

Invasive Plants of Leelanau County, Grand Traverse County and Benzie County, Michigan



Fact Sheets were created by the Michigan Natural Features Inventory

The entire booklet is available at:
<http://web4.msue.msu.edu/mnfi/education/invasives.cfm>

***Additional fact sheets were created by the Leelanau Conservancy and Grand Traverse Regional Land Conservancy**



Top 20 List of Invasive Species for Leelanau, Grand Traverse and Benzie Counties

(Alphabetical order, not ranked)

1. Autumn Olive
2. Baby's Breath*
3. Barberry (Japanese)
4. Bladder Champion*
5. Black Locust
6. Blue Lyme Grass*
7. Bull Thistle*
8. Canada Thistle
9. Dame's Rocket
10. Garlic Mustard
11. Giant Reed /Phragmites (exotic)
12. Glossy Buckthorn
13. Japanese Knotweed
14. Leafy Spurge
15. Multiflora Rose
16. Purple Loosestrife
17. Reed Canarygrass
18. Spotted Knapweed
19. Tartarian Honeysuckle
20. Tree of Heaven

Thanks for input and support from the Sleeping Bear Dunes National Lakeshore and The Nature Conservancy.

Using this booklet

This booklet is intended to help you identify common invasive species easily, so that control efforts can be initiated while infestations are small. It includes a description of each plant, its habitat preferences, reproductive strategies and a quick overview of suggested control methods.

When invasive species are discovered early, hand pulling and ongoing monitoring may be an effective means of control. In some cases, all plant parts should be removed and destroyed, and this is noted in the text.

This booklet does NOT provide detailed information on using specific herbicides. Land managers are responsible for obtaining any necessary licenses or permits, determining that particular herbicides are registered in Michigan, and approved by their agency. Herbicides must be used in accordance with label instructions. Note potential damage to non-target plants and precautions for safe use.

For large infestations, a detailed, integrated approach may be required. Every site and infestation is unique and control efforts should take specific details into account.

How old is a specific invasive population? Often, established populations with extensive root systems may require higher concentrations of herbicide. Are high quality populations of native species present? In some cases, herbicides can be applied during the dormant season. In other cases, herbicides that only target broadleaved weeds, for example, might be most appropriate. Some species may be effectively controlled by prescribed fire or mowing, while in other cases, these methods are ineffective when used alone, but may be effective in conjunction with herbicides. Control timing is also a critical factor in determining the success of a particular method. While many herbicides are best absorbed by young leaf tissue, the herbicide may not be effectively drawn down into plant roots while plants are actively growing.

When herbicide is applied as the plants die back, it is often drawn into the roots along with stored resources and can be particularly

effective. Similarly, for annual or biennial invasive species, mowing while the plant is in bud can provide an effective means of control.

In some cases, control efforts at the wrong time of year may actually result in an increase in size or vigor of an invasive population.

In every case, success or failure of a particular control method depends on a number of variables: the site, including slope, soil texture and proximity to water; the particular species; the age and extent of the infestation; the particular herbicide or mechanical control under consideration; and the timing of control efforts.

Given the lack of available resources in addressing the spread of invasive species, it is worth the time to thoroughly research a particular species before initiating an extensive control effort.

Assess the entire region in determining priorities.

The following online resources provide a detailed overview of the existing literature on the control and eradication of a number of invasive species:

The Nature Conservancy's Global Invasive Species Initiative
Invasives and Control Methods -Provides abstracts that summarize plant descriptions, biology and current research for controlling specific invasive species:

<http://tncweeds.ucdavis.edu/esadocs.html>

U.S.D.A. Forest Services Fire Effects Information System (FEIS)

Provides invasive species summaries with detailed information on plant biology, ecology, fire behavior and control methods:

<http://www.fs.fed.us/database/feis/plants/weed/weedpage.html>

USDA National Agricultural Library

National Invasive Species Information Center - Provides links to current federal, state and academic literature on selected invasive species: <http://www.invasivespeciesinfo.gov/plants/main.shtml>

Herbarium specimens & early response

Invasive species present an enormous threat to Michigan's native biodiversity. Tracking the spread of new invasives before they are well-established is a critical first step in fighting this onslaught. At the time of this writing, Michigan has no centralized database dedicated to documenting the spread of invasive species within the state.

The University of Michigan's Herbarium's Online Atlas, at:

<http://herbarium.lsa.umich.edu/website/michflora/>

provides the most comprehensive record of the distribution of invasive plant species at present, although there is a substantial time lag before new specimens are posted.

You can help track the spread of invasive species by submitting specimens for species that have not yet been recorded in a particular county.

Specimens should be pressed and dried in a plant press before submission. If a plant press is unavailable, specimens may be dried between several newspaper sheets, layered between pieces of corrugated cardboard and tightly bound.

Detailed instructions for preparing specimens are available at the the University of Florida's Herbarium website at:

<http://www.flmnh.ufl.edu/herbarium/voucher.htm>

Specimens should be submitted unmounted, with a label that includes:

- Scientific Name
- Collector (and other individuals who were present)
- Locality (including GPS coordinates, if possible)
- Habitat, site quality, species abundance and extent
- Collection Number (assigned by collector)
- Date of Collection

Ship to:

Anton Reznicek, Curator (Vascular Plants),

University of Michigan Herbarium

3600 Varsity Drive,

Ann Arbor, MI 48108-2287.

Autumn Olive

Elaeagnus umbellata

Habit: Deciduous shrub or small tree growing up to 6 meters (20 feet) in height and 9 meters (30 feet) wide.

Leaves: Simple, alternate, oval, 5-10 cm (2-4 in) inches long; entire margins, wavy; gray-green above, silvery scaly below; early leaf out (mid-March).

Stems/Bark: Often thorny; silvery or golden brown, with brownish scales giving stems a speckled appearance.

Flowers: Fragrant; tubular; 4 petals and stamens; cream to light yellow; in clusters of 1-8; flowers from April to June.

Fruits/Seeds: Occur in drupes; 0.25 inches; silvery with brown scales when immature, speckled red or yellow when mature; ripen September to October; begin to bear fruit at 3 to 5 years; each tree can produce 2-8 lbs. of seed per year.

Habitat: Shade tolerant; occurs in a variety of soil types (pH range of 4.8-6.5), thrives on infertile soils because of nitrogen-fixing root nodules; found in open woods, forest edges, roadsides, fencerows, meadows, sand dunes, and other disturbed areas.

Reproduction: Primarily by seed, also by stump sprouting and roots.

Similar Species: Native - Silver-berry (*E. commutata*) has opposite leaves; non-native Russian olive (*E. angustifolia*) has longer, narrower, leaves, silver above.

Comments: Invades disturbed areas, resprouts quickly; can out-compete native species; increases nitrogen levels to the detriment of native communities.

Monitoring & Rapid Response: Monitor sunny open sites; autumn olive leafs out early in spring, retains leaves in fall, can be recognized year-round; hand pull seedlings; focus on highest quality areas first; burning and cutting stimulate resprouting; treat cut stumps with an herbicide, best in fall; basal bark/stem sprays effective in late spring, possibly in fall; foliar herbicide sprays effective for small trees and resprouts but may harm non-target plants; basal stem injection of herbicide on dormant plants provides excellent control with low concentrations of herbicide.

Current Known Distribution:

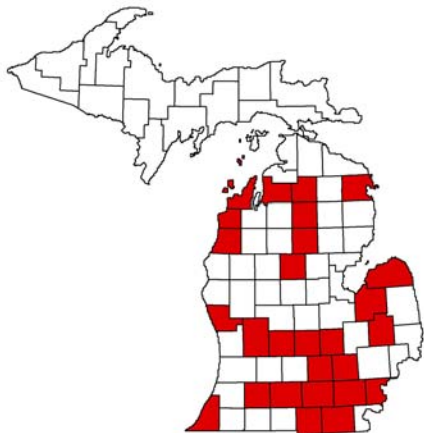


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57. USDA NRCS Archives, USDA NRCS, www.forestryimages.org



Baby's Breath

Gypsophila paniculata

Habit: Herbaceous perennial ranging in up to three feet in height and two feet wide, with a deep, thick tap root and branched stems.

Leaves: Simple, opposite, long, narrow, green to purpleish in color.

Stems/Roots: Typically have multiple stems; however, may develop only one stem the first growing season. Stems are smooth, green to purpleish in color. Plants have a deep, penetrating tap root that may extend 12 feet into the soil. It is this root system that allows the plant to survive the winter and to grow in harsh conditions, such as sand dunes.

Flowers: Flowers are numerous, small (1/8 inch) and white in color; blooms from late June to early August.

Seeds: Small, black seeds begin to form in mid August. The plant dries out and forms a tumbleweed in the fall for seed dispersal. One plant can produce 14,000 seeds.

Habitat: Sand dunes, roadsides, fields, and ditches.

Reproduction: Seed is the primary mechanism for reproduction. The majority of seeds drop are dispersed to remote locations by wind. Seeds show little or no dormancy.

Similar Species: Bladder campion (*Silene vulgaris*) is similar in appearance before flowering distinguished when flowering occurs.

Comments: Limited range. Is primarily located along sand dunes of northeastern Lake Michigan.

Monitoring & Rapid Response: Monitor sandy areas regularly from May through July. Plants flowering. Chemical control is effective from May to August using glyphosate with a surfactant sticking agent. Plants must be cut underground with a shovel below the caudex.

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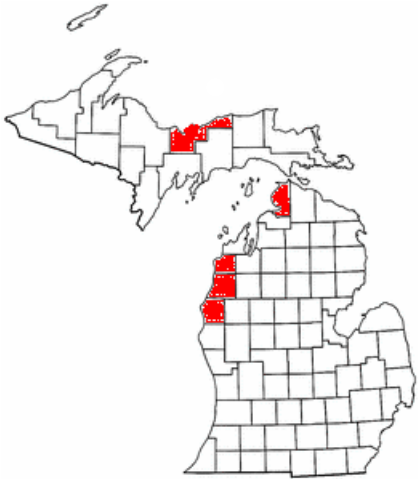


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1. Hubert J Steed, <http://www.pbase.com/hjsteed>
2. <http://www.agf.gov.bc.ca/cropprot/babysbreath.htm>
3. Elizabeth J. Czarapata, <http://dnr.wi.gov/invasives/photos/>
4. Emmet Judziewicz, <http://dnr.wi.gov/invasives/photos/>
5. Ken Hyde, Sleeping Bear Dunes National Lakeshore
6. Ken Hyde, Sleeping Bear Dunes National Lakeshore

Japanese Barberry

Berberis thunbergii

Habit: Spiny, deciduous shrub, typically 0.6-0.9 m (2-3 ft) tall.

