



### Weed Common Name

Leafy Spurge

### Weed Botanical Name

*Euphorbia esula* (Linnaeus)

### Points to Consider

- The root system can be 15 feet or deeper in the soil profile
- The root system's vast nutrient reserves enable leafy spurge to regenerate aggressively if control measures are inadequate
- The plant can discharge ripe seeds 15–20 feet away



**Figure 1.** Vegetative growth in mid-June after early grazing. Note: blue mustard flowers are mixed in the area.

## Authors

**Jared Gibbons**, University Extension Educator, University of Idaho Extension, Madison County

# Integrated Pest Management of Leafy Spurge

## Importance

Leafy spurge is a highly invasive and aggressive plant that forms dense stands, significantly reducing the carrying capacity of rangelands or pastures by 50%–75%. It grows into monocultures, damaging wildlife and native plant habitat. All plant parts contain a milky white latex sap. The sap contains toxins that cause skin and eye irritation and digestive problems in both animals and humans. It is classified as a noxious weed under [Idaho's Noxious Weed Law](#) (title 22, chapter 24).

By understanding the biology and ecology of leafy spurge and adopting an integrated management approach that combines cultural, biological, chemical, and mechanical control methods, land managers can effectively control this persistent weed and restore the productivity of infested areas. Eradicating leafy spurge over large areas of the landscape is unlikely. Eradicating it from individual fields and rights-of-way is possible but requires a sustained, multiyear effort. Consistent monitoring and adaptive management techniques are essential for long-term success.

## Description, Biology, and Ecology

Leafy spurge is a creeping perennial plant that grows from deep roots and grows in clumps from 12 to 28 inches high. Leaves are narrow, long, and pointed (¼ inch wide and 2–3 inches long). They are attached singly and on alternating sides of the stem (Figure 1). In the spring they are dark green and resemble willow leaves, gradually changing to blue green and then yellowish from midsummer to fall. Throughout the year, the plant releases sap when broken. The plant is especially characterized by its greenish-yellow, heart-shaped flower bracts. It flowers in June in most areas of Idaho but can flower in May in warmer areas (Figure 2).

Leafy spurge reproduces through both seeds and roots. Its seed capsules explode upon ripening, scattering seeds as far as 15–20 feet from the parent plant. Its extensive root system can reach depths beyond 15 feet and spread horizontally up to 15 feet, allowing it to store significant nutrient reserves and making it

resilient against control measures. Vegetative buds along the entire root system enable the emergence of new shoots.

In the soil, microorganisms play a significant role in numerous ecosystem processes and form symbiotic relationships with plants that lead to plant resilience, both in cultivated, native, and noxious plants. The soil microbiome composition of the plants can be unique: leafy spurge has been shown to encourage higher mycorrhizal fungi colonization, diversity, and richness than mixed communities of native plants (Lekberg et al. 2013). All these features make leafy spurge a highly successful invasive weed. Ongoing research in this area is still new but seeks to provide better insights on the plant-microbe ecology for new control strategies in the future.

Leafy spurge spreads both by root sprouting and seed production (Figure 3). Most seedlings emerge early in the spring after heavy precipitation. Seeds germinate at depths between ½ and 2 inches, with better germination in silty and clay textured soils compared to sandy textured soils. The seedlings grow rapidly, sometimes regrowing after being cut within a week of emergence. They can also resprout even after being severed 1 inch below the soil surface. Seedling leaves have a more rounded or spatula shape (Figure 4). In the first year, the plants do not produce seeds. Mature seeds develop about thirty days after pollination and can remain viable in the soil for five to eight years.

Leafy spurge thrives in a variety of terrains, including floodplains, riverbanks, grasslands, ridges, and mountain slopes. It is commonly found in noncropland habitats such as pastures, rangelands, forest openings and edges, roadsides, ditch banks, and waste areas. Although it has a diverse habitat range it tends to follow water or old/dry water channels (Figure 5).

## Management

### Primary Management Tactics

Controlling leafy spurge requires a comprehensive, integrated approach due to its persistence and adaptability. The key to successful management lies in combining multiple control methods to target the plant at various, specific stages of its life cycle and exploit its natural weaknesses. Control efforts should take place for at least 4–5 years followed by repeated



**Figure 2.** Leafy spurge in full bloom in late June, near Rexburg, Idaho.



**Figure 3.** Seeds of leafy spurge. Courtesy of Howard F. Schwarz, Colorado State University, [Bugwood.org](http://Bugwood.org).



