

Euphorbia esula  

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Euphorbiales	Euphorbiaceae

Common name leafy spurge (English), spurge (English), euphorbia esule (French), wolf's milk (English), faitours-grass (English), Hungarian spurge (English), Scharfe Wolfsmilch (German, Germany), Esels-Wolfsmilch (German, Germany), euphorbe feuillue (French), Heksenmelk (Swedish, Sweden), vargtoerel (Swedish, Sweden), euphorbia (English)

Synonym *Euphorbia pseudovirgata*
Euphorbia intercedens
Galarhoeus esula
Tithymalus esula
Euphorbia gmelinii , (Steudel)
Euphorbia virgata , (Waldst. & Kit.)
Euphorbia zhiguliensis , (Schur)

Similar species

Summary Native to Europe and temperate Asia, *Euphorbia esula* (leafy spurge) is found throughout the world, with the exception of Australia. This aggressive invader is one of the first plants to emerge in the spring and displaces native vegetation by shading and out-competing them for available water and nutrients. Leafy spurge contains a highly irritating substance called ingenol that, when consumed by livestock, is an irritant, emetic and purgative.



[view this species on IUCN Red List](#)

Species Description

Euphorbia esula has hairless, non-woody stems that sprout from a woody crown root and have alternate, frosted, lance-shaped leaves that are bluish-green in colour. Its height ranges from 5- 90cm. During summer, this plant has yellow bracts (leaf-like petals), which contain greenish-yellow flower clusters at the top of the stem. It grows in very dense stands.

Lifecycle Stages

Euphorbia esula is one of the first plants to emerge in the spring. Stem elongation is very rapid as daily temperatures increase from May through June. Seedlings may emerge when temperatures are near freezing. They may appear deep red or purplish and as the growing season progresses some seedlings will appear to dry up and die but their underground parts will persist and produce adventitious buds especially near the hypocotylar end of the shoot. The main seedling shoot usually does not survive and flower because of the rapid development of adventitious organs. It is replaced by an adventitious shoot that will mature into the flowering shoot. Inflorescences form on the main axis from May to the end of July with flowering and seed development again occurring for a short time in the fall, usually from axillary branches. Seed development and maturation continue for 4 to 6 weeks after the appearance of the last flowers with seed dispersal. The plant usually ceases to grow during the hottest and driest weeks of the growing season. Stems from seedling or root buds generally do not flower the first year. During senescence in the fall, the plants turn a golden-yellow or reddish-yellow before the leaves fall from the plant. The naked stem axis is woody enough to persist from summer to summer and remnants of it can be seen at the base of newly emerged shoot. As light becomes limiting, plants fail to flower, decrease in density, and increase in height. As patches develop, density reaches over 200 shoots/sq m. On heavy soils about 60% of the shoots are produced from seed, whereas on light soils density is maintained and increased mainly by vegetative reproduction (Biesboer, 1996).

Uses

Euphorbia esula has nutrient value similar to alfalfa (*Medicago sativa* L.) and crested wheatgrass (*Agropyron cristatum* (L.) Gaertn.) and provides nutritious forage for sheep and goats. Leafy spurge is used by bee keepers as an early-season food source to maintain honeybee (*Apis* spp.) colonies in early spring, but the honey is bitter and not sold for human consumption.

Habitat Description

Euphorbia esula prefers areas of full sunlight and dry soil but can tolerate a variety of habitats, such as roadsides. *E. esula* is found on prairies, savannas, mountain meadows, and near woodlands.

Reproduction

Euphorbia esula produces flowers following its first year. Each plant can produce up to 200 seeds, of which 60% to 80% will germinate. The seeds are contained in a three-celled capsule which bursts when ripe and shoots seeds up to 4.5 m away from the parent plant. Leafy spurge also spreads from buds on lateral secondary roots.

