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# G87-834 Leafy Spurge (Revised February 1989)

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# Leafy Spurge

**Identification and control of leafy spurge, a noxious weed established in about three-fourths of Nebraska's counties, is discussed here.**

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- Identification
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Leafy spurge, (*Euphorbia esula* L.) introduced to the United States from Eurasia in 1827, has become a troublesome weed in North Dakota, South Dakota, Wyoming, Montana and Nebraska.

Leafy spurge is found in about three-fourths of Nebraska's counties (*Figure 3*). It is most common in the state's northern and eastern areas. Leafy spurge is found primarily on untilled land such as pastures, range, roadsides, woodlands and farmsteads. Leafy spurge is a noxious weed according to the Nebraska Seed Law and the Nebraska Noxious Weed Law.

## Identification

**Figure 1. Field of leafy spurge. *Photo: Robert A. Masters***

Leafy spurge is a persistent, deep-rooted perennial which reproduces by seeds and roots. Leafy spurge has a somewhat woody crown below the soil surface. Each crown area produces several upright stems giving the plant a clump-like appearance. In addition, new stems arise from buds on lateral, secondary roots. Stem growth starts in April, making leafy spurge an early, vigorous competitor with forage and pasture plants. The plant bears numerous linear-shaped leaves with smooth margins. Leaves have a bluish-green color but turn yellowish or reddish-orange in late summer (*Figure 2*).

Leafy spurge produces a flat-topped cluster of yellowish-green, petal-like structures called bracts, which bear the true spurge flowers. The showy, yellow bracts appear in May and give the plant a "blooming" appearance. The true spurge flowers, however, develop about 10 days later and have small, green, bracts.

**Figure 2. Left, leafy spurge in mid-bloom. Right, spurge plant bearing seed pods.**
***Photos: Robert A. Masters***

The distinction between bract appearance and true flowering is important for timing herbicide applications. Spring applied herbicides are more effective when applied on plants with developing flower parts.

Seeds are borne in pods which contain three gray-brown, sometimes speckled, oblong, smooth seeds. At maturity pods pop open, throwing seeds up to 15 feet from the parent plant. About 140 seeds are produced per stem and seeds may remain viable in the soil for up to eight years. Leafy spurge seed's peak germination time is later April to early May. Leafy spurge seedlings can vegetatively reproduce within 7 to 10 weeks after germination. New seedlings develop throughout the summer but usually do not flower during the first year.