Leaves: Simple, alternate, oval to spoon shaped with smooth margins, 1.3-2 cm long; bright green above, lighter below, in clusters at each node, red to purple in the fall depending on the cultivar.

Stems/Bark: Numerous, spiny, slightly curving; older stems gray; twigs and young stems turning reddish brown in winter; inner bark yellow.

Flowers: Small, yellow, 6-petaled, stalked; single or in small clusters of 2-4 blossoms; blooms April - May

Fruits/Seeds: Small, bright red, egg-shaped berries found singly or in clusters on slender stalks; mature in midsummer; remain on stems into winter; often dispersed by birds, deer, turkey and grouse.

Habitat: Found along woodland edges, open woods, roadsides, stream banks, old fields; tolerates a range of soil, moisture and light conditions.

Reproduction: By seed, creeping roots and cut stumps; branches root freely where they touch the ground.

Similar Species: American barberry (*B. canadensis*) - has toothed leaves and usually 3-pronged spines.

Comments: Species is often planted as a hedge and escapes from cultivation; at least 47 cultivars exist; growth minimal in low light; deer herbivory minimal.

Monitoring & Rapid Response: Monitor sunny open sites and edges in spring when barberry leafs out before native shrubs; remove all plants before seed is produced; begin control efforts in highest quality areas and remove mature shrubs that provide a source of seed; hand pull or dig young plants, removing all roots; treat cut stumps with herbicide; foliar herbicide spray is effective on areas with few native plants; cut shrubs at base in winter so that only resprouts need to be sprayed in spring.

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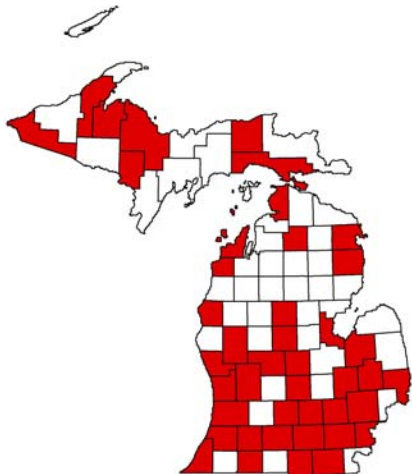


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17. Terry English, USDA APHIS PPQ,

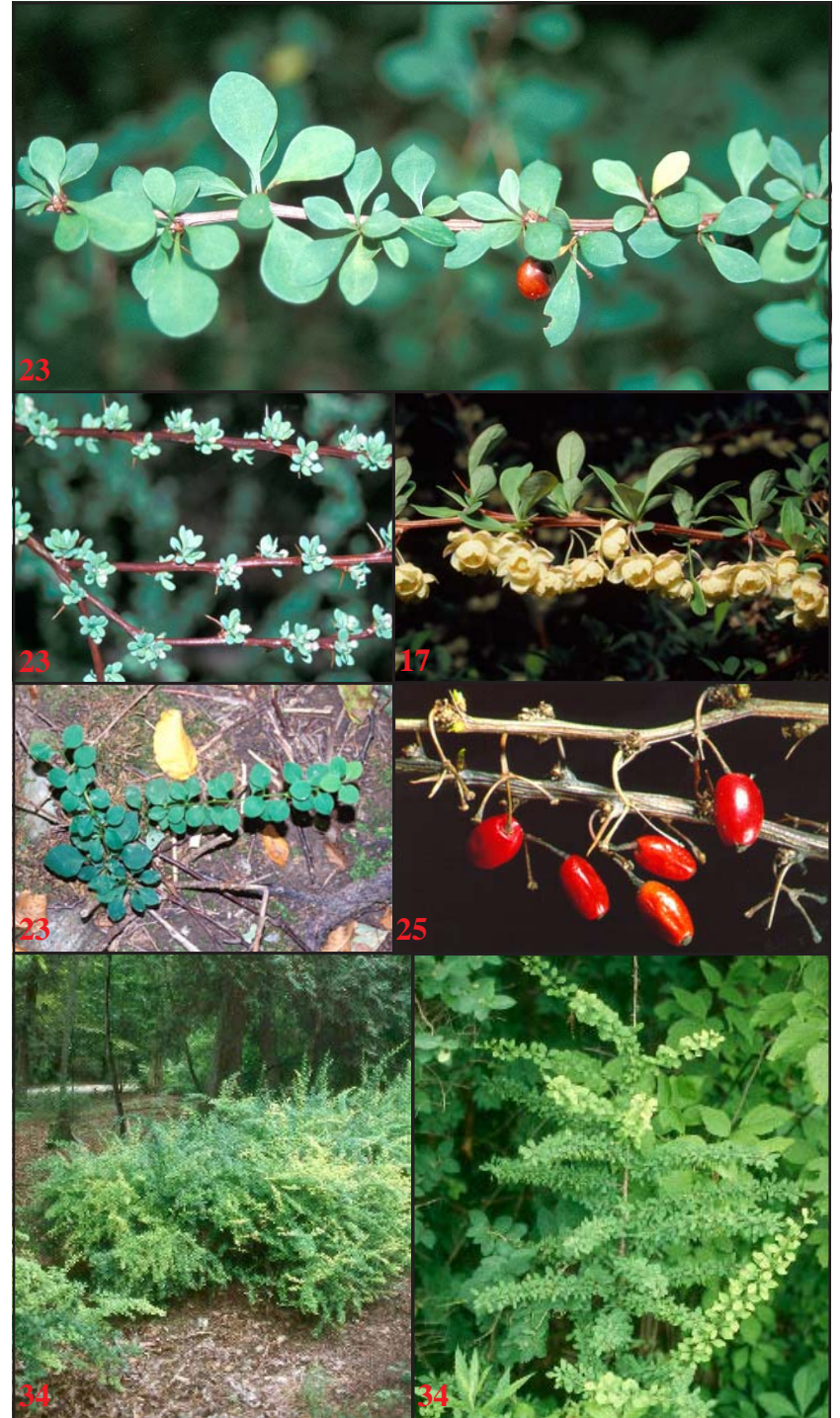
www.forestryimages.org

23. Erich Haber, <http://dnr.wi.gov/invasives/photos/index.asp>

25. Tom Heutte, USDA Forest Service,

www.forestryimages.org

34. David Mindell, Plantwise Native Landscapes



Bladder Campion

Silene cucubalus

Habit: Herbaceous and erect perennial. Bladder Campion is deep-rooted that can reproduce both by seed and vegetatively by sprouting from lateral branches of its deep taproot (rhizomes). Severed root pieces can produce new plants.

Leaves: are lance shaped, waxy, and very variable in size- 3-8cm, attaching to stems in opposite pairs. Leaves have a distinctive center crease.

Stems/Roots: Stems are erect, smooth and hairless, growing up to 50cm tall. There are several branching stems per plant, forming clumps. Stems are swollen where the leaves attach (nodes). Bladder Campion is a deep-rooted plant, reproducing both by seed and vegetatively by sprouting from lateral branches of its deep taproot. Severed root pieces can produce new plants.

Flowers: Flowers consist of five white petals that are deeply lobed or split, and occur in clusters at the ends of stems. The base of the flower (calyx) becomes inflated (bladder-like), veiny and purplish brown as the plant matures. The calyx terminates at the flower with five short, triangular teeth.

Seeds: are light brown in color, kidney shaped and rough serrated seeds about 2-3mm in size. One plant may produce as many as 20,000 seeds.

Habitat: This plant does not appear to flourish in high quality natural habitats, and so its capacity to invade such natural areas is rather low." This statement maybe somewhat true, except for dune systems. Bladder campion is a problem in some high quality shoreline habitats on both Lk Michigan and Huron

Reproduction: The main method of spread is by seed. Large quantities of seed are produced from mid-July through fall. Seed remains viable in the soil for many years. Reproduction from root pieces and severed crown pieces are the secondary means of reproduction.

Similar species: often confused with White Cockle and Night Flowering Catchfly as the flowers are very similar, but Bladder Campion has smooth leaves and stems while the other two are very hairy.

Comments: Bladder Campion is native to Europe and Asia and is thought to have been first observed in the lat 19th century.

Monitoring & Rapid Response: Chemical control is the most effective means of controlling large infestations, although repeated applications will be required. Small infestations may be removed by hand or grubbing; although several treatments will be required to ensure that all viable plant material is removed. Bladder Campion can be prevented from entering your property by ensuring your purchases of machinery, stock, fodder and seed are free of pest plants.

Current Know Distribution: Green= infestation.

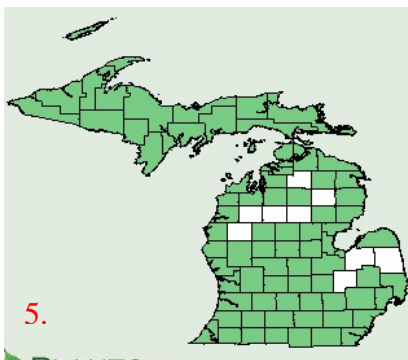


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2. ct-botanical-society.org/.../sileneulg.html
3. www.kuleuven.kortrijk.be/.../?lang=en&detail=357
4. www.omafra.gov.on.ca/.../bladder_campion.htm
5. plants.usda.gov/java/profile?symbol=SILAA3



Black Locust

Robinia pseudo-acacia

Habit: Deciduous medium tree ranging in height from 12-25 m (40-82 ft) and 30-60 cm (12-24 in) in diameter; crown narrow, open, irregular with contorted branches.