General Impacts

The root system of leafy spurge is extensive and consists of numerous coarse and fine roots which occupy a large volume of soil. Roots are most abundant in the upper 30 cm of soil, but some roots can extend to a depth of 4.5 m or more. The roots are woody and durable in structure with numerous buds capable of producing new shoots. *E. esula* out-competes native vegetation by consuming available water and nutrients and inhibits growth of surrounding plants by shading. An infestation of leafy spurge reduces forage grasses up to 70% or more, but does not completely eliminate them.

Leafy spurge produces a flat-topped cluster of yellowish-green petal-like structures called bracts, which surround the true flowers. The showy, yellow bracts appear about a month after the plant has emerged in the spring and give the plant the appearance of "blooming." However, the true flowers, which are small and green, develop several weeks later.

Seeds are borne in pods, which contain three grey-brown, oblong, smooth seeds. After the seed has matured, the seed pods burst explosively and throw seeds up to 15 feet from the parent plant. An average of 140 seeds is produced per stem, and seeds may remain viable in the soil at least 8 years.

E. esula has spread to more than 2 million ha of rangeland in the northern Great Plains, causing estimated production losses, control expenses, and other economic damages in excess of \$100 million per year (Anderson *et al.*, 2004). Leafy spurge spread has been estimated up to 12 to 16% per year (Duncan *et al.*, 2004). *E. esula* infestations in grazing pastures dramatically reduces desirable species and because of the latex cattle avoid grazing areas where leafy spurge is found. Leafy spurge also causes losses due to reduced wildlife-associated recreation and reduced soil and water conservation. Leafy spurge has invaded the habitat of the western prairie fringed orchid (*Platanthera praeclara*) which is an endangered native species of the tall grass prairie in the northern Great Plains of North America and threatens to further reduce the orchid's remaining habitat.

Management Info

Physical: Hand-pulling and cutting are ineffective and could actually increase the spread.

Chemical: Leafy spurge is difficult to eradicate with herbicides alone, but top growth control and a gradual decrease in the root system are possible with a persistent management program. Herbicides are used in combination with rotational grazing programs (sheep and goats), biological control insects, and with cultivation or reseeding of competitive grass species. Use of herbicides on a large scale is not cost-effective and generally reduces desirable forbs and shrubs.

Biological: Biological control with insects has been very successful in nearly all habitats leafy spurge is found except in sandy soils and near rivers and streams that seasonally flood. Mixed populations of the flea beetles *Aphthona czwalinae* Weise and *Aphthona lacertosa* Rosenhauer are extremely effective and reduced leafy spurge density by over 95% within four years of release (Lym & Nelson, 2000). *A. lacertosa* has been the most successful agent in a variety of environments, but *A. nigriscutis* and *A. cyparissiae* have also been widely distributed and have become established in North America.

The leafy spurge gall midge (*Spurgia esulae* Gagnè) causes stem tip galls on leafy spurge and is the only multi-generational biological control insect introduced for this weed. Since the gall midge only prevents seed-set, established infestations are not reduced. However, this insect will establish in areas *Aphthona* spp. will not such as shaded woodlands and seasonally wet meadows.

Potential microbial biological control agents have been extensively researched but have not yet been successfully introduced for control of leafy spurge.

Integrated management: *A. czwalinae* and *A. lacertosa* combined with a fall-applied treatment of herbicides such as picloram plus 2,4-D or imazpic reduced leafy spurge density 3 to 5 years earlier than when either method was used alone and once reduced, the *Aphthona* flea beetles maintained acceptable control for at least 7 yr. Spring-applied herbicides eliminated the adult food source and negatively affected the flea beetle establishment, but fall-applied treatments did not reduce the flea beetle establishment or its reproduction (Lym & Nelson, 2002). Also, incorporation of *Aphthona* spp. with sheep or goat grazing has resulted in a larger decline in leafy spurge production than insects alone (Lym, 2005).

Pathway

May be introduced for its colourfully yellow bracts. May be accidentally mixed in agricultural seed.



