**Draft Version -** Please note that this is a draft version of this field guide.

**Feedback -** We would appreciate your feedback regarding this booklet.

Comments and suggestions can be sent to Kim Borland (email: borlandk@michigan.gov) or Suzan Campbell (email: campbellsl@michigan.gov).

Compiled by:
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# Invasive Plant Species of Michigan


## A Pocket Guide

DEPARTMENT OF NATURAL RESOURCES DNR MICHIGAN

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan Natural Features Inventory

# Contents

## Using this booklet

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

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

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

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

How old is a specific invasive population? Often, established populations with extensive root systems may require higher concentrations of herbicide. Are high quality populations of native species present? In some cases, herbicides can be applied during the dormant season. In other cases, herbicides that only target broadleaved weeds, for example, might be most appropriate.

Some species may be effectively controlled by prescribed fire or mowing, while in other cases, these methods are ineffective when used alone, but may be effective in conjunction with herbicides.

Control timing is also a critical factor in determining the success of a particular method. While many herbicides are best absorbed by young leaf tissue, the herbicide may not be effectively drawn down into plant roots while plants are actively growing.

When herbicide is applied as the plants die back, it is often drawn into the roots along with stored resources and can be particularly effective. Similarly, for annual or biennial invasive species, mowing while the plant is in bud can provide an effective means of control.

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

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

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

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

**The Nature Conservancy's Global Invasive Species Initiative**
Invasives and Control Methods -Provides abstracts that summarize plant descriptions, biology and current research for controlling specific invasive species:
http://tncweeds.ucdavis.edu/esadocs.html

**U.S.D.A. Forest Services Fire Effects Information System** (FEIS)
Provides invasive species summaries with detailed information on plant biology, ecology, fire behavior and control methods:
http://www.fs.fed.us/database/feis/plants/weed/weedpage.html

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

## Herbarium specimens & early response

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

The University of Michigan's Herbarium's Online Atlas, at:
http://herbarium.lsa.umich.edu/website/michflora/
provides the most comprehensive record of the distribution of invasive plant species at present, although there is a substantial time lag before new specimens are posted.

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

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

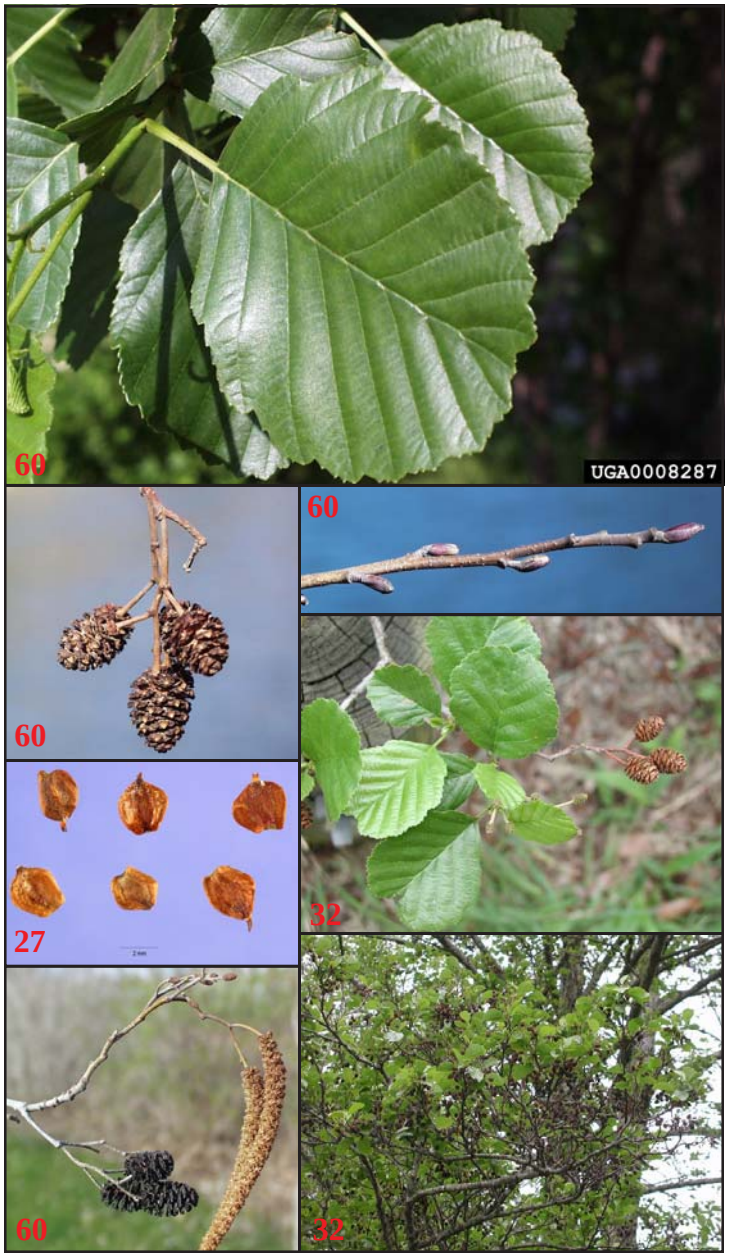
Detailed instructions for preparing specimens are available at the the University of Florida's Herbarium website at:
http://www.flmnh.ufl.edu/herbarium/voucher.htm

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

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

Ship to:
Anton Reznicek, Curator (Vascular Plants),
University of Michigan Herbarium
3600 Varsity Drive,
Ann Arbor, MI 48108-2287.

