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INTRODUCTION

The name “spurge” is applied to members of the genus *Euphorbia*, which includes approximately 2,000 species worldwide. Members of this genus have a highly specialized flowering branch, the cyathium (**Fig. 1a**), that consists of a central female flower surrounded by five groups of male flowers. The female flower develops before the male flowers. Neither type of flower has any true petals or sepals; rather, all flowers are enclosed within a group of petal-like bracts. Glands in the cyathium produce nectar that attracts animals which pollinate the plant. All parts of *Euphorbia* plants exude a milky, toxic sap when injured (**Fig. 1b**).

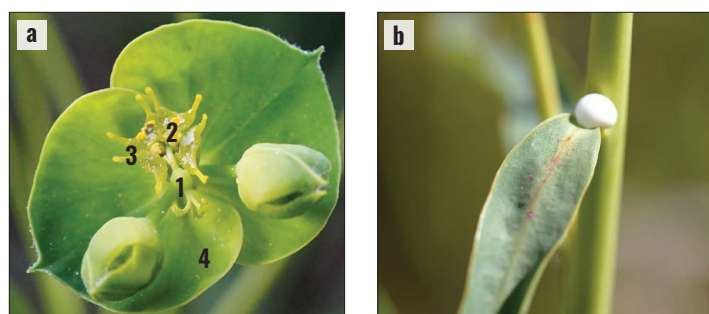


Figure 1. *Euphorbia* plants have specialized flowering branches called a cyathium (a) with a (1) central female flower surrounded by (2) 5 groups of male flowers and (3) nectar glands. All flowers are enclosed by (4) petal-like bracts. All parts of *Euphorbia* plants (b) exude a milky, toxic sap when damaged (a: Patrick Hacker, iNaturalist.org CC BY-4.0; b: Travis McMahon, MIA Consulting)

Approximately 51 species or varieties of *Euphorbia* are native to the USA and Canada, and an additional 30 have been introduced from elsewhere. Of these, the exotic leafy spurge (herein referred to as *Euphorbia virgata*) and cypress spurge (*E. cyparissias*) are by far the most common and problematic for land managers, and are the focus of this publication.

TAXONOMIC ISSUES

The name *Euphorbia esula* L. has long been applied to leafy spurge in weed and biological control literature. Recent evidence, however, indicates the plant leafy spurge that is considered weedy throughout North America is *Euphorbia virgata* Waldst. & Kit., a species distinct from *Euphorbia esula*. There are no issues with the taxonomy of cypress spurge (*Euphorbia cyparissias* L.).

SYNONYMS

Cypress spurge: Bonaparte’s crown, graveyard moss

Leafy spurge: *Euphorbia esula* L., Faitour’s grass, wolf’s milk

CLASSIFICATION

RANKING	SCIENTIFIC NAME	COMMON NAME
Kingdom	Plantae	Plants
Subkingdom	Tracheobionta	Vascular plants
Superdivision	Spermatophyta	Seed plants
Division	Magnoliophyta	Flowering plants
Class	Magnoliopsida	Dicotyledons
Subclass	Rosidae	
Order	Malpigiales	
Family	Euphorbiaceae	Spurge family
Genus	<i>Euphorbia</i>	Spurge
Species	<i>Euphorbia cyparissias</i> L.	Cypress spurge
Species	<i>Euphorbia virgata</i> Waldst. & Kit.	Leafy spurge

HISTORY AND DISTRIBUTION

Cypress spurge is native to Europe and was introduced to North America in the 1860s as an ornamental plant. Cypress spurge has since been reported in 43 continental states and ten Canadian provinces (**Fig. 2a**). Leafy spurge is native to Europe and Asia. It was introduced to North America by 1827, likely in contaminated ship’s ballast and as a seed contaminant in the prairie states and provinces. It has since been reported from most of northern North America, including 38 states in the USA and nine Canadian provinces plus one Canadian territory (**Fig. 2b**).

IMPACT

Both cypress and leafy spurge displace native plant species and reduce range, pasture, and crop production. The plants are toxic to livestock and humans and have resulted in livestock poisoning and severe dermatitis in people.

