state.mn.us/weedcontrol/default.htm)

<http://www.mda.state.mn.us/weedcontrol/default.htm>

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Lym, Rodney G and Richard K. Zollinger, 1995. Integrated Management of Leafy Spurge, North Dakota State University publication W-866.

Beck, K. G. 2003. Leafy Spurge, Colorado State University Cooperative Extension, no. 3.107

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