# Trees




# Black Alder

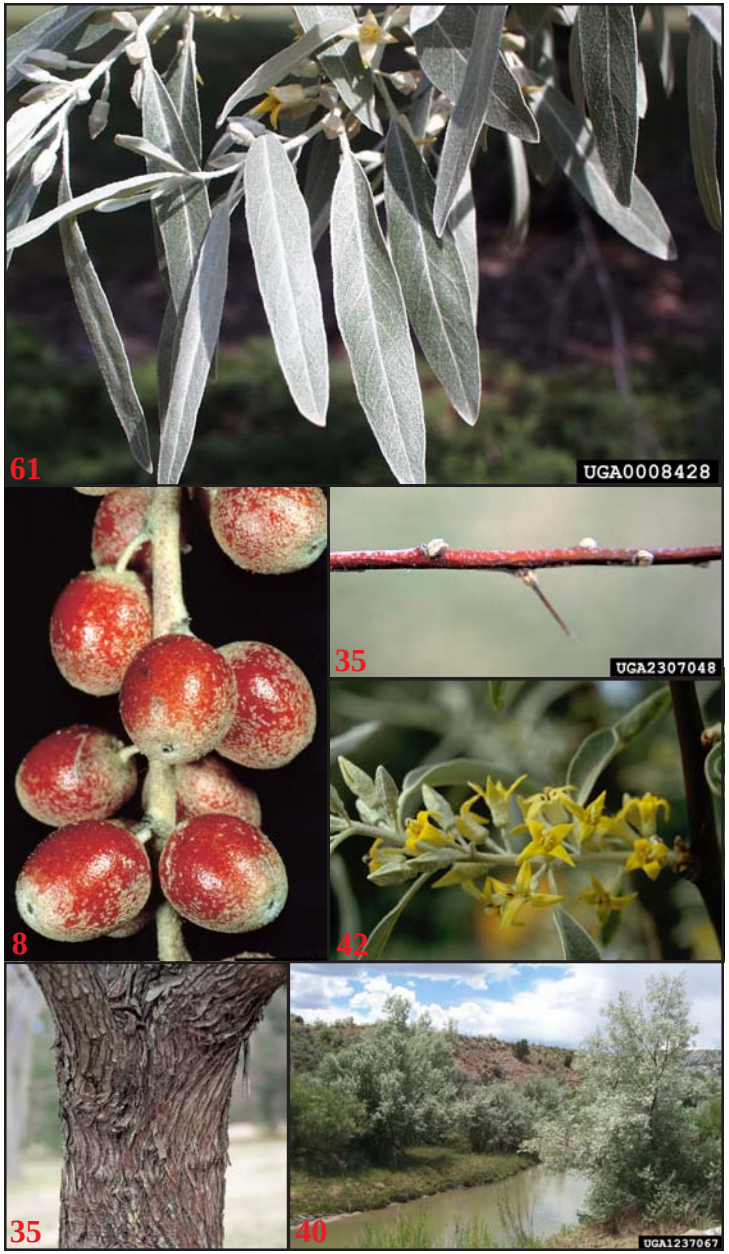
*Alnus glutinosa*

**Habit:** Deciduous, medium tree, ranging from 9-15 m (30-50 ft) in height and 2.5-5 cm (1-2 in) in diameter; narrow pyramidal shape when young, becoming more irregular with age.
**Leaves:** Simple, alternate, broadly rounded to truncate or notched at the apex; 5-13 cm long and 5-10 cm wide; toothed leaf margin; young leaves sticky to the touch; fall leaves green or brown.
**Stems/Bark:** Dark green-brown, smooth or rough; speckled with short lenticels; bark with prominent warty strips; buds stalked.
**Flowers:** Male and female flowers in separate structures; male flowers borne on long narrow catkins; female flowers borne in small woody structures resembling pinecones; bloom March-May.
**Fruits/Seeds:** Small, glutinous, woody, pinecone-like structure borne on long, narrow stalks; seeds are small and narrowly winged.
**Habitat:** Prefers full sun and wet soil but tolerant of drier soil and a range of pH conditions; found along rivers, in wetlands and moist forests.
**Reproduction:** By seed and spreading roots.
**Similar Species:** Native - Speckled alder *(Alnus rugosa)* - leaves with a distinct (acute) tip, usually shrubbier than *A. glutinosa*.
**Comments:** Capable of displacing desirable vegetation; fixes nitrogen; has been planted on highly disturbed or infertile sites and for windbreaks; several cultivars including pyramidal forms and trees with finely dissected leaves; vulnerable to tent caterpillar.
**Monitoring & Rapid Response:** Monitor pond, river and wetland margins; distinguishable year-round by its rounded leaves, catkins, cones and stalked vegetative buds; begin control efforts in highest quality areas and remove mature trees that provide a source of seed; hand pull seedlings, young shrubs; resprouting likely following cutting, girdling, mowing, burning etc.; treat cut stumps with herbicide; all stems must be treated.


# Black Locust

*Robinia pseudo-acacia*

**Habit:** Deciduous medium tree ranging in height from 12-25 m (40-82 ft) and 30-60 cm (12-24 in) in diameter; crown narrow, open, irregular with contorted branches.
**Leaves:** Pinnately compound with 7-21 leaflets per leaf; alternate, 20-35 cm long; ovate leaflets 2-5 cm long and about half as wide, with smooth margins; hairless, very thin; dull bluish green above paler beneath, turning yellowish brown in the fall.
**Stems/Bark:** Twigs puberulent, becoming smooth, green to reddish brown, with zigzag shape and two spines at each node; bark is thick, tan to gray-brown, deeply furrowed; inner bark orange.
**Flowers:** White, 5-petaled, pea-like, very fragrant; raceme of 10-25 on a thin dangling pedicel;  bloom May-June.
**Fruits/Seeds:** Seedpods form in the fall but persist over winter, pods are smooth, dark-brown, flat, and contain 4-8 small, flat, brown seeds.
**Habitat:** Very shade intolerant; can grow in many soil types except those with a high water table; formerly widely planted in Michigan and now found colonizing old fields, prairies, disturbed forests and woodlands.
**Reproduction:** By seed; also sprouts easily from roots and forms natural clones.
**Similar Species:** Honey locust (*Gleditsia triacanthos*) has smaller, more numerous leaflets.
**Comments:** The nitrogen fixing capacity of this species may alter soil chemistry and subsequent nutrient cycling of forest systems.
**Monitoring & Rapid Response:** Monitor prairie and woodland edges and paths, particularly on well-drained soils; most visible in May and June while in flower; cutting, girdling and burning are ineffective without herbicide as they stimulate sprouting; mowing stimulates germination of the (black locust) seedbank; treat cut stumps with herbicide; foliar application of bud inhibitor effective on trees under five feet tall;  basal bark treatment also effective, may be used in conjunction with girdling.




# Russian Olive

*Elaeagnus angustifolia*

**Habit:** Deciduous thorny shrub or small tree growing up to 9 meters (30 feet) in height, rounded in shape with a loose arrangement of branches**.**

**Leaves:** Simple, alternate, oblong, 4-8 cm long, untoothed margins; light green and covered with silvery star-shaped hairs above, silvery white and densely covered with scales below.

**Stems/Bark:** Slightly thorny on ends; silvery scales present when young; bark is thin and comes off in elongated strips.

**Flowers:** Small, highly aromatic yellowish flowers, silver inside; umbel-shaped, single or clustered; usually flowers early (June-July), shortly after leaf emergence.