Leaves: Pinnately compound with 7-21 leaflets per leaf; alternate, 20-35 cm long; ovate leaflets 2-5 cm long and about half as wide, with smooth margins; hairless, very thin; dull bluish green above paler beneath, turning yellowish brown in the fall.

Stems/Bark: Twigs puberulent, becoming smooth, green to reddish brown, with zigzag shape and two spines at each node; bark is thick, tan to gray-brown, deeply furrowed; inner bark orange.

Flowers: White, 5-petaled, pea-like, very fragrant; raceme of 10-25 on a thin dangling pedicel; bloom May-June.

Fruits/Seeds: Seedpods form in the fall but persist over winter, pods are smooth, dark-brown, flat, and contain 4-8 small, flat, brown seeds.

Habitat: Very shade intolerant; can grow in many soil types except those with a high water table; formerly widely planted in Michigan and now found colonizing old fields, prairies, disturbed forests and woodlands.

Reproduction: By seed; also sprouts easily from roots and forms natural clones.

Similar Species: Honey locust (*Gleditsia triacanthos*) has smaller, more numerous leaflets.

Comments: The nitrogen fixing capacity of this species may alter soil chemistry and subsequent nutrient cycling of forest systems.

Monitoring & Rapid Response: Monitor prairie and woodland edges and paths, particularly on well-drained soils; most visible in May and June while in flower; cutting, girdling and burning are ineffective without herbicide as they stimulate sprouting; mowing stimulates germination of the (black locust) seedbank; treat cut stumps with herbicide; foliar application of bud inhibitor effective on trees under five feet tall; basal bark treatment also effective, may be used in conjunction with girdling.

Current Known Distribution:

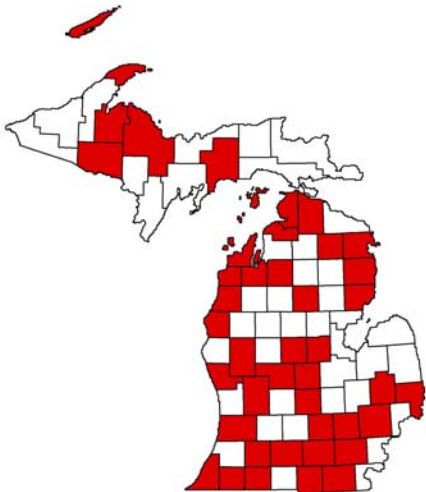


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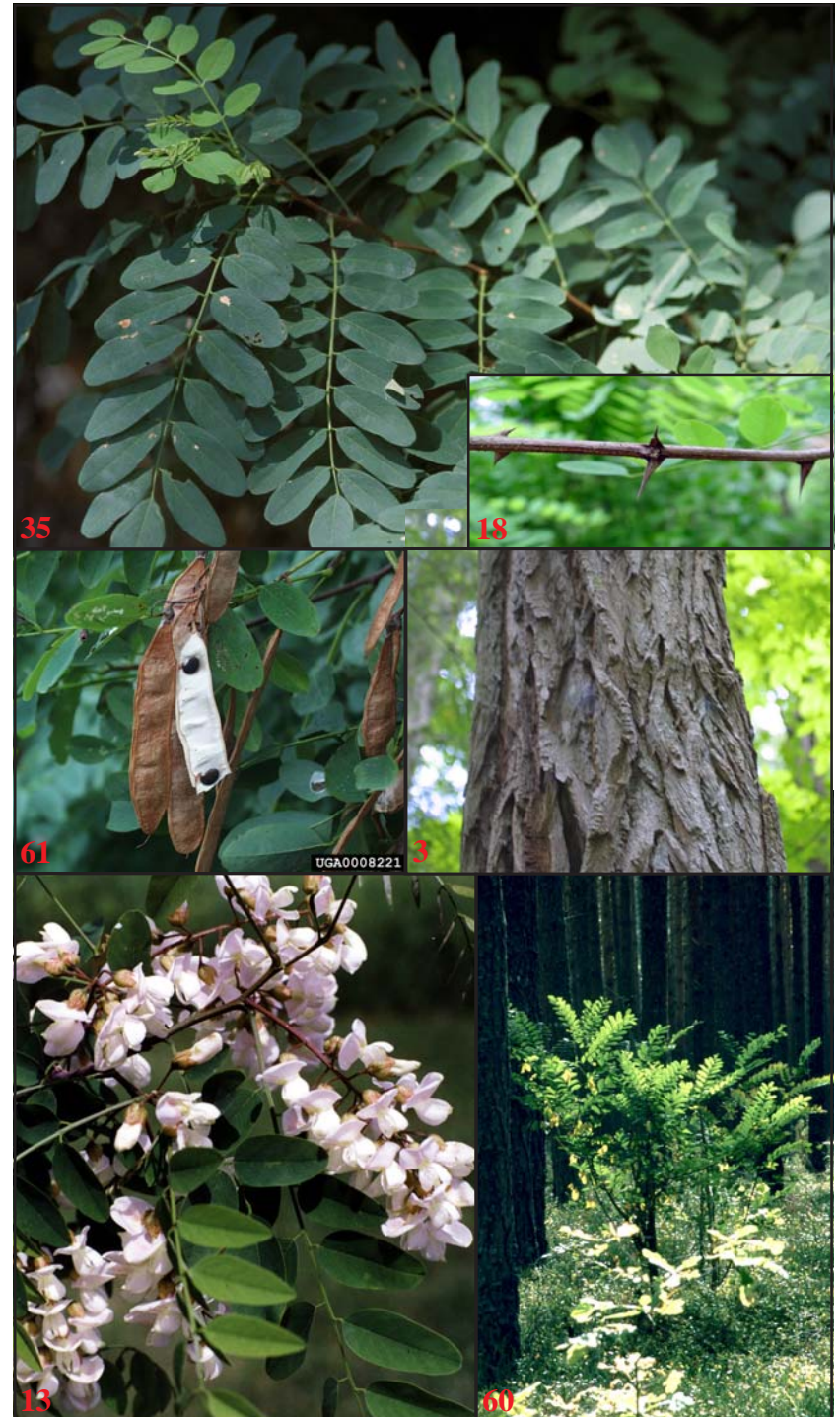
13. Bill Cook, Michigan State University, www.forestryimages.org

18. Chris Evans, The University of Georgia, www.forestryimages.org.

35. James H. Miller, USDA Forest Service, www.forestryimages.org

60. Gil Wojciech, Polish Forest Research Institute, www.forestryimages.org.

61. Paul Wray, Iowa State University, www.forestryimages.org.



Blue Lyme Grass

Leymus arenarius

Habit: Perennial grass which grows to 2-4 feet in height

Leaves: The evergreen leaves are 12 inches long and ½ inch wide, rough, and colored a deep bluish green

Stems/Roots: Stems are upright, bluish green in color. Root system is by rhizomes.

Flowers: Flowers are dense spikes that are blue-green in early summer and turn beige later in the year.

Seeds: Small beige seeds

Habitat: This grass can grow in most habitats, although it prefers well-drained sandy soil and full sun. It can handle extremes of heat and cold, and it is drought resistant. This plant is sold as an ornamental, and is used to control erosion. However, it can quickly become invasive on dunes. Of particular concern in the Great Lakes area is its ability to stabilize naturally shifting sand dunes of the Great Lakes.

Reproduction: Primarily through rhizomes but also through seeds

Similar Species: The blue leaves stand out clearly among the green leaves of the native American dune grass (*Ammophila breviligulata*). Lyme grass also has bigger seeds, tougher blades and stiffer seed stalk.

Comments Because of its attractive evergreen foliage, Blue lyme grass may be used in many places, as a general cover or to control erosion on dune landscapes.

Monitoring & Rapid Response: Mechanical removal is not effective because new plants sprout from rhizomes and root fragments left in the soil. Treating the stems with a glyphosate solution in early spring before other native species emerge is effective. Grass specific herbicides can be used but will also kill native grasses. Repeated applications may be necessary to kill all plants.

Current Known Distribution:

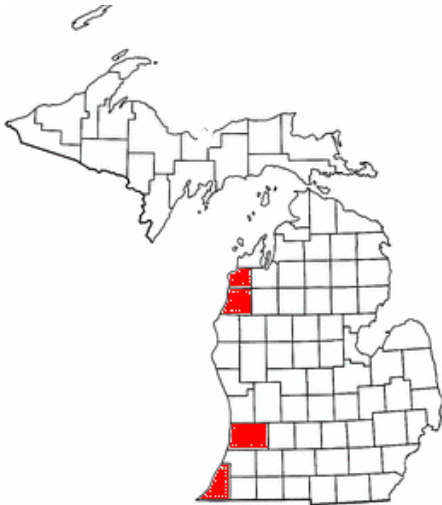
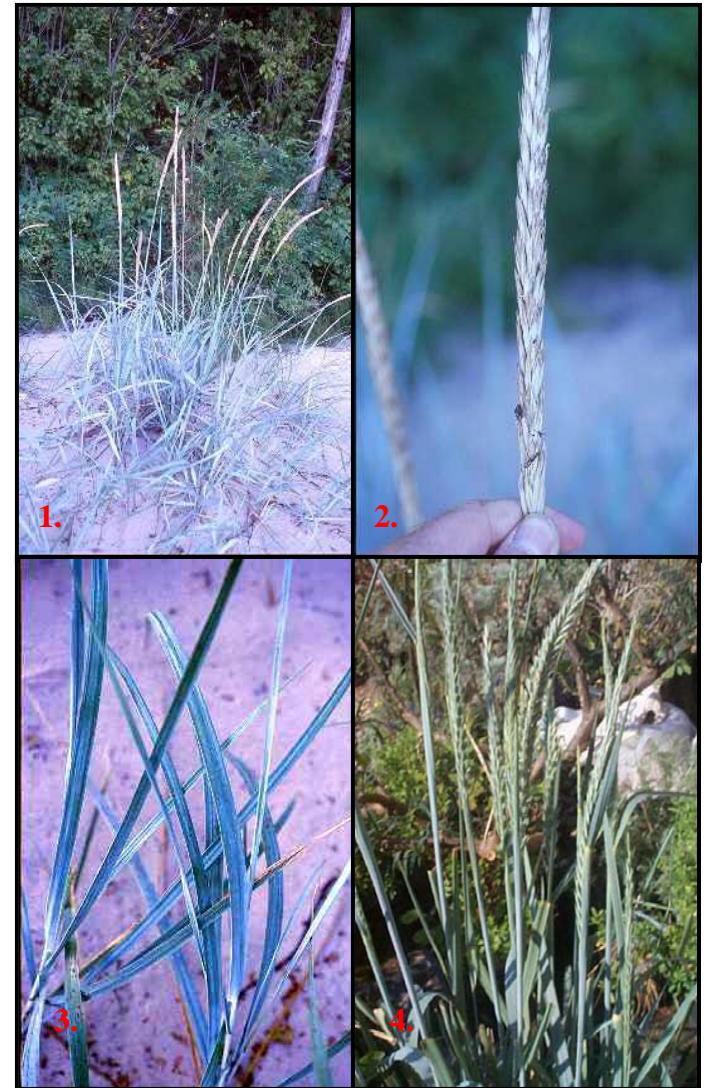


