

A FIELD GUIDE TO TERRESTRIAL INVASIVE PLANTS IN WISCONSIN



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Prohibited=P	Restricted=R	Prohibited/Restricted=P/R	Not Regulated=N

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Prohibited=P

Restricted=R

Prohibited/Restricted=P/R

Not Regulated=N

Introduction to the Field Guide

There has long been a need for a photographic field guide providing basic information on the major terrestrial invasive plants in Wisconsin. With the development of the Wisconsin Invasive Species Identification, Classification and Control Rule – NR 40, Wisconsin has, for the first time, a legal list of invasive species including 60 plants that are featured in this guide. Also featured in this guide are some species that are not regulated under NR 40 as of September 2009 for various reasons. They were included because they have been observed to be invasive in parts of Wisconsin or in other regions of the U.S. that are similar to Wisconsin.

The bulk of this guide is made up of photos and text to describe species including characteristics to aid in identification, characteristics to tell the invasive species apart from look-alike species, and control information.

To supplement the control information we have provided Appendix B which has an overview of control methods, a list of herbicides referenced in the text, guidance for prioritizing control work, suggested timing of controls for select species, and suggested mowing times for select species.

Appendix A contains additional species regulated by NR 40 with photos that are helpful for identification, but no text, as they are unlikely to be found by most users of this guide. These species are either not yet known in the state or are known to be in very restricted areas. If you suspect you have found one of these species or any of the prohibited species, please report them to the Wisconsin Department of Natural Resources (DNR) as instructed on page 2.

NR 40 Invasive Species Identification, Classification and Control Rule

To assist with minimizing the introduction and spread of invasive species in Wisconsin, the state legislature authorized the Wisconsin DNR to develop a comprehensive invasive species program and rule to identify, classify, and control invasive species. The rule became effective September 2009. It establishes a science-based assessment and classification system designed to help Wisconsin DNR staff and others prioritize their actions regarding invasive species to be more efficient and cost-effective by ensuring that energy and resources are spent on those species and populations with the greatest likelihood of harm and the greatest opportunity for control. The rule provides flexibility allowing citizens, businesses, and governments to continue operations without undue restrictions.

The rule establishes two legal categories—"prohibited" and "restricted." For each species there is a map indicating how and where the species is regulated.

Prohibited species ("P") (red maps) are not currently found in Wisconsin, with the exception of small pioneer stands. They may not be transported, possessed, transferred (including sale), or introduced. The goal is to contain prohibited species wherever they may be found in the state.

Reporting prohibited species: When prohibited species are found, the Wisconsin DNR should be contacted immediately at 608-267-5066 or at invasive.species@wi.gov. In addition, a voucher specimen should be collected and sent to the Wisconsin State Herbarium for identification. Instructions for how to collect a useful voucher specimen can be found on the web at <http://dnr.wi.gov/invasives/voucher.htm>. You may also send photos of suspected prohibited species to the Wisconsin DNR for identification in addition to, or in lieu of, sending a voucher specimen to the herbarium.

Restricted species ("R") (orange maps) are already established in the state. They may not be transported, transferred (including sale), or introduced. If they are already on your property, you are encouraged, but not required, to remove them.

Some species are split-listed ("P/R"). A split-listed species is prohibited in areas of the state where it is not known to be established and restricted in areas where it is known to be established. The maps for these species show where in Wisconsin each species is prohibited (red) or restricted (orange).

People should take reasonable precautions to minimize the spread of regulated (ie. prohibited and restricted) species, such as following Best Management Practices for invasive species (see page 5). If reasonable precautions are taken, incidental or unknowing transport, transfer, or introduction may not be a violation. Regulated species may be possessed and transported for education, identification, control, and disposal. Permits may be available for other purposes such as research.

Some species that are not regulated ("N") (white maps) as of September 2009 were included in this guide because they have been observed to be invasive in parts of Wisconsin or other regions of the U.S. that are similar to Wisconsin. It is not necessary to report these species; control is encouraged but not required.

Aquatic Invasive Plants Regulated by NR 40: The invasive species rule (NR 40) lists aquatic as well as terrestrial invasive plants. Although this guide focuses on terrestrial invasive plants, we have provided (below) a list of regulated aquatic invasives for reference. Additional information on these species can be found at <http://dnr.wi.gov/invasives/classification/>.

Australian swamp crop (<i>Crassula helmsii</i>) - P	Flowering rush (<i>Butomus umbellatus</i>) - R
Brazilian waterweed (<i>Egeria densa</i>) - P	Hydrilla (<i>Hydrilla verticillata</i>) - P
Brittle waternymph (<i>Najas minor</i>) - P	Oxygen-weed, African elodea (<i>Lagarosiphon major</i>) - P
Curly-leaf pondweed (<i>Potamogeton crispus</i>) - R	Parrot feather (<i>Myriophyllum aquaticum</i>) - P
Eurasian water milfoil (<i>Myriophyllum spicatum</i>) - R	Water chestnut (<i>Trapa natans</i>) - P
European frog-bit (<i>Hydrocharis morsus-ranae</i>) - P	Yellow floating heart (<i>Nymphoides peltata</i>) - P
Fanwort (<i>Cabomba caroliniana</i>) - P	

Species Regulation Map Key



Prohibited=P



Restricted=R



Prohibited/Restricted=P/R



Not Regulated=N

More details on the Wisconsin Invasive Species Identification, Classification and Control Rule - NR 40 can be found at <http://dnr.wi.gov/invasives/classification/>

Best Management Practices for Invasive Species

A diverse set of stakeholders under the direction of the Wisconsin Council on Forestry developed voluntary Best Management Practices (BMPs) to prevent the introduction and spread of terrestrial invasive plants, insects, and diseases. Separate but related sets of BMPs were developed for the forest industry, outdoor recreational users, urban forests, and transportation and utility rights-of-way. Some examples of BMPs include:

- Plan activities to limit the potential for the introduction and spread of invasive species.
- Avoid traveling through or working in small, isolated populations of invasive plants.
- Clean equipment, shoes, and clothing upon leaving infested areas.
- Minimize soil disturbance.
- Do not plant known invasive plants.
- Inform and educate users of an area about common invasive species.
- Provide invasive species training opportunities for staff, contractors, and volunteers.



For more information and to learn how you can follow BMPs to limit the introduction and spread of invasive species please go to <http://council.wisconsinforestry.org/invasives/>

Black locust *Robinia pseudoacacia*



T-1

Black locust *Robinia pseudoacacia*



N

A fast-growing tree in the legume family, black locust grows 30-90' tall with a trunk up to 4' in diameter. It forms large, multiple-stemmed clones that can occupy acres. Seedlings and small branches have paired thorns. The bark is smooth and green on saplings, but dark with deep furrows on mature trees.

Leaves: Alternate; pinnately compound with 7-21 leaflets arranged in pairs, with one unpaired leaflet at the tip; leaflets are entire, narrowly oval, bluish green above and pale beneath; leaves are slow to emerge in the spring.

Flowers: White; pea-like; very fragrant; in showy, drooping inflorescences. Blooms in mid-spring.

Fruits & seeds: Flat, shiny, brown pods contain 4 to 8 seeds; 2-6" long; often persist on tree through winter.

Roots: Extensive system of fibrous roots and shallow rhizomes; reproduces vegetatively by root suckering and stump sprouting.

Ecological threats:

- It invades forests, prairies, oak savannas, pas-

tures, fields, and roadsides. It forms extensive, dense groves of clones that exclude native vegetation including canopy trees.

- Damage to roots or stems (such as from fire, wind, cutting, or disease) stimulates vigorous sprouting, root suckering, and lateral spread.

Control:

- **Manual/Mechanical:** Neither cutting nor girdling alone are effective to kill a clone; they stimulate stump and root sprouting or suckering. Burning and mowing can temporarily control the spread of young shoots from a parent tree or clone; however both can promote seed germination and stimulate sprouting.

- **Chemical:** All black locust stems in a clone must be treated for chemical treatment to be effective. Foliar spray if under 8' tall with clopyralid, metsulfuron-methyl, aminopyralid, or fosamine ammonium. Basal bark treat if over 8' tall and under 4" DBH with triclopyr. Chainsaw girdle or cut and treat if over 8' tall and over 4" DBH with triclopyr ester, clopyralid, glyphosate, or fosamine ammonium from late summer into the dormant season.

Common buckthorn *Rhamnus cathartica*



T-2

Common buckthorn *Rhamnus cathartica*



R

Common buckthorn is a shrub or small tree growing up to 20-25' tall, often with several stems and a spreading crown. Its bark is gray to brown with prominent light-colored lenticels. Cut branches reveal yellow sapwood and orange heartwood. Twigs often end in small sharp spines.

Leaves: Mostly opposite; 1-2.5" long; ovate or oval with tiny teeth and prominent veins curving toward tip; stay green into fall.

Flowers: Inconspicuous but fragrant; small; greenish yellow; 4-petaled; and clustered in leaf axils; dioecious. Blooms May-June.

Fruits & seeds: Female trees produce abundant clusters of round, black, pea-sized fruit which ripens in late summer.

Roots: Extensive fibrous root system.

Similar species: Native plums and cherries have a similar bark. Alder buckthorn (*Rhamnus alnifolia*; native) is under 3' tall with spineless twigs. Lance-leaved buckthorn (*R. lanceolata*; native) is less than 6' tall, found in dry to moist

calcareous soils, and has 2-6" alternate leaves, gradually tapering to a point at the tip.

Ecological threats:

- Common buckthorn invades forests, woodlands, oak savannas, prairies, fields, and roadsides.
- It leafs out very early blocking out sunlight typically available for spring wildflowers and retains its leaves late into the fall.
- It forms dense, even-aged thickets, reducing light availability for understory species and preventing native tree regeneration.
- Buckthorn may alter soil nitrogen dynamics facilitating the elimination of leaf litter and invasion by non-native earthworms.

Control:

- Manual/Mechanical: Hand pull small plants. Dig or use a leverage tool on larger plants. Cutting without herbicide treatment will result in resprouting. Burn in spring to kill seedlings.
- Chemical: Foliar spray with metsulfuron-methyl or triclopyr. Cut-stump or basal bark treat with triclopyr or glyphosate in late fall through the winter.

Tree-of-heaven *Ailanthus altissima*



T-3

Tree-of-heaven *Ailanthus altissima*



R

This rapidly growing tree can reach 80' or more. Tree-of-heaven has smooth, pale gray bark and stout, light brown twigs. Leaves and male flowers have a strong odor of rancid peanuts.

Leaves: Alternate; large (1-4' long); pinnately compound; composed of 11-25 entire leaflets, with the exception of one to several glandular teeth near the base.

Flowers: Small; yellow-green; 5- to 6-petaled; and borne in dense clusters near ends of upper branches; dioecious. Blooms in late spring.

Fruits & seeds: Clusters of papery, two-winged samaras; green turning pink to tan; develop in late summer to early fall and may remain on the tree through winter.

Roots: Aggressive, spreading rhizomes.

Similar species: Native plants that look similar include: black walnut (*Juglans nigra*), butternut (*J. cinerea*), and some species of sumac (*Rhus* spp.). The leaf edges of the look-alikes have small teeth, with the exception of winged sumac, which are smooth like tree-of-heaven.

CAUTION: Exposure to sap may cause dermatitis or myocarditis, an uncommon inflammation of the heart.

Ecological threats:

- Tree-of-heaven invades forest openings, woodland edges, fencerows, fields, roadsides, and urban areas.
- It grows rapidly and can overtop and shade out canopy trees in forests.
- It is a prolific seed producer and is allelopathic. Once established it can form an impenetrable thicket.

Control:

- **Manual/Mechanical:** Hand pull seedlings. Cut trees at ground level when the tree has begun to flower. Resprouts may occur; successful control will require repeated cutting.
- **Chemical:** Foliar spray with glyphosate or triclopyr ester from June-September. Basal bark treat with triclopyr ester during the summer. Cut-stump treat with triclopyr or glyphosate.

Eurasian bush honeysuckles

Amur (*Lonicera maackii*), Bell's (*L. x bella*),
Morrow's (*L. morrowii*), Tartarian (*L. tatarica*)



Left to Right: Morrow's, Bell's, Tartarian

S-1

Eurasian bush honeysuckles

Amur (*Lonicera maackii*), Bell's (*L. x bella*),
Morrow's (*L. morrowii*), Tartarian (*L. tatarica*)

Bush honeysuckles are dense, multi-stemmed shrubs, 6-12' tall. Older stems may have shaggy, peeling bark and are often hollow between the nodes.

Leaves: Opposite; oval or oblong; untoothed; hairless to downy; and green or blue-green. *L. maackii* leaves are dark green and glossy, narrowly oval to oblong and come to a sharp, long point.

Flowers: Fragrant; tubular; and arranged in pairs at leaf axils; reddish pink or white, turning yellow with age. All bloom mid to late spring.

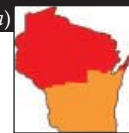
Fruits & seeds: Red, orange, or yellow; in pairs at leaf axils; fruits contain many seeds which are readily dispersed by birds.

Roots: Fibrous and shallow.

Similar species: Native *Lonicera* spp. have shorter, sparser growth forms and white pith in stems. Native bush honeysuckles (*Diervilla* spp.) have yellow flowers and grow in dry or rocky sites. Native species develop leaves 1-2 weeks later and drop them earlier than the non-natives and often have solid stems.

Ecological threats:

- Bush honeysuckles invade forest edges, woodlands, fields, pastures, fens, bogs, lake shores, and roadsides.
- They alter habitats by depleting soil moisture and nutrients, and possibly releasing allelopathic chemicals that inhibit growth of other plants.
- It forms dense, even-aged thickets, reducing light availability for understory species and preventing native tree regeneration.
- They have been widely planted as ornamentals and for wildlife.



L. maackii



L. morrowii
L. tatarica
L. x bella

P/R

R

Control:

- **Manual/Mechanical:** Hand pull small plants. Dig or use a leverage tool on larger plants. Cutting without herbicide treatment will result in resprouting. Burn in spring to kill seedlings.
- **Chemical:** Foliar spray with metsulfuron-methyl, triclopyr, or glyphosate in early spring prior to leaf out of native species. Cut-stump treat with glyphosate or triclopyr ester.

Glossy buckthorn *Frangula alnus* (*Rhamnus frangula*)



S-2

Glossy buckthorn *Frangula alnus* (*Rhamnus frangula*)



R

This shrub or small tree grows up to 20', often with several stems and a spreading crown. It has gray to brown bark with very prominent light-colored lenticels. Cut branches reveal yellow sapwood and orange heartwood. All cultivars except 'Asplenifolia' and 'Fineline' (Ron Williams) are restricted.

Leaves: Mostly alternate; 2-3" long; ovate or oval; entire; prominent parallel veins come straight out from midrib and curve slightly towards tip; upper surface is glossy; underside is dull and may be hairy; stay green into fall.

Flowers: Inconspicuous; pale yellow; 5-petaled; and clustered in leaf axils. Blooms late May to first frost.

Fruits & seeds: Abundant clusters of round, pea-sized fruit; ripens progressively from red to dark purple in late summer to fall.

Roots: Extensive fibrous root system.

Similar species: Native plums and cherries have a similar bark. Alder buckthorn (*Rhamnus alnifolia*; native) is under 3' tall with spineless twigs.

Lance-leaved buckthorn (*R. lanceolata*; native) is less than 6' tall, found in dry to moist calcareous soils, and has 2-6" alternate leaves, gradually tapering to a point at the tip.

Ecological threats:

- Glossy buckthorn invades wetlands including acidic bogs, calcareous fens, and sedge meadows. It also grows well in upland habitats and tolerates full sun to deep shade.
- It forms dense, even-aged thickets, reducing light availability for understory species and preventing native tree regeneration.

Control:

- Manual/Mechanical: Hand pull small plants. Dig or use a leverage tool on larger plants. Cutting without herbicide treatment will result in resprouting. Burn in spring to kill seedlings. Restore flooding or high water tables where water tables were artificially lowered.
- Chemical: Foliar spray with metsulfuron-methyl or triclopyr. Cut-stump or basal bark treat with triclopyr or glyphosate in late fall through the winter.