**Fruits/Seeds:** Hard, yellow-red, olive-shaped fruits, 0.5 inches long with silvery scales, clustered along stems in great quantities; eaten and dispersed by many bird species; begin fruiting at 3 to 5 years.

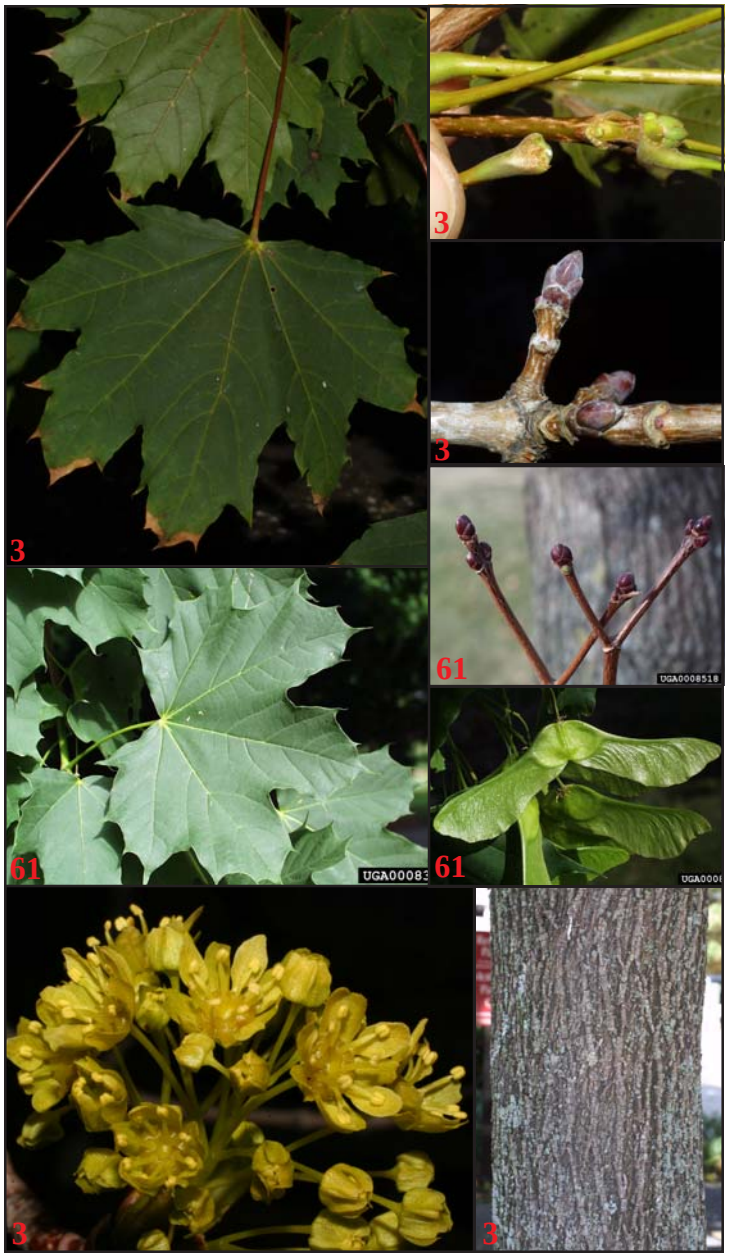
**Habitat:** Relatively shade tolerant; invades open and disturbed areas; can occur in a variety of soil and moisture conditions; not tolerant of acidic conditions (pH<6.0).

**Reproduction:** Primarily by seed, also vegetatively or by root sucker at the root crown.

**Similar Species:** non-native autumn olive (*Elaeagnus umbellata*) has shorter, broader, slightly less silvery leaves; closely related native *Shepardia* spp. have opposite leaves, usually smaller.

**Comments:** Forms a dense, monospecific shrub layer displacing native species and closing open areas; alters nutrient cycling and hydrology of a system; 4th most common riparian tree in the West.

**Monitoring & Rapid Response:** Monitor edge habitats, particularly along streams and rivers; early detection is critical as large stands are almost impossible to eradicate; hand pull seedlings while soil is moist; small seedlings susceptible to fire; burning, mowing, cutting and girdling all stimulate resprouting in larger plants unless accompanied by herbicide treatment; treat cut stumps with an herbicide; basal bark/stem sprays effective on younger trees; foliar herbicide sprays effective for small trees, resprouts.



## Norway Maple

*Acer platanoides*

**Habit:** Medium tree reaching 12-18 m (40-60 ft) in height and 30-60 cm (12-24 in) in diameter; crown is dense, symmetrical, and rounded; spread is approximately two-thirds of the tree's height.
**Leaves:** Simple, opposite, green to bronze, smooth, 5-7 lobed with few teeth and broad bases up to 18 cm wide; wider than long; petioles with a milky juice; leaves retained late in autumn.
**Stems/Bark:** Stout twigs, smooth, olive brown; leaf scars meet to form a sharp angle; buds are plump, rounded, fleshy, green to maroon; one large bud in center with two smaller lateral buds; bark is grayish black with small furrows.
**Flowers:** Stalked, yellow-green and perfect; in loose clusters; appearing before or with the leaves in spring.
**Fruits/Seeds:** Two-winged samaras with the wings almost horizontally (180 angle) divergent; seeds are wind dispersed with low fall rates; appear in late spring through summer.
**Habitat:** Shade tolerant; occurs in a variety of soil and moisture conditions but prefers fertile, moist, well-drained soils; found on roadsides, waste places, hedgerows, roadside thickets and disturbed forest communities; somewhat resistant to drought.
**Reproduction:** By seed.
**Similar Species:** Native - Sugar maple *(A. saccharum)* - does not produce milky juice; samara wings are at an angle and leaf scars do not meet.
**Comments:** At least 36 cultivars; creates dense shade; monopolizes soil moisture; regenerates prolifically under its own canopy, can reduce overall plant diversity of a site.
**Monitoring & Rapid Response:** Monitor forest edges and paths; stays green until November, can be identified in spring, summer and early fall by the milky sap in its leaves and stems; for large infestations, focus on highest quality areas and remove mature trees that provide a source of seed; hand pull seedlings in spring while soil is moist; girdle mature trees - spring most effective; treat cut stumps with herbicide, may enhance effects of girdling; basal bark treatment effective for trees less than 4" in diameter.