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1-3. Emmet J. Judziewicz,

<http://wisplants.uwsp.edu/scripts/detail.asp?SpCode=LEYARE>

4. <http://thierry.jouet.free.fr/base/couleurs/leymus.htm>



Bull Thistle

Cirsium vulgare

Habit: Annual or biennial, herbaceous plant. It grows between 3 to 6 feet tall with one erect branched stem. It grows a rosette in its first year and bloom with a light-green midrib, smooth and hairless on both sides, coarsely lobed, slightly wavy, and arranged alternates in its second year.

Leaves: Leaves are alternate, dark green on a stem that appears winged. Each lobe ends with a prominent spine.

Stems/Roots: The spiny, spreading, winged stems are up to 7 feet tall. Plants have a fleshy taproot.

Flowers: The terminal flower of musk thistle is large, 1 1/2 to 3 inches in diameter, solitary, and usually nodding or slightly bent over.

Seeds: Numerous straw-colored seeds with plume-like bristles are dispersed by wind. They remain viable in the soil for over 10 years.

Habitat: disturbed areas such as pastures, roadsides, and ditch banks, but also in hayfields and disturbed prairies.

Reproduction: Seed is the primary mechanism for reproduction. Each plant can produce over 10,000 seeds which are dispersed by the wind 7 to 10 days after flowering. Germination may be as high as 95%.

Similar Species: Canada Thistle (*Cirsium arvense*) is smaller (2 to 5 feet tall)

Comments: Bull thistle is native to Europe, western Asia, and northern Africa. It is thought to have been introduced to the eastern United States during colonial times and the western United States in the late 1800s. It is currently found in all 50 states.

Monitoring & Rapid Response: Chemical control is most effective when rosettes are targeted (fall or spring depending on population density and the plant's stage of growth). Mechanical controls can be used to eliminate small populations or plants in a later growth stage. To be effective plants with buds or flowers should be collected and immediately either put in a landfill or destroyed in a method that eliminates seeds. Two exotic weevils, the flower head weevil (*Rhinocyllus conicus*) and the rosette weevil (*Trichosiocalus horridus*) have been introduced in several states, and appear to be effective biological control agents that limit populations of musk thistle.

Current Known Distribution:

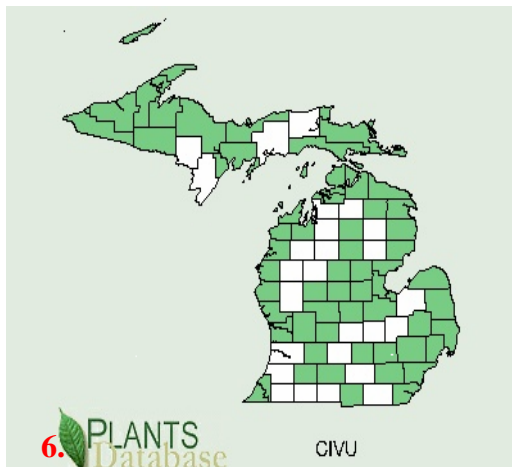


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1. Andy Fyon, www.ontariowildflower.com/wildflower_waste.htm
2. http://www.cnr.uidaho.edu/rx-grazing/Forbs/Bull_Thistle.htm
3. plantsci.sdstate.edu/weeds/noxious.cfm
4. http://www.illinoiswildflowers.info/weeds/plants/bull_thistle.htm
5. <http://dnr.state.il.us/Stewardship/cd/biocontrol/19BullThistle.html>
6. http://plants.usda.gov/java/county?state_name=Michigan&statefips=26&symbol=CIVU



Canada Thistle

Cirsium arvense

Habit: Perennial, rhizomatous thistle ranging in height from 0.6-1.5 m (2-5 ft); forms large monocultures.

Leaves: Simple, alternate, lance-shaped; crinkly, tapering, with irregular lobes and spiny toothed margins.

Stems: Upright, slender and branching towards the top, becoming increasingly hairy with age.

Flowers: Numerous, purple-lavender flowers, small flowerheads (< 2.5 cm high), clustered at the tops of stems, blooms June-September; fragrant.

Fruits/Seeds: Seeds are small, light brown; tufts of hair attached to the tip for wind dispersal; one plant produces between 1500-5000 seeds, which can germinate 8-10 days after flowering begins and persist in the seed bank for up to 20 years.

Habitat: Found in disturbed open areas, roadsides, agricultural fields; invades prairie and riparian areas; salt-tolerant; shade intolerant.

Reproduction: Primarily by creeping, laterally spreading rhizomes, but also by prolific seed production; dioecious, with separate male and female clones; some hermaphroditic forms.

Similar Species: Native swamp thistle (*Cirsium muticum*) - has pink rather than purple flowers and flower heads are sticky.

Comments: Canada thistle was introduced to North America from Europe in the early 1600s; declared a noxious weed in Vermont in 1795.

Monitoring & Rapid Response: Monitor sunny, disturbed sites including degraded grasslands, open woodlands, edge habitats and restoration sites; begin control efforts in highest quality areas; pull seedlings within 2.5 weeks after germination or they become perennial; Canada thistle is clonal; resprouts from root fragments; may require 5-10 years of ongoing efforts to eradicate this species; different strains of Canada thistle respond differently to the same herbicide; herbicides most effective with two applications per season – spring (just before flowering) and fall (on new growth after mowing).

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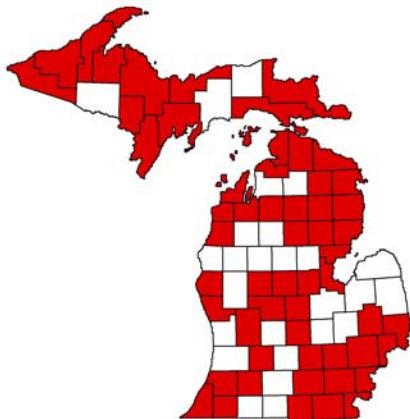
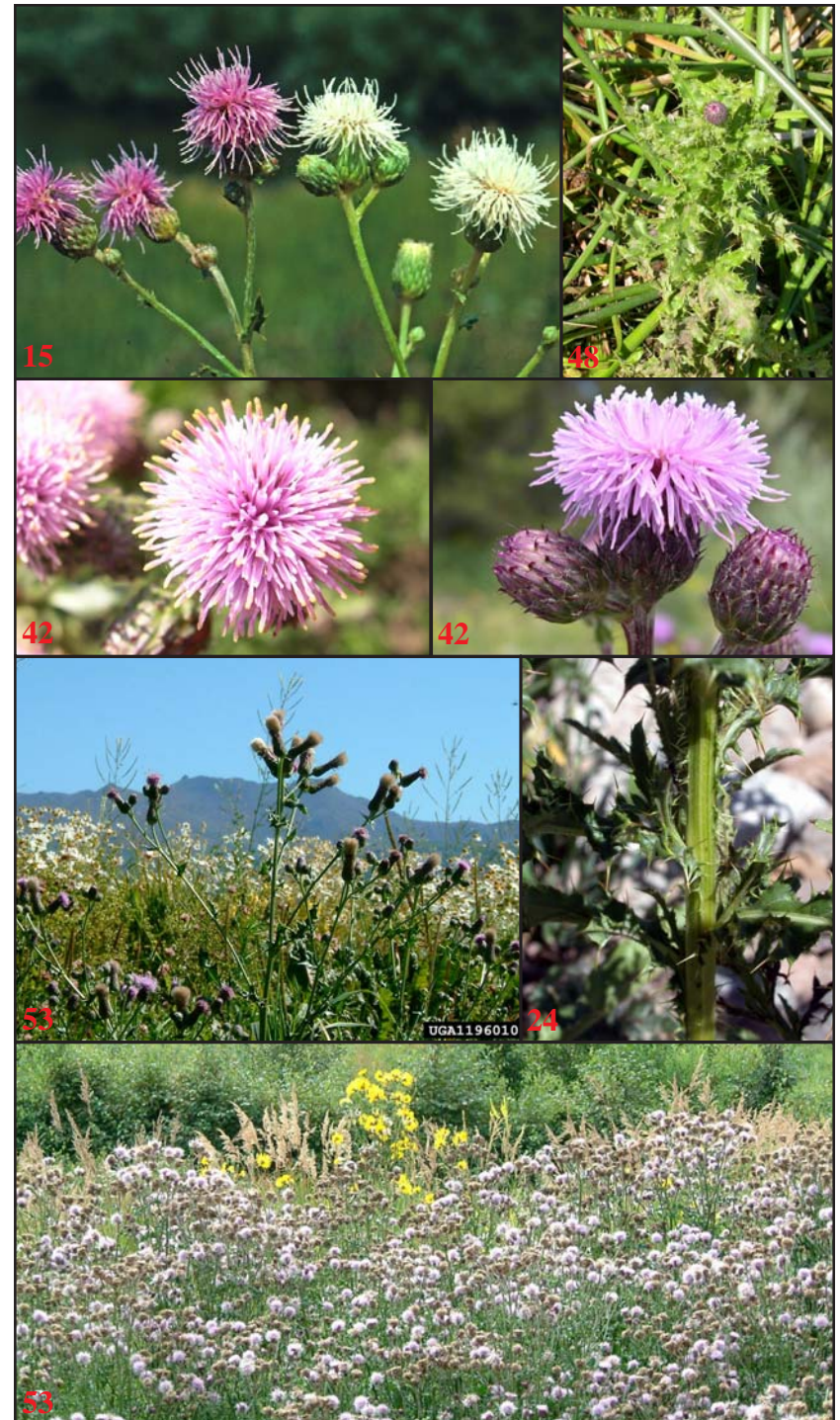


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48. Michael Shephard, USDA Forest Service, www.forestryimages.org
53. UAF Cooperative Extension Archives, University of Alaska - Fairbanks, www.forestryimages.org



Dame's Rocket

Hesperis matronalis

Habit: Showy, biennial or short-lived perennial; ranging between 0.6-1.0 m (2-3 ft) tall; first year plants over-winter as an evergreen basal rosette.