Principal source:

Compiler: IUCN/SSC Invasive Species Specialist Group (ISSG)

Review: Rodney G. Lym, Department of Plant Sciences, North Dakota State University

Publication date: 2010-06-03

ALIEN RANGE

[1] ARGENTINA

[10] CANADA

[40] UNITED STATES

Red List assessed species 1: EN = 1;

[Platanthera praeclara](#) EN

BIBLIOGRAPHY

57 references found for *Euphorbia esula*

Management information

Anderson, Gerald L., Prosser, Chad W., Wendel, Lloyd E., Delfosse, Ernest S., Faust, Robert M., 2003. The Ecological Area-wide Management (TEAM) of Leafy Spurge program of the United States Department of Agriculture-Agricultural Research Service. *Pest Management Science*. 59(6-7). June-July 2003. 609-613.

Anderson, James V., Horvath, David P., Chao, Wun S., Foley, Michael E., Hernandez, Alvaro G., Thimmapuram, Jyothi, Liu, Lie, Gong, George L., Band, Mark, Kim, Ryan, Mikel, Mark A., 2007. Characterization of an EST database for the perennial weed leafy spurge: An important resource for weed biology research. *Weed Science*. 55(3). MAY-JUN 2007. 193-203

Bangsund, D. A., Leistritz, F. L., Leitch, J. A., 1999. Assessing economic impacts of biological control of weeds: The case of leafy spurge in the northern Great Plains of the United States. *Journal of Environmental Management*. 56(1). May, 1999. 35-43.

Biesboer, David D., [update by Nancy Eckardt], 1996. Element Stewardship Abstract for *Euphorbia esula* Leafy Spurge

[Bourchier, Rob; Rich Hansen; Rodney Lym; Andrew Norton; Denise Olson; Carol Bell Randall, Mark Schwarzlander and Luke Skinner, 2006. Biology and Biological Control of Leafy Spurge. Forest Health Technology Enterprise Team USDA, Forest Service](#)

Summary: Available from: <http://www.invasive.org/weedcd/pdfs/LeafySpurgeBiocontrols.pdf> [Accessed 15 March 2010]

Caesar, A. J. 2003. Synergistic interaction of soilborne plant pathogens and root-attacking insects in classical biological control of an exotic rangeland weed. *Biological Control*. 28(1). 144-153.

Summary: Supplementing flea beetle establishments with plant pathogens, for increased effectiveness in biological control of Leafy spurge. Caesar, Anthony J., 2006. *Uromyces scutellatus* as a keystone species affecting *Euphorbia* spp. in Europe as shown by effects on density in the field. *Biocontrol Science & Technology*. 16(10). NOV 2006. 1079-1086.

Davies, Kirk W., Sheley, Roger L., 2007. A conceptual framework for preventing the spatial dispersal of invasive plants. *Weed Science*. 55(2). MAR-APR 2007. 178-184.

DiTomaso, Joseph M., 2000. Invasive weeds in rangelands: Species, impacts, and management. *Weed Science*. 48(2). March-April, 2000. 255-265.

Ferrell, Mark A., Whitson, Thomas D., Koch, David W., Gade, A. E., 1998. Leafy spurge (*Euphorbia esula*) control with several grass species. *Weed Technology*. 12(2). April-June, 1998. 374-380.

Hyder, Ayaz, Leung, Brian, Miao, Zewei., 2008. Integrating Data, Biology, and Decision Models for Invasive Species Management: Application to Leafy Spurge (*Euphorbia esula*). *Ecology & Society*. 13(2). DEC 2008. Article No.: 12.

Jordan, Nicholas R., Larson, Diane L., Huerd, Sheri C., 2008. Soil modification by invasive plants: effects on native and invasive species of mixed-grass prairies. *Biological Invasions*. 10(2). FEB 2008. 177-190.

Joshi, Ankush., 2008. Integrating flea beetles (*Aphthona* spp.) with herbicide and grasses for leafy Spurge (*Euphorbia esula*) management. *Weed Technology*. 22(3). JUL-SEP 2008. 523-529.

Kalischuk, A. R., Bourchier, R. S., McClay, A. S., 2004. Post hoc assessment of an operational biocontrol program: Efficacy of the flea beetle *Aphthona lacertosa* Rosenhauer (Chrysomelidae: Coleoptera), an introduced biocontrol agent for leafy spurge. *Biological Control*. 29(3). March 2004. 418-426.