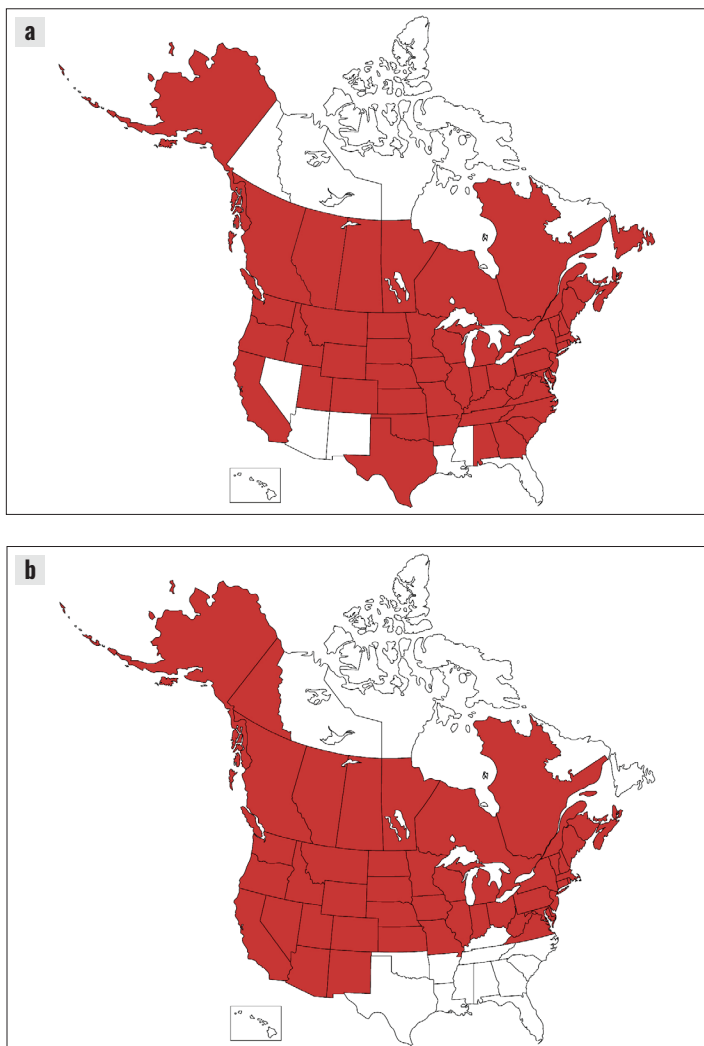


Figure 2. North American distribution of (a) cypress spurge and (b) leafy spurge. Some states and provinces are more heavily infested than others (Credit: EDDMapS, www.eddmaps.org; USDA PLANTS Database, plants.usda.gov [both accessed 20 November 2023])

Cypress spurge

Euphorbia cyparissias L.

IDENTIFICATION AT A GLANCE

Cypress spurge (Fig. 3) is an herbaceous perennial with thickly clustered stems typically growing no higher than 16 in (40 cm) tall. It has deep vertical roots as well as extensive creeping lateral roots that produce adventitious buds. Leaves are green, alternate, stalkless, and very narrow. They have



Figure 3. Cypress spurge plant (Paola Fallabrini, iNaturalist.org CC BY-NC 4.0)

smooth margins and are clustered tightly on plant stems. Flowers are tiny, lime green, and enclosed by showy, yellow-green bracts. They are arranged in clusters at stem tips. Seed capsules contain three smooth, oval, gray-brown seeds.

Roots

Cypress spurge has an extensive root system. Vertical roots extend up to 10 ft (3 m) deep. The roots have creeping lateral branches that are brown and produce numerous pink-colored buds that give rise to new stems (Fig. 4a). Very small, severed root segments can develop into new plants.