**Figure 4.** Seedlings of leafy spurge have more rounded leaves than mature plants. Courtesy of Bruce Ackley, The Ohio State University, [bugwood.org](http://bugwood.org).





**Figure 5.** Tracking along the ditch in the treeline, leafy spurge entered this pasture and then followed the water channels.

monitoring. Some key methods (and how they can be used to best control leafy spurge) include the following:

### Prevention

- Averting the introduction and spread of leafy spurge should be the top priority. This involves using certified weed-free seed and cleaning equipment and carefully managing livestock movement after grazing in leafy spurge-infested areas.
- Focus on canals and rights-of-way to slow down its population spread.
- Scout for early introductions. Better control is achieved before the plants are well established.

### Mechanical

Although they aren't stand-alone solutions, practices like cultivation and mowing contribute to successful management. Leafy spurge is not typically found in cultivated fields, but it can encroach from field edges. If allowed to establish, the weed will make mechanical control ineffective.

- Cultivation, particularly during the early bud to flowering stage when root carbohydrate reserves are low, weakens the plant.
- Time your mowing prudently. Mowing before seed set curtails seed production, but repeated mowing throughout the growing season is also advised, because it helps to suppress vegetative growth effectively.

### Cultural

Integrate spurge-resistant grazing animals:

- Sheep and, better yet, goats are valuable assets in leafy spurge management (Figure 6). The grazing habits and toxin resistance of goats effectively target leafy spurge, weakening the plants and creating opportunities for other control methods to be more effective. However, grazing alone does not eradicate leafy spurge.
- Combining sheep or goat grazing with herbicides has proven highly effective.
- Similarly, integrating grazing with biological control agents like flea beetles enhances control efforts. Carefully pace the order of these events. The use of flea beetles is most effective depending on spurge stem counts per square foot, whereas grazing reduces this stem density, possibly below the thresholds the flea beetles prefer.
- Establishing vigorous grass stands or maintaining healthy plant communities is critical to preventing and controlling leafy spurge.
- Avoid overgrazing.

### Biological

Introducing natural enemies (insects) of leafy spurge has proven effective in many areas of the West. These insects are officially called biocontrol agents.

- *Aphthona* spp. flea beetles are particularly effective. They undergo a life cycle during which adults feed on the leaves and flowers, reducing photosynthesis and seed production, while their larvae target the roots, disrupting nutrient and water uptake and depleting carbohydrate reserves.
- Gall midges or bud gall mites, *Spurgia esulae*, induce galls on leafy spurge stems, preventing flowering and reducing seed production. Three different moths also feed on leafy spurge; however,



they are not considered as effective as the abovementioned controls.

- The success of biological control hinges on selecting suitable insect species, ensuring their establishment, and integrating their use with other control measures. See Table 1 for more help with selecting the appropriate species for your habitat.

## Chemical

Chemical control is expensive for large areas and harms desirable broadleaf species that compete against leafy spurge (Figure 7), contributing to reinfestation if not accounted for. Many natural areas are inaccessible to spray equipment or are off label (illegal due to label instructions). Herbicides can have a high success rate in controlling leafy spurge but need the correct application timing, selection, and integration with other control methods to be the most effective.

- Spring applications are rarely effective. Use other control methods during this season.
- When in flower, root reserves are depleted, making this phase an important time for applying herbicide to prevent seed formation and weakening of the plants.
- Fall applications after the first frost tend to yield the best results, because herbicides are more readily transported to and throughout the root system during this period.
- One-time or single per-season applications are less damaging to desirable plant populations.
- Select subsequent herbicide from completely different types, known as herbicide groups. Find group numbers on the herbicide labels.
- Other methods of avoiding herbicide resistance must also be used. There is evidence that leafy spurge roots release herbicides that were initially applied to the plant's leaves. Development of herbicide-resistant leafy spurge would be devastating for any landowner. For additional help with this development, contact your local University of Idaho county Extension office or county weed department.
- See the [PNW Pest Management Handbooks](#) website for recommendations of specific herbicides to use in the management of leafy spurge.