Kremer, Robert J., Caesar, Anthony J., Souissi, Thouraya., 2006. Soilborne microorganisms of *Euphorbia* are potential biological control agents of the invasive weed leafy spurge. *Applied Soil Ecology*. 32(1). MAY 2006. 27-37.

Larson, Diane L., Grace, James B., Larson, Jennifer L., 2008. Long-term dynamics of leafy spurge (*Euphorbia esula*) and its biocontrol agent, flea beetles in the genus *Aphthona*. *Biological Control*. 47(2). NOV 2008. 250-256.

Larson, Diane L., Grace, James B., Rabie, Paul A., Andersen, Paula., 2007. Short-term disruption of a leafy spurge (*Euphorbia esula*) biocontrol program following herbicide application. *Biological Control*. 40(1). JAN 2007. 1-8.

Lym, Rodney G., 1998. The biology and integrated management of leafy spurge (*Euphorbia esula*) on North Dakota rangeland. *Weed Technology*. 12(2). April-June, 1998. 367-373.

Lym, Rodney G., 2005. Integration of biological control agents with other weed management technologies: Successes from the leafy spurge (*Euphorbia esula*) IPM program. *Biological Control*. 35(3, Sp. Iss. SI). DEC 2005. 366-375.



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Euphorbia esula*

- Lym, Rodney G., Deibert, Kenneth J., 2005. Diflufenzopyr influences leafy spurge (*Euphorbia esula*) and Canada thistle (*Cirsium arvense*) control by herbicides. *Weed Technology*. 19(2). APR-JUN05. 329-341.
- Lym, Rodney G., Nelson, Jeff A., 2000. Biological control of leafy spurge (*Euphorbia esula*) with *Aphthona* spp. along railroad right-of-ways. *Biological control of leafy spurge (Euphorbia esula) with Aphthona spp. along railroad right-of-ways*. *Weed Technology*. 14(3). July-September, 2000. 642-646.
- Lym, Rodney G., Nelson, Jeffrey A., 2002. Integration of *Aphthona* spp. flea beetles and herbicides for leafy spurge (*Euphorbia esula*) control. *Weed Science*. 50(6). November-December 2002. 812-819.
- Markle, Denise M., Lym, Rodney G. 2001. Leafy spurge (*Euphorbia esula*) control and herbage production with imazapic. *Weed Technology*. 15(3). July-September, 2001. 474-480.
- Mueller-Schaerer, Heinz, Schaffner, Urs., 2008. Classical biological control: exploiting enemy escape to manage plant invasions. *Biological Invasions*. 10(6). AUG 2008. 859-874.
- [North American Plant Protection Organization \(NAPPO\), 2003. NAPPO - PRA / Grains Panel Pest Fact Sheet - Euphorbia esula L. complex June / 2003](#)
- Summary:** Available from: <http://www.naplo.org/PRA-sheets/Euphorbiaesula.pdf> [Accessed 15 July 2009]
- Olliff, Tom, Renkin, Roy, McClure, Craig, Miller, Paul, Price, Dave, Reinhart, Dan, Whipple, Jennifer., 2001. Managing a complex exotic vegetation program in Yellowstone National Park. *Western North American Naturalist*. 61(3). July, 2001. 347-358.
- Pritekel, Cynthia, Whittmore-Olson, Amanda, Snow, Neil, Moore, John C. 2006. Impacts from invasive plant species and their control on the plant community and belowground ecosystem at Rocky Mountain National Park, USA. *Applied Soil Ecology*. 32(1). MAY 2006. 132-141.
- [Rejmanek and Pitcairn, 2002. When is eradication of exotic pest plants a realistic goal? In Turning the tide: the eradication of invasive species: 249-253. Veitch, C.R. and Clout, M.N.\(eds\). IUCN SSC Invasive Species Specialist Group. IUCN. Gland, Switzerland and Cambridge, UK.](#)
- Summary:** Eradication case study in Turning the tide: the eradication of invasive species.