STEMS AND LEAVES

Seedlings (Fig. 4b) and young stems (Fig. 4c) are covered in tightly packed leaves that are alternate, stalkless, narrow (1–2 mm wide), and $\frac{1}{2}$ –1½ in (1–3 cm) long. Leaves have smooth margins and are either a bright green or bluish-green (Fig. 4c). Mature stems typically grow no higher than 16 in (40 cm) tall and are often thickly clustered. Stems are hairless, green to yellowish-green, and sometimes branched in the upper portions (Fig. 4d). All stems and leaves exude a milky sap when damaged (Fig. 1b). The sap is very irritating to the skin, especially to the eyes and mouth, and may cause vomiting, abdominal pain, and diarrhea if consumed.

FLOWERS

Flowers are arranged in clusters at stem tips with all flower stems arising from the same point (umbel, Fig. 4e). Flower umbels may be simple or compound. Flowering stems (cyathia) are highly specialized and consist of a central female flower surrounded by five groups of male flowers. Each flower is lime green, tiny, and lacks true petals and sepals. Instead, the cyathia are enclosed by showy, yellow-green bracts that resemble petals (Fig. 4e). Bracts may turn pinkish or red at maturity (Fig. 4f). Glands in the cyathia (Fig. 4g) produce nectar that attracts animals for pollination (typically ants).

FRUITS AND SEEDS

Fruits are capsules with three chambers (Fig. 4h), each chamber containing a smooth, oval, gray-brown seed (Fig. 4i). When the seeds mature, the seed capsule bursts explosively and ejects the seeds.

ECOLOGY

Cypress spurge spreads by seeds and its creeping lateral roots. Root pieces as small as $\frac{1}{2}$ in (1¼ cm) can develop into new plants under the right circumstances. Peak seed germination is in early spring from March through May with new seedlings usually not flowering the first year. Flowers appear from May to June. A second flowering often occurs in late summer or early fall. Seed capsules shatter upon maturation, scattering