# Tree of Heaven

*Ailanthus altissima*

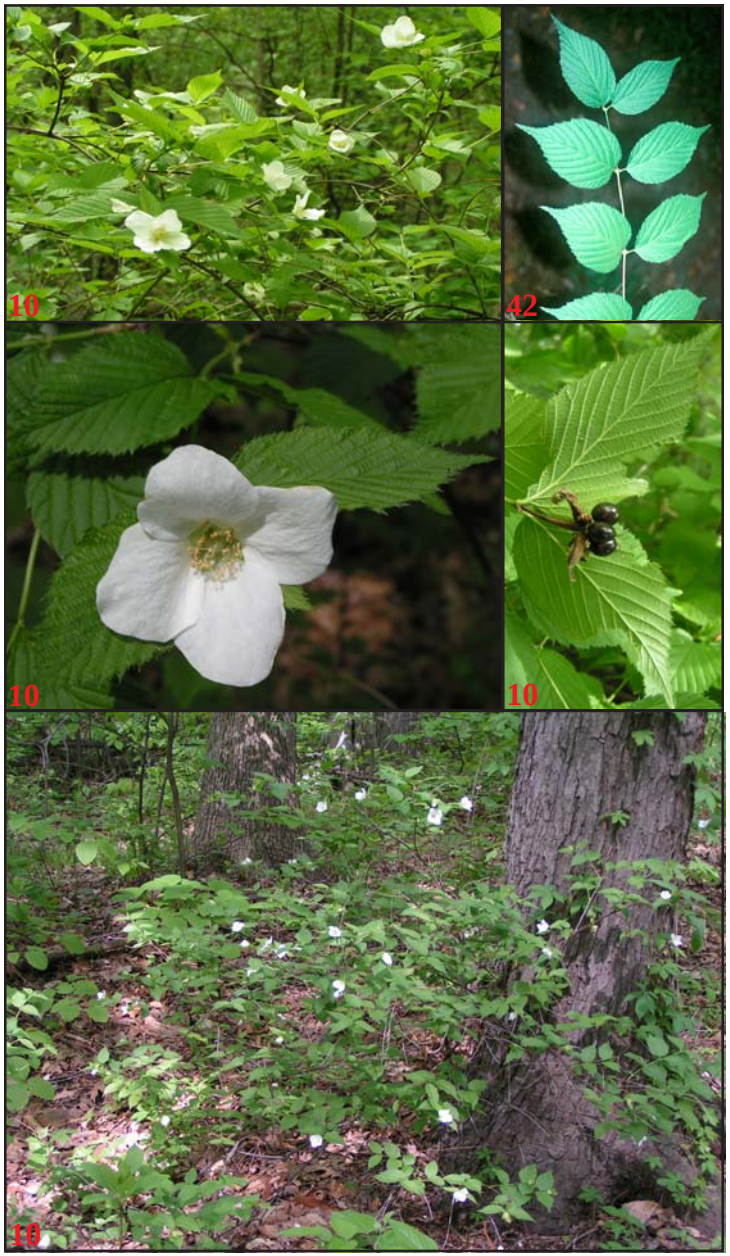
**Habit:** Deciduous small to large tree; 12-20 m (40-65 ft) tall and 60-100 cm (24-40 in) in diameter; crown wide-spread with multiple branches.
**Leaves:** Pinnately compound with 11-30 lance-shaped leaflets per leaf; alternate; large - 30-90 cm long; entire, except for 1-5 small gland tipped teeth near the base; dark green above, pale green below, turn yellow in fall; unpleasant odor resembling rancid peanut butter when crushed.
**Stems/Bark:** Twigs very stout, light to dark brown, smooth with large V-shaped leaf scars; bark thin, gray to brownish gray, smooth with shallow fissures appearing on older trunks
**Flowers:** Small; yellow-green; 5-petaled; borne in dense clusters near ends of upper branches; bloom in late spring; male and female flowers on different plants; pollen has an offensive odor.
**Fruits/Seeds:** Two-winged papery, flat, samara with a single seed in the middle; develop in clusters on female trees in fall; may remain on tree through winter; germinate readily; dispersed by wind, birds and water.
**Habitat:** Shade intolerant; thrives in poor soils; found in disturbed soils, fence rows, fields, roadsides, woodland edges, forest openings and rocky areas; very fast growing.
**Reproduction:** By seed and vegetatively via root suckering, up to 350,000 seeds produced annually by a single plant.
**Similar Species:** Native - sumacs *(Rhus glabra, R. typhina)*; walnuts (*Juglans nigra, J. cinerea*) - crushed leaves or broken stems of these plants lack rancid peanut butter aroma.
**Comments:** Extensive cloning; allelopathic properties present.
**Monitoring & Rapid Response:** Monitor edges, paths; hand pull seedlings before taproot develops (< 3 months) as taproot fragments may resprout; resprouts following cutting, girdling, mowing, burning - follow-up treatment required; girdling followed by herbicide most effective; treat cut stumps with an herbicide - most effective in late spring & all stems in a clone must be treated; basal bark/stem sprays with herbicide provide good root kill, particularly in fall; foliar herbicide spray is effective on small trees.

## Autumn Olive

*Elaeagnus umbellata*

**Habit:** Deciduous shrub or small tree growing up to 6 meters (20 feet) in height and 9 meters (30 feet) wide.
**Leaves:** Simple, alternate, oval, 5-10 cm (2-4 in) inches long; entire margins, wavy; gray-green above, silvery scaly below; early leaf out (mid-March).
**Stems/Bark:** Often thorny; silvery or golden brown, with brownish scales giving stems a speckled appearance.
**Flowers:** Fragrant; tubular; 4 petals and stamens; cream to light yellow; in clusters of 1-8; flowers from April to June.
**Fruits/Seeds:** Occur in drupes; 0.25 inches; silvery with brown scales when immature, speckled red or yellow when mature; ripen September to October; begin to bear fruit at 3 to 5 years; each tree can produce 2-8 lbs. of seed per year.
**Habitat:** Shade tolerant; occurs in a variety of soil types (pH range of 4.8-6.5), thrives on infertile soils because of nitrogen-fixing root nodules; found in open woods, forest edges, roadsides, fencerows, meadows, sand dunes, and other disturbed areas.
**Reproduction:** Primarily by seed, also by stump sprouting and roots.
**Similar Species:** Native - Silver-berry (*E. commutata*) has opposite leaves; non-native Russian olive (*E. angustifolia*) has longer, narrower, leaves, silver above.
**Comments:** Invades disturbed areas, resprouts quickly; can out-compete native species; increases nitrogen levels to the detriment of native communities.
**Monitoring & Rapid Response:** Monitor sunny open sites; autumn olive leafs out early in spring, retains leaves in fall, can be recognized year-round; hand pull seedlings; focus on highest quality areas first; burning and cutting stimulate resprouting; treat cut stumps with an herbicide, best in fall; basal bark/stem sprays effective in late spring, possibly in fall; foliar herbicide sprays effective for small trees and resprouts but may harm non-target plants; basal stem injection of herbicide on dormant plants provides excellent control with low concentrations of herbicide.