Japanese barberry *Berberis thunbergii*



S-3

Japanese barberry *Berberis thunbergii*



Japanese barberry is a small, dense, spiny shrub, typically 2-3' tall, though it may grow to 6' tall and 6' wide. Its branches are reddish brown, deeply grooved, somewhat zigzag in form, and bear a single sharp spine at each node. The inner bark and wood is bright yellow. Research is underway to determine which cultivars are invasive and which are not.

Leaves: Small; alternate; entire; and oval to spatulate; may be green, bluish green, or dark reddish purple depending on the cultivar; arranged in clusters above single spines.

Flowers: Small; yellow; bowl-shaped with 6 petals and 6 slightly larger sepals; single or in clusters of 2-4. Blooms mid-spring.

Fruits & seeds: Small, bright red, oblong berries occur on narrow stalks; mature in mid-summer and persist on shrub into winter; dispersed by birds.

Roots: It spreads vegetatively through horizontal lower branches that root freely when they touch the ground. Roots are yellow inside.

Ecological threats:

- Japanese barberry invades forests, woodlands, oak savannas, and fields; it prefers well-drained soils.
- It appears to alter soil pH and nitrate levels, creating conditions that are beneficial for its growth.
- Very invasive and widespread in states further east. Infestations in WI are more localized.
- Cultivars are widely planted as ornamentals.

Control:

- **Manual/Mechanical:** Hand pull or dig plants in early spring using heavy gloves, a hoe, or leverage tool. Cutting without herbicide treatment will result in resprouting. Use controlled burns in early spring or late fall to kill seedlings.
- **Chemical:** Foliar spray with metsulfuron-methyl, triclopyr, or glyphosate. Cut-stump treat with glyphosate or triclopyr.

Multiflora rose *Rosa multiflora*



S-4

Multiflora rose *Rosa multiflora*



R

Multiflora rose is a thorny thicket-forming shrub with wide, arching canes and stiff, curved thorns. It can grow 6-15' tall and 6-13' wide.

Leaves: Alternate; pinnately compound leaves with 5-11 small (0.5-1"), sharply-toothed, oval leaflets; nearly smooth on upper surface and paler with short hairs below; pair of fringed stipules at the base of each leaf.

Flowers: Abundant; showy; fragrant; and white to slightly pink; flowers are 0.5-1.5" wide and form a panicle. Blooms mid to late spring.

Fruits & seeds: Clusters of small, hard, bright red fruits, or rose hips, develop in summer; become brownish red at maturity; and remain on plant through winter; dispersed by birds and mammals.

Roots: Stolons can root at the nodes; arching stems are capable of rooting at their tips.

Similar species: Native roses are distinguished by smooth edged stipules and slender, straight thorns. Most native roses have larger, pink flowers.

Ecological threats:

- Multiflora rose invades forest edges, woodlands, oak savannas, prairies, fields, pastures, and roadsides.
- It is extremely prolific and can form impenetrable thickets that cast dense shade and exclude native plants.

Control:

- **Manual/Mechanical:** Dig up or pull using a tractor, ATV, or truck. Mow 3 to 6 times during the growing season for 2 to 4 years. Burn in spring to kill seedlings.
- **Chemical:** Foliar spray with metsulfuron-methyl, glyphosate, or triclopyr. To prevent bud development the following year, foliar spray with fosamine ammonium in late summer. Basal bark treat with triclopyr ester. Cut-stump treat with glyphosate or triclopyr.

Olive, autumn *Elaeagnus umbellata*
 Olive, Russian *Elaeagnus angustifolia*



Russian olive



Autumn olive



Russian olive



Autumn olive



Autumn olive

S-5

Olive, autumn *Elaeagnus umbellata*
 Olive, Russian *Elaeagnus angustifolia*



R

Autumn olive is a multi-stemmed shrub that grows to 20'. Russian olive is a small tree that grows to 30' and has twigs with a terminal thorn. Leaves and twigs on both species are covered by small silver or copper-colored scales.

Leaves: Alternate and simple. Autumn olive leaves are silver-gray on the underside, lance-shaped or oval, with untoothed, wavy edges. Russian olive leaves are silver on both sides, longer and more lance-shaped. Both species have a gray-green hue when seen from a distance.

Flowers: Tube or bell-shaped; fragrant; and borne in leaf axils. Autumn olive flowers are creamy white to light yellow. Russian olive flowers are yellow inside and silver outside. Both bloom in late spring.

Fruits & seeds: Autumn olive fruits are small, fleshy, pink to red with silver scales. Russian olive fruits are yellow with silver scales, dry, and mealy. Both are dispersed by birds.

Roots: Associated with nitrogen-fixing bacteria. Cutting or other damage causes root suckering.

Similar species: Two native buffaloberries, silver (*Shepherdia argentea*) and russet (*S. canadensis*), have silvery or copper spots on foliage and stems but their leaves are opposite.

Ecological threats:

- Autumn olive invades open and forested natural areas, as well as roadsides and agricultural fields. Russian olive invades open areas, including shorelines. It uses water more quickly than native species, and it can dry out riparian areas.
- Both species alter nutrient cycling by adding nitrogen to the soil.

Control:

- Manual/Mechanical: Pull seedlings. Cutting, mowing, and burning can top kill plants, but they will resprout unless followed up with chemical control.
- Chemical: Foliar spray with imazapyr, glyphosate, metsulfuron-methyl, or triclopyr. Basal bark treat with triclopyr ester. Cut-stump treat with glyphosate, triclopyr, or imazapyr.

Chinese yam *Dioscorea oppositifolia*



V-1

Chinese yam *Dioscorea oppositifolia*



P

Chinese yam is a deciduous, perennial vine that twines counterclockwise and can grow up to 15' in length.

Leaves: Generally opposite, sometimes alternate along upper nodes; spear or heart-shaped with 7-9 veins; 1.5-3" long and up to 1.5" wide. Newly emerged leaves are tinted bronze; mature leaves have purplish red edges and leaf stalks.

Flowers: Small; yellowish white; with a cinnamon fragrance. Flowers appear in leaf axils forming panicles or spikes. Blooms June-September.

Fruits & seeds: Bulbils, small potato-like tubers produced in the leaf axils, are covered with buds that can produce new plants. Bulbils are dispersed by gravity, animals, and water. Capable of bearing seeds in membranous capsules; however, reproduction by seed has not been verified in the United States.

Roots: Large tuberous root; resprouts if damaged.

Similar species: Wild yam (*Dioscorea villosa*; native) twines clockwise, has hairs on the upper leaf surface, and lacks bulbils. Morning glory (*Ipomoea*

spp.; non-native) and field bindweed (*Convolvulus arvensis*; invasive) have similar leaves, but also lack bulbils. Greenbriars (*Smilax* spp.; native) have blue to purple berries and some species have thorns.

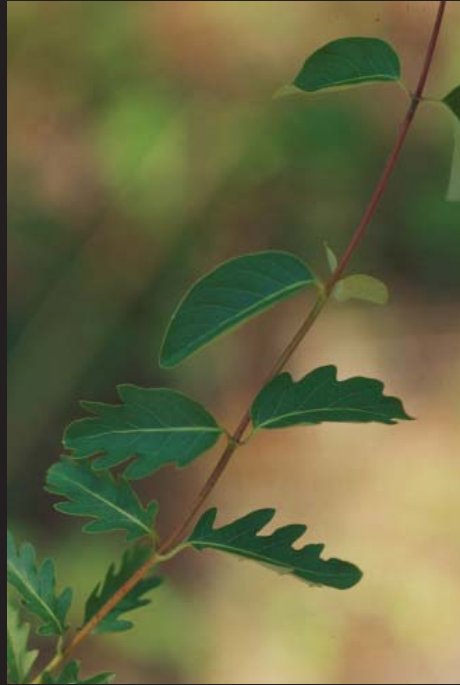
Ecological threats:

- Chinese yam invades riparian areas and drainage ways, as well as mesic forests, fencerows, and roadsides.
- Rapid, early growth allows the vine to shade out native plants. It forms dense mats that can down branches and kill small trees.

Control:

- Manual/Mechanical: Hand pull or dig up small populations; remove entire root. Cut or mow as close to the ground as possible for several seasons prior to bulbil production in July.
- Chemical: Foliar spray with glyphosate or triclopyr in July-October when leaves are developed but bulbils have not matured.

Japanese honeysuckle *Lonicera japonica*



V-2

Japanese honeysuckle *Lonicera japonica*



P

Japanese honeysuckle is a perennial, semi-evergreen, woody vine that grows up to 80' in length. Young stems are brown to red in color and are usually covered with short hairs or soft down. Older stems are woody and hollow, with bark that peels in long strips. All cultivars of this species are prohibited.

Leaves: Simple; opposite; oblong to oval; 1.5-3" long; sometimes lobed; and may be covered with fine soft hairs. Leaves persist on vine until mid-winter.

Flowers: Tubular; very fragrant; white to pink, turning yellow with age; borne in pairs at leaf axils. Blooms late spring to early summer.

Fruits & seeds: Small, purple-black berries are produced in fall and dispersed by birds and mammals.

Roots: Produces underground rhizomes and long, aboveground stolons that develop roots where nodes contact soil.

Similar species: Native honeysuckle vines (*Lonicera* spp.) are much shorter and less robust

than Japanese honeysuckle. They also have red or orange berries, flowers at the tips of stems, and connate leaves below flowers.

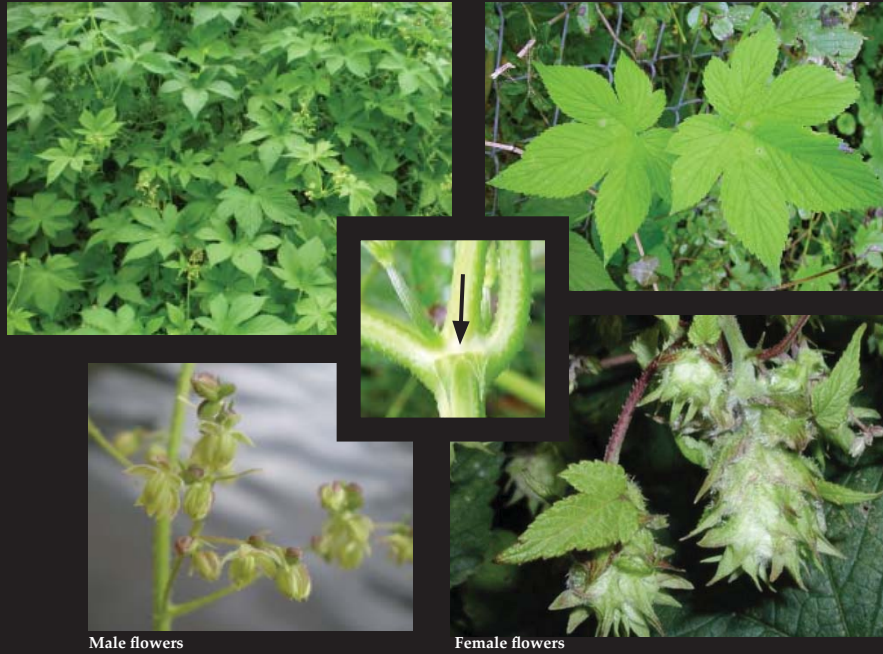
Ecological threats:

- Japanese honeysuckle invades forests, prairies, fields, and roadsides.
- Japanese honeysuckle vines can kill shrubs and young trees by growing over them and blocking out the sun, pulling them down with their weight or girdling them by twisting tightly around stems and trunks.

Control:

- **Manual/Mechanical:** Hand pull or mow repeatedly followed up by chemical control. Burn in spring to kill seedlings.
- **Chemical:** Foliar spray with glyphosate or triclopyr amine in fall when native plants are dormant. Cut-stump treat with glyphosate or triclopyr amine.

Japanese hops *Humulus japonicus*



Male flowers

Female flowers

V-3

Japanese hops *Humulus japonicus*



P/R

Japanese hops is a climbing, annual, herbaceous vine that grows up to 35' long. Downward pointing, rough, prickly hairs on stems and leaves aid in twining clockwise on nearby vegetation. Stems are light green to reddish in color.

Leaves: Opposite; 2-5" long; palmately divided into 5 or more lobes; toothed. Leaf stalks are as long or longer than the length of the leaves. Downward pointing stipules occur at the base of the leaf stalks (see photo).

Flowers: Originate in leaf axils; dioecious. Male flowers are dull green on upright, branched panicles. Female flowers are pale green in plump, drooping, catkin-like clusters. Blooms July-September.

Fruits & seeds: Dry fruits (hops) are yellow-brown in color. Seeds are dispersed by wind and water.

Roots: Shallow, fibrous roots.

Similar species: Common hops (*Humulus lupulus*; native), including all beer varieties, has unlobed to 3-lobed leaves with leaf stalks that are

shorter than the length of the leaf. Wild cucumber (*Echinocystis lobata*; native) has 5-lobed leaves like Japanese hops, but it has tendrils and does not have downward pointing, prickly hairs along its stem.

CAUTION: Skin contact with this plant may cause dermatitis and blisters. Wear gloves and long sleeves when handling.

Ecological threats:

- Japanese hops invades open woodlands, floodplains, stream banks, and lakeshores where seeds can disperse via water.
- It spreads quickly because it produces seed in the first growing season.

Control:

- Manual/Mechanical: Hand pull to remove plants before seeds ripen.
- Chemical: Foliar spray with glyphosate before flowering.

Kudzu *Pueraria montana* (*P. lobata*)



V-4

Kudzu *Pueraria montana* (*P. lobata*)



P

Kudzu is a deciduous, semi-woody, perennial vine that grows 35-100' long. Young stems are yellowish green with golden and silver hairs. Mature stems become woody, gray-brown, and hairless. At the time of printing, there are no known populations of kudzu in Wisconsin.

Leaves: Alternate; 3-7" long and 2.5-8" wide; compound leaves with 3 leaflets; leaflets are entire or 2-3 lobed with pointed tips; young leaves hairy; mature leaves retain hair on leaf edges only. Leaf stalks are long (6-12") and swollen where they attach to the stem (see photo).

Flowers: Fragrant; pea-like; reddish purple; on 6" spikes in leaf axils. Blooms June-September.

Fruits & seeds: Clusters of flat, brown, golden-haired pods; 2-3" long; contain up to 10 hard seeds. Seed viability is variable.

Roots: Starchy tuberous roots may grow to 12' deep; spreads vegetatively by rooting at nodes that touch the ground.

Similar species: Native vines commonly mistaken for kudzu are: poison ivy (*Toxicodendron*

radicans), ground nut (*Apios americana*), hog peanut (*Amphicarpaea bracteata*), native grapes (*Vitis* spp.), wild cucumber (*Echinocystis lobata*), and bur-cucumber (*Sicyos angulatus*). Soybeans (*Glycine max*) have similar looking leaves.

Ecological threats:

- Kudzu invades forest edges, prairies, fields, wetlands, and roadsides. It prefers full sun, but can tolerate some shade.
- It kills trees and shrubs by girdling them, shading them out with its leaves, and breaking branches or uprooting them due to its weight.

Control:

- Manual/Mechanical: Cut or mow as close to the ground as possible every month for several growing seasons; burn or bag and landfill cuttings. Best if used in conjunction with chemical control.
- Chemical: Foliar spray or cut-stump treat with clopyralid, triclopyr, metsulfuron methyl, or glyphosate. Basal bark treat with triclopyr.

Oriental bittersweet *Celastrus orbiculatus*



V-5

Oriental bittersweet *Celastrus orbiculatus*



R

Oriental bittersweet is a woody, perennial, climbing vine that can grow into tree canopies. Stems may reach 6" in diameter.

Leaves: Alternate, 2-5" long, glossy, shallowly toothed, and round with a pointed tip.

Flowers: Small and inconspicuous; 5-petaled; greenish yellow; in clusters of 3-7 at leaf axils; most plants dioecious. Blooms in late spring.

Fruits & seeds: Showy, round capsules; clustered in leaf axils; green in summer turning yellow-orange in fall; split open at maturity to reveal orange, fleshy fruits; dispersed by birds and small mammals.

Roots: Spreading underground roots can sprout to form new stems.

Similar species: American bittersweet (*C. scandens*; native) has fewer, larger clusters of fruits or flowers, which are borne terminally rather than at leaf axils and are generally darker red-orange. Its leaves are also less rounded than Oriental bittersweet. Hybrids of the two may occur, which makes identification difficult.