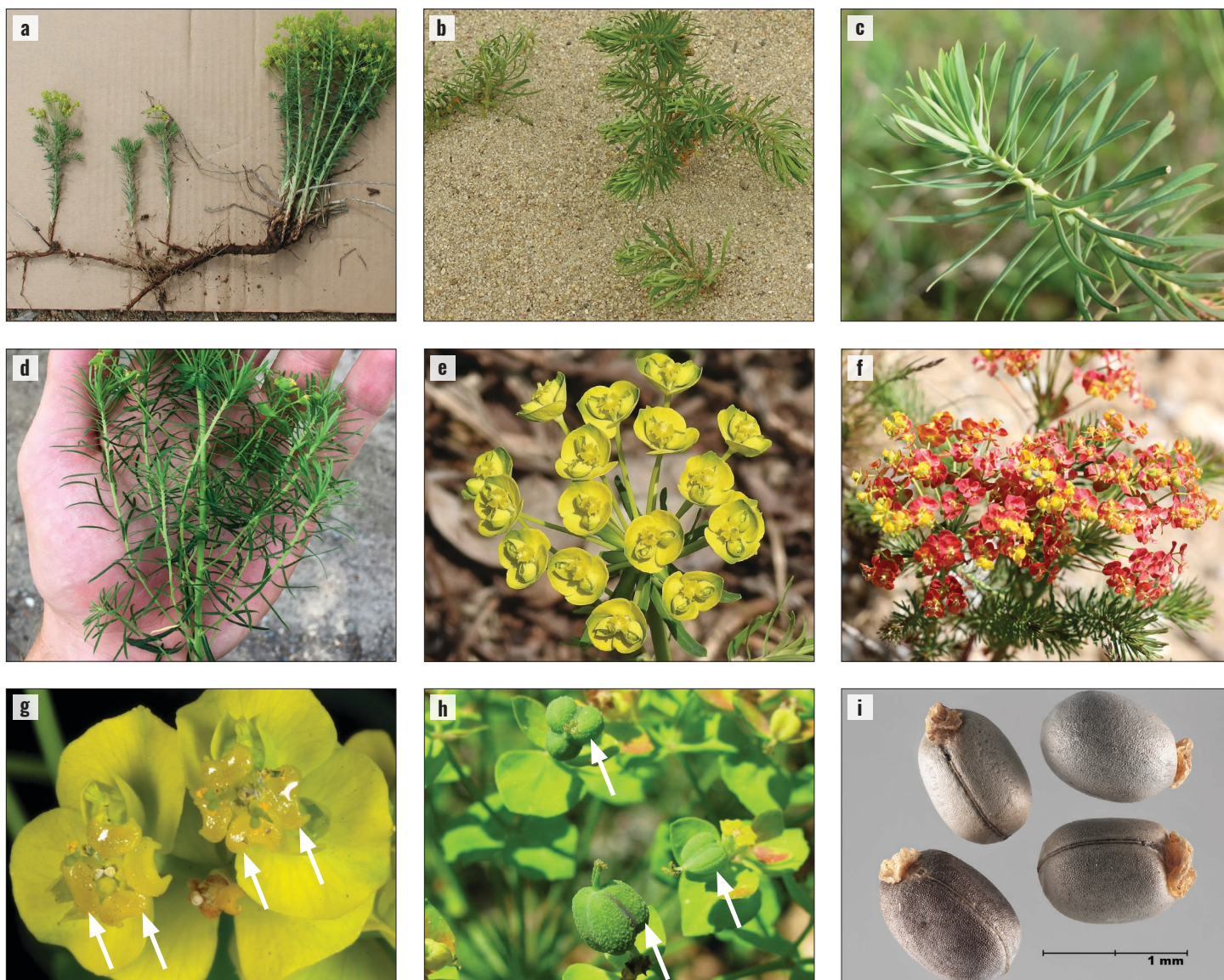


Figure 4. Cypress spurge (a) lateral roots with new stems arising from pinkish buds; (b) seedlings; (c) narrow, tightly-clustered leaves; (d) branched stems; (e) flowering branches in umbels and flowers with no true petals, but enclosed by petal-like bracts; (f) bracts often turn reddish at maturity; (g) nectar glands (white arrows); (h) fruit (white arrows); (i) seeds (a,h: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org CC BY 3.0 US; b: Małgorzata Śliz, iNaturalist.org CC BY-NC 4.0; c: Andreas Rockstein, iNaturalist.org CC BY-NC 4.0; d: Owen Strickland, iNaturalist.org CC BY-NC 4.0; e: Michael J. Oldham, iNaturalist.org CC BY-NC 4.0; f: Martin Grimm, iNaturalist.org CC BY-NC 4.0; g: Doug Goldman, iNaturalist.org CC BY-NC 4.0; i: © Canadian Food Inspection Agency, [Seed Identification Guide](#))

seeds up to 16 ft (5 m). Seeds are also readily transported by water, humans, and other animals. Seeds may remain viable in soil for up to 20 years. Stems typically die back for the winter and re-sprout each spring from the root crown or buds on the lateral roots.

HABITAT

Cypress spurge capitalizes on disturbance and can be found in dry to moderately moist meadows, pastures, cemeteries, and gardens and along forest edges, roadsides, and rights-of-way (**Fig. 5a–d**).



Figure 5. Cypress spurge is frequently found in or along (a) moist meadows, (b) forest understories, (c) logged forest clearings or edges, and (d) dry roadsides. (a,b,d: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org CC BY 3.0 US; c: Todd Pfeiffer, Klamath County Weed Control, Bugwood.org CC BY-3.0 US)

Leafy spurge

Euphorbia virgata Waldst. & Kit.

IDENTIFICATION AT A GLANCE

Leafy spurge (Fig. 6) is an herbaceous perennial with thickly clustered stems growing up to 3 ft (90 cm) tall. It has deep vertical roots as well as extensive creeping lateral roots that produce adventitious buds. Leaves are alternate and narrow with smooth margins and a deep midvein. Flowers are tiny, lime-green, and enclosed by



Figure 6. Leafy spurge plant (John M. Randall, The Nature Conservancy, Bugwood.org CC BY 3.0 US)

showy, yellow-green bracts. They are arranged in clusters at stem tips. Seed capsules contain three smooth, oval, mottled gray or brown seeds.