# Shrubs



## Black Jetbead

*Rhodotypos scandens*

**Habit:** Open, arching shrub ranging in height from 1-2 m (3-6 ft) in height and 1.2-2.7 m (4-9 ft) in width.
**Leaves:** Simple, opposite, bright green, 5-10 cm (2.25-4) in long; doubly toothed margins, rough texture on the leaf surface; resemble raspberry leaflets; emerge early in spring, retained until late fall.
**Stems/Bark:** Stems arching, loosely branched.
**Flowers:** White, 4-petaled, occurring singly at branch tips, bloom in late April, early May, occasional flowers later in season.
**Fruits/Seeds:** Fruits are black, hard and ovoid, 1cm (0.3 in) long; clustered at branch tips, hanging below leaves; persist over winter.
**Habitat:** Native to China and Japan; escaped ornamental capable of invading forests; prefers sunny, dry, well-drained sites but thrives in shade and in harsh urban conditions.
**Reproduction:** by seed; possibly bird-dispersed.
**Similar Species:** slightly resembles other opposite leaved shrubs including honeysuckle and privet but form more open and arching, fruits clustered at stem tips, rather than along branches.
**Comments:** Although jetbead is a member of Rosaceae, its leaves are opposite, rather than alternate.
**Monitoring & Rapid Response**: Monitor woodland edges and along paths; jetbead is most visible while its white flowers with four petals are in bloom in spring; pull seedlings and hand dig small plants; for large infestations, cut shrubs to the ground in fall or winter; may be controlled with herbicide, applied in spring; little information is available on this species but applying herbicide to cut stems is likely to enhance control efforts.

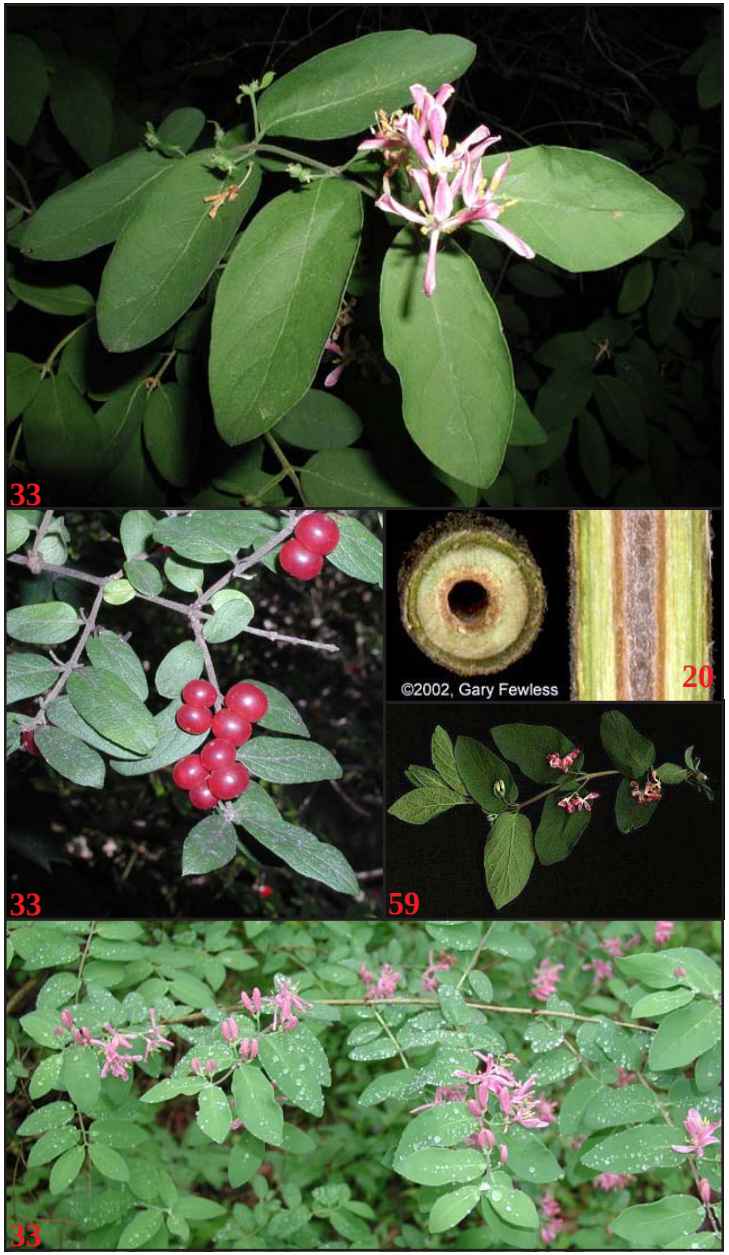
As this species has a limited distribution in Michigan, it is
important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.


# Amur Honeysuckle

*Lonicera maackii*

**Habit:** Deciduous upright to spreading shrub growing up to 5 m (16-18 ft) tall.
**Leaves:** Simple, opposite, slightly hairy, elliptical leaves; 4-9 cm long; smooth margins and a long distinctive apex or “drip tip”; early leaf out; long growing season.
**Stems/Bark:** Multiple stems, numerous arching branches; thick non-exfoliating gray to tan bark with noticeable interlacing ridges; older branches often hollow.
**Flowers:** Small, white to pink, tubular, paired flowers on short (0.5 cm) stalks arising from the leaf axils; blooms May-June; fragrant.
**Fruits/Seeds:** Berries are red and paired, borne on very short stalks; abundant; persistent; dispersed by birds.
**Habitat:** Relatively shade intolerant; occurs in a variety of soil and moisture conditions; invades open forests, savannas and prairies; disturbed areas are particularly vulnerable to invasion.
**Reproduction:** By seed; dispersed by birds.
**Similar Species:** Canada honeysuckle *(L. canadensis)*, American fly honeysuckle *(L. involucrata)*, fly honeysuckle *(L. oblongifolia)* and swamp fly honeysuckle *(L. villosa)*. Native honeysuckles are relatively short, sparse shrubs as compared to non-native species.
**Comments:** Usually distributed near large urban areas but also occurs in rural areas where it was planted for wildlife food and cover; forms dense thickets; inhibits growth of native plant species, reducing tree and shrub regeneration and decreasing overall plant diversity; birds nesting in this shrub experience increased nest predation in comparison with native shrubs.
**Monitoring & Rapid Response:** Monitor sunny, upland sites and open forests in spring as honeysuckle leafs out before natives; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations where few natives are present; treat cut stumps with herbicide in fall/winter; basal bark treatment is also effective - spray bottom 18 inches of all stems; prescribed fire provides effective control.