Ecological threats:

- Oriental bittersweet invades forests, woodlands, fields, and fencerows; it can grow in open sites or under closed forest canopy.
- Oriental bittersweet may damage trees by girdling trunks with its woody stem and shading out leaves. It can weigh down crowns, making them susceptible to damage from wind or heavy snowfall or ice storms.
- It has been widely planted as an ornamental vine, sometimes accidentally, having been mistaken for American bittersweet.

Control:

- Manual/Mechanical: Hand pull or dig seedlings. Use controlled burns to kill seedlings.
- Chemical: Foliar spray with glyphosate or triclopyr. Basal bark treat with triclopyr ester. Cut-stump treat with glyphosate or triclopyr amine.

Porcelain berry *Ampelopsis brevipedunculata*



V-6

Porcelain berry *Ampelopsis brevipedunculata*



P

Porcelain berry is a perennial, deciduous, woody vine that can climb to 20'. It twines with the help of tendrils that occur opposite the leaves. Porcelain berry has a smooth stem with lenticels. Stems contain white pith that is continuous through the nodes.

Leaves: Alternate; broadly ovate with a heart-shaped base and 3-5 or more coarsely toothed, palmate lobes or more deeply dissected, variable; dark green above and lighter beneath with hairs along the veins.

Flowers: Clusters of small, inconspicuous, greenish white to yellow flowers; Blooms July-September.

Fruits & seeds: Clusters of shiny, speckled berries which change from pastel green to purple to blue; all colors may be present simultaneously. Each berry contains 2-4 seeds; seeds are dispersed by birds, small mammals, and water.

Roots: Large woody taproot.

Similar species: Native grape vine (*Vitis* spp.) stems lack lenticels and contain brown pith; its

bark peels and shreds.

Ecological threats:

- Porcelain berry invades forest edges, prairies, fields, riverbanks, shorelines, roadsides, and disturbed areas; it prefers moist soils and high to moderate light.
- It forms a blanket on the ground and climbs over trees and shrubs shading out other vegetation.
- Porcelain berry has been sold as an ornamental, most commonly in the variegated form.

Control:

- Manual/Mechanical: Hand pull small populations before they fruit.
- Chemical: Cut in summer and foliar spray resprouts in early fall with glyphosate. Basal bark treat 2-3 foot long sections at the base of the stem with triclopyr ester. Cut-stump treat with triclopyr ester.

Swallow-wort, black *Cynanchum louiseae* (*Vincetoxicum nigrum*)
 Swallow-wort, pale *Cynanchum rossicum* (*Vincetoxicum rossicum*)



Black swallow-wort



Black swallow-wort



Pale swallow-wort



Pale swallow-wort

V-7

Swallow-wort, black *Cynanchum louiseae* (*Vincetoxicum nigrum*)
 Swallow-wort, pale *Cynanchum rossicum* (*Vincetoxicum rossicum*)

Both swallow-worts are herbaceous, perennial vines. They twine 3-6' high and have small hairs on their stems. Both species die back in the winter. At the time of printing, there are no known populations of pale swallow-wort in Wisconsin.

Leaves: Opposite; 2-5" long; oblong to ovate with pointed tips; on short leaf stalks; smooth, dark green, and shiny.

Flowers: Umbel-like, branched clusters have 6-10, 5-pointed, star-shaped flowers. Black swallow-wort flowers are dark purple and covered with fine, white hairs. Pale swallow-wort flowers are maroon to pale pink; its petals are twice as long as wide and hairless. Both bloom June-July.

Fruits & seeds: Similar to milkweed; slender pods, 2-3" long, form in late July-August; green turning light brown or golden as they mature. Seeds are flat and attached to long, thin filaments that aid in wind dispersal.

Roots: Black swallow-wort forms dense, knobby root masses. Both species can quickly replace cut shoots from buds on the rhizome and regenerate

from root fragments.

Ecological threats:

- They invade upland habitats such as forests, woodlands, fields, fencerows, and roadsides; they tolerate both sun and shade.
- They form dense thickets and cover native vegetation.
- Black swallow-wort reduces monarch butterfly populations; also grassland bird presence decreases greatly as infestations expand.



P/R

C. louiseae



P

C. rossicum

Control:

- Manual/Mechanical: Remove all seed pods before they open (mid-July); burn or bag and landfill. Dig up plants before seeds ripen, removing the root crown and all root fragments.
- Chemical: Foliar spray with triclopyr ester or glyphosate after flowering but before seed pods form. If not possible, cut or mow to remove seed pods then foliar spray regrowth in August-September. Cut-stump treat with glyphosate.

Bird's-foot trefoil *Lotus corniculatus*



F-1

Bird's-foot trefoil *Lotus corniculatus*



N

Bird's-foot trefoil is a perennial, fine-stemmed, leafy legume that rises 6-24" above the ground. It has a sprawling growth pattern, but can also be erect. Its stems are nearly square and have many branches that can become tangled and matted.

Leaves: Clover-like leaves are alternate and pinnately compound with three oval leaflets and two smaller leaflet-like stipules that grow at the base of the leaf stalk.

Flowers: Bright yellow, pea-like flowers, sometimes streaked with red, are found in flat-topped clusters at the ends of long stalks. Blooms from June to first frost.

Fruits & seeds: Clusters of 1" long, slender seed pods resembling a bird's foot; pods turn dark brown as they mature.

Roots: The root system includes a long taproot, which may be longer than 3', and a fibrous mat near the soil surface consisting of secondary roots, rhizomes, and modified stems.

Similar species: When not in flower, bird's-foot trefoil is similar in appearance to some clovers (*Trifolium* spp.; non-native) and medics (*Medicago* spp.; non-native). Clover and medic leaflets have finely toothed edges whereas those of bird's-foot trefoil are smooth.

Ecological threats:

- Bird's-foot trefoil invades prairies, barrens, fields, roadsides, and open disturbed areas.
- It can form dense mats choking and shading out other vegetation.
- Prescribed burns increase seed germination making it troublesome in native grasslands.
- It is planted as forage and for erosion control.

Control:

- Manual/Mechanical: Dig out small populations; remove all root fragments. Mow frequently to a height of 2" for several years.
- Chemical: Foliar spray with clopyralid, glyphosate, or triclopyr.

Canada thistle *Cirsium arvense*



F-2

Canada thistle *Cirsium arvense*



R

Canada thistle is an herbaceous perennial with upright, grooved, hairy stems that branch near the top of the plant. It grows 2-6.5' tall. It is legally classified as a noxious weed.

Leaves: Simple; alternate; lance-shaped; tapering; irregularly lobed; with spiny, toothed edges; stalkless; green on both sides; smooth when young but becoming hairy or downy with maturity.

Flowers: Numerous, small (0.5-0.75" wide), purple to pink (rarely white), terminal flower heads; dioecious. Bracts have spineless tips. Blooms June-September.

Fruits & seeds: Small, light brown seeds have a tuft of tan hair loosely attached to the tip to enable wind dispersal. Seeds are often spread by mowing after flowering has begun.

Roots: Reproduces clonally by horizontal roots that grow up to 10-12' per year. Also produces taproots that may grow more than 6' deep. Readily regenerates from root fragments.

Similar species: Canada thistle is distinguished from other thistles (see F-7 and F-22) by its creeping lateral roots, dense clonal growth, and dioecious flowers.

Ecological threats:

- It invades forest openings, oak savannas, prairies, dunes, agricultural fields, pastures, roadsides, and disturbed areas.
- Once established, it spreads quickly, forming monospecific stands.

Control:

- **Manual/Mechanical:** Pull or mow (minimum 3 times per growing season) to decrease root reserves; mow when flower buds are just about to open. Late spring (May-June) burns for 3 consecutive years stimulates germination and kills seedlings.
- **Chemical:** Foliar spray with glyphosate during the early bolting phase when plants are 6-10" tall. Foliar spray with animopyralid, metsulfuron-methyl, or clopyralid during the bud to flower phase or to rosettes in the fall.

Celandine *Chelidonium majus*



F-3

Celandine *Chelidonium majus*



P/R

Celandine, also called greater celandine, is a biennial or monocarpic perennial that is 12-32" tall with branched stems. Stems are ribbed and have scattered hairs. The plant has a distinct yellowish orange sap.

Leaves: Alternate; deeply divided; up to 6" long and 3" across; with rounded teeth; green above and pale green below.

Flowers: Yellow; up to 0.75" across; 4-petaled; in clusters of 3-8. Blooms May-August.

Fruits & seeds: Hairless, erect, cylindrical, tapering seed pods; up to 2" long; pods become constricted at intervals as they mature. Seeds are oval, flattened, and shiny.

Roots: Taproot.

Similar species: Celandine belongs to the poppy family but could be confused as a member of the mustard family which has similar flowers and seed pods; however celandine flowers are larger than mustard flowers. Celandine poppy (*Stylophorum diphyllum*; non-invasive), blooms in early spring, has larger flowers, and hanging,

egg-shaped, hairy fruits. Lesser celandine (*Ranunculus ficaria*; invasive) has 8-12 petals and its leaves are more rounded.

Ecological threats:

- Celandine invades mesic forests and woodlands, roadsides, and disturbed areas.
- It is poisonous to most animals and humans.
- It has been planted as an ornamental.

Control:

- Manual/Mechanical: Use sharp shovel to cut root 1-2" below soil surface before seeds set. Mow several times throughout growing season to deplete root reserves.
- Chemical: Foliar spray with clopyralid.

Creeping bellflower *Campanula rapunculoides*



F-4

Creeping bellflower *Campanula rapunculoides*



R

Creeping bellflower is an herbaceous perennial that grows 16-40" tall. Its stems are smooth to slightly hairy.

Leaves: Alternate; spade-shaped; slightly toothed; rough on both sides; reduced to bracts in inflorescence. Leaves on long leaf stalks at base of the plant; short to no leaf stalks above; leaf stalks purplish with downward pointing hairs.

Flowers: Blue-purple; bell-shaped; 5-lobed; Inflorescence is an unbranched, one-sided raceme that is more than half the length of the plant with nodding flowers. Blooms June-October.

Fruits & seeds: Round seed capsules; each containing several small, light brown seeds; seeds have small wings or ridges that aid in wind dispersal. Ripen in late summer and fall.

Roots: Rhizomes with numerous, fleshy, vertical roots.

Similar species: Bluebell (*Campanula rotundifolia*; native) is a smaller plant, 4-20" tall with similar blue flowers that are shorter and on thin

stems. Leaves are stalked with the lower leaves being oval and falling off as the plant matures.

Ecological threats:

- Creeping bellflower invades woodlands, oak savannas, prairies, fields, roadsides, stream banks, and urban areas.
- Brought in as an ornamental, creeping bellflower escaped gardens and is now found throughout many Wisconsin counties.
- It creates dense stands through seed production and rhizomes.

Control:

- Manual/Mechanical: Dig out plants; dig at least 6" deep and several inches out from each plant to ensure you have gotten all of the roots.
- Chemical: Foliar spray with glyphosate or dicamba.

Crown vetch *Securigera varia* (*Coronilla varia*)



F-5

Crown vetch *Securigera varia* (*Coronilla varia*)



Crown vetch is a perennial legume with long trailing stems that grow 2-6' long. It forms dense colonies. In winter and early spring, crown vetch can be easily recognized as large, brown patches because it leafs out late.

Leaves: Alternate; pinnately compound, 2-6" long; 11-25 narrow, oval leaflets occur in an odd number.

Flowers: Pea-like; fragrant; white to pink to purple. Flowers are clustered in umbels of 14-20 flowers on long stalks. Blooms mid-spring through mid-summer.

Fruits & seeds: Long, slender, pointed seed pods contain 3-7 narrow seeds each; seeds remain viable in the soil for up to 15 years.

Roots: Reproduces vegetatively by fleshy rhizomes that grow up to 10' long. Roots are not fibrous, limiting the utility of crown vetch for erosion control.

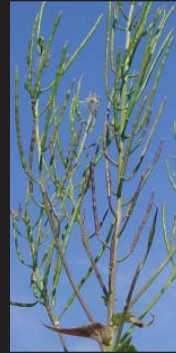
Ecological threats:

- Crown vetch invades prairies, barrens, dunes, fields, and roadsides. It prefers open, sunny areas and can withstand periods of drought.
- It climbs over and shades out native plants, and it alters native ecosystems through nitrogen fixation.
- Fire stimulates germination of crown vetch seeds and can exacerbate invasions.
- It is planted for erosion control.

Control:

- **Manual/Mechanical:** Hand pull or dig up entire plant. Mow repeatedly over several years; mow when flower buds are just about to open. Cut as low to ground as possible. Use controlled burns in late spring; burns may need to be repeated for several years.
- **Chemical:** Foliar spray with metsulfuron-methyl, aminopyralid, clopyralid, glyphosate, or triclopyr.

Dame's rocket *Hesperis matronalis*



F-6

Dame's rocket *Hesperis matronalis*



R

Dame's rocket is a showy, short-lived perennial or biennial. First-year leaves form a basal rosette that overwinters. Flowering stalks emerge in spring and grow 3-4' tall.

Leaves: Lance-shaped, finely toothed, alternate, with short or no leaf stalks. Decrease in size as they ascend the stem. Fine hairs on leaves and stems. Distinct light green midrib.

Flowers: White, pink, or purple 4-petaled flowers in large, loose, rounded inflorescences; fragrant, especially at night. Blooms late spring through summer.

Fruits & seeds: Abundant; produced in long (up to 5"), thin seed pods that break apart lengthwise at maturity to release seeds; seeds are eaten and dispersed by ground-foraging birds.

Roots: Weak taproot.

Similar species: Garden phlox (*Phlox paniculata*; non-native) has opposite leaves that are not toothed, and flowers with five petals, not four. It blooms in late summer.

Ecological threats:

- Dame's rocket invades mesic forests and woodlands, fields, and roadsides.

- It is planted as an ornamental and is often found in "wildflower" seed mixes. It quickly escapes cultivation because of its prolific seed production.

Control:

- **Manual/Mechanical:** Pull plants in early spring; if flowering, burn or bag and landfill. Use controlled burns to kill plants in seedling or rosette stage.

- **Chemical:** Foliar spray with glyphosate, imazapic, or triclopyr in late fall or very early spring when native plants are dormant but the basal rosettes of dame's rocket are still green.

European marsh thistle *Cirsium palustre*



F-7

European marsh thistle *Cirsium palustre*



P/R

European marsh thistle is an herbaceous biennial or monocarpic perennial that is mostly covered in long, sticky hairs. Flowering stems are 4-5' tall, erect, thick, sometimes dark purple in color, branched at the top, and bristling with spiny wings aligned with the stem.

Leaves: First-year rosette leaves are spiny, long, deeply lobed, and hairy on the underside. Flowering plants have spiny leaves that are 6-8" long near the base and shorter toward the top.

Flowers: Clusters of 12 or more purple flower heads; flower heads up to 0.75" wide; bracts have spineless tips. Blooms June-July.

Fruits & seeds: Seeds are small, hard and elongated with a tuft of feathery bristles at the top; dispersed by wind.

Roots: Fibrous.

Similar species: Marsh thistle (*Cirsium muticum*; native) and Canada thistle (*Cirsium arvense*; invasive) (see F-2) occur in similar habitats but have non-spiny stems. Bull thistle (*Cirsium vulgare*; invasive) and plumeless thistle (*Carduus*

acanthoides; invasive) (see F-22) have sharply spined leaves, stems, and flower heads. Musk thistle (*Carduus nutans*; invasive) has solitary nodding flower heads (see F-22).