Roots

Leafy spurge has an extensive root system. Vertical roots extend up to 21 ft (6½ m) deep. The roots have creeping lateral branches that are brown and produce numerous pink-colored buds that give rise to new stems (Fig. 7a). Very small, severed root segments can develop into new plants.

STEMS AND LEAVES

Seedlings and young stems (Fig. 7b) are moderately covered in leaves that are narrow, 1–3 in (2½–7½ cm) long, and have smooth margins and a deep midvein (Fig. 7c). Leaves are alternate, though they may at times appear nearly opposite or whorled. They may vary from bright green to duller bluish-green, but many leaves turn red when plants dry out in late summer and fall (Fig. 7d). The thickly clustered

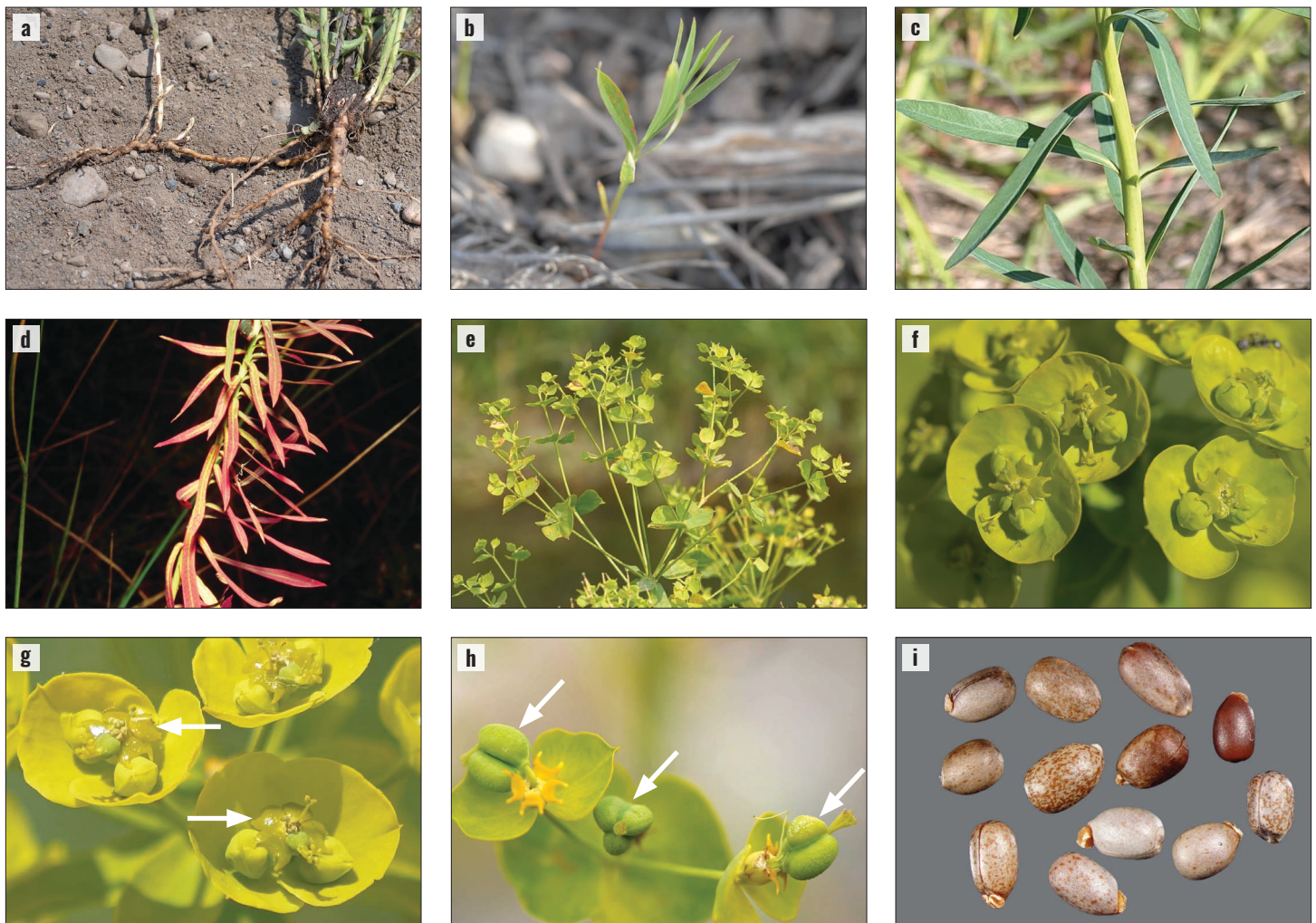


Figure 7. Leafy spurge (a) lateral roots with new stems arising from pinkish buds; (b) seedling; (c) narrow leaves with prominent midvein; (d) leaves turning reddish in fall; (e) flowering branches in umbels; (f) flowers with no true petals, but enclosed by petal-like bracts; (g) nectar glands (white arrows); (h) fruit (white arrows); (i) seeds (a–c, e–h: Travis McMahon, MIA Consulting; d: William M. Ciesla, Forest Health Management International, Bugwood.org CC BY 3.0 US; i: Julia Scher, USDA APHIS PPQ, Bugwood.org CC BY 3.0 US)

stems grow up to 3 ft (90 cm) tall. Stems are hairless, green to yellowish-green (**Fig. 7c**), and often branched only in the upper portions (**Fig. 6**). All stems and leaves exude a milky sap when damaged (**Fig. 1b**). The sap is very irritating to the skin, especially to the eyes and mouth, and may cause vomiting, abdominal pain, and diarrhea if consumed.

FLOWERS