## Bell's Honeysuckle

*Lonicera* x*bella*

**Habit:** Deciduous upright to spreading shrub growing up to 5.5 m (18 ft) tall; hybrid between Tartarian and Morrow's honeysuckles; shallow roots.
**Leaves:** Simple, opposite, elliptic to oval or oblong; slightly hairy beneath; 3-6 cm long; early leaf out, long growing season.
**Stems/Bark:** Multiple stems, arching branches; older branches hollow between nodes; pith brown; bark is gray or tan, shaggy.
**Flowers:** Small, pink, tubular, paired and fragrant; borne on stalks (0.5-1.5 cm long) arising from the leaf axils; blooms May to June
**Fruits/Seeds:** Berries are red and paired; dispersed by birds.
**Habitat:** Sun and shade tolerant; occurs in a variety of soil and moisture conditions; found along roadsides and on disturbed sites; invades forest, savannas and prairies.
**Reproduction:** By seed, dispersed by birds.
**Similar Species:** American fly honeysuckle *(L. canadensis)*, bracted honeysuckle *(L. involucrata)*, swamp fly honeysuckle *(L. oblongifolia)* and mountain honeysuckle *(L. villosa)*. Native honeysuckles are relatively short, sparse shrubs as compared to non-native species.
**Comments:** Especially affects woodlands and disturbed habitats; usually distributed near large urban areas, but also occurs in rural areas where it was planted for wildlife food and cover; can form dense thickets in a forest under-story, shading out herbaceous plants, reducing tree and shrub regeneration, and decreasing overall plant diversity.
**Monitoring & Rapid Response:** Monitor sunny, upland sites and open forests in spring as honeysuckle leafs out well before native species; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations where few natives are present; treat cut stumps with herbicide; basal bark treatment is also effective - spray bottom 18 inches of all stems; prescribed fire provides effective control.


## Morrow's Honeysuckle

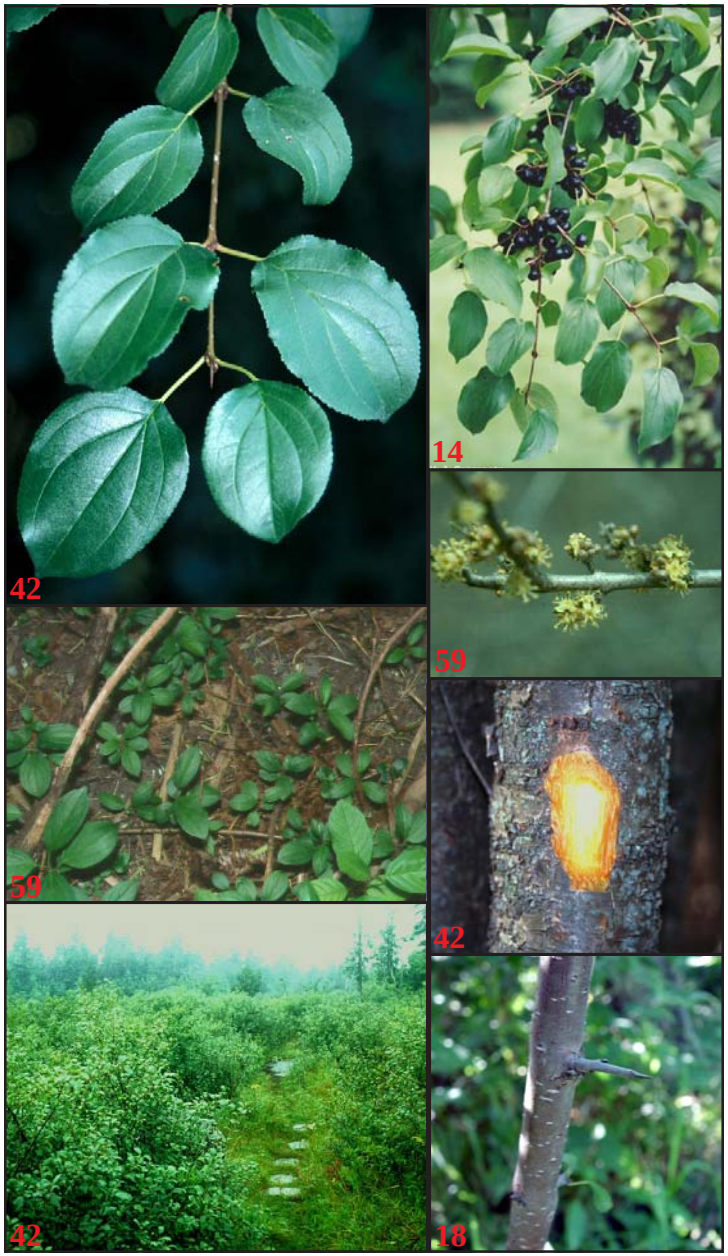
*Lonicera morrowii*

**Habit:** Deciduous upright to spreading shrub growing up to 1.8 m (6 ft) tall.; shallow roots.
**Leaves:** Simple, opposite, elliptical to oblong; short; gray-green, softly hairy beneath; 3-6 cm long; early leaf out, long growing season.
**Stems/Bark:** Multiple stems; numerous arching branches; older branches often hollow; bark is gray or tan, shaggy.
**Flowers:** Small, white, tubular, paired, hairy and fragrant; borne on hairy stalks (0.5-1.5 cm long) arising from the leaf axils; blooms May-June.
**Fruits/Seeds:** Berries are red and paired; dispersed by birds.
**Habitat:** Sun and shade tolerant; occurs in a variety of soil and moisture conditions; commonly found along roadsides and on disturbed sites; invades forest, savannas, and prairies.
**Reproduction:** By seed; dispersed by birds.
**Similar Species:** Canada honeysuckle *(L. canadensis)*, American fly honeysuckle *(L. involucrata)*, fly honeysuckle *(L. oblongifolia)* and swamp fly honeysuckle *(L. villosa)*. Native honeysuckles are relatively short, sparse shrubs as compared to non-native species.
**Comments:** Especially affects woodlands and disturbed habitats; usually distributed near large urban areas, but also occurs in rural areas where it was planted for wildlife food and cover; can form dense thickets in a forest under-story, shading out herbaceous plants, reducing tree and shrub regeneration, and decreasing overall plant diversity.
**Monitoring & Rapid Response:** Monitor sunny, upland sites and open forests in spring as honeysuckle leafs out well before native species; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations where few natives are present; treat cut stumps with herbicide; basal bark treatment is also effective - spray bottom 18 inches of all stems.