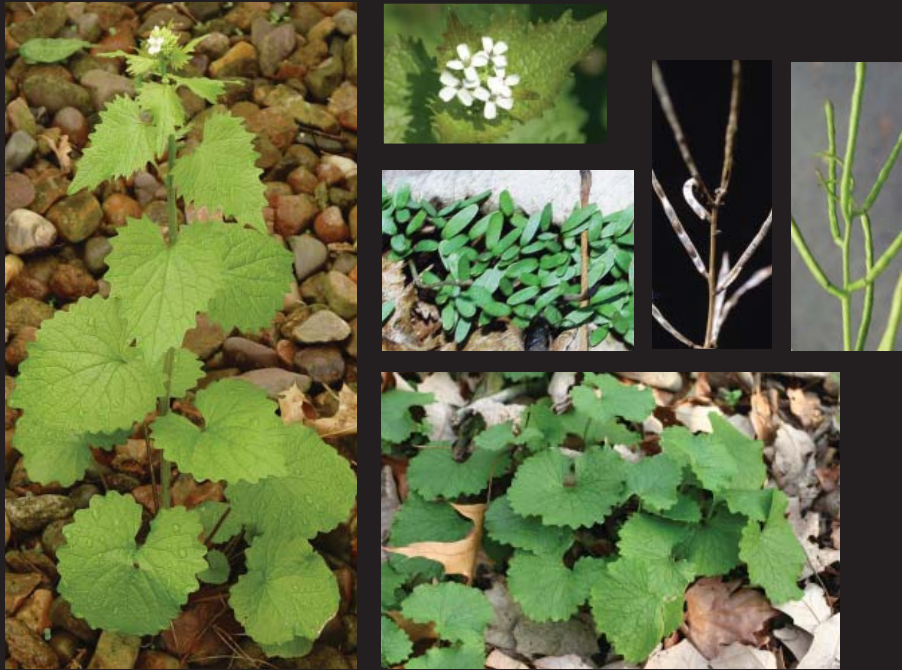
Ecological threats:

- European marsh thistle invades moist forest and woodland edges, beaches, dunes, wetlands, fields, and roadsides.
- Spontaneous hybrids between European marsh thistle and Canada thistle have been reported.

Control:

- Manual/Mechanical: Hand pull or dig rosettes. Pull or mow (minimum 3 times per growing season) to weaken second year plants; mow when flower buds are just about to open.
- Chemical: Foliar spray with glyphosate during the early bolting phase when plants are 6-10" tall. Foliar spray with aminopyralid, or clopyralid during the bud to flower phase or to rosettes in the fall.

Garlic mustard *Alliaria petiolata*



F-8

Garlic mustard *Alliaria petiolata*



R

Garlic mustard is an herbaceous biennial. First-year plants form basal rosettes that remain green through the winter. Second-year plants grow up to 4' tall and produce one to several flowering stems.

Leaves: Basal leaves are dark green, heart or kidney-shaped, with a scalloped-edge and wrinkled appearance. Stem leaves are alternate, triangular, up to 2" across, with large teeth. Leaves and stems smell like garlic when crushed.

Flowers: Small; white; 4-petaled; and abundant. Blooms throughout the spring.

Fruits & seeds: Seed pods are green, drying to pale brown; 1-2.5" long and thin; they hold many small, shiny, black seeds.

Roots: White, slender taproot; "S"-shaped at the top; will resprout from the root crown if only the top of the plant is removed.

Similar species: Native white flowered toothworts (*Dentaria* spp.) and sweet cicely (*Osmorhiza claytonii*) bloom at the same time as garlic mustard. The leaves of native violets (*Viola* spp.) and non-native creeping Charlie (*Glechoma hederacea*) may

be mistaken for first year garlic mustard plants, but have no garlic odor when crushed.

Ecological threats:

- Garlic mustard rapidly invades high-quality forests, woodlands, and oak savannas, as well as disturbed areas. It can be found in full sun, but prefers shade.
- Native herbaceous cover declines at sites invaded by garlic mustard, in part because it exudes a chemical that disrupts mycorrhizal fungi associations with native plants.

Control:

- Manual/Mechanical: Pull plants in early spring prior to seed set; if flowering, burn or bag and landfill. Cut plants close to the ground just after the flower stalks have elongated but before flowers have opened; repeat if necessary during growing season. Use controlled burns to kill plants in seedling or rosette stage.
- Chemical: Foliar spray with triclopyr, glyphosate, sulfometuron methyl, imazapic, or 2,4-D in early spring or late fall when native plants are dormant.

Giant hogweed *Heracleum mantegazzianum*



F-9

Giant hogweed *Heracleum mantegazzianum*



P

Giant hogweed is a tall (8-20'), very robust, herbaceous biennial or monocarpic perennial. The plant stays as a basal rosette for several years; then when mature it sends up a large (2-4" wide), hollow, bristly flower stem with purple mottling.

Leaves: Compound; 1-5' wide; deeply palmate with pointed lobes. Undersides of leaves are covered in coarse white hairs.

Flowers: Many white, 5-petaled flowers in large (up to 2.5" wide), flat-topped umbels. Blooms May-July.

Fruits & seeds: Two-winged, dry fruits contain 1 flattened, oval seed each.

Roots: Large, deep taproot.

Similar species: There are several white flowering natives: American cow parsnip (*Heracleum lanatum*) is 3-7' tall with non-mottled flower stems and pinnately divided leaves; great angelica (*Angelica atropurpurea*) is 2-8' tall with a purplish stem, spherical umbel, and pinnately divided leaves; glade mallow (*Napaea dioica*) is

3-6' tall with round leaves that have 5-9 deep lobes.

CAUTION: When sap contacts skin in the presence of sunlight, it can cause severe rashes, blisters, and discoloration of the skin (phytophotodermatitis). Wear gloves, long sleeves, and long pants when handling.

Ecological threats:

- Giant hogweed invades woodland edges, roadsides, and disturbed areas, but it prefers areas with moist soils and some shade such as stream banks.
- It crowds out native vegetation, increases soil erosion, and readily disperses seed downstream.

Control:

- Manual/Mechanical: Use sharp shovel to cut 1-2" below soil surface before seeds set; burn or bag and landfill flower heads.
- Chemical: Foliar spray or cut-stump treat with glyphosate, triclopyr, or metsulfuron-methyl.

Hedgeparsley, Japanese *Torilis japonica*
Hedgeparsley, spreading *Torilis arvensis*



F-10

Hedgeparsley, Japanese *Torilis japonica*
Hedgeparsley, spreading *Torilis arvensis*

The hedgeparsleys are rapidly spreading herbaceous biennials. First-year plants are low, parsley-like rosettes that stay green into winter. Flowering plants are 2-6' tall with erect, ridged, branched stems. At the time of printing, there are no known populations of spreading hedgeparsley in Wisconsin.

Leaves: Alternate; compound; 2-5" long; and slightly hairy; leaflets are pinnately divided and toothed.

Flowers: Small, loose, flat-topped umbels of tiny, white flowers. Japanese hedgeparsley has 2 or more pointed bracts at the base of each umbel; spreading hedgeparsley does not. Both bloom July-August.

Fruits & seeds: Small seeds are covered in hooked hairs that attach to clothing, fur, and hair.

Roots: Taproot.

Similar species: Wild carrot (*Daucus carota*; non-native) smells like carrots when crushed, has more finely divided leaves, and has fewer but larger umbels, usually with a purple flower in the center

of each. Wild chervil (*Anthriscus sylvestris*; invasive) (see F-23) has more fern-like leaves, and its seeds are larger and grooved. Poison hemlock (*Conium maculatum*; invasive) (see F-15) is taller, up to 10', and its ridged stems are larger and purple mottled.

Ecological threats:

- Hedgeparsleys invade forests, prairies, fields, fencerows, and roadsides.
- People and animals appear to be spreading Japanese hedgeparsley quickly throughout parts of the state.

Control:

- **Manual/Mechanical:** Pull, cut, or mow prior to or at earliest stage of flowering; cut or mow as close to the ground as possible. If flowering, burn or bag and landfill. Use controlled burns to kill seedlings, however this may result in more germination.
- **Chemical:** Foliar spray with glyphosate, triclopyr, or metsulfuron methyl in early spring or on plants that are resprouting after having been cut.



P/R

T. japonica



P

T. arvensis

Hemp nettle *Galeopsis tetrahit*



F-11

Hemp nettle *Galeopsis tetrahit*



R

Hemp nettle is an herbaceous annual that grows 1-3' tall. Stems are square, swollen at leaf nodes, and covered with coarse, downward pointing hairs intermixed with shorter glandular hairs.

Leaves: Opposite; stalked; ovate; coarsely toothed; and hairy on both sides. True shape can be variable.

Flowers: Dense axillary clusters of purplish pink to white, two-lipped flowers; the upper lip hood-like; the lower lip spreading and 3-lobed; flowers variable in size. Calyx is armed with 5 sharp points. Blooms June-September.

Fruits & seeds: Each flower produces 4 nutlets, each containing one seed.

Roots: Taproot with lateral roots

CAUTION: Bristly hairs on stem can irritate skin in some people. Wear long sleeves and gloves when handling.

Ecological threats:

- Hemp nettle invades forests, woodlands, fields, pastures, and roadsides; it generally prefers disturbed sites where it creates monospecific stands.
- Hemp nettle is considered an agricultural weed. It is avoided by most grazers and is the host for a potato fungus and several nematodes.

Control:

- Manual/Mechanical: Hand pull or dig when in flower bud stage; burn or bag and landfill flowering plants.
- Chemical: Foliar spray with dicamba.

Hill mustard *Bunias orientalis*



F-12

Hill mustard *Bunias orientalis*



P/R

Hill mustard, also called Turkish warty cabbage, is an herbaceous biennial that can act as a perennial in Wisconsin. It grows 1-4' tall. Small warty bumps on the stem help to distinguish this mustard; another common name for this plant is warty cabbage. Both stems and leaves are somewhat hairy.

Leaves: Leaves are lance-shaped with sharply pointed lobes. Basal leaves can be 12" or longer; leaves become smaller as they move up the stem. Leaves are somewhat hairy and may have a warty texture.

Flowers: Dense clusters of yellow, 4-petaled, fragrant flowers. Blooms in late spring.

Fruits & seeds: Teardrop-shaped fruits are covered with warty bumps and contain 2-4 seeds.

Roots: Taproot, at least 1" wide, generally in cluster of roots; extremely difficult to pull or dig out.

Similar species: Hill mustard resembles yellow rocket (*Barbarea vulgaris*; non-native). However, yellow rocket is shorter; its leaves are hairless

and without sharply pointed lobes; its stems are not warty; and its fruits are narrow pods. It blooms in early spring.

Ecological threats:

- Hill mustard invades prairies, fields, pastures, and roadsides.
- It can get into high quality areas and create monospecific stands.

Control:

- Manual/Mechanical: Till to dislodge root system. Mow as close to ground as possible to halt seed production.
- Chemical: Foliar spray with metsulfuron-methyl, glyphosate, or 2, 4-D.

Hound's tongue *Cynoglossum officinale*



F-13

Hound's tongue *Cynoglossum officinale*



R

Hound's tongue is an herbaceous biennial. First-year leaves form a basal rosette. Second year plants have a single stem that branches above and grows to 1-4' tall.

Leaves: Alternate; narrowly oval; dark green; and hairy. Basal rosette leaves are 6-8" long. Lower leaves on second year plants can be 12" long; leaves decrease in size as they progress up the stem.

Flowers: Reddish purple; 5-petaled; saucer or funnel-shaped; and up to 0.3" wide. Arranged in raceme-like clusters in the upper leaf axils. The mature flower stalks widely curving. Blooms June-July.

Fruits & seeds: The seed is a nutlet covered in barbs which easily attaches to clothes, fur, and hair. Most of the seed overwinters in the soil, although some may remain attached to the parent plant for up to 2 years creating an aboveground seed bank.

Roots: Large, woody taproot.

Ecological threats:

- Hound's tongue invades woodland edges, prairies, fields, pastures, riparian areas, and roadsides.
- Alkaloids present in the plant decrease in toxicity as it matures, yet it can still be toxic to horses and cattle.

Control:

- Manual/Mechanical: Use sharp shovel to cut root 1-2" below soil surface. Mow second year plants while in flowering stage but before seed production.
- Chemical: Foliar spray rosettes in spring with dicamba or metsulfuron-methyl.

Knotweed, giant *Polygonum sachalinense* (*Fallopia sachalinensis*)
 Knotweed, Japanese *Polygonum cuspidatum* (*Fallopia japonica*)



Japanese knotweed



Giant knotweed



F-14

Knotweed, giant *Polygonum sachalinense* (*Fallopia sachalinensis*)
 Knotweed, Japanese *Polygonum cuspidatum* (*Fallopia japonica*)

Giant knotweed and Japanese knotweed are herbaceous perennials that can reach 9' and form large vegetative colonies. Semi-woody stems are erect and hollow with distinct raised nodes (resembling bamboo canes). They are similar in appearance and are known to hybridize.

Leaves: Alternate; simple; narrowing to a pointed tip; dark green. Japanese knotweed leaves are 4-6" long and have a squared-off base. Giant knotweed leaves are 6-14" long and have a heart-shaped base.

Flowers: Upright racemes of numerous small, greenish white flowers. Giant knotweed blooms have both male and female parts in the same flower while Japanese knotweed bears only male or female flowers on a given plant. Blooms in late summer.

Fruits & seeds: Three-angled fruits are small (0.2"), shiny, black, and dry. Fruits are enclosed in a winged calyx that makes them buoyant. Seed viability is variable.

Roots: Robust rhizomes grow up to 6' deep and create a dense impenetrable mat.

Ecological threats:

- Japanese knotweed invades forest edges, wetlands, fields, roadsides, and urban areas. It poses a significant threat to riparian areas where it eliminates other vegetation and causes erosion.
- Young stems of Japanese knotweed can produce new roots and shoots if buried or floating in water.
- Japanese knotweed is able to break through pavement and building foundations.
- Both knotweeds have been planted as ornamentals.

Control:

- **Manual/Mechanical:** Hand pull young plants; burn or bag and landfill. Mow or cut multiple times per growing season for several years.
- **Chemical:** Plants are more susceptible to herbicides if they are cut when 4-5' tall and the regrowth treated around 3' tall. Foliar spray with aminopyralid, imazapyr, glyphosate, or triclopyr. Cut-stump treat with glyphosate or triclopyr.



P. sachalinense



P. cuspidatum

P

R

Poison hemlock *Conium maculatum*



F-15

Poison hemlock *Conium maculatum*



P/R

Poison hemlock is an herbaceous biennial that grows 3-10' tall. The hairless, ridged stems branch extensively and are hollow except at the nodes. Reddish purple mottling is common on the lower stem.

Leaves: Fern-like; pinnately compound; toothed; 8-16" long; and broadly triangular. Leaf veins end at the tips of the teeth on the edges of the leaflets. Leaves are shiny, green, and emit an unpleasant odor when crushed.

Flowers: Umbels (4-6" across) with numerous small, 5-petaled, white flowers; umbels appear on individual stems that extend from a common stalk. Blooms May-August.

Fruits & seeds: Seeds are 2-joined, distinctly ridged, curved on one side and flattened to concave on the other.

Roots: Fleshy, thick, white taproot. Can be mistaken for parsnip.

Similar species: Can be mistaken for edible members of the carrot family--fennel, parsley, carrot, but poison hemlock lacks hairs on stems

and leaves. Water hemlock (*Cicuta maculata*; native) has leaf veins that end in the notches between the teeth on the edges of the leaflets. Giant hogweed (*Heracleum mantegazzianum*; invasive) (see F-9) has a hairy stem and larger, less divided leaves. Wild chervil (*Anthriscus sylvestris*; invasive) (see F-23) has slightly hairy leaves and long, narrow, 2-joined seeds.

CAUTION: All parts of the plant (fresh or dried) are toxic to animals and humans if ingested.

Ecological threats:

- Poison hemlock invades prairies, pastures, riparian woodlands, stream banks, floodplains, and roadsides.
- It can quickly colonize disturbed sites.

Control:

- Manual/Mechanical: Hand pull or mow close to the ground prior to seed set multiple times per growing season for several years.
- Chemical: Foliar spray with 2, 4-D or dicamba before buds are present.

Purple loosestrife *Lythrum salicaria*



F-16

Purple loosestrife *Lythrum salicaria*



R

Purple loosestrife is a wetland perennial that grows 3-7' tall on 4 to 6-sided, somewhat woody stems. Plants get larger and more bush-like with each year of growth.

Leaves: Opposite; entire; downy; each pair of leaves is at right angles to the next pair above or below; occasionally leaves appear in groups of three.

Flowers: Individual flowers have 5-7 pink-purple petals surrounding small, yellow centers; arranged on spikes. Blooms July-September.