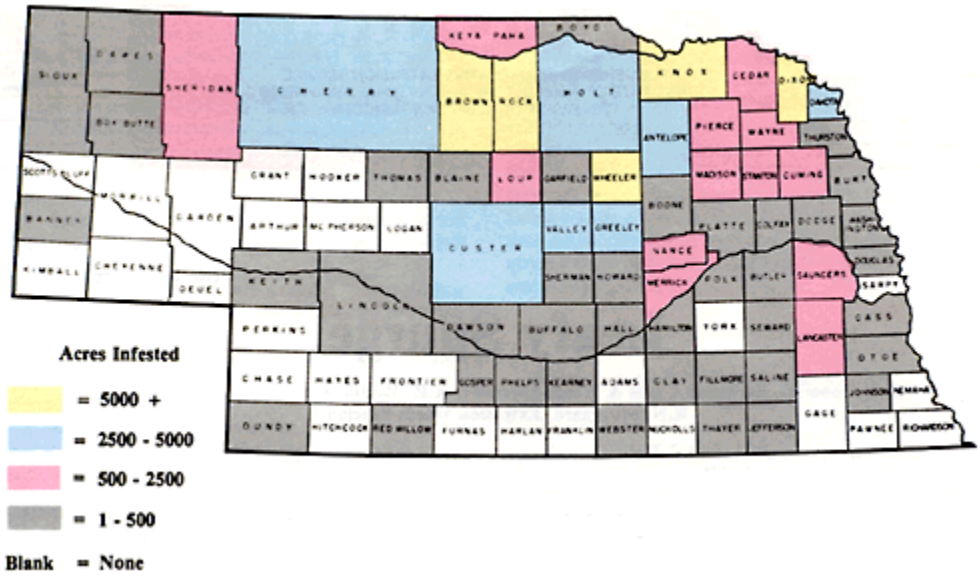


**Figure 3. Leafy spurge infestations in Nebraska, 1984 survey**.

Leafy spurge roots are most abundant in the upper foot of soil but can penetrate 15 feet or more. The root system contains a large nutrient reserve capable of sustaining the plant for years. Roots are woody, some coarse and others fine, with numerous buds capable of producing new shoots. Patches of leafy spurge may reach a density of 200 or more stems per square yard. Existing patches usually spread vegetatively up to four feet per year.

**Figure 4. Root system of leafy spurge.** ***Photo: Robert A. Masters***

Leafy spurge plants contain a toxic substance which causes scours, weakness, and even death in cattle. Cattle avoid eating growing leafy spurge plants. Grazing studies by North Dakota State University show that forage growing in leafy spurge patches is poorly used by cattle (*Figure 5*).

By contrast, sheep will graze leafy spurge. Recent Montana State University research showed that after a one to three week adjustment period, sheep readily grazed leafy spurge. Spurge intake increased during the summer, making up 40 to 50 percent of animal intake by mid-August. Producers interested in sheep production may find them of value in controlling but not eliminating leafy spurge. Extra fencing of leafy spurge patches may be required to assure intense grazing to stop seed production.

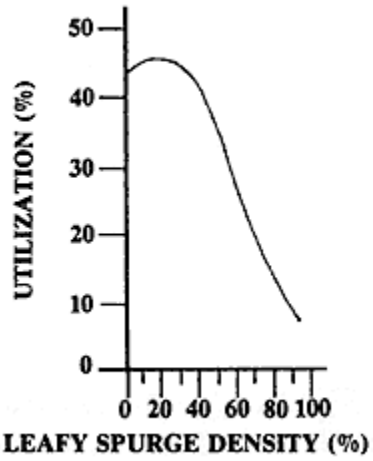


**Figure 5. Forage use by cattle in pasture areas infested with leafy spurge.**

## Control with Herbicides in Pastures and Rangeland

Herbicides discussed below can be applied in either late May or early June during flower development, or in early to mid-September when leafy spurge plants have developed new fall regrowth. Fall treatments to actively growing plants control established leafy spurge more effectively than spring treatments.

If two treatments per year can be made, both spring and fall applications will be more effective than a single treatment in reducing leafy spurge root growth.

**Tractor-mounted sprayer in leafy spurge.** ***Photo: Robert A. Masters***

**Tordon (Picloram)**. Tordon is the most effective herbicide for leafy spurge control. Application of 2 to 4 qt/acre of Tordon 22K will give 70 to 90 percent control the first year after treatment (*Table I*). However, control declines without retreatment, especially with lower application rates of Tordon. Apply Tordon in the spring during flower development. Because of cost and label restrictions, a Tordon treatment may not be practical for large areas.

Some Nebraska research indicates that Tordon may be applied more economically to leafy spurge in pastures through a selective ropewick applicator. *Table II* shows that with a conventional rigid ropewick applicator, control of leafy spurge with two passes of the applicator dispensing 33 percent Tordon 22K

solution was equal to a broadcast application of 2 qt/acre Tordon 22K. Leafy spurge control was improved further by using a ropewick applicator of four short segments, rather than a single, long ropewick. The flexible ropewick was designed for use in pastures with rough, uneven terrain where it is difficult to uniformly wipe herbicide solution on plants with a rigid ropewick.

North Dakota data showed that a pipewick applicator gave control similar to broadcast treatments of Tordon but at reduced expense. The pipewick applied 75 to 83 percent less Tordon than the broadcast sprayer application. Only about half as much Tordon residue was found in soil following a ropewick application compared to a broadcast spray treatment. Environmental hazards associated with broadcast application of Tordon may be diminished using selective applicators.