- Rinella, Matthew J., Luschei, Edward C. 2007. Hierarchical Bayesian methods estimate invasive weed impacts at pertinent spatial scales. *Biological Invasions*. 9(5). JUL 2007. 545-558.
- Rinella, Matthew J., Maxwell, Bruce D., Fay, Peter K., Weaver, Theodore, Sheley, Roger L., 2009. Control effort exacerbates invasive-species problem. *Ecological Applications*. 19(1). JAN 2009. 155-162.
- Ringold, Paul L., Magee, Teresa K., Peck, David V., 2008. Twelve invasive plant taxa in US western riparian ecosystems. *Journal of the North American Benthological Society*. 27(4). DEC 2008. 949-966.
- Roehrdanz, R., Olson, D., Fauske, G., Bourchier, R., Cortilet, A., Sears, S., 2009. New DNA markers reveal presence of *Aphthona* species (Coleoptera: Chrysomelidae) believed to have failed to establish after release into leafy spurge. *Biological Control*. 49(1). APR 2009. 1-5.
- Scheiman, Daniel M.; Bollinger, Eric K.; Johnson, Douglas H., 2003. Effects of leafy spurge infestation on grassland birds. *Journal of Wildlife Management*. 67(1). 115-121.
- Summary:** Impacts of spurge on grassland bird densities.
- Scheiman, Daniel M., Bollinger, Eric K., Johnson, Douglas H., 2003. Effects of leafy spurge infestation on grassland birds. *Journal of Wildlife Management*. 67(1). January 2003. 115-121.
- Schwab, Lori K., Raghu, S., 2006. Leafy spurge biological control information and photo resource gallery. *Australian Journal of Entomology*. 45(Part 4). 2006. 345-348.
- Scott, Lisa K., 2008. Weeds cross borders project: A Canada-United States collaboration. U S Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR.(694). JUN 2007. 153-155.
- Seefeldt, S. S., Taylor, J. B., Van Vleet, S., 2007. Reducing *Euphorbia esula* with a combination of sheep grazing and imazapic. *Journal of Arid Environments*. 69(3). MAY 2007. 432-440.
- Sell, Randall S., Bangsund, Dean A., Leistritz, F. Larry, 1999. *Euphorbia esula*: Perceptions by ranchers and land managers. *Weed Science*. 47(6). Nov.-Dec., 1999. 740-749.
- Skinner, Kerri, Smith, Lincoln, Rice, Peter., 2000. Using noxious weed lists to prioritize targets for developing weed management strategies. *Weed Science*. 48(5). September-October, 2000. 640-644.
- Taylor, J. Bret, Seefeldt, Steven S., Thelen, Tonya M., 2005. The use of short-duration intensive sheep grazing to increase sheep utilization of leafy spurge (*Euphorbia esula* L.). *Journal of Food Agriculture & Environment*. 3(2). APR 2005. 323-326.
- [Thunhorst, Gwendolyn & Jil M. Swearingen, 2005. Factsheet: Leafy Spurge. Plant Conservation Alliances Alien Plant Working Group The Nature Conservancy, Arlington, VA. and Jil M. Swearingen, U.S. National Park Service, Washington, DC.](#)
- Summary:** Report on description, biology, effects of introduction, distribution, and management.
- Available from: <http://www.nps.gov/plants/alien/fact/pdf/eues1.pdf> [Accessed 20 March 2010]
- [USDA-ARS., 2009. Euphorbia esula L. National Genetic Resources Program. Germplasm Resources Information Network - \(GRIN\) \[Online Database\]. National Germplasm Resources Laboratory, Beltsville, Maryland](#)
- Summary:** Available from: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?16366> [Accessed 15 July 2009]

General information

- Baker, John., May 2004. *Aphthona* flea beetles used to control leafy spurge. *Aliens-L Archives*.
- Bjerknes, Anne-Line, Totland, Orjan, Hegland, Stein Joar, Nielsen, Anders., 2007. Do alien plant invasions really affect pollination success in native plant species? *Biological Conservation*. 138(1-2). AUG 2007. 1-12.