Fruits & seeds: Fruit is a 2-valved capsule. "Sterile" purple loosestrife cultivars can cross pollinate with other cultivars and native *Lythrum alatum* to produce seed.

Roots: A large, woody taproot with extensive rhizomes can send out 30-50 shoots.

Similar species: Northern willow-herb (*Epilobium ciliatum*; native) and hairy willow-herb (*Epilobium hirsutum*; invasive) (see a-4) are perennials that resemble purple loosestrife but can be distinguished from it by round stems and

smaller, 4-petaled, pink flowers. Hairy willow-herb is also covered by long spreading hairs.

Ecological threats:

- Purple loosestrife invades many types of wetlands including, wet meadows, marshes, river and stream banks, ponds, lake edges and ditches.
- Once established it can quickly form dense stands that displace other emergent wetland species.
- It has been planted as an ornamental.

Control:

- Manual/Mechanical: Cut and remove flowering spikes to prevent seed production for that year; plants will resprout.
- Chemical: Foliar spray with triclopyr, imazapyr, or aquatic approved glyphosate in the fall when the plant is reaching dormancy. Cut-stump treat with aquatic approved glyphosate.
- Biological: Biological control is an option.

Spotted knapweed *Centaurea stoebe* (*C. biebersteinii*, *C. maculosa*)



F-17

Spotted knapweed *Centaurea stoebe* (*C. biebersteinii*, *C. maculosa*)



R

Spotted knapweed is an herbaceous, short-lived perennial that grows 2-4' tall. It persists as a rosette for 1-4 years before bolting. Flowering plants typically have 1-6 stems, but some have up to 20.

Leaves: Alternate; deeply divided; gray-green; and covered in rough hairs. Rosette leaves grow up to 6" long; lower stem leaves resemble rosette leaves, becoming small (1-3" long), entire, and linear higher up the stem.

Flowers: Thistle-like, pink to purple (rarely white) flower heads have stiff bracts tipped with black, fringed hairs. Blooms mid-summer to early fall.

Fruits & seeds: Wind-dispersed for short distances but carried long distances by humans, livestock, or small mammals.

Roots: Taproot; sometimes with a shallow mat of fibrous roots extending several feet from the plant; sometimes sprouting from lateral roots.

Similar species: There are many *Centaureas*; all are aggressive in Wisconsin.

CAUTION: Wear long sleeves and gloves when handling. Spotted knapweed exposure can irritate skin.

Ecological threats:

- Spotted knapweed invades dry and/or sandy areas, including oak and pine barrens, prairies, dunes, pastures, and roadsides.
- The roots exude allelopathic chemicals.
- It is avoided by both livestock and native grazers.
- Infestations cause increased runoff and sedimentation and decreased water-holding capacity in soil.

Control:

- Manual/Mechanical: Hand pull small populations; remove entire root.
- Chemical: Foliar spray with aminopyralid, clopyralid, glyphosate, or 2,4-D ester during bolting or flower bud stage.
- Biological: Biological control is an option.

Spurge, cypress *Euphorbia cyparissias*

Spurge, leafy *Euphorbia esula*



Leafy spurge



Leafy spurge



Cypress spurge

F-18

Spurge, cypress *Euphorbia cyparissias*
Spurge, leafy *Euphorbia esula*



R

Both spurges are herbaceous perennials with deep root systems and milky sap in stems, flowers, and leaves. The sap is distasteful to some animals and can cause blistering in their mouths or throats. Leafy spurge grows 0.5-3' tall; cypress spurge can reach 1'. It spreads both vegetatively and by seed. Leafy spurge is legally classified as a noxious weed.

Leaves: Leafy spurge leaves are alternate, 1-4" long, hairless, bluish green, and linear with pointed tips. Cypress spurge leaves are numerous, alternate or whorled, 1" long, bright green, and more narrow than leafy spurge leaves.

Flowers: Small; yellowish green; and surrounded by cup-shaped bracts. Flowers are paired, with 7-10 pairs clustered in umbels at tops of stems. Both bloom late spring through mid-summer.

Fruit & seeds: Reproduces readily from seed. Mature seed pods disperse seeds explosively, expelling seeds up to 20' away.

Roots: Woody rhizomes grow to depths of 15' and spread laterally up to 35'. Sprouts from root buds facilitate spread into undisturbed areas.

Root fragments buried as deep as 9' in the soil can give rise to new plants.

Ecological threats:

- They invade oak savannas, prairies, fields, pastures, and roadsides; they are most aggressive where soil moisture is limited.
- They can quickly create monospecific stands which exclude native vegetation and reduce wildlife habitat value.
- Leafy spurge is more widespread and aggressive than cypress spurge in Wisconsin.

Control:

- Manual/Mechanical: Hand pull or dig; this is only effective if you remove the entire root system which is difficult.
- Chemical: Foliar spray with aminopyralid or imazapic.
- Biological: Biological control is an option.

Sweet clover, white *Melilotus albus*
Sweet clover, yellow *Melilotus officinalis*



Yellow sweet clover



White sweet clover



White sweet clover

F-19

Sweet clover, white *Melilotus albus*
Sweet clover, yellow *Melilotus officinalis*



White and yellow sweet clover are herbaceous, biennial legumes. They appear similar except for their distinguishing yellow or white flowers. Yellow sweet clover is usually shorter than white sweet clover. First-year plants do not bloom. Second-year plants grow 3-5' tall and can be bush-like.

Leaves: Leaves are alternate and compound with 3 finely-toothed leaflets; the middle leaflet grows on a short but distinct stalk. Sweet clover leaves are longer and thinner than other clovers.

Flowers: Flowers are small, five-parted, pea-like, fragrant, and white (*M. albus*) or yellow (*M. officinalis*); they are clustered in dense racemes in the top 4" of the stem. Both bloom late spring through summer.

Fruits & seeds: Fruits are small, dark brown to black, ovate pods; each pod contains 1 or 2 small oval yellow seeds. Seeds remain viable in the soil for up to 30 years.

Roots: Taproot with extensive lateral roots.

Ecological threats:

- Both sweet clovers invade oak savannas, prairies, fields, dunes, and roadsides.
- Fire stimulates germination of sweet clover seeds and can exacerbate invasions.
- Sweet clover increases nitrogen in soil which may increase other weeds in prairies.
- Both are planted as forage.

Control:

- **Manual/Mechanical:** Hand pull small populations before seed set. Use brush-cutter for large populations. Use controlled burns to stimulate germination; then burn in late spring the following season to kill 2nd year plants.
- **Chemical:** Foliar spray seedlings in early spring with dicamba, sulfometuron methyl, clopyralid, aminopyralid, metsulfuron-methyl, or 2,4-D.

Tansy *Tanacetum vulgare*



F-20

Tansy *Tanacetum vulgare*



R

Tansy is an herbaceous perennial that grows 2-5' tall. It is erect and unbranched except for the flower head. Stems are slightly hairy, woody, and purplish red near the base. All cultivars except 'Aureum' and 'Compactum' are regulated.

Leaves: Alternate; 2-12" long and 1/2 as wide; pinnately divided, toothed. Leaves are strongly aromatic when crushed.

Flowers: Flat-topped clusters of bright yellow, button-like discs; each disc up to 0.5" wide. Blooms July-October.

Fruits & seeds: Seeds are yellowish brown dry fruits with short, five-toothed crowns; dispersed via wind, water, and roadside mowing.

Roots: Spreads vegetatively forming new plants from even small root fragments.

Similar species: Lake Huron tansy (*Tanacetum huronense*; native), a Wisconsin endangered species, is shorter (16-23"), has fewer and larger flowers, and is found only on a few Great Lakes beaches.

Ecological threats:

- Tansy invades well-drained or sandy soils in prairies, fields, pastures, and roadsides.
- It is unpalatable to grazing animals, and contains alkaloids that are toxic to both livestock and humans if consumed in large quantities.
- Tansy has been planted as an ornamental.

Control:

- **Manual/Mechanical:** Cut or mow prior to flowering to prevent seed set. Remove dead vegetation with controlled burns to make the plants easier to target with herbicides.
- **Chemical:** Foliar spray with metsulfuron-methyl, imazapyr, glyphosate, or 2,4-D in the spring.

Teasel, common *Dipsacus fullonum* (*D. sylvestris*)

Teasel, cut-leaved *Dipsacus laciniatus*



Common teasel



Cut-leaved teasel



F-21

Teasel, common *Dipsacus fullonum* (*D. sylvestris*)

Teasel, cut-leaved *Dipsacus laciniatus*



R

Teasels are herbaceous, monocarpic perennials. They grow as a basal rosette for at least one year; then form a prickly flower stalk, 2-6' tall, typically in the second or third year.

Leaves: Opposite; large (up to 1.5' long); oblong; and prickly. Leaves of flowering plants join into a cup around the stem. Common teasel leaves are not lobed; cut-leaved teasel has broader leaves with deep, feathery lobes.

Flowers: Hundreds of small flowers, clustered in dense, egg-shaped heads; stiff, spiny, bracts curve up from base of flower head. Common teasel has purple flowers and bracts longer than the flower heads. Cut-leaved teasel has white flowers and bracts shorter than the flower heads. Common teasel blooms June-October; cut-leaved teasel blooms July-September.

Fruits & seeds: Small fruits produce 1 hairy, gray-brown seed each.

Roots: Deep taproot; up to 2' long and 1" in diameter.

Ecological threats:

- Both teasels invade oak savannas, prairies, fields, sedge meadows, and roadsides.
- Rapid range expansion of cut-leaved teasel has been observed in several Midwestern states, especially along roadsides.
- They have been used as both cut and dried flowers.

Control:

- Manual/Mechanical: Dig rosettes; remove as much of root as possible. Cut mature plants in full bud stage; plants will re-sprout but will not flower. Burn or bag and landfill flower heads. Use controlled burns in late spring.
- Chemical: Foliar spray with triclopyr, clopyralid, aminopyralid, or metsulfuron-methyl before plant has bolted. Foliar spray rosettes in fall with glyphosate.

Thistle, bull *Cirsium vulgare*
 Thistle, musk (nodding thistle) *Carduus nutans*
 Thistle, plumeless *Carduus acanthoides*



Musk thistle



Plumeless thistle



Bull thistle



Typical thistle rosette

F-22

Thistle, bull *Cirsium vulgare*
 Thistle, musk (nodding thistle) *Carduus nutans*
 Thistle, plumeless *Carduus acanthoides*

All are herbaceous biennials. Flowering plants are 1-7' tall. Stems are spiny winged. Musk and plumeless thistles hybridize.

Leaves: First-year basal rosette leaves can be 20" long or longer. Stem leaves are alternate, stalkless, lance-shaped, and coarsely lobed; lobes are tipped with stout spines. Musk - smooth and hairless on both sides. Plumeless and bull - 0.5-1" and 1.5-2" across respectively; on winged stems; bracts with spiny tips. All bloom May-August.

Flowers: Flower heads are brush-like, pink to purple, single or clustered at end of stem. Musk - 1.5-3" across; solitary; usually bent over or "nodding" on smooth stalk. Plumeless and bull - 0.5-1" and 1.5-2" across respectively; on winged stems; bracts with spiny tips. All bloom May-August.

Fruits & seeds: Seeds have a tuft of feathery bristles; wind-dispersed.

Roots: Taproot.

Similar species: Marsh thistle (*Cirsium muticum*; native) and Canada thistle (*C. arvense*; invasive)

(see F-2) have non-spiny stems and flower heads. European marsh thistle (*C. palustre*; invasive) (see F-7) has spiny, winged stems and is covered with long, sticky hairs.

Ecological threats:

- All invade prairies, fields, pastures, roadsides, and ditches.



Cirsium vulgare



Carduus nutans
Carduus acanthoides

N

R

Control:

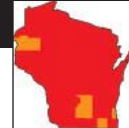
- **Manual/Mechanical:** Use sharp shovel to cut 1-2" below the soil surface. Mow (minimum 2-3 times per growing season) when flower buds are about to open to prevent seed production.
- **Chemical:** Foliar spray with glyphosate during the early bolting phase when plants are 6-10" tall. Foliar spray with aminopyralid, clopyralid, metsulfuron-methyl, or triclopyr during the bud to flower phase or to rosettes in the fall. Foliar spray musk thistle with 2,4-D ester or dicamba in early bolting phase.

Wild chervil *Anthriscus sylvestris* (*Chaerophyllum sylvestre*)



F-23

Wild chervil *Anthriscus sylvestris* (*Chaerophyllum sylvestre*)



P/R

Wild chervil is an herbaceous, monocarpic perennial that has grooved, hollow stems covered in soft hairs. It grows 3-6' tall. All cultivars of this species are regulated.

Leaves: Alternate; compound with fern-like leaflets; nearly hairless; leaf base clasping the stem.

Flowers: Umbels of small, 5-petaled, white flowers. Blooms late May-early July.

Fruits & seeds: Seeds are 2-joined, 0.25" long, shiny brown, and narrow with antennae-like tips; dispersed via water, birds, and human activity.

Roots: Thick taproot; up to 6' deep; with lateral buds.

Similar species: Wild carrot (*Daucus carota*; non-native) has bracts at the base of each umbel and often has a purple flower in the center of each umbel, and smells like carrots when crushed. Japanese and spreading hedgeparsley (*Torilis japonica* and *T. arvensis*; both invasive) (see F-10) are more freely branching; their leaves are sparser, and their seeds are smaller. Poison hemlock

(*Conium maculatum*; invasive) (see F-15) is taller, up to 10', and has stems that are ridged and have purple mottling.

Ecological threats:

- Wild chervil invades open forests and woodlands, fields, pastures, and roadsides where it can shade out surrounding vegetation.
- It is a host to parsnip yellow fleck virus which infects carrots, celery, and parsnips.
- It has been planted as an ornamental and is found in some European "wildflower" seed mixes.

Control:

- **Manual/Mechanical:** Hand pull or dig rosettes or small plants; remove entire root. Mow repeatedly throughout growing season to deplete root reserves and prevent seed set.
- **Chemical:** Foliar spray before blooming and one month after a pre-bloom cut with glyphosate, dicamba, clopyralid, or imazapyr.

Wild parsnip *Pastinaca sativa*



F-24

Wild parsnip *Pastinaca sativa*



R

Wild parsnip is an herbaceous, monocarpic perennial. It grows as a rosette with upright leaves, for at least 1 year. Flowering stems are stout, hollow, grooved, and up to 5' tall. The garden vegetable form is not restricted.

Leaves: Rosette leaves are pinnately compound with 5-15 broad, ovate to oblong leaflets. Stem leaves are alternate, with 2-5 pairs of sharply toothed leaflets. Leaf stalks wrap around the stem. Upper stem leaves are reduced to narrow bracts.

Flowers: Numerous; small; 5-petaled; yellow; in 2-6" wide, flat umbels. Blooms late spring to early summer.

Fruits & seeds: Yellowish; oval; 0.25" long; smooth on one side with four curved "ribs" on the other (see photo).

Roots: Long, thick taproot.

Similar species: Wisconsin threatened species prairie parsley (*Polytaenia nuttallii*; native) has sparser umbels that are somewhat rounded; leaves have few teeth. Golden Alexander

(*Zizia aurea*; native) has more condensed umbels and 3-7 leaflets.

CAUTION: When sap contacts skin in the presence of sunlight, it can cause severe rashes, blisters, and discoloration of the skin (phytophotodermatitis). Wear gloves, long sleeves, and long pants when handling.

Ecological threats:

- Wild parsnip invades oak savannas, prairies, fields, pastures, and roadsides.
- It has a broad habitat tolerance, growing in dry, mesic, or wet habitats, but it does not grow in dense shade.

Control:

- Manual/Mechanical: Hand pull or use a sharp shovel to cut root 1-2" below soil surface. Use a brush-cutter on large populations before seeds develop. If flowering or in seed, burn or bag and landfill the flower heads.
- Chemical: Foliar spray with metsulfuron-methyl (mid-May to mid-June), glyphosate, or 2,4-D.

Yellow star thistle *Centaurea solstitialis*



F-25

Yellow star thistle *Centaurea solstitialis*



P

Yellow star thistle is a multi-stemmed herbaceous annual that grows 1.5-3' tall. Stems are upright, stiff, winged, and branched. Stems are covered with tangled, matted hairs which give the plant a gray-green appearance.