Leaves: Simple, alternate, lanceolate or ovate-lanceolate, toothed margins; downy, with simple hairs above, branched hairs below; leaves become smaller as they ascend the stem.

Stems: Upright, branched, with rough spreading hairs.

Flowers: White, pink, or purple; 4-petaled; borne in terminal clusters; bloom from mid-May through July; fragrant, clove-like aroma in evening.

Fruits/Seeds: Seeds are rounded, dark reddish-brown, 3-4 mm long; held in long, erect pods (siliques), up to 12 cm in length; ripen from June through August.

Habitat: prefers moist, well-drained loams; tolerates light shade but prefers full sun; tolerates high alkalinity; established along roadsides, woodlands, wetlands, old fields and open areas.

Reproduction: By abundant seed production; a single plant produces up to 20,000 seeds.

Similar Species: Phlox (*Phlox divaricata*) - native phlox have five petals.

Comments: Native to Europe; introduced in wildflower mixes; in some areas, has been present at low levels for many years but is now spreading aggressively like its mustard family relative, garlic mustard.

Monitoring & Rapid Response: Dame's rocket is easiest to identify while in bloom during June and July; hand-pull plants while the soil is moist; remove flower and seed heads; do not compost; foliar herbicide applications are effective in early spring or late fall while native species are dormant; control efforts should continue for several years until the seedbank is exhausted.

Current Known Distribution:

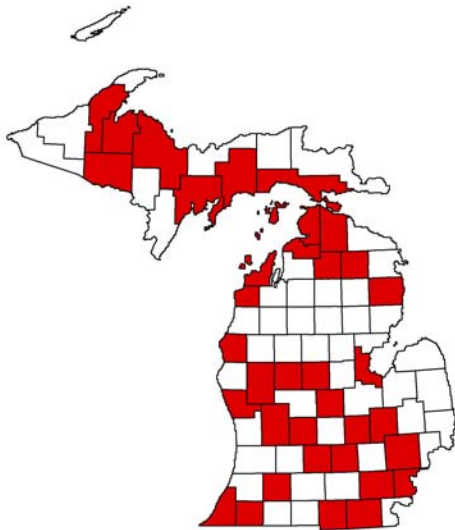


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25. Tom Heutte, USDA Forest Service, www.forestryimages.org



Garlic Mustard

Alliaria petiolata

Habit: Upright, herbaceous biennial growing up to 1 m (3ft) tall.

Leaves: Simple, alternate, triangular, toothed; lower leaves kidney shaped with palmate venation, 2-12 cm long, scalloped edges, arranged in a basal rosette; upper leaves stalked.

Stems: Up to about 1 m (3ft); typically one flowering stem per rosette but may be more.

Flowers: Numerous, small, white, 4-petaled; usually in clusters at the tops of stalks, sometimes in leaf axils; bloom late April-early June.

Fruits/Seeds: Seeds are small, dark brown/black; in long narrow capsules (siliques); one plant can produce up to 3,000 seeds; seeds viable within a few days of flowering and remain viable up to seven years; two germination periods - one in mid-spring and another in late summer.

Habitat: Found in upland and floodplain forests, savannas, along trails, roadsides and disturbed areas; shade tolerant but also found in full sun; spreads rapidly.

Reproduction: Prolific seeding, preferentially outcrosses but may self; produces basal rosette the first year, flowers the second year.

Similar Species: Basal leaves resemble those of *Thaspium*, *Zizia*, *Senecio*, *Viola* spp; fruiting structures similar to other mustards; can be distinguished by garlic odor when crushed.

Comments: All parts smell like garlic when crushed, especially in spring and early summer; dominates the ground layer of forests to the exclusion of almost all other herbaceous species; lacks mycorrhizal fungi needed by woody plants for regeneration.

Monitoring & Rapid Response: Monitor forest edges, paths and floodplains; remove all plants before seed is produced; begin control efforts in highest quality areas; pull seedlings; remove upper half of root or it may resprout; tamp soil thoroughly to minimize recolonization and germination; cut flowering stems at ground level; flowerheads must be removed to prevent seed development; herbicide can be used in early spring and fall, while native plants are dormant; continue control efforts until the seed bank is depleted.

Current Known Distribution:

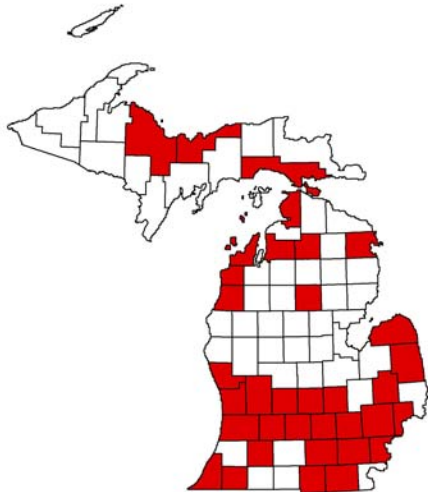
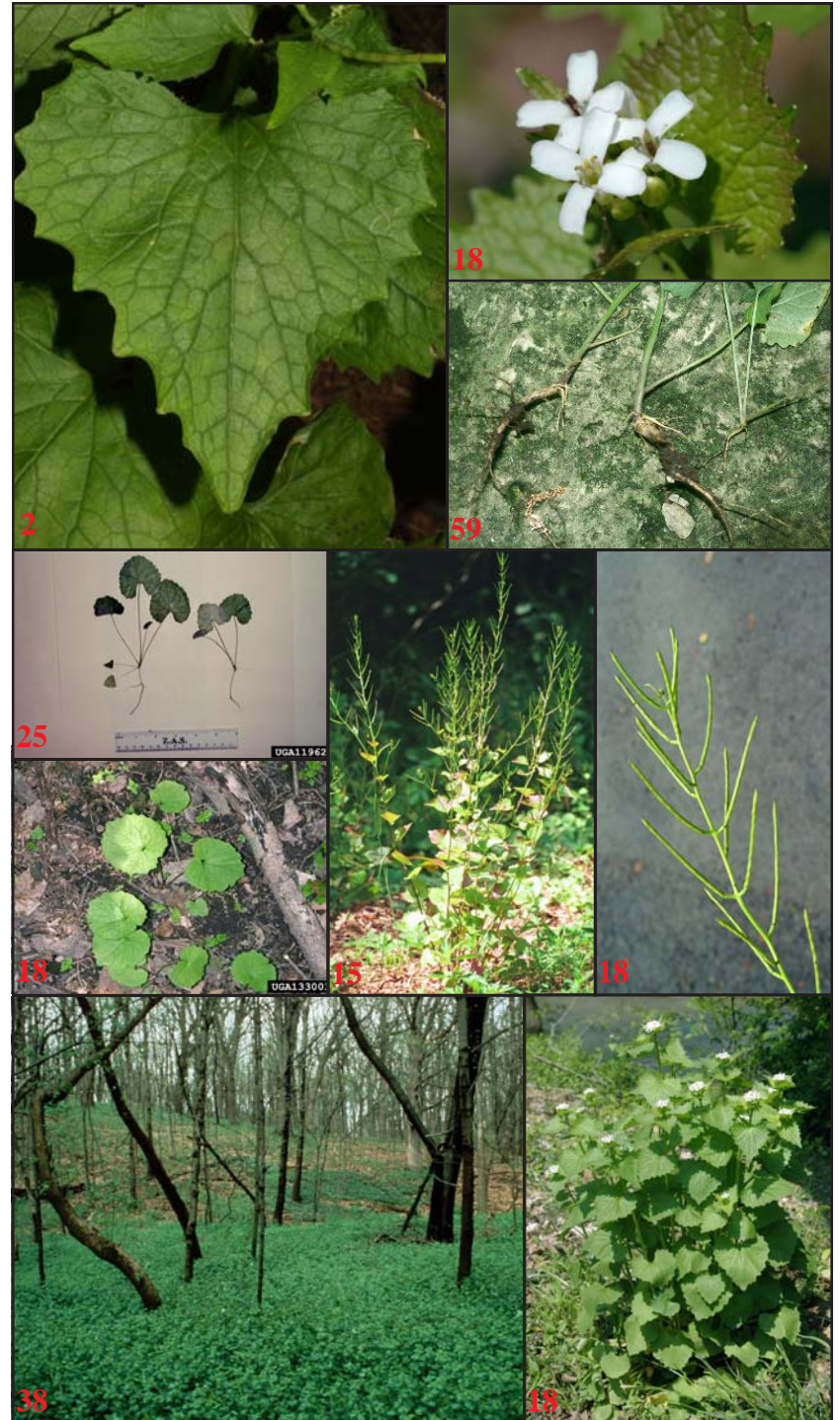


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Giant Reed

Phragmites australis

Habit: Stout, warm-season perennial grass ranging in height from 1.8-3.9 m (6-13 ft).

Leaves: Alternate, flat, smooth leaf blades; 25-50 cm long, 1-3.5 cm wide; hairy ligules; green to grayish-green, yellow-orange in fall.

Stems: Stems upright, rigid and hollow; up to 2.5 cm in diameter.

Flowers: Dense branched clusters on bearded axis at the end of each stem; becoming open and feathery at maturity.

Fruits/Seeds: Seeds with white hairs below that are almost as long as the seed; prolific seeder but seed is not always viable.