# Tartarian Honeysuckle

*Lonicera tatarica*

**Habit:** Deciduous upright to spreading shrub growing to 3 m (9 ft) tall; shallow roots.
**Leaves:** Simple, opposite, oval to oblong, short, hairless, leaves with pointed tips; 3-6 cm long and 2-4 cm wide with smooth margins; dark green above and paler beneath; early leaf out, long growing season.
**Stems/Bark:** Twigs are slender, brown to reddish with brown pith; multiple stems; numerous arching branches; older branches often hollow; bark is light gray, somewhat exfoliating.
**Flowers:** Small, pink to white, tubular, fragrant, paired flowers on long (1.5-2.5 cm) stalks arising from the leaf axils; bloom May-June.
**Fruits/Seeds:** Abundant, red or orange paired berries.
**Habitat:** Sun and shade tolerant; occurs in a variety of soil and moisture conditions; commonly found along roadsides and on disturbed sites; invades forest, savannas and prairies.
**Reproduction:** By seeds; dispersed by birds.
**Similar Species:** Canada honeysuckle *(L. canadensis)*, American fly honeysuckle *(L. involucrata)*, fly honeysuckle *(L. oblongifolia)* and swamp fly honeysuckle *(L. villosa)*. Native honeysuckles are relatively short, sparse shrubs as compared to non-native species.
**Comments:** Invades woodlands and disturbed habitats; found near large urban areas and in rural areas where it was planted for wildlife food and cover; forms dense thickets in a forest under-story, shading out herbaceous plants, reducing tree and shrub regeneration and decreasing overall plant diversity.
**Monitoring & Rapid Response:** Monitor sunny, upland sites and open forests in spring as honeysuckle leafs out well before native species; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations where few natives are present; treat cut stumps with herbicide; basal bark treatment is also effective - spray bottom 18 inches of all stems.




# Common Buckthorn

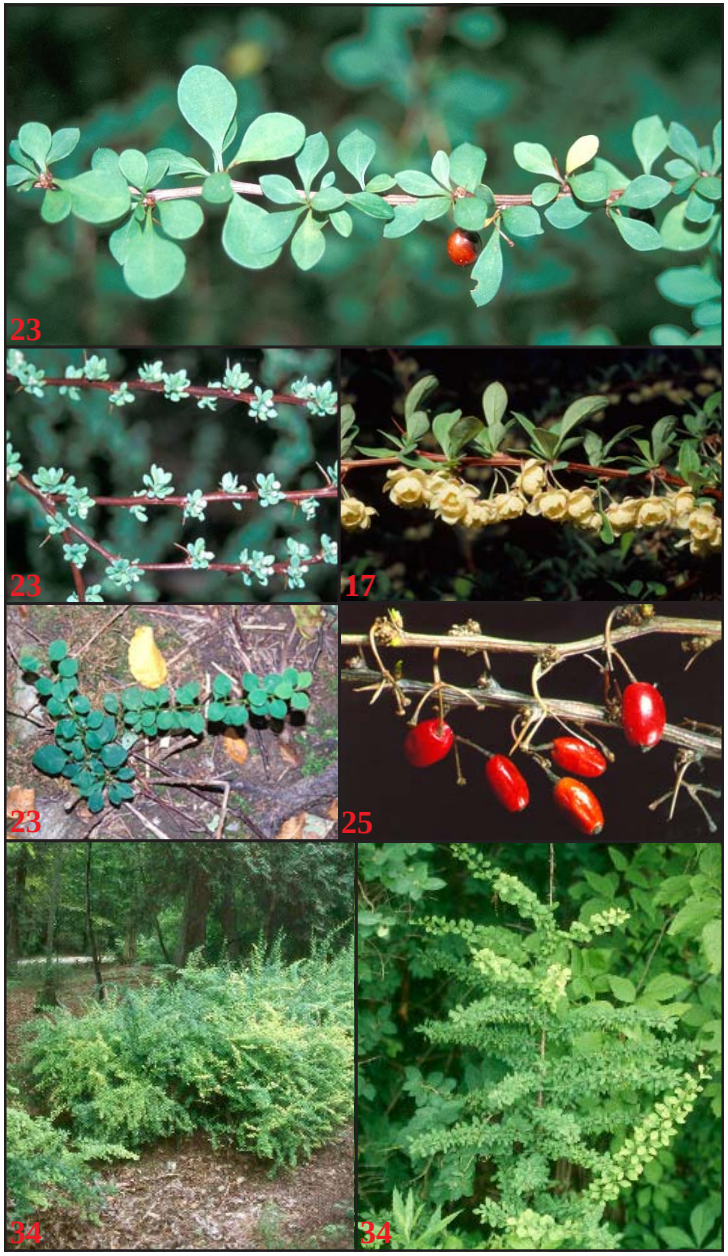
*Rhamnus cathartica*

**Habit:** Deciduous, woody shrub to small tree ranging from 3-7.5 m (10-25 ft) in height and reaching 25 cm (10 in) in diameter.
**Leaves:** Simple, opposite to sub-opposite, oval, dark green, smooth and shiny; small teeth along margins; veins that curve from base towards leaf tip; early leaf out, long growing season.
**Stems/Bark:** One to several stems from the base; stems branch towards the crown; twigs with thorns often found near the tips; bark is brown to gray, peeling with age, dotted with vertical light-colored lenticels; inner bark is orange.
**Flowers:** Small, green-yellow, 4-petaled, clustered in leaf axils; blooms May-June; fragrant.
**Fruits/Seeds:** Round, pea-size, black berries (on female plants only); persistent through the winter.
**Habitat:** Widely planted as an ornamental shrub in hedge rows; now found along roadsides, woodland edges, prairies, and old fields.
**Reproduction:** By prolific fruit and seed production, seeds widely dispersed by birds.
**Similar Species:** Alder-leaved buckthorn *(Rhamnus alnifolia)*- less than 1 m (3 ft) in height with hairless twigs and dark scales on winter buds; non-native glossy buckthorn (*Rhamnus frangula*) has shiny leaves, always lacks terminal “thorn”(see page 15).
**Comments:** Produces a dense shade that can limit light to tree and shrub seedlings, and native herbaceous groundcover, limiting overall plant diversity; changes nutrient cycling by increasing nitrogen and carbon.
**Monitoring & Rapid Response**: Monitor woodland edges and paths on dry, well-drained soils; buckthorn leafs out early and retains its leaves late into fall; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations where there are few natives present; treat cut stumps with herbicide as stumps sprout; basal bark treatment also effective; monitor site and control new seedlings until the seedbank is exhausted.