Leaves: Basal leaves are deeply, pinnately lobed, 2-3" long, and form a rosette. Stem leaves are 0.4-4" long, entire, linear or tapered at both ends with the broadest part below the middle. Stem leaves attach directly to the stem by a wing that runs down the side of the stem.

Flowers: Flowers are bright yellow and have sharp spines that protrude from the surrounding base. Blooms June-October.

Fruits & seeds: Produces both tufted and non-tufted dry fruit.

Roots: Taproot.

CAUTION: Wear gloves when handling to protect hands from sharp spines.

Ecological threats:

- Yellow star thistle invades open woodlands, prairies, fields, pastures, and roadsides.
- It is toxic to horses; it may cause injury to grazing animals due to its spines; and it decreases wildlife habitat quality.
- It can deter human activities with its spiny flower heads.

Control:

- Manual/Mechanical: Pull, till, or mow before bloom.
- Chemical: Foliar spray with clopyralid, aminopyralid, dicamba, glyphosate, or triclopyr.
- Biological: Biological control is an option.

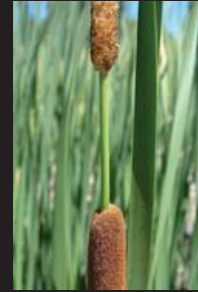
Cattail, hybrid *Typha x glauca*
 Cattail, narrow-leaved *Typha angustifolia*



Broad-leaved cattail
 (native, non-invasive; one parent
 of hybrid)



Hybrid cattail



Narrow-leaved cattail--
 showing the separation
 between male and female
 spikes (invasive; one
 parent of hybrid)

G-1

Cattail, hybrid *Typha x glauca*
 Cattail, narrow-leaved *Typha angustifolia*



R

Cattails are perennial, wetland plants 5-10' tall, often with a submersed base. Hybrid cattail is a cross between the native, non-invasive *T. latifolia* (common or broad-leaved cattail) and the invasive *T. angustifolia* (narrow-leaved cattail). The best way to identify the hybrid is to first learn the characteristics of the parental species then look for plants that are intermediate.

Leaves: Erect; linear; flat; very long; and narrow (0.15-0.5" wide for *T. angustifolia*, 0.4-1.14" wide for *T. latifolia*, and 0.3-0.8" wide for the hybrid). About 15 leaves per shoot.

Flowers: Numerous tiny flowers densely packed into cylindrical spikes at end of stem; divided into upper section of male flowers and lower, cigar-shaped section of female flowers. The separation between male and female spikes is 0.5-4" in *T. angustifolia* and 0-2" in the hybrid; there is generally no separation in *T. latifolia*. All bloom May-July.

Fruits & seeds: Seeds are tiny with downy hairs underneath are wind dispersed. Hybrid cattail is highly sterile and produces very few or no seeds.

Roots: Rhizomes form large colonies.

Ecological threats:

- Invasive cattails can be found in freshwater marshes, wet meadows, fens, shallow ponds, streams, lake shores, ditches, and roadsides.
- Large monospecific stands of invasive cattails spread vegetatively and exclude other plants that provide wildlife food and cover.
- Seeds are widely dispersed, therefore minimizing disturbance in wet soils will limit invasions.

Control:

- **Manual/Mechanical:** Cut or crush all stems, both green and dead, in mid to late summer or early fall. Where possible, maintain a water level at a minimum of 3" above the cut stems for the entire growing season.
- **Chemical:** Foliar spray with imazapyr. Repeat as needed.

Japanese stilt grass *Microstegium vimineum*



G-2

Japanese stilt grass *Microstegium vimineum*



P

Japanese stilt grass, also known as Nepalese browntop, is an annual grass with a spreading habit that can grow up to 3' tall and form large colonies. It has a branched stalk that resembles weak bamboo. At the time of printing, there are no known populations of Japanese stilt grass in Wisconsin.

Leaves: Leaves are narrow, lance-shaped, and up to 3" long. They have a silvery stripe of reflective hairs down the middle of the upper surface.

Flowers: Slender stalks of tiny flowers can arise singly or in sets of 2-3. Blooms in late summer.

Fruits & seeds: Dry fruits vary from yellow to red in color. Seeds are dispersed by wind, water, animals, and humans.

Roots: Spreads vegetatively during the growing season by rooting at nodes along the stem.

Similar species: White grass (*Leersia virginica*; native) appears similar, however, it lacks the reflective silver strip. Spotted lady's thumb (*Polygonum persicaria*; native) can form masses of

grass-like plants, but the leaves have a dark blotch on them and the flowers appear pink and bead-like.

Ecological threats:

- Japanese stilt grass invades streambanks, floodplains, and woodland edges, then expands into forests.
- It adapts readily to both high and low light conditions and from moist to relatively dry soils.
- It has been shown to change the pH of the soil, as well as the organic soil and litter ratios.
- Japanese stilt grass spreads quickly because it produces seed in the first growing season.
- Dry plant material increases fuel loads for fires.

Control:

- **Manual/Mechanical:** Hand pull small populations before seed set. Use brush-cutter for large populations.
- **Chemical:** Foliar spray with sethoxydim, glyphosate, or an herbicidal soap such as pelargonic acid. Imazapic can be applied pre- or post-emergence.

Phragmites *Phragmites australis*



G-3

Phragmites *Phragmites australis*



R

Phragmites, also known as common reed, is a perennial wetland grass that grows 3-20' tall with dull, rigid, hollow stems. It creates dense clones. Canes persist throughout winter. The native type is not restricted.

Leaves: Smooth; narrow; 6-24" long and 0.4-2.4" wide; gray-green in color. Leaf bases form overlapping smooth sheaths around the stems.

Flowers: Large feathery panicles; 5-16" long; purple-brown turning golden brown with age. Blooms July-September.

Fruits & seeds: Produces thousands of seeds annually, but viability is typically low.

Roots: Dense network of roots and rhizomes, up to 6' deep. Rhizomes can grow over 10' per year spreading above and below ground.

Similar species: The native subspecies of phragmites (*Phragmites australis* ssp. *americanus*) has smooth reddish brown canes with shiny black spots; canes are flexible. The inflorescence is less dense, as are the stands. Both the leaves and leaf sheaths are loose and usually drop at the end of

the growing season. On the introduced phragmites, the leaf sheaths typically adhere tightly to dead stems.

Ecological threats:

- Phragmites invades moist habitats including lake shores, river banks, and roadways.
- Once it invades a site, it can quickly form monospecific stands, excluding native plants, changing hydrology, altering wildlife habitat, and increasing fire potential.
- It is difficult to control as rhizomes and adventitious buds continue to spread.

Control:

- **Manual/Mechanical:** Mow (where possible) 3-5 times during the growing season to decrease stand density. Mow or burn after a chemical application for additional control and maintenance (i.e. apply chemical in late summer and burn in late fall).
- **Chemical:** Foliar spray or bundle, cut, and treat with imazapyr from June-September.

Reed canary grass *Phalaris arundinacea*



G-4

Reed canary grass *Phalaris arundinacea*



N

Reed canary grass is a perennial, sod-forming, cool-season grass with erect, hairless stems that grow 2-6' tall. Although there is evidence that there are native strains, it's generally believed that the invasive strains are not native.

Leaves: Leaves are flat, rough textured on both surfaces, gradually tapering from base to tip, 4-8" long and 0.5" wide. The ligule is unusually large (0.1-0.3" tall) and transparent (see photo).

Flowers: Flower heads are 3-6" long; green to purple when in bloom; but changing to tan as seeds form. Flower branches spread open when in bloom but draw close to stem at maturity. Blooms May-June.

Fruits & seeds: Seeds ripen in late June and can germinate immediately at maturation; dispersed via water, animals, and human activity.

Roots: Rhizomes with large numbers of dormant buds create a thick fibrous mat at, or just below, the soil surface.

Similar species: Orchard grass (*Dactylis glomerata*; non-native) has narrower leaves than reed canary

grass. Bluejoint grass (*Calamagrostis canadensis*; native) does not have a transparent ligule.

Ecological threats:

- Reed canary grass dominates a significant number of wetlands in the Midwest and also spreads into forests, prairies, fields, and floodplains.
- It forms dense persistent monospecific stands which out-compete desirable vegetation and are of little use to wildlife.
- It is used as forage and for erosion control.

Control:

- **Manual/Mechanical:** Hand pull, dig, or smother small patches. Mow close to the ground at least 3 times/year to retard growth and prevent seed set. Till soil repeatedly for at least one growing season or remove the top 8-18" of sod. Burn in late spring or fall for 5-6 years in a row.

- **Chemical:** Foliar spray with sethoxydim, clethodim, glyphosate, sulfometuron methyl, or imazapic. Bundle, cut, and treat with glyphosate.

A combination of these methods over several years may be necessary to reduce a stand.

Tall manna grass *Glyceria maxima*



G-5

Tall manna grass *Glyceria maxima*



P/R

Tall manna grass is a perennial grass with unbranched stems that can reach 8' tall. All varieties are prohibited or restricted including the variegated form.

Leaves: Leaves are 0.75" wide and 8-12" long, shallowly grooved, flat or slightly folded with a prominent mid-vein. Leaf edges have stiff, short hairs that are rough to the touch. Leaf sheaths are rough textured with a reddish brown band at the junction with the leaf. Ligules are membranous, smooth, rounded, and 0.2" long.

Flowers: The inflorescence is an open or compressed panicle, 6-12" long, with branches that have short stiff hairs. Spikelets are 0.2-0.3" long. Blooms June-August.

Fruits & seeds: Seeds are small (0.07"), dark brown, and smooth with a deep, narrow central furrow. Seed viability is variable.

Roots: Rhizomes.

Similar species: American manna grass (*Glyceria grandis*; native) is shorter (4.5' tall); its panicles have nodding, hairless branches and shorter spikelets.

Ecological threats:

- Tall manna grass invades wetlands, including swamps, lakes, ponds, slow-moving rivers, creeks, ditches, and wet pastures, where it forms monospecific stands that are capable of crowding out native vegetation.
- It degrades wetland habitats because it's not suitable for nesting and is a poor food source for wildlife.
- Tall manna grass has been sold as an ornamental in a variegated variety.
- Young shoots can cause cyanide poisoning in cattle if used as forage.

Control:

- **Manual/Mechanical:** Smother small populations with black plastic. Cut or mow repeatedly for several years. Flooding cut stems may drown the plant.
- **Chemical:** Foliar spray with glyphosate formulated for use over water. Repeat as needed.

Appendix A - Additional NR 40 Species

TREES



P

Princess tree *Paulownia tomentosa*



P

Sawtooth oak *Quercus acutissima*

a-1

SHRUBS



P

Scotch broom *Cytisus scoparius*



P

Wineberry *Rubus phoenicolasius*

a-2

VINES



P

Mile-a-minute vine *Polygonum perfoliatum*

FORBS



P/R

Hairy willow herb *Epilobium hirsutum*

a-3



R

Helleborine orchid *Epipactis helleborine*



P

Perennial pepperweed *Lepidium latifolium*

a-4



P

Sericea lespedeza *Lespedeza cuneata* (*Lespedeza sericea*)

GRASSES



P/R

Lyme grass *Leymus arenarius*

a-5

Appendix B - Control

Often more than one control method is required to effectively control a species, but the general goal of control efforts is to prevent the production of seeds and other propagules and where possible eliminate the plants.

Manual control includes activities such as hand-pulling, digging, flooding, smothering, cutting, girdling, and burning. Works best on small populations or where chemicals or motorized equipment cannot be used. Efforts must be persistent and several treatments may be needed. Manual control may become too labor intensive and thus not economically feasible.

Mechanical control includes using various tools and machines for pulling, cutting, mowing, girdling, tilling, and chopping. Most useful for large infestations where terrain does not create safety or equipment issues. Can be most effective when combined with herbicide treatments. Mechanical control may become too labor intensive and thus not economically feasible.

Digging/Hand-pulling - Remove entire root to prevent resprouting. Usually works best with small or young plants, in sandy or loose soils, or when soils are damp.

Cutting/Mowing - Cut or mow several times during the growing season. Most effective if done just before plants flower. Check for reflowering. Herbicide can be applied to the cut stems or sprouts. Avoid mowing if seeds have already developed as this will spread them. (See b-6 and b-7).

Smothering - Use mulch, black plastic, or any other impenetrable barrier to cover target plants for at least one growing season. The effectiveness of this technique can be increased by first cutting the target plants and then smothering them. Be sure to cover all stems of clonal species.

Girdling - Remove the bark and cambium in a ring, 2-5" wide, extending entirely around a trunk or stem. Herbicide can be applied to the wound. Thick barked trees may be girdled using a chainsaw; cut two rings 2-6" apart, making sure to cut beyond the cambium, and apply herbicide to the cuts.

Burning - Appropriate for fire adapted communities where there is enough fuel to carry a fire. A propane torch can be used to spot-treat young plants or seedlings. Timing of burning will depend on the species that is targeted for control.

b-1

Flooding - Only feasible where water levels can be manipulated to completely cover cut plants for a period of time. The depth of water necessary and the amount of time cut plants should be covered will vary from species to species.

Disposal of invasive plants: In order to prevent the spread of propagules, carefully dispose of plants that are in flower or beginning to produce seeds. In general, plants are considered yard waste and may not be landfilled. However temperatures generated by home composting are generally not high enough to kill seeds. Therefore, it is legal in Wisconsin to landfill prohibited and restricted plants with seeds or fruits.

Biological control refers to the use of insects, fungi, or disease causing organisms to control invasive species. Control organisms usually come from the native range of the target species. They require an extensive period of study to ensure that they will remain specific to the target population and will not harm native species, crops, or other ornamental species and require both federal and state permits for their use. For more information contact the Wisconsin Department of Agriculture, Transportation, and Consumer Protection (DATCP) at 1-866-440-4523 or go to <http://www.invasive.org/eastern/biocontrol/>.

Grazing animals can also be utilized as biological control agents. For effective control, grazing may need to be used multiple, consecutive years, generally during the rosette (early growth) to early flowering stages, sometimes with multiple treatments per year. This practice is best used as part of an integrated pest management plan including manual, mechanical, or chemical controls. Care needs to be taken when using grazers since they can eat desirable plants as well as invasive plants and some plants are toxic depending on the grazer breed.

The following is a list of invasive plant species and the grazers that will eat them:

Sheep, goats, and cattle - kudzu, thistle (bull, Canada, and musk), wild parsnip

Sheep and goats - garlic mustard, spotted knapweed, cypress and leafy spurge, white and yellow sweet clover, tansy, yellow star thistle, reed canary grass

Goats and cattle - giant and Japanese knotweed

Goats - black locust, common buckthorn, honeysuckle (all species), Japanese barberry, multiflora rose, autumn and Russian olive, Oriental bitter-sweet, crown vetch

b-2

Chemical control refers to the use of herbicides. The choice of herbicide and method of application depends on the target population, stage of growth, the presence of desirable species that may be affected, the proximity of water resources, and environmental conditions. **Herbicides must always be applied in accordance with the label.** Surfactants and other additives can be very important to the effectiveness of herbicide treatments; consult the label and retailers for information on the appropriate additives to use. Surfactants should not be used when applying herbicides near water.

Basal bark - Apply herbicide (generally in an oil carrier) in a ring, at least 6" wide, to the base of a woody stem, typically the bottom 12-24 inches. For trees that root sucker, treat the exposed root collar as well. Spray to the point of run-off, but not beyond. Herbicide will penetrate the stem and move to the roots. Best done in fall and early winter. Do not treat wet bark.

Bundle and cut - Bundle together all the stems of a plant (typically a grass). Cut the stems above where they are bundled, and apply herbicide to the cut stems.

Cut-stump treatment - Cut all stems of a plant near its base and apply herbicide to the cut surfaces. Water-based herbicides should be applied immediately after the stem is cut. Oil-based herbicides can be applied later. Best done in fall and early winter.

Foliar spray - Apply herbicide directly to the leaf surfaces of plant. Use care to avoid applying to any non-target plants. Use special formulations near open water.