Habitat: Native to North America and found around the world; aggressive colonies are thought to be the result of genetic crossing between native and more invasive European varieties. Found in marshes, wetlands, ditches, swales, stream and pond banks.

Reproduction: Primarily through an extensive, aggressive system of horizontal and vertical rhizomes that can live for 3-6 years; rarely by seed establishment.

Similar Species: *Phragmites* is distinctive and much taller than most other grasses. The state threatened wild rice (*Zizania aquatica* var. *aquatica*) though quite tall, lacks the feathery appearance; large non-flowering plants of reed canarygrass (*Phalaris arundinacea*) appear similar but lack hairy ligules.

Comments: Forms dense, impenetrable stands.

Monitoring & Rapid Response: Monitor wetlands, ditches and moist sites, particularly adjacent to areas which receive nutrient rich run-off or road salt; mowing, discing and digging may increase populations; foliar herbicide spraying in late summer provides effective control for large dense stands; may be combined with August mowing and herbicide application of resprouts; for small populations, in July or August, tying large clumps together, cutting off stems and immediately spraying them with herbicide is effective; where controlled flooding is possible, cutting off *Phragmites* shoots and flooding them 3 feet deep for at least 4 months during the growing season may provide control.

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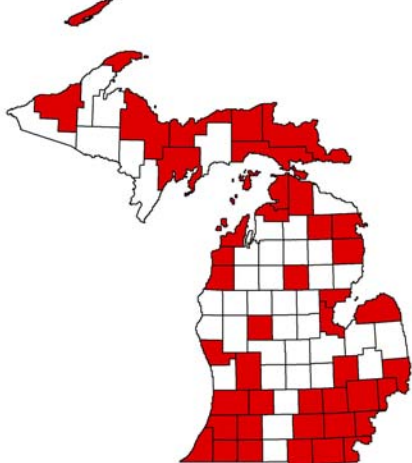
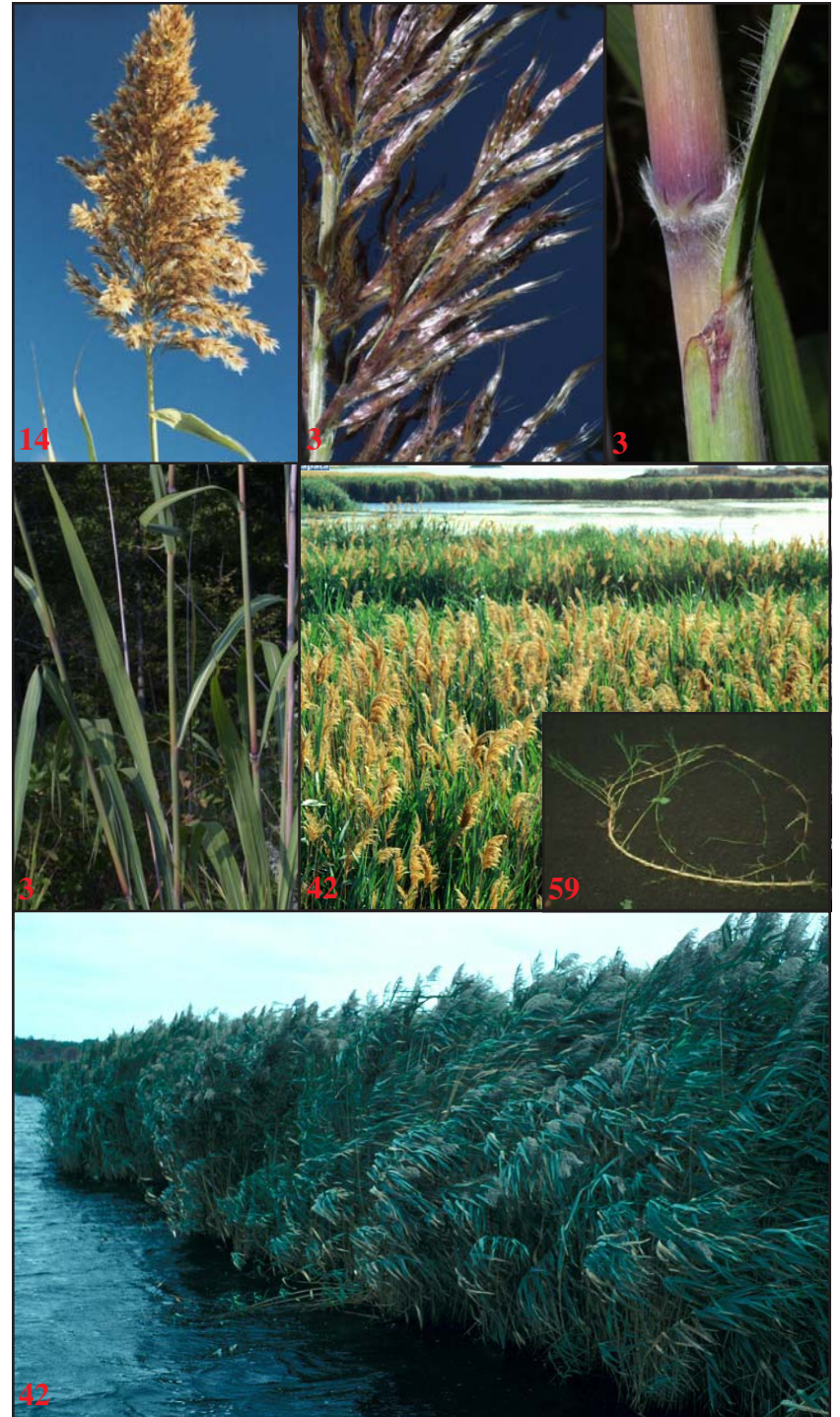


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Glossy buckthorn

Rhamnus frangula (*Frangula alnus*)

Habit: Deciduous shrub or small tree growing up to 6 m (20 ft.) tall, multiple stems at the base, crown spreading, trunk up to 10 inches in diameter.

Leaves: Simple, alternate, oblong, 1-2.5" long, untoothed or crenulate margins, dark green, shiny; smooth or slightly hairy below; veins turn toward tip near leaf margins; leaves present from mid-May to November.

Stems/Bark: Brown-green, hairy, prominent lenticels, chunky bark; terminal buds rust colored; bark gray or brown; sapwood yellow; heartwood pinkish to orange.

Flowers: Small, greenish yellow, four petals, clusters of 2-6; bisexual; blooms late May through September.

Fruits/Seeds: Round, pea-sized, drupes of 3-4 seeds, red, ripening to black/dark purple in July through September; abundant; remain viable in the soil for 2 to 3 years.

Habitat: Sun and shade tolerant; occurs in a variety of soil and moisture conditions; found in pastures, fencerows, roadsides, wetlands, and woodland edges.

Reproduction: Primarily sexual; plants mature quickly; at any given time there can be flowers, partially ripened fruit (red) and fully ripened fruit (black) on the same plant.

Similar Species: Alder buckthorn (*R. alnifolia*) - less than 3' tall, hairless twigs; Lance-leaved buckthorn (*R. lanceolata*) - less than 6' tall, leaves 2-6" long, tapering.

Comments: Rapidly form dense, even-aged thickets, crown spreads laterally; resprouts vigorously.

Monitoring & Rapid Response: Monitor woodland edges and paths on moist soils; buckthorn leafs out early and retains its leaves late into fall; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations, where few natives are present; treat cut stumps with herbicide; basal bark treatment is also effective; monitor site and control new seedlings until the seedbank is exhausted.

Current Known Distribution:

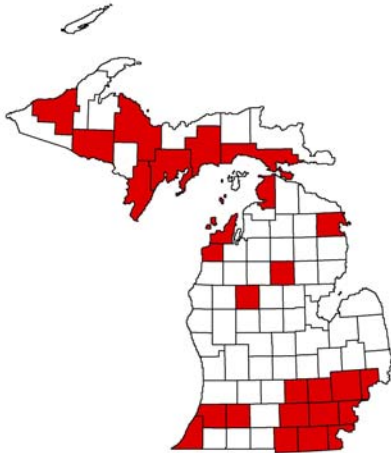


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Japanese Knotweed

Polygonum cuspidatum

Habit: Perennial, herbaceous shrub reaching 3 m (10 ft); although it is larger than many woody shrubs, stems die but stalks persist through winter; growth form is a circular colony with interior plants dying as colony advances outward.

Leaves: Simple, alternate, broad, 8-15 cm long, 5-12 cm wide with an abruptly pointed tip and a flat base.

Stems: Upright, round, hollow, glaucous, often mottled; swollen nodes surrounded by a papery membrane; persistent dead stalks look like bamboo.

Flowers: Numerous, small, green-white flowers on a slender stalk arising from the leaf axils and near the ends of stems; blooms August-September.

Fruits/Seeds: Fruits are 3-winged, 8-9 mm, seeds are dark and glossy; wind and water dispersed.

Habitat: Semi-shade tolerant; found along roadsides, stream and river banks, wetlands, wet depressions and woodland edges; can tolerate a wide array of soil and moisture conditions.

Reproduction: Primarily through rhizomes or fragments; does not reproduce significantly by seed; spread by flood waters

Similar Species: Virginia knotweed (*P. virginianum*) - not shrub-like, flowers on a slender spike.

Comments: Forms dense thickets that shade out natives; aggressive rhizomes can damage pavement; once established, stands are extremely difficult to eradicate.

Monitoring & Rapid Response: Monitor riverbanks, stream and pond edges, particularly downstream from known occurrences; can be identified most readily while in bloom, in August and September; cutting or mowing at least 3 times per season can reduce rhizome reserves; biweekly cutting preferable; foliar herbicide application effective; provides best control when plants have been cut, allowed to resprout to 3' tall and then treated; hand pull seedlings but not larger plants as new colonies can develop from cut stems or rhizomes; continued control efforts are required to keep this species in check.