[CONABIO. 2008. Sistema de información sobre especies invasoras en México. Especies invasoras - Plantas. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.](#)

Summary: English:

The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), under the section Novedades for information on updates.

Invasive species - Plants is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas [Accessed 30 July 2008]

Spanish:

La lista de especies del Sistema de información sobre especies invasoras de México cuenta actualmente con información acerca de nombre científico, familia, grupo y nombre común, así como hábitat, estado de la invasión en México, rutas de introducción y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la página de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualización, por favor consulte la portada (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), en la sección novedades, para conocer los cambios.

Especies invasoras - Plantas is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas [Accessed 30 July 2008]

Duncan, Celestine A., Jachetta, John J., Brown, Melissa L., Carrithers, Vanelle F., Clark, Janet K., DiTomaso, Joseph M., Lym, Rodney G., McDaniel, Kirk C., Renz, Mark J., Rice, Peter M., 2004. Assessing the economic, environmental, and societal losses from invasive plants on rangeland and wildlands. *Weed Technology*. 18(Suppl. S). 2004. 1411-1416.

Foley, Michael E., 2004. Leafy spurge (*Euphorbia esula*) seed dormancy. *Weed Science*. 52(1). January-February 2004. 74-77.

Foley, Michael E., 2008. Temperature and moisture status affect afterripening of leafy spurge (*Euphorbia esula*) seeds. *Weed Science*. 56(2). MAR-APR 2008. 237-243.

[ITIS \(Integrated Taxonomic Information System\), 2005. Online Database *Euphorbia esula*](#)

Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.

Available from:

http://www.cbif.gc.ca/pls/itisca/taxastep?king=every&p_action=containing&taxa=Euphorbia+esula&p_format=&p_ifx=plglt&p_lang= [Accessed March 2005]

Leistriz, F. Larry., Dean A. Bangsund, Nancy M. Hodur., 2004. Assessing the Economic Impact of Invasive Weeds: The Case of Leafy Spurge (*Euphorbia esula*). *Weed Technology*, Vol. 18, Invasive Weed Symposium (2004), pp. 1392-1395

Montgomery, B. R., 2009. Effect of introduced *Euphorbia esula* on the pollination of *Viola pedatifida*. *Botany-Botanique*. 87(3). MAR 2009. 283-292.

Olson, Bret E., Wallander, Roseann T. 2002. Effects of invasive forb litter on seed germination, seedling growth and survival. *Basic & Applied Ecology*. 3(4). 2002. 309-317.

Selbo, Sarena M., Carmichael, Jeffrey S., 1999. Reproductive biology of leafy spurge (*Euphorbia esula* L.): Breeding system analysis.

Canadian Journal of Botany. 77(11). Nov., 1999. 1684-1688.

Trammell, Michael A., Butler, Jack L., 1995. Effects of exotic plants on native ungulate use of habitat. *Journal of Wildlife Management*. 59(4). 1995. 808-816.

[USDA-NRCS. 2009. *Euphorbia esula* L. leafy spurge The PLANTS Database \(<http://plants.usda.gov>, 17 July 2009\). National Plant Data Center, Baton Rouge, LA 70874-4490 USA](#)

Summary: Available from: <http://plants.usda.gov/java/profile?symbol=EUES> [Accessed 15 July 2009]

[USDA-NRCS \(Natural Resource Conservation Service\). 2005. *Euphorbia esula*. The PLANTS Database Version 3.5 \[Online Database\] National Plant Data Center, Baton Rouge, LA.](#)

Summary: Available from: <http://plants.usda.gov/java/profile?symbol=EUES> [Accessed 12 March 2006].

Wald, Eric J., Kronberg, Scott L., Larson, Gary E., Carter Johnson, W., 2005. Dispersal of leafy Spurge (*Euphorbia esula* L.) seeds in the feces of wildlife. *American Midland Naturalist*. 154(2). OCT 2005. 342-357.