Flowers are arranged in umbel clusters at stem tips (**Fig. 7e**). Flower umbels may be simple or compound. Flowering stems (cyathia) are highly specialized and consist of a central female flower surrounded by five groups of male flowers. Each flower is lime green, tiny, and lacks true petals and sepals. Instead, the cyathia are enclosed by showy, yellow-green bracts that resemble petals (**Fig. 7f**). Glands in the cyathia (**Fig. 7g**) produce nectar that attracts animals for pollination (typically ants).

FRUITS AND SEEDS

Fruits are capsules with three chambers (**Fig. 7h**), each chamber containing a smooth, oval, mottled gray or brown seeds (**Fig. 7i**). When the seeds mature, the seed capsule bursts explosively and ejects the seeds.

ECOLOGY

Leafy spurge spreads by seeds and its creeping lateral roots. Root pieces as small as ½ in (1¼ cm) can develop into new plants under the right circumstances. Peak seed germination is in early spring from April through May with new seedlings usually not flowering the first year. Flowers appear from June to July. A second flowering often occurs in late summer or early fall. Seed capsules shatter upon maturation, scattering

seeds up to 16 ft (5 m). Seeds are also readily transported by water, humans, and other animals. Seeds may remain viable in soil for up to eight years. Stems typically die back for the winter and re-sprout each spring from the root crown or buds on the lateral roots.

HABITAT

Leafy spurge occupies many different habitats and soil types and can be found from grasslands to open forests to riparian areas. It is dominant in pastures and abandoned fields, and along roadsides (**Fig. 8a–d**).

DIFFERENTIATING CYPRESS AND LEAFY SPURGE

Cypress spurge is very similar to leafy spurge, but it grows shorter and less robust, has much smaller bracts, and narrower and denser leaves than leafy spurge (**Fig. 9**).