**Figure 6.** Goat-grazed spurge (left), ungrazed (right foreground).



**Figure 7.** The yellow-green plants on the canyon floor that roll up the draw and beyond are leafy spurge.



**Table 1.** Leafy spurge biological control matrix.

Common Name	Scientific Name	Efficacy	Availability	Leafy Spurge Density	Leafy Spurge Stem ht.	Aspect	Shade Exposure	Soil Type	Moisture Regime	Notes
Leafy Spurge Flea beetles	Minute	Unknown	Available in Idaho	Moderate (7–10 stems/ft <sup>2</sup> )	Intermediate (15–20 inches)	Level or South-Facing	None	Sandy Loam or Loam	Mesic	Avoid very high sand or very high clay content soils
	Brown Dot	Low to moderate	Limited, available in Idaho	Moderate (7–10 stems/ft <sup>2</sup> )	Intermediate (15–20 inches)	Level or South-Facing	None	Sandy Loam	Mesic to somewhat dry	
		High in mixed pop'ns with <i>A. lacertosa</i>	Readily available in mixed pop'ns with <i>A. lacertosa</i>	Moderate (7–10 stems/ft <sup>2</sup> )	Intermediate (15–20 inches)	Level or South-Facing	None	Sandy Loam or Loam	Mesic to somewhat dry	
	Copper	Moderate	Limited, available in Idaho	Moderate (7–10 stems/ft <sup>2</sup> )	Intermediate (15–20 inches)	Level or South-Facing	None	Sandy Loam or Loam	Mesic to somewhat dry	
	Brown-legged	High	Readily available	Moderate (7–10 stems/ft <sup>2</sup> )	Intermediate (15–20 inches)	Level or South-Facing	None	Sandy Loam or Loam	Mesic to somewhat dry	
		High	Readily available	Low to Moderate (<8 stems/ft <sup>2</sup> )	Short (<17 inches)	South-Facing	None	Sandy Loam	Dry	
	Red-Headed Stem Boring Beetle	Moderate	Limited, available in a few states	Moderate (7–10 stems/ft <sup>2</sup> )	Intermediate to Tall (>17 inches)	Level or South-Facing	Can tolerate some shade	Loam	Mesic to somewhat dry	
	Bud Gall Mite	Low to moderate	Limited, available in Idaho	Moderate to Dense (>9 stem/ft <sup>2</sup> )	Intermediate to Tall (>17 inches)	All but Steep North-Facing	Can tolerate some shade	Sandy Loam or Loam	Mesic to Moist	
	Leafy Spurge Hawk Moth	Low to moderate	Limited, available in Idaho	Moderate to Dense (>9 stem/ft <sup>2</sup> )	Intermediate to Tall (>17 inches)	All but Steep North-Facing	Can tolerate some shade	Tolerates most soils	Mesic	
	Leafy Spurge Clear Wing Moth	Unknown	Unknown	Unknown	Moderate to Dense (>9 stem/ft <sup>2</sup> )	Intermediate to Tall (>17 inches)	Unknown	Unknown	Mesic	
Hungarian Clear Wing Moth	Unknown	Unknown	Available in Idaho	Moderate to Dense (>9 stem/ft <sup>2</sup> )	Intermediate to Tall (>17 inches)	Unknown	Unknown	Mesic		

- See [North Dakota Weed Control Guide](#) (2024) (pp. 70–71) for a chart on the best herbicide for each habitat in which the weed is located. State laws on pesticides vary and change with time. Some details or specific pesticide formulations in this guide may be prohibited in Idaho.

## Further Reading

- Bourchier, R., R. Hansen, R. Lym, A. Norton, D. Olson, C. B. Randall, M. Schwarzlander, and L. Skinner. 2006. *Biology and Biological Control of Leafy Spurge*. FHTET-2005-07. USDA-FS Forest Health Technology Enterprise Team. <https://www.idaholandcan.org/article/Biology-and-Biological-Control-of-Leafy-Spurge/2815>.
- Lekberg, Y., S. M. Gibbons, S. Rosendahl, and P. W. Ramsey. 2013. "Severe Plant Invasions Can Increase Mycorrhizal Fungal Abundance and Diversity." *The ISME Journal* 7(7): 1424–33.
- Merritt, S., C. Prosser, K. Sedivec, and D. Bangsund. 2002. *Multi-Species Grazing and Leafy Spurge*. Sidney, MT: USDA-ARS TEAM Leafy Spurge. 28 p. A comprehensive easy-to-read manual on using multispecies grazing as an effective leafy spurge management tool. <https://extension.unl.edu/statewide/lincolnmcperson/grazingmanual-1.pdf>.

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### Caution: Read Pesticide Labels

Pesticide labels override other recommendations.

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ALWAYS read and follow the instructions printed on the pesticide label. The pesticide recommendations in this UI webpage do not substitute for instructions on the label. Pesticide laws and labels change frequently and may have changed since this publication was written. Some pesticides may have been withdrawn or had certain uses prohibited. Use pesticides with care. Do not use a pesticide unless the specific plant, animal, or other application site is specifically listed on the label. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

**Trade Names** — To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

**Groundwater** — To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

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