All herbicide label formulations are listed as percent active ingredient (a.i.); this is the chemical that kills the plant. When an herbicide is purchased it will contain a certain amount of active ingredient. You will need to know the percent a.i. in your herbicide of choice to determine the amount of carrier (i.e. water or oil depending on the herbicide's formulation) you need to add. For example if the herbicide you purchased contains 41% glyphosate, but you need a solution of 1% a.i. you would need to add roughly 3.12 ounces of your original 41% herbicide to a gallon of carrier.

$1 (\% \text{ a.i. in solution}) \times 128 (\text{oz in a gallon}) / 41 (\% \text{ a.i. in herbicide}) = 3.12 (\text{oz of herbicide})$

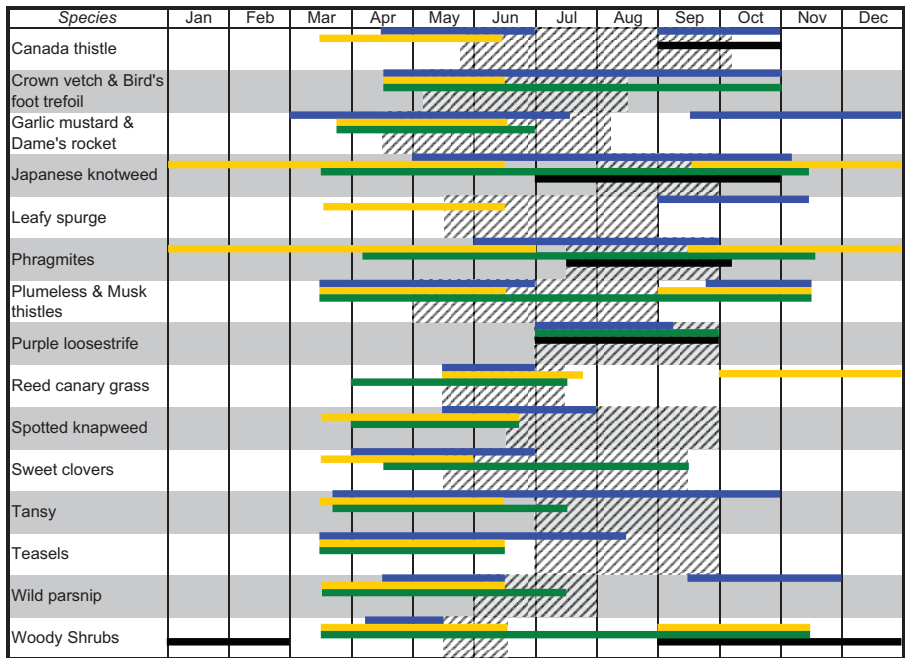
b-3

Referenced herbicides

Chemical Name	Trade Name Examples*	Formulation	Applications
Aminopyralid	Milestone VM	Water soluble	Broad spectrum
Clethodim	N/A	Water soluble	Grass specific
Clopyralid	Transline	Water soluble	Legumes and composites
Dicamba	Banvel, Oracle	Water soluble	Broadleaf specific
Fosamine ammonium	Krenite	Water soluble	Broadleaf specific; bud inhibitor
Glyphosate	Roundup, Accord	Water soluble	Broad spectrum
Glyphosate (Aquatic)	Rodeo	Water soluble	Broad spectrum
Imazapic	Plateau, Journey (+glyphosate)	Water soluble	Broad spectrum
Imazapyr	Arsenal, Assault, Stalker	Water soluble	Pre and post emergent; broad spectrum
Imazapyr (Aquatic)	Habitat	Water soluble	Broadleaf specific (will not work on mostly to fully immersed plants)
Metsulfuron methyl	Escort	Dispersible	Pre and post emergent; broadleaf and some grasses
Sethoxydim	Vantage, Poast	Water soluble	Grass specific
Sulfometuron methyl	Oust	Water soluble	Pre and post emergent; broad spectrum; woody species
Triclopyr amine	Brush-B-Gon, Garlon 3A, Element 3A, Renovate	Water soluble	Broadleaf specific; woody species
Triclopyr ester	Garlon 4, Garlon 4 Ultra, Pathfinder II	Bark oil or methylated seed oil	Broadleaf specific; woody species
2,4-D	Many	Water soluble	Broadleaf specific

*Trade names are listed only as examples of herbicides containing a specific active ingredient and are not endorsements of a company's products.

Suggested timing of control for select species in southern Wisconsin



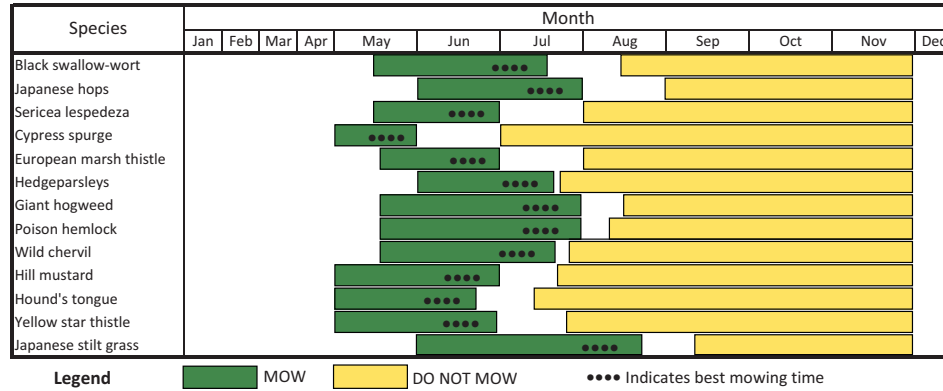
flowering
 spray foliar herbicide
 burn
 hand-pull, dig
 apply herbicide to cut stems

Note: These times become later as you move north or for areas near the Great Lakes.

Suggested mowing times for select species in southern Wisconsin

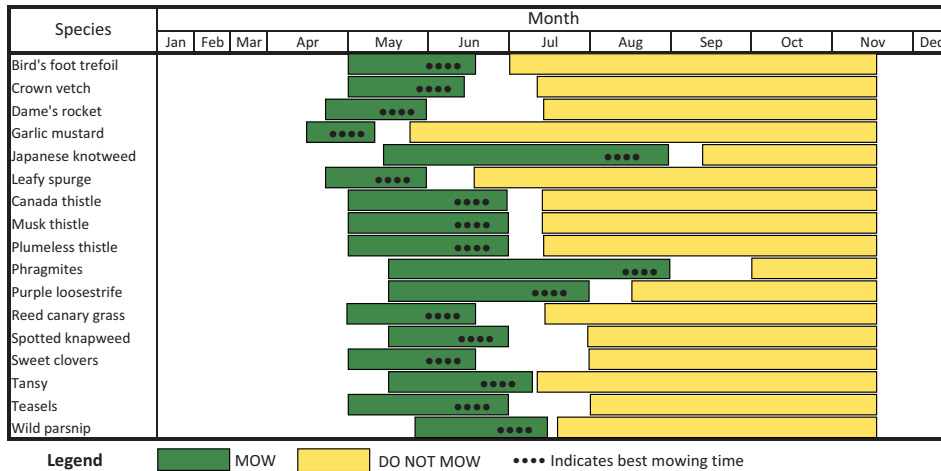
Mowing can be an effective control for some invasive species; however, it can spread those species if not timed correctly. Mowing can be done multiple times per growing season (into the “Do Not Mow” time) to prevent seed production and to deplete root reserves; however, the first mowing should occur when the target invasive is just about to flower or in the early flowering stage. Avoid mowing if seeds have already developed as this will spread them. Emergence, flowering, and seeding times vary from year to year for most species; the charts show average times. These times become later as you move north or for areas near the Great Lakes.

Mowing times for less common* invasive species in southern Wisconsin

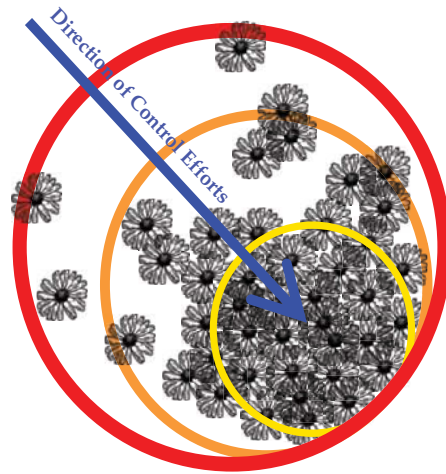


*These species are not yet common in most of Wisconsin and need to be contained if found where prohibited.

Mowing times for common invasive species in southern Wisconsin



Prioritizing Control Efforts for a Single Species by Density of Infestation



Note: Effective control may require the use of multiple control methods. Control efforts must be followed up by monitoring for new plants, regrowth, and flowering, generally within the same growing season. Monitoring should be done annually.

Outliers – Highest priority

- Lowest density of infestation
- Goal = eliminate small, isolated infestations
- Prevent the reproduction and survival of outliers
- Monitor annually beyond the known infestation for new outliers
- Lowest level of commitment, resources and effort needed

Advancing Front

- Goal = control the advancing front and perimeter of core infestations
- Prevent the expansion of the core infestation

Core – Lower priority

- Highest density of infestation
- Goal = suppress the interior of core infestations
- Highest level of commitment, resources and effort needed

Appendix B

Adapted from work by Fred Clark, Clark Forestry, Inc. and Wisconsin DNR-Urban Forestry

b-8

Appendix C - References and Resources

Books and field guides:

- A Field Guide to Invasive Plants of the Midwest* by the Midwest Invasive Plant Network (MIPN), 2008
- A Guide for Prescribed Fire in Southern Forests*, USDA Forest Service Southern Region, Feb. 1989, Technical Pub. R8-TP 11
- Biological Control of Invasive Plants in the Eastern US*, USDA Forest Service, Pub. FHTET-2002-04
- Interactive Encyclopedia of North American Weeds DVD-ROM*, North Central and Southern Weed Science Society
- Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species* by S.R. Kaufman & W. Kaufman, Stackpole Books, 2007
- Control and Identification of Invasive Species: A Management Guide for Missouri in Shaw Nature Reserve Native Landscaping Manual*, MO Dept. of Conservation and Shaw Nature Reserve
- Encyclopedia of North American Weeds DVD-ROM* by the Weed Science Society of America
- A Pocket Naturalist Guide to Invasive Plants of Eastern North America: An Introduction to Problematic Non-native Species* by the Midwest Invasive Plant Network (MIPN), 2008
- Invasive Plants Field & Reference Guide: An Ecological Perspective of Plant Invaders of Forests and Woodlands* by C.D. Huebner, USDA Forest Service, 2006
- Invasive Plants of the Eastern United States CD-ROM: Identification and Control*, USDA Forest Service, Forest Health Technology Enterprise Team, FHTET-2003-08, 2003
- Invasive Plants of the Southern Tier*, USFS Region 9 by C. Mortensen, USDA Forest Service, 2002
- Invasive Plants of the United States DVD-ROM: Identification, Biology and Control*. USDA Forest Service, Forest Health Technology Enterprise Team, FHTET-08-11, 2008
- Invasive Plants of the Upper Midwest* by E. Czarapata, University of Wisconsin Press, 2005
- Manual of Vascular Plants of Northeastern United States and Adjacent Canada*, 2nd Ed. by H.A. Gleason and A. Cronquist, The New York Botanical Garden, 1991
- Minnesota Invasive Non-native Terrestrial Plants: An Identification Guide for Natural Resource Managers* by the Minnesota DNR, 2002
- Nonnative Invasive Plants of Southern Forests: A Field Guide for Identification and Control* by J.H. Miller, USDA Forest Service, Southern Research Station, 2003

Appendix C

c-1

Plant Invaders of Mid-Atlantic Natural Areas by J. Swearingen et al., National Park Service and U.S. Fish and Wildlife Service, 2002
Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas Management by Tu et al., The Nature Conservancy, 2001
Weeds of the North Central States, North Central Regional Research Pub. No. 281, Bul. 772, University of Illinois at Urbana-Champaign, 1981
Weeds of the Northeast by R. Uva, et al. Cornell University Press, 2007
Weeds of the Northern Lake States by C.E. Mortensen, USDA Forest Service, 2001
Weeds of the Northern U.S. and Canada by F. Royer & R. Dickinson, The University of Alberta Press & Lone Pine Publishing, 1999
Weeds of the West by T.D. Whitson, et al. The Western Society of Weed Science, 5th edition, 1999

Websites (as of December 2009):

Center for Invasive Species and Ecosystem Health, Bugwood Network, <http://www.bugwood.org/>
 Illinois DNR, Exotic Species Photo Gallery, <http://dnr.state.il.us/education/ExoticSpecies/photogallery.htm>
 Illinois Nature Preserves Commission, Vegetation Management Guide, <http://www.inhs.uiuc.edu/chf/outreach/VMG/VMG.html>
 Illinois Wildflowers, Dr. John Hilty, http://www.illinoiswildflowers.info/weeds/weed_index.htm
 Invasipedia, <http://wiki.bugwood.org/Invasipedia>
 Invasive Plant Association of Wisconsin (IPAW), <http://www.ipaw.org/>
 Invasive Plant Atlas of New England (IPANE), <http://nbii-nin.ciesin.columbia.edu/ipane/>
 Invasive Plants of the Eastern US - Illinois DNR, <http://www.dnr.state.il.us/Stewardship/cd/>
 Invasive Plants of the US: Identification, Biology and Control, <http://www.invasive.org/weedcd/>
 Midwest Invasive Plant Network (MIPN), www.mipn.org
 MissouriPlants.com, Dan Tenaglia, <http://www.missouriplants.com/>
 Montana Plant Life, <http://montana.plant-life.org/>
 Montana State University Extension, Cropland Weed Management, <http://scarab.msu.montana.edu/CropWeedSearch/Docs/>

North American Plant Protection Organization (NAPPO) Pest Fact Sheets, <http://www.nappo.org/PRA-sheets/PestFactsheets.htm>
 North Central Weed Science Society, <http://www.ncwss.org/>
 Plant Conservation Alliance (PCA), Weeds Gone Wild: Alien Plant Invaders of Natural Areas, <http://www.nps.gov/plants/ALIEN/>
 Southeast Exotic Pest Plant Council, Invasive Plant Manual, <http://www.invasive.org/eastern/eppc/>
 The Nature Conservancy, Element Stewardship Abstracts, <http://www.imapinvasives.org/GIST/ESA/>
 The Nature Conservancy, Fire Management Manual, <http://www.tnfiremanual.org/>
 University of Rhode Island, College of the Environment and Life Sciences Outreach Center, Invasive Plant Management Certification Program Information Portal, http://www.uri.edu/cels/ceoc/ceoc_programs_clp_imcp_resources.html
 University of Wisconsin Extension, Master Gardener Horticulture Information, <http://www.hor.wisc.edu/mastergardener/>
 University of Wisconsin-Stevens Point, Freckmann Herbarium, <http://wisplants.uwsp.edu/VascularPlants.html>
 University of Wisconsin-Green Bay, Herbarium, Invasive Plants of Wisconsin, http://www.uwgb.edu/biodiversity/herbarium/invasive_species/invasive_plants01.htm
 USDA Forest Service, Eastern Region, Non-Native Invasive Species (NNIS), <http://www.fs.fed.us/r9/wildlife/nnis/r9-nnis-sitemap.shtml>
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 USDA Forest Service, Northeastern Area Forest Health Protection's Invasive Plants Website, http://www.na.fs.fed.us/fhp/invasive_plants/weeds/
 USDA National Agricultural Library, National Invasive Species Information Center - Plants, <http://www.invasivespeciesinfo.gov/plants/main.shtml>
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 Weed US: Database of Plants Invading Natural Areas in the United States, <http://www.invasive.org/weedus/>

Wildflowers and Weeds, Thomas J. Elpel's Web World Pages, <http://www.wildflowers-and-weeds.com/weedsinfo/weedprofiles.htm>
Wisconsin DNR, Invasive Species, <http://www.dnr.wi.gov/invasives/>
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Appendix D - Photo Credits