Figure 9. Cypress spurge (left) grows much shorter with smaller features than leafy spurge (right). (Leslie J. Mehrhoff, University of Connecticut, Bugwood.org CC BY 3.0 US)

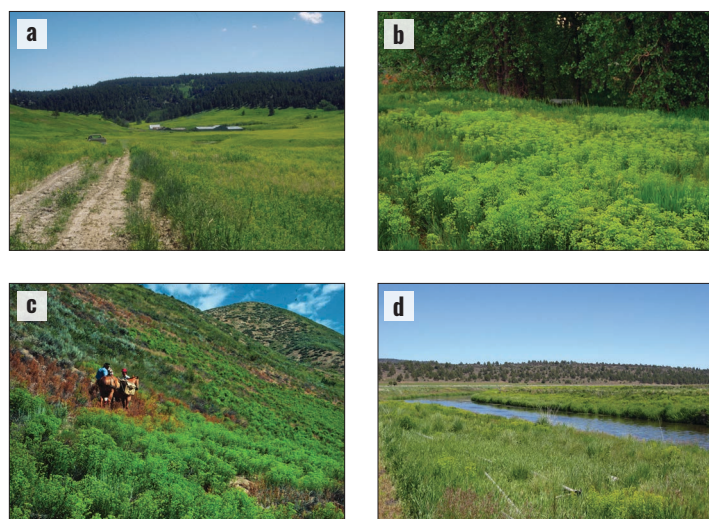


Figure 8. Leafy spurge infesting (a) moist rangeland, (b) a moist forest clearing, (c) dry, open hillsides, (d) a riparian area (a: Norman E. Rees, USDA ARS; b: William M. Ciesla, Forest Health Management International; c: Steve Dewey, Utah State University; d: Todd Pfeiffer, Klamath County Weed Control; a–d: Bugwood.org CC BY 3.0 US)

SIMILAR SPECIES

Prior to flowering, several unrelated plant species (such as yellow toadflax and bastard toadflax) resemble cypress and leafy spurge with their narrow, alternate leaves, creeping lateral roots, and similar height. These lack the milky white sap of spurges and have true petals and sepals rather than the showy bracts and specialized cyathia of spurges. During flowering, cypress and leafy spurge are most often confused for other spurge species present in North America. Some of these are described in greater detail in **Table 1**, along with key characteristics that can be used to differentiate the look-alikes.

Table 1. Comparison of other spurge (*Euphorbia*) species present in continental North America that resemble cypress and leafy spurge, and key traits for differentiation. All species in this table have the milky sap and inflorescences with cyathia that are characteristic of the genus.