**Table I. Leafy spurge control in pastures and rangeland.[a]**

| Treatment | | Rate of product per acre[b] | | Months after initial treatment | | | |
|---|---|---|---|---|---|---|---|
| Year 1 | Years 2-4 | Year 1 | Years 2-4 | 12 | 24 | 36 | 48 |
| | | | | ---------(% control)-------- | | | |
| Tordon 22K | Tordon 22K | 1 qt | 1 qt | 65 | 71 | 73 | 90 |
| Tordon 22K | _ | 2 qt | _ | 74 | 21 | 0 | _ |
| Tordon 22K | _ | 4 qt | _ | 96 | 82 | 74 | 23 |
| 2,4-D[c] | 2,4-D[c] | 2 qt | 2 qt | 19 | 30 | 35 | 20 |
| 2,4-D + Tordon 22K | 2,4-D + Tordon 22K | 1 qt + 1 pt | 1 qt + 1 pt | 52 | 66 | 66 | 85 |
| 2,4-D + Tordon 22K | 2,4-D + Tordon 22K | 1 qt + 1 qt | 1 qt + 1 qt | 71 | 75 | 82 | 94 |

[a]Data from North Dakota State University.
[b]4 lb/gallon formulation of 2,4-D amine or ester.
[c]2,4-D applied twice per year spring and fall.

**Table II. Leafy spurge control with Tordon 22K applied through ropewick applicators, Concord, NE.**

| **Herbicide treatment[a]** | **Number of passes with applicator** | **Type of ropewick applicator Rigid-----Flexible** | | **Sprayer application** |
|---|---|---|---|---|
| | | (% control) | | |
| Tordon - 10% concentration | 1 | 30 | 48 | |
| (1 part Tordon: 9 parts water) | 2 | 55 | 82 | |
| Tordon 33% concentration | 1 | 57 | 81 | |
| (1 part Tordon: 2 parts water) | 2 | 79 | 84 | |
| Tordon 22K broadcast at 2 qt/A | -- | -- | -- | 78 |

[a]Treatments were spring applied for two consecutive years and percent control determined in the third year.

**Table III. Comparison of forage production versus cost of several leafy spurge treatment programs after three years.[a]**

| Treatment | | Rate of product per acre[b] | | | | |
|---|---|---|---|---|---|---|
| **Year 1** | **Years 2-3** | **Year 1** | **Years 2-3** | **Forage yield** | **Total cost** | **Total net return [c]** |
| | | | | (% of check) | ($/A) | ($/A) |
| Tordon 22K | _ | 4 qt | _ | 113 | 82 | -72 |
| 2,4-D + Tordon | 2,4-D + Tordon | 1 qt + 1 pt | 1 qt + 1 pt | 161 | 36 | +21 |
| 2,4-D | 2,4-D | 2 qt | 1 qt | 138 | 15 | +15 |

[a]Data from North Dakota State University.
[b]4 lb/gallon formulation of 2,4-D amine or ester.
[c]Based on forage yield and value less cost of treatment.

North Dakota State University research has shown that a less expensive option than Tordon 22K alone is a tank mix of 2,4-D + Tordon 22K at 1 qt + 1 pt/acre applied annually (*Table I*). Treatment with 2,4-D + Tordon at 1 qt + 1 pt/acre was the most cost effective treatment. Economic data in *Table III* were based on forage yield and value, less treatment cost. Tordon + 2,4-D provided a net return of $21/acre. Because of low cost, 2,4-D also gave a $15/acre net return. Treatment with 4 qt/acre Tordon 22K resulted in a loss of $72/acre.

There are several restrictions when using Tordon 22K.