Current Known Distribution:

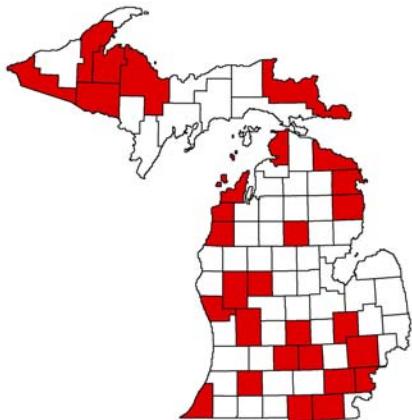


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Leafy Spurge

Euphorbia esula

Habit: Herbaceous perennial ranging in height from 15-92 cm (6-36 in).

Leaves: Simple, alternate, long, narrow, bluish green; usually pointed and drooping with smooth margins; exude white milky sap when crushed.

Stems/Roots: Upright stems that branch towards the top of the plant; dry stems may persist into the winter and following summer; stems also release white, milky sap when broken; deep taproot, up to 3.5-4.5 m (12-15 ft) deep; tough, woody extensive root system that may spread laterally up to 10 m (35 ft); large root reserves allow plant to recover from most disturbances.

Flowers: Small, yellowish-green flowers with fused petals forming a cuplike structure; bloom mid-June to late-July.

Fruits/Seeds: Smooth, oblong, gray-brown seeds; one plant can produce up to 200 seeds; high germination rate; viable up to 8 years with adequate moisture.

Habitat: Roadsides, prairies, savannas, gravel pits, open areas.

Reproduction: By prolific seed production and long distance seed dispersal (up to 4.5 m); also spreads rapidly through its persistent root system from crown and root buds that overwinter under the soil surface.

Similar Species: Flowering spurge (*Euphorbia corollata*) - has white flowers and erect leaves; non-native Cypress spurge (*Euphorbia cyparissias*) has stem leafblades less than 2.5mm wide.

Comments: Classified as noxious in Iowa, Minnesota, and Wisconsin.

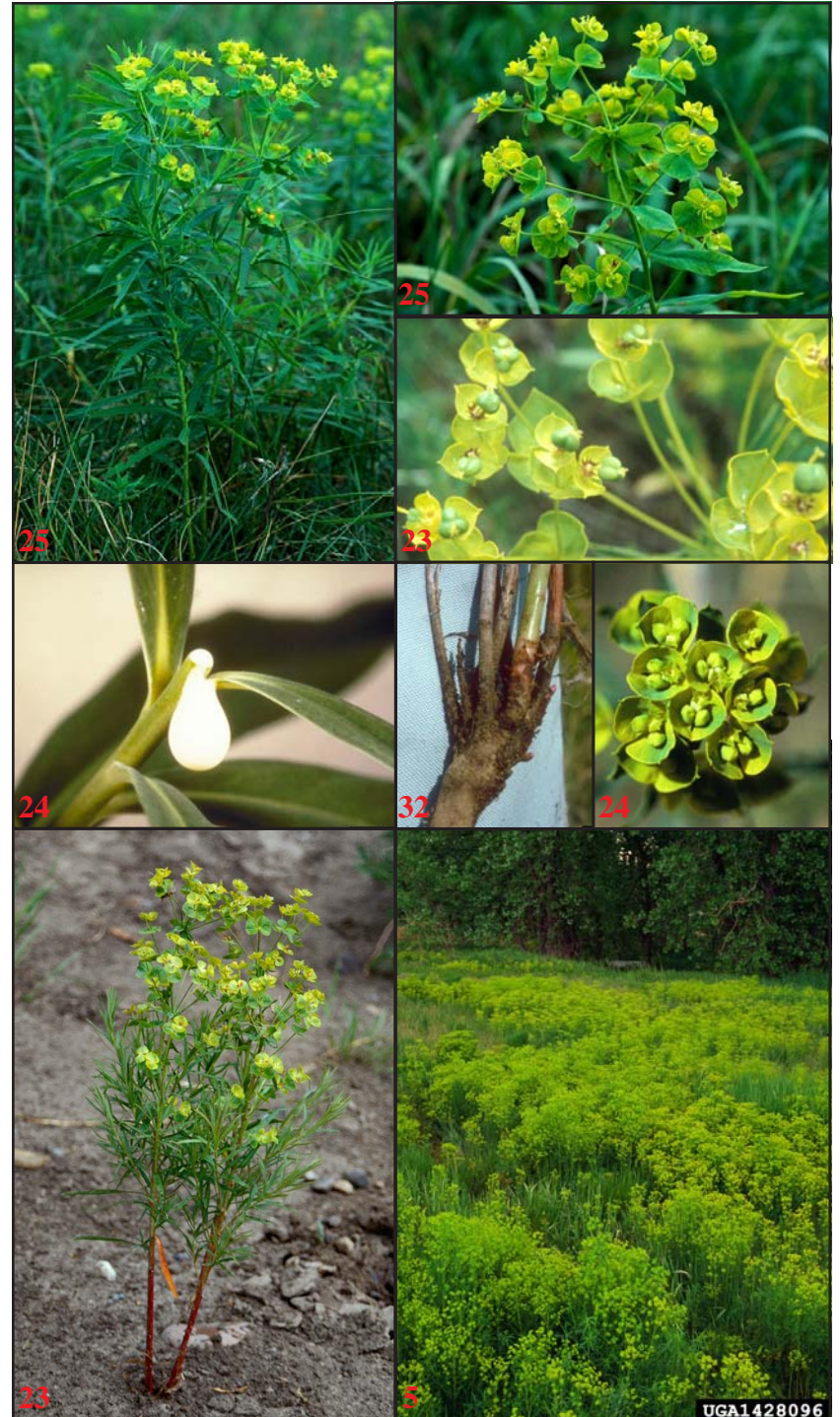
Monitoring & Rapid Response: Monitor open sites and woodland edges; early detection is critical; leaves out early in spring; bright yellow-green bracts appear in late May or early June, seedlings develop buds w/in 7-10 days of emergence; long shoots spread laterally (up to 4.8 m deep); pulling, digging, burning and tilling may cause increase; foliar herbicide application provides effective control of small occurrences; surveillance and control efforts needed for 5-10 years; biological control agents undergoing research currently.

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UGA1428096

Multiflora Rose

Rosa multiflora

Habit: Deciduous, dense, perennial shrub growing up to 5 m (16 ft) tall and 2.7-3.9 m (9-23 ft) wide, with long, slender, arching branches.

Leaves: Alternate, pinnately compound with 5-11 leaflets; leaflets 2.5 cm long and finely toothed; base of leaf with a fringed appendage (stipule).

Stems: Green-reddish, arching, rigid with re-curved thorns.

Flowers: Numerous, white or slightly pink, 5-petaled, 1-4 cm wide; arranged in a panicle; bloom May-June.

Fruits/Seeds: Fruits are small, clustered, hard, smooth, red, rose hips that appear in September-October and last into winter; seeds yellowish and dispersed by birds and mammals, remain viable for 10-20 years.

Habitat: Found along roadsides, pastures, disturbed areas, forests and streambanks; tolerates a variety of soil conditions; prefers open, well-drained sites.

Reproduction: By seed; also by horizontal stems that root at the node and shoots that root at the tips.

Similar Native Species: Several native species of *Rosa*; native roses usually have pink flowers and do not have fringed stipules.

Comments: Introduced from Japan and Korea in the 1800s; later promoted to control soil erosion, as a living fence and for wildlife food and cover; vulnerable to Japanese beetles and a number of other pests and diseases.

Monitoring & Rapid Response: Monitor paths, edges and open areas; dig out small plants after tops have been cut and removed; remove all roots; cutting or mowing several times throughout the growing season for several years may reduce populations; treat cut stems with herbicide; basal bark treatment effective - spray bottom 18 inches of all stems; foliar application of bud inhibitor (effective only on woody species) causes dieback the following year; foliar herbicide application effective but may injure non-target species.

Current Known Distribution:

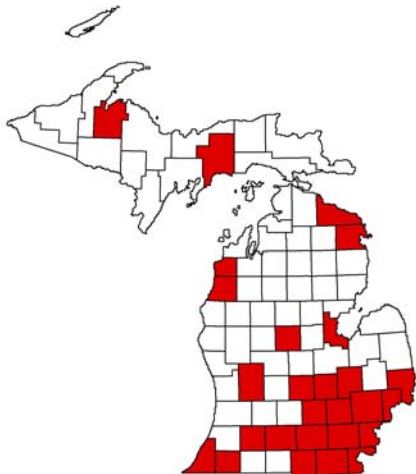


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Purple Loosestrife

Lythrum salicaria

Habit: Herbaceous, perennial, stout, erect, 0.5 to 2.0 meters in height, densely pubescent, especially the upper part of the plant, pubescence can be variable; strongly developed taproot which becomes woody with plant maturity.

Leaves: Leaf shape variable, lanceolate to almost linear, opposite or whorled; sessile to somewhat clasping; 3-10 cm with larger leaves at the base.

Stems: Four-angled; glabrous to pubescent.

Flowers: Numerous, purple, white or light pink, terminal spike-like inflorescences in axillary clusters of two to several; bract and floral tube pubescent; 5-7 petals about 7-11 mm long; petioles red-purple, 7-12 mm; stamens mostly 12; blooms July to October.

Fruits/Seeds: Capsule with small seeds; prolific seed production.

Habitat: Shade intolerant but can tolerate up to 50 percent shade; found in marshes, bogs, shores, borders of rivers and streams, ditches, other disturbed wet soil areas; tolerates a wide range of soils but prefers high organic soils.

Reproduction: By seed, or vegetatively by resprouting from cut stems and regenerating from pieces of root stock.

Similar Species: Native: winged loosestrife (*Lythrum alatum*) - has solitary flowers borne in axils of small bracts; petals 4-7 mm long; leaves are larger toward base of plant; fireweed (*Epilobium angustifolium*) has 4-petaled flowers and leaves taper at base.

Comments: Attractive but persistent weed; spreads vigorously in moist soil conditions; crowds out native wetland plant species.

Monitoring & Rapid Response: Monitor wetlands, lake and stream banks, and ditches in July and August when plants are in bloom; hand pull seedlings; remove all flower and seed heads; foliar spraying with herbicide after peak bloom (late August) provides effective control but may damage non-target plants; a biological control, the *Galerucella* beetle, provides effective control (on smaller populations the beetle colonies may die out).