SPECIES	CHARACTERISTICS AND DISTRIBUTION	PLANT	LEAVES	FLOWERS
Glade spurge <i>Euphorbia purpurea</i> Euphorbiaceae Native perennial forb	Glade spurge is often found in moist, shaded areas but can grow in drier, full sun areas as well; consequently, its habitat overlaps both cypress and leafy spurge. Glade spurge plants can grow up to 3.3 ft (1 m) tall. Its leaves are broader than cypress and leafy spurge and can be ≤4 in (10 cm) long with more prominent midveins. Glade spurge fruits are very bumpy. USA: DE, GA, MD, NJ, NC, OH, PA, VA, WV; CAN: Not present			
Horned spurge <i>Euphorbia brachycera</i> Euphorbiaceae Native perennial forb	Horned spurge grows in a similar habitat to both cypress and leafy spurge and often has a similar blue-green tinge to its leaves. It also grows to a similar height as cypress spurge, but is usually shorter. It differs in that its leaves are wider, its bracts are heart-shaped or broadly triangular, and its glands are horned. USA: AZ, CO, ID, MN, MT, ND, NE, NM, NV, SD, TX, UT, WY; CAN: Not present			
Petty spurge <i>Euphorbia pepus</i> Euphorbiaceae Introduced annual forb	Petty spurge grows in a similar habitat to both cypress and leafy spurge and often has a similar blue-green tinge to its leaves. It differs by only growing a few inches to 1 ft (30 cm) tall, having a taproot, its leaves are broader at the tips than the base, its glands have long thin horns, and its fruits are pitted. USA: AK, AL, AZ, CA, CO, CT, DE, FL, GA, HI, IA, ID, IL, IN, LA, MA, MD, ME, MI, MT, ND, NH, NJ, NM, NY, OH, OR, PA, RI, TN, UT, VA, VT, WA, WI, WV, WY; CAN: AB, BC, MB, NB, NF, NS, ON, PE, QC, SK			
Oblong spurge <i>Euphorbia oblongata</i> Euphorbiaceae Introduced perennial forb	Oblong spurge grows in a similar habitat to both cypress and leafy spurge and also grows to a similar height as leafy spurge. It differs in that its leaves are wider than leafy spurge and have very finely toothed margins, and its stems are covered in fine hair. USA: CA, MT, NV, OR, WA; CAN: Not present			
Siberian spurge <i>Euphorbia seguieriana</i> Euphorbiaceae Introduced perennial forb	Most often grown as an ornamental in North America, Siberian spurge resembles both cypress and leafy spurge with its alternate, narrow, blue-green leaves and its lime-green inflorescences. It grows to a similar height as cypress spurge (typically 12–18 in or 30–45 cm) but is more clump-forming or ball-shaped than either cypress or leafy spurge. USA, CAN: ornamental plantings			
Tinted woodland spurge <i>Euphorbia commutata</i> Euphorbiaceae Native biennial (occasionally annual) forb	The woodland and often moist habitat of tinted woodland spurge overlaps with both cypress and leafy spurge. Tinted woodland spurge plants typically only grow a few inches to 1 ft (30 cm) tall from a taproot. Its leaves are broader at the tips than the base, its glands have long thin horns, and its seeds are pitted. USA: AL, AR, DC, FL, GA, IA, IL, IN, KY, LA, MD, MI, MO, MS, NC, OH, OK, PA, SC, TN, VA, WI, WV; CAN: ON			
Warty spurge <i>Euphorbia spathulata</i> Euphorbiaceae Native annual forb	Warty spurge grows in a similar habitat to both cypress and leafy spurge. It also grows to a similar height as cypress spurge, but is usually shorter. It differs in that it has a taproot, its leaves are broader at the tips than the base, and its leaves and bracts typically have very fine teeth along their margins, especially near the tips. USA: AL, AR, AZ, CA, CO, DC, FL, IA, ID, IL, IN, KS, KY, LA, MD, MI, MN, MO, MS, MT, NC, ND, NE, NM, OH, OK, OR, PA, SC, SD, TN, TX, UT, WA, WI, WV, WY; CAN: ON			

Photos: glade spurge plant, flowers (Jim Brighton), leaves (Elizabeth Byers) (all iNaturalist.org CC BY-NC 4.0); horned spurge plant (Abelkinser), leaves (Audrey Spencer), flowers (Carol Blaney) (all iNaturalist.org CC BY-NC 4.0); petty spurge plant, flowers (Gilles San Martin, iNaturalist.org CC BY-NC-SA 4.0), leaves (Stanley, iNaturalist.org CCO); oblong spurge plant (Tabitha Lee, iNaturalist.org CC BY-NC 4.0), stem/leaves, flowers (Peter de Lange, iNaturalist.org CCO); Siberian spurge: plant (Mallaliev), leaves (Татьяна Ильина), flowers (Ludwig Treuter) (all iNaturalist.org CC BY-NC 4.0); tinted woodland spurge plant (Alvin Diamond), leaves (Jim Brighton), flowers (Kendallbrooke) (all iNaturalist.org CC BY-NC 4.0); warty spurge plant, flowers (CDance), leaves (Abelkinser) (all iNaturalist.org CC BY-NC 4.0). **Distribution:** NatureServe Explorer, explorer.natureserve.org, and EDDMapS, www.eddmaps.org [Both accessed 23 January 2024].

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ACKNOWLEDGMENTS

The authors thank two anonymous reviewers for providing helpful comments on earlier versions of this publication. This fact sheet was produced by the North American Invasive Species Management Association (NAISMA) with financial support from USDA Forest Service. The layout was designed by Rachel Winston, MIA Consulting.

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SUGGESTED CITATION

Milan, J., N.M. West, R.S. Bourchier, and C.B. Randall. 2024. Spurges (*Euphorbia* spp.): History and Ecology in North America. In: R.L. Winston, Ed. Biological Control of Weeds in North America. North American Invasive Species Management Association, Milwaukee, WI. NAISMA-BCW-2024-40-SPURGES-P.

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