1. At rates greater than 8 ounces/acre, limit coverage to no more than 10 percent of 10 acres, whichever is greater, of an acreage found in any particular watershed.
2. Treat no more than once in any 12-month period and no more than twice in any three-year period. Do not apply with a mist blower.
3. Do not use Tordon where a sandy, porous surface and substrate overlie ground water which may be 15 feet or less below the surface.
4. Do not use Tordon near trees or other desirable broadleaf vegetation. Careful application is necessary to prevent spray drift.
5. When applying Tordon at the 2 to 4 qt/acre rate, do not cut grass for feed within two weeks after treatment. Meat animals grazing for up to two weeks after treatment should be removed from treated areas three days before slaughter. Do not graze dairy animals on treated areas within two weeks after treatment.

**2,4-D.** 2,4-D ester at 1 qt/acre (4 lb/bal product) gives short term control of leafy spurge top growth, but a single application is not effective in reducing spurge plant density. Forage production is increased when 2,4-D is applied annually in the spring (*Table I*).

In eastern Nebraska where pastures often are fertilized to increase forage production, a late fall application of nitrogen fertilizer preceeding herbicide application in the spring will likely increase control of leafy spurge (*Table IV*). An early spring fertilizer application should produce the same effect. The risk of losing applied nitrogen by either leaching or runoff is increased by fall application. That risk may be minimized by late fall fertilizer application.

**Table IV. Leafy spurge control as influenced by fail application of ammonium nitrate fertilizer preceeding the spring herbicide treatment, O'Neill, NE.**

| Herbicide treatment | Rate of product per acre | Nitrogen, lb/acre | | |
|---|---|---|---|---|
| | | 0 | 75 | 150 |
| | | (% control)[a] | | |
| 2,4-D | 2 qt | 39 | 56 | 66 |
| 2,4-D + Banvel | 1 qt + 1/2 qt | 35 | 56 | 74 |
| Tordon 22K | 1 qt | 44 | 68 | 83 |

[a]Leafy spurge control was evaluated one year after herbicide application.

## Control with Herbicides in Trees

**2,4-D amine.** Application of 1 qt/acre 2,4-D at flower development stage may be used to control leafy spurge top growth in trees. Take care to avoid contacting tree foliage or green bark with herbicide or spray drift.

**Roundup (glyphosate).** Roundup at 1 qt/acre applied mid-August to mid-September will give reasonably good leafy spurge control. Roundup is nonselective and will kill grasses and prevent immediate regrowth of desirable species which may be present. Do not permit spray solution to contact tree foliage or green bark of trees or injury will result. Since Roundup does not have soil residual activity to prevent leafy spurge seedling reinfestation, apply a follow-up treatment with 2,4-D amine at 1 qt/acre from mid-June to mid-July. Avoid contacting tree foliage with 2,4-D.

## Control of New Infestations

Vigilance is necessary to identify new infestations. When leafy spurge is confined to small areas, begin herbicide treatment at once. Apply Tordon 22K at 4 qt/acre to existing plants, plus an extra 10 to 15 feet around the established stand. A follow-up program is necessary for several years to control missed stems and new seedlings.

## Biological Control

Expanded investigations toward biological control of leafy spurge are in progress. The United States Department of Agriculture has several research units investigating leafy spurge control by insects and disease organisms.

The Animal and Plant Health Inspection Service is involved in the rearing of biological control agents approved for release in North America. Several promising insect species--the gall midge, flea beetle and long-horn beetle.

Some flea beetles were released recently in Nebraska and their survival will be monitored closely. All the insects under study come from regions in Europe and western Asia where natural predators have kept leafy spurge under control.

In addition to insect predators, disease organisms which attack leafy spurge are being investigated. Research has focused on two rust fungi which attack specific spurge species. Biological control is in the

experimental stage at this time.

Although biological control is not expected to be the total answer for leafy spurge control, it may be a valuable supplement to chemical control.

*The information in this publication is supplied with the understanding that no discrimination and no endorsement by the Nebraska Extension Service is intended.*

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