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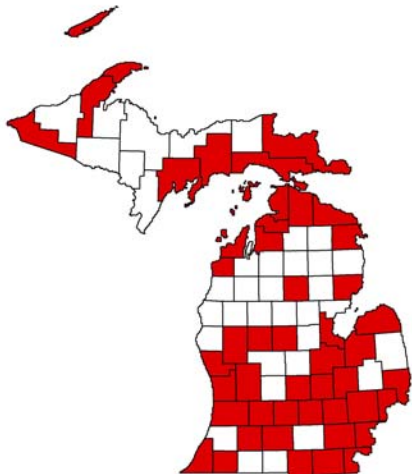


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Reed Canarygrass

Phalaris arundinacea

Habit: Cool-season, colonial, perennial grass ranging from 0.7-2.4 m (2.5-8 ft) tall; forms dense monotypic stands.

Leaves: Flat leaf blades; rough in texture; 1.9-2.6 cm wide and up to 45 cm long; top blades are horizontal with a prominent transparent ligule.

Stems/ Roots: Stems are upright; bluish-green in color. Root system is a thick, fibrous mat of rhizomes.

Flowers: Found in crowded, branched clusters at the end of each stem. Flower clusters dense and spike-like at immaturity, spreading open at maturity.

Fruits/Seeds: Small, shiny brown seeds; dispersed by water, humans, animals and machinery.

Habitat: Native to temperate regions of North America and Europe; most colonies found throughout the Midwest are thought to be escapes of cultivated and European varieties; widely planted for erosion control, now found throughout wetlands, ditches, stream and pond banks, and wet meadows.

Reproduction: Primarily through dense, mat-forming, spreading rhizomes; also by seed.

Similar Species: Native blue joint grass (*Calamagrostis canadensis*) occurs in many of the same sites but is draping rather than upright.

Comments: Reed canarygrass is a cool-season grass.

Monitoring & Rapid Response: Monitor moist, fertile sites and wetlands; most visible in spring when inflorescences expand to facilitate pollination; all control methods require ongoing monitoring and follow-up for 5-10 years until seedbank is exhausted; for small populations, in July or August, tying large clumps together, cutting off stems and immediately spraying them with herbicide is effective; root fragments may resprout; burning, mowing, discing and plowing must be ongoing - one-time efforts may increase population; can be effectively combined with herbicide or flooding where possible; herbicide provides effective control; reseeding beneficial.

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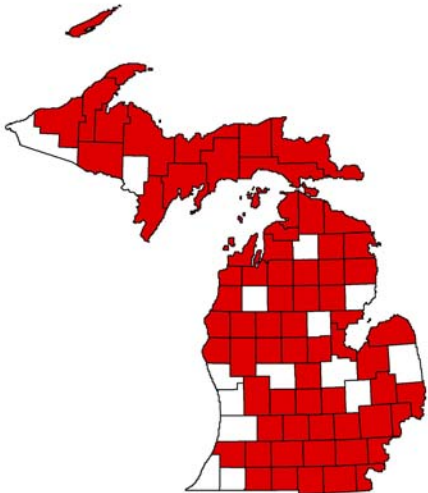


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Spotted Knapweed

Centaurea maculosa

Habit: Short-lived herbaceous biennial or perennial reaching 0.6-1.2 m (2-4 ft).

Leaves: All leaves pale or grayish green with rough fine hairs; basal leaves form a rosette which may persist for up to four years; basal and lower stem leaves up to 15 cm long; leaflets deeply divided to irregularly lobed, tapered at both ends; upper stem leaves smaller (2-7 cm in length) with few lobes or smooth margins.

Stems: 1-7 upright rough stems that branch towards the upper half of the plant.

Flowers: Numerous, pink-purple, terminal solitary flowers at the end of each stem; phyllaries with dark tips and fringed margins; bloom from July-September.

Fruits/Seeds: Small brown wind-dispersed seeds; germinate throughout the growing season; remain viable for up to nine years.

Habitat: Roadsides and right-of-ways, old fields, pastures, undisturbed dry prairies and oak and pine barrens.

Reproduction: By prolific seed production and to a lesser extent by lateral roots.

Similar Non-Native Species: Russian knapweed (*Centaurea repens*), diffuse or white-flowered knapweed (*C. diffusa*), black knapweed (*C. nigra*), brown knapweed (*C. jacea*), short-fringed knapweed (*C. nigrescens*), and yellow star thistle (*C. solstitialis*). The best way to distinguish spotted knapweed is by the dark tips and fringed margins of its phyllaries.

Comments: A serious threat to western rangelands; may cause skin reactions in some individuals.

Monitoring & Rapid Response: Monitor well-drained, sunny sites – knapweed is recognizable throughout the growing season; wear gloves, long pants and sleeves to prevent skin contact; begin control efforts in highest quality areas; pull or dig plants in small infestations; remove entire root; remove flower/seed heads from site; tamp down soil; foliar herbicide spraying of rosettes is most effective (before stem elongation); continue control annually until the seedbank is exhausted.

Current Known Distribution:

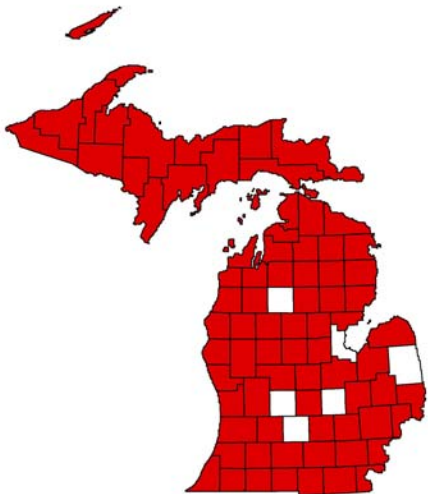


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Tartarian Honeysuckle

Lonicera tatarica

Habit: Deciduous upright to spreading shrub growing to 3 m (9 ft) tall; shallow roots.

Leaves: Simple, opposite, oval to oblong, short, hairless, leaves with pointed tips; 3-6 cm long and 2-4 cm wide with smooth margins; dark green above and paler beneath; early leaf out, long growing season.

Stems/Bark: Twigs are slender, brown to reddish with brown pith; multiple stems; numerous arching branches; older branches often hollow; bark is light gray, somewhat exfoliating.

Flowers: Small, pink to white, tubular, fragrant, paired flowers on long (1.5-2.5 cm) stalks arising from the leaf axils; bloom May-June.

Fruits/Seeds: Abundant, red or orange paired berries.

Habitat: Sun and shade tolerant; occurs in a variety of soil and moisture conditions; commonly found along roadsides and on disturbed sites; invades forest, savannas and prairies.

Reproduction: By seeds; dispersed by birds.

Similar Species: Canada honeysuckle (*L. canadensis*), American fly honeysuckle (*L. involucrata*), fly honeysuckle (*L. oblongifolia*) and swamp fly honeysuckle (*L. villosa*).

Native honeysuckles are relatively short, sparse shrubs as compared to non-native species.

Comments: Invades woodlands and disturbed habitats; found near large urban areas and in rural areas where it was planted for wildlife food and cover; forms dense thickets in a forest under-story, shading out herbaceous plants, reducing tree and shrub regeneration and decreasing overall plant diversity.

Monitoring & Rapid Response: Monitor sunny, upland sites and open forests in spring as honeysuckle leafs out well before native species; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations where few natives are present; treat cut stumps with herbicide; basal bark treatment is also effective - spray bottom 18 inches of all stems.

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Tree of Heaven

Ailanthus altissima

Habit: Deciduous small to large tree; 12-20 m (40-65 ft) tall and 60-100 cm (24-40 in) in diameter; crown wide-spread with multiple branches.

Leaves: Pinnately compound with 11-30 lance-shaped leaflets per leaf; alternate; large - 30-90 cm long; entire, except for 1-5 small gland tipped teeth near the base; dark green above, pale green below, turn yellow in fall; unpleasant odor resembling rancid peanut butter when crushed.

Stems/Bark: Twigs very stout, light to dark brown, smooth with large V-shaped leaf scars; bark thin, gray to brownish gray, smooth with shallow fissures appearing on older trunks

Flowers: Small; yellow-green; 5-petaled; borne in dense clusters near ends of upper branches; bloom in late spring; male and female flowers on different plants; pollen has an offensive odor.

Fruits/Seeds: Two-winged papery, flat, samara with a single seed in the middle; develop in clusters on female trees in fall; may remain on tree through winter; germinate readily; dispersed by wind, birds and water.

Habitat: Shade intolerant; thrives in poor soils; found in disturbed soils, fence rows, fields, roadsides, woodland edges, forest openings and rocky areas; very fast growing.

Reproduction: By seed and vegetatively via root suckering, up to 350,000 seeds produced annually by a single plant.

Similar Species: Native - sumacs (*Rhus glabra*, *R. typhina*); walnuts (*Juglans nigra*, *J. cinerea*) - crushed leaves or broken stems of these plants lack rancid peanut butter aroma.

Comments: Extensive cloning; allelopathic properties present.

Monitoring & Rapid Response: Monitor edges, paths; hand pull seedlings before taproot develops (< 3 months) as taproot fragments may resprout; resprouts following cutting, girdling, mowing, burning - follow-up treatment required; girdling followed by herbicide most effective; treat cut stumps with an herbicide - most effective in late spring & all stems in a clone must be treated; basal bark/stem sprays with herbicide provide good root kill, particularly in fall; foliar herbicide spray is effective on small trees.

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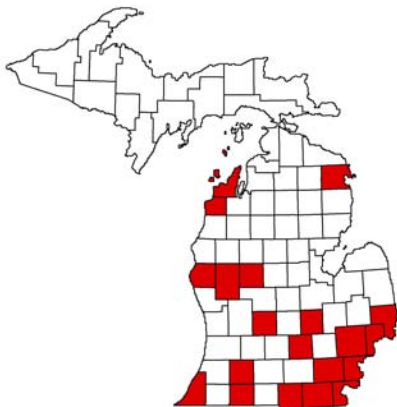


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