Slow the Spread logo: Laura MacFarland, River Alliance of Wisconsin; **Bird's-foot trefoil:** David Cappaert, Michigan State University, Bugwood.org (close-up flowers); Elizabeth J. Czarapata (close-up flowers & leaves); Richard Old, XID Services, Inc., Bugwood.org (seed pods, flowering plant); **Black locust:** Steven J. Baskauf, Vanderbilt University (seed pods); Marcia Moore, Friesner Herbarium at Butler University (flowers); Katherine Howe, MIPN (leaves); Forest Preserve District of DuPage Co., IL (bark); **Canada thistle:** David Eagan, WDNR (seed-head); Paul Rothrock, Taylor University (flower); Peter Dziuk, Minnesota Dept. of Agriculture (rosette); **Cattails:** Joy Marburger, National Park Service (hybrid & *T. latifolia*); Louis-M. Landry (*T. angustifolia*); **Celandine:** J.R. Crellin, Floral Images (flowering plant, leaf), Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (close-up flower), Stacey Leicht, University of Connecticut, Bugwood.org (seed pods); **Chinese yam:** Peter Whan, The Nature Conservancy of Ohio (leaves); Steven J. Baskauf, Vanderbilt University (bulbils); Elizabeth J. Czarapata (leaves & bulbils); **Common buckthorn:** Paul Rothrock, Taylor University (leaves & fruit); Elizabeth J. Czarapata (seedling, winter branches); Chris Evans, River to River CWMA, Bugwood.org (bark); **Creeping bellflower:** Elizabeth J. Czarapata (plants); Dick Bauer, WDNR (close-up flower); Katy Chayka (leaves); **Crown vetch:** John Cardina, The Ohio State University, Bugwood.org (seed pods); Nathan Tucker, Fort McCoy/CSU-CEMML (close-up flowers); Peter Dziuk, Minnesota Dept. Agriculture (flowering plant); Minnesota Dept. of Agriculture (leaves); **Dame's rocket:** Forest Preserve District of DuPage Co., IL (rosette); Peter Dziuk, Minnesota Dept. of Agriculture (close-up flowers); Richard Old, XID Services, Inc., Bugwood.org (seed pods); Gary Fewless, UW-Green Bay Herbarium (leaves); Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (flowering plants); **Eurasian bush honeysuckles:** Peter Dziuk, Minnesota Dept. of Agriculture (Amur); Elizabeth J. Czarapata (fruit); Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (leaves & flowers); **European marsh thistle:** Gary Fewless, UW-Green Bay Herbarium (stem, rosette, leaf); Ian Shackelford, USDA Forest Service (flowers); **Garlic mustard:** Chris Evans, River to River CWMA, Bugwood.org (close-up flowers); Nathan Tucker, Fort McCoy/CSU-CEMML (flowering plant); Paul Rothrock, Taylor University (leaves); Gary Fewless, UW-Green Bay Herbarium (seedlings); Chris Evans, River to River CWMA, Bugwood.org (green seed pods); Ohio State Weed Lab Archive, The Ohio State University, Bugwood.org (dry seed pods); **Giant hogweed:** Donna R. Ellis, University of Connecticut, Bugwood.org (leaf, plant); Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (stem); **Glossy buckthorn:** Stephen L. Solheim, UW-Whitewater (fruit); Christopher Noll (seedling); Elizabeth J. Czarapata (bark); **Hairy willow herb:** J.R. Crellin, Floral Images (flower & seed pod); Elizabeth Czarapata (flower); **Hedgeparsleys:** Dan Tenaglia, MissouriPlants.com, Bugwood.org (fruit); Elizabeth J. Czarapata (flowering stem); WDNR (leaves);

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Elizabeth J. Czarapata (stem, flower); **Reed canary grass:** Peter Dziuk, Minnesota Dept. of Agriculture (green leaves); Elizabeth J. Czarapata (seedhead); Gary Fewless, UW-Green Bay Herbarium (infestation), Richard Old, XID Services, Inc., Bugwood.org (ligule); **Sawtooth oak:** David J. Moorhead, University of Georgia, Bugwood.org (leaf & bark); Chuck Barger, University of Georgia, Bugwood.org (acorn); **Scotch broom:** J.R. Crellin, Floral Images (flower); Richard Old, XID Services, Inc., Bugwood.org (leaves or seedhead); **Sericea lespedeza:** Elizabeth Czarapata (plant); Dan Tenaglia, MissouriPlants.com, Bugwood.org (flower); **Spotted knapweed:** Peter Dziuk, Minnesota Dept. of Agriculture (flower & rosette); Minnesota Dept. of Agriculture (leaves); **Spurges:** Kenneth J. Sytsma (leafy spurge plant); Debbie Maurer, Lake Co. Forest Preserve District, IL (close-up leafy spurge flower); Marilyn J. Jordan, The Nature Conservancy - Long Island (cypress spurge); **Swallow-worts:** John M. Randall, The Nature Conservancy, Bugwood.org (pale swallow-worts), Kelly Kearns, WDNR (black swallow-wort flower); Courtney LeClair, WDNR (black swallow-wort leaf & pod); **Sweet clovers:** Nathan Tucker, Fort McCoy/CSU-CEMML (yellow plant); Elizabeth J. Czarapata (white flowers); Pedro Tenorio-Lezama, Bugwood.org (close-up leaves); **Tall manna grass:** Debbie Maurer, Lake Co. Forest Preserve District, IL (flower); Anna-Lena Anderberg, Swedish Museum of Natural History (plants); **Tansy:** Elizabeth J. Czarapata (plant); Steve Dewey, Utah State University, Bugwood.org (close-up flowers); Tom Boos, WDNR (infestation, seedhead); **Teasels:** Paul Rothrock, Taylor University (common flower, rosette); Debbie Maurer, Lake Co. Forest Preserve District, IL (cut-leaved flower); Peter Dziuk, Minnesota Dept. of Agriculture (cut-leaved seedheads); Richard Old, XID Services, Inc., Bugwood.org (cut-leaved leaves); **Thistles:** Paul Rothrock, Taylor University (musk thistle); Elizabeth J. Czarapata (bull thistle, plumeless thistle); Todd Pfeiffer, Klamath County Weed Control, Bugwood.org (typical thistle rosette); **Tree-of-heaven:** Paul Wray, Iowa State University (leaves); Debbie Maurer, Lake Co. Forest Preserve District, IL (samaras); James H. Miller, USDA Forest Service, Bugwood.org (branch); **Wild chervil:** J.R. Crellin, Floral Images (plant); Elizabeth J. Czarapata (stem with leaves & close-up flowers) Richard Old, XID Services, Inc., Bugwood.org (seedhead); **Wild parsnip:** Nathan Tucker, Fort McCoy/CSU-CEMML (flower, leaves); Debbie Maurer, Lake Co. Forest Preserve District, IL (seeds); **Wineberry:** Leslie J. Mehrhoff, University of Connecticut, Bugwood.org; **Yellow star thistle:** Peggy Greb, USDA Agricultural Research Service, Bugwood.org (flower); Richard Old, XID Services, Inc., Bugwood.org (plant); Barry Rice, sarracenia.com, Bugwood.org (stem).

Appendix E - Glossary

* Illustration provided on page e-4 or e-5.

allelopathic	producing and releasing substances that inhibit the growth of other species
alternate*	leaves arranged singly at each node along a stem
annual	a plant which germinates from seed, flowers, sets seed, and dies within one year
axil*	the upper angle at the point of attachment between a leaf stalk and stem
biennial	a plant which lives only two years, flowering in the second year
bract*	a leaflike structure from which the flower arises, sometimes a specialized leaf below an inflorescence
calyx	modified leaves that are also called sepals and are immediately below the petals of a flower
capsule	a dry fruit of two or more chambers which splits open when ripe
clonal	multiple individuals originating from vegetative reproduction from a single individual
compound	leaf blade divided into distinct leaflets
connate*	fused or united to a similar plant part, such as leaves connate around a stem
cool-season grass	grass species which grow actively during cool, rainy months (spring and fall) but go dormant in hot, dry weather (summer)
cultivar	a form of plant originating under intentional breeding or cultivation
DBH	diameter at breast height of a tree (1.4 meters above the ground)
dioecious	male and female flowers borne on different plants
divided	cut into distinct parts or lobes near the base or midrib
dormancy	the state of a plant when its metabolic activity slows drastically to conserve energy during adverse conditions, usually during winter
entire*	a smooth leaf edge, without teeth, notches, or lobes
glandular	bearing glands which produce sticky or oily matter
herbaceous	typical of an herb, not woody
inflorescence*	the flowering clusters on a plant

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Appendix E

joint	place on stem where a leaf arises, usually used for grasses
lance-shaped	longer than wide, broadest toward the base, tapering toward tip
legume	a plant that has pods as fruits and roots that bear nodules containing nitrogen- fixing bacteria; peas and beans are legumes
lenticel*	slightly raised pore on the stem of some woody plants
ligule	membrane between the leaf sheath and stem on grasses
linear	long and thin with nearly parallel sides
lobed	rounded leaf segments, cut less than halfway to the base or midrib
margin*	the edge of a leaf
mesic	conditions of moderate moisture or water supply
midrib*	the central vein or rib of a leaf
monocarpic	blooming only once, then dying
monospecific	consisting of one species (also monotypic and monoculture, used informally)
mycorrhizal	a symbiotic relationship between a plant root and a fungus
node*	attachment point on stem for a leaf or branch, called a joint in grasses
oblong	longer than wide, rectangular
opposite*	leaves paired at the nodes
ovate*	shaped like a cross-section through an egg with the larger end toward the base
palmate*	consisting of leaflets or lobes radiating from the base of the leaf
panicle*	a branched inflorescence, usually broadest near the base and tapering upwards
perennial	living for 2 years or more, often flowering annually after maturity
pinnate*	on a compound leaf, rows of leaflets on two sides of the leaf stalk
pith	central tissues of some stems and roots
propagule	any reproductive structure or part of a plant, such as a fruit, seed, bud, tuber, root, stem with rooting structures, or shoot, that can grow independently of its parent source
raceme*	an unbranched, elongated inflorescence with flowers that have short flower stalks and mature from the bottom upwards
rhizome	a horizontal underground stem
riparian	about wetlands and banks adjacent to streams or rivers

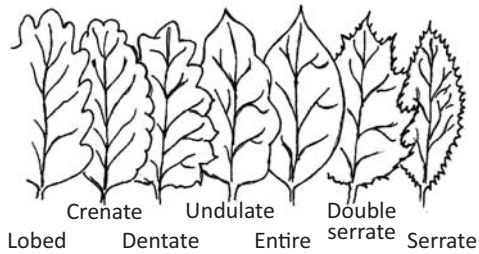
Appendix E

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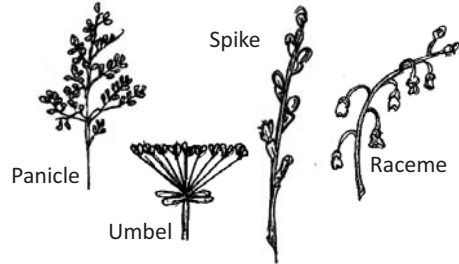
root crown	the persistent base of an herbaceous perennial
root suckering	shoots originating from below ground, usually near a parent stem of a woody plant
rosette*	cluster of leaves arranged in a circle, often at the base of a plant
samaras*	a winged fruit
sepals	modified leaves which protect the flower bud, may resemble the petals
sheath	in grasses, a leaf base which wraps at least partly around the stem
simple	not compound, a term usually applied to leaves
spatulate	rounded edge tapering at the base, like a spatula
spike*	an unbranched inflorescence with flowers attached directly to stem
stamen	flower part made up of anther and filament, produces pollen
stipule	a leaflike structure at the base of a leaf stalk
stolon*	a stem which creeps along the ground, often has roots at nodes
style	flower part, the stalk between ovary and stigma (the pollen receptor)
tendrils	a specialized stem, leaf or petiole with a threadlike shape, used by climbing plants for support and attachment by twining around whatever it touches at the end of a branch
terminal	inflorescence with flower stalks of equal length radiating from a central point
umbel*	having discrete markings of different colors
variegated	describes reproduction in which new individuals develop asexually from specialized structures such as bulbs, rhizomes, or runners rather than from specialized sex cells
vegetative	
whorled*	with three or more leaves at a node

Glossary - Illustrations

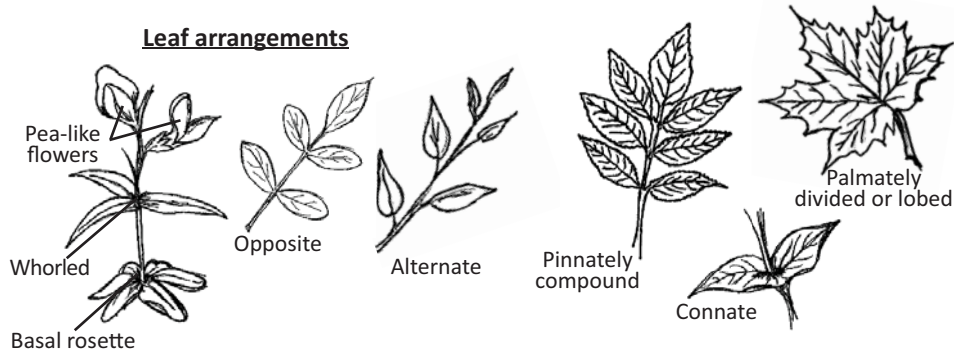
Leaf margins (Edges)

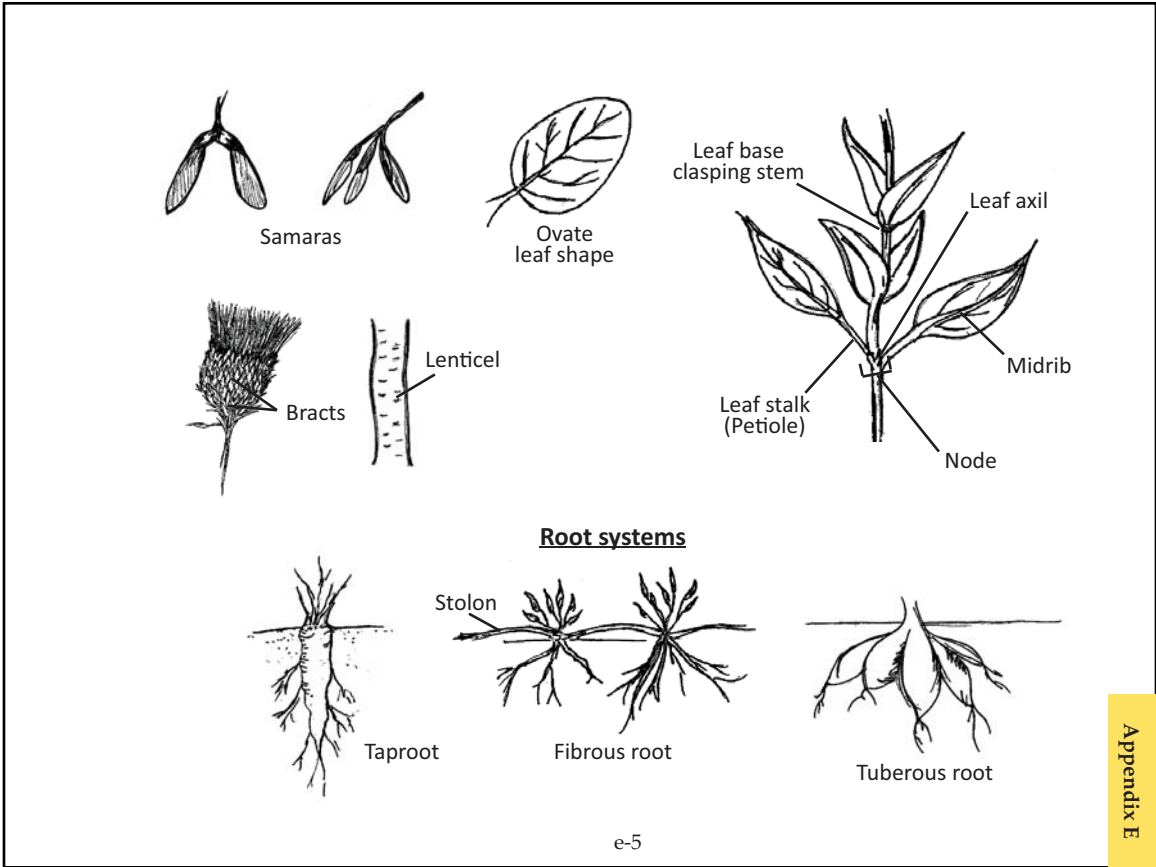


Inflorescence types



Leaf arrangements





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