## Glossy buckthorn

*Rhamnus frangula (Frangula alnus)*

**Habit:** Deciduous shrub or small tree growing up to 6 m (20 ft.) tall, multiple stems at the base, crown spreading, trunk up to 10 inches in diameter.
**Leaves:** Simple, alternate, oblong, 1-2.5” long, untoothed or crenulate margins, dark green, shiny; smooth or slightly hairy below; veins turn toward tip near leaf margins; leaves present from mid-May to November.
**Stems/Bark:** Brown-green, hairy, prominent lenticels, chunky bark; terminal buds rust colored; bark gray or brown; sapwood yellow; heartwood pinkish to orange.
**Flowers:** Small, greenish yellow, four petals, clusters of 2-6; bisexual; blooms late May through September.
**Fruits/Seeds:** Round, pea-sized, drupes of 3-4 seeds, red, ripening to black/dark purple in July through September; abundant; remain viable in the soil for 2 to 3 years.
**Habitat:** Sun and shade tolerant; occurs in a variety of soil and moisture conditions; found in pastures, fencerows, roadsides, wetlands, and woodland edges.
**Reproduction:** Primarily sexual; plants mature quickly; at any given time there can be flowers, partially ripened fruit (red) and fully ripened fruit (black) on the same plant.
**Similar Species:** Alder buckthorn (*R. alnifolia*) - less than 3’ tall, hairless twigs; Lance-leafed buckthorn (*R. lanceolata*) - less than 6’ tall, leaves 2-6” long, tapering.
**Comments:** Rapidly form dense, even-aged thickets, crown spreads laterally; resprouts vigorously.
**Monitoring & Rapid Response**: Monitor woodland edges and paths on moist soils; buckthorn leafs out early and retains its leaves late into fall; begin control efforts in highest quality areas; target large, fruit-bearing plants; hand pull or dig seedlings or small plants in spring; foliar spraying may be effective for large populations, where few natives are present; treat cut stumps with herbicide; basal bark treatment is also effective; monitor site and control new seedlings until the seedbank is exhausted.




## Japanese Barberry

*Berberis thunbergii*

**Habit**: Spiny, deciduous shrub, typically 0.6-0.9 m (2-3 ft) tall.
**Leaves**: Simple, alternate, oval to spoon shaped with smooth margins, 1.3-2 cm long; bright green above, lighter below, in clusters at each node, red to purple in the fall depending on the cultivar.
**Stems/Bark**: Numerous, spiny, slightly curving; older stems gray; twigs and young stems turning reddish brown in winter; inner bark yellow.
**Flowers**: Small, yellow, 6-petaled, stalked; single or in small clusters of 2-4 blossoms; blooms April - May
**Fruits/Seeds**: Small, bright red, egg-shaped berries found singly or in clusters on slender stalks; mature in midsummer; remain on stems into winter; often dispersed by birds, deer, turkey and grouse.
**Habitat:** Found along woodland edges, open woods, roadsides, stream banks, old fields; tolerates a range of soil, moisture and light conditions.
**Reproduction**: By seed, creeping roots and cut stumps; branches root freely where they touch the ground.
**Similar Species:** American barberry *(B. canadensis)* - has toothed leaves and usually 3-pronged spines.
**Comments**: Species is often planted as a hedge and escapes from cultivation; at least 47 cultivars exist; growth minimal in low light; deer herbivory minimal.
**Monitoring & Rapid Response:** Monitor sunny open sites and edges in spring when barberry leafs out before native shrubs; remove all plants before seed is produced; begin control efforts in highest quality areas and remove mature shrubs that provide a source of seed; hand pull or dig young plants, removing all roots; treat cut stumps with herbicide; foliar herbicide spray is effective on areas with few native plants; cut shrubs at base in winter so that only resprouts need to be sprayed in spring.


# Multiflora Rose

*Rosa multiflora*

**Habit:** Deciduous, dense, perennial shrub growing up to 5 m (16 ft) tall and 2.7-3.9 m (9-23 ft) wide, with long, slender, arching branches.
**Leaves:** Alternate, pinnately compound with 5-11 leaflets; leaflets 2.5 cm long and finely toothed; base of leaf with a fringed appendage (stipule).
**Stems:** Green-reddish, arching, rigid with re-curved thorns.
**Flowers:** Numerous, white or slightly pink, 5-petaled, 1-4 cm wide; arranged in a panicle; bloom May-June.
**Fruits/Seeds:** Fruits are small, clustered, hard, smooth, red, rose hips that appear in September-October and last into winter; seeds yellowish and dispersed by birds and mammals, remain viable for 10-20 years.
**Habitat:** Found along roadsides, pastures, disturbed areas, forests and streambanks; tolerates a variety of soil conditions; prefers open, well-drained sites.
**Reproduction:** By seed; also by horizontal stems that root at the node and shoots that root at the tips.
**Similar Native Species:** Several native species of *Rosa*; native roses usually have pink flowers and do not have fringed stipules.
**Comments:** Introduced from Japan and Korea in the 1800s; later promoted to control soil erosion, as a living fence and for wildlife food and cover; vulnerable to Japanese beetles and a number of other pests and diseases.
**Monitoring & Rapid Response:** Monitor paths, edges and open areas; dig out small plants after tops have been cut and removed; remove all roots; cutting or mowing several times throughout the growing season for several years may reduce populations; treat cut stems with herbicide; basal bark treatment effective - spray bottom 18 inches of all stems; foliar application of bud inhibitor (effective only on woody species) causes dieback the following year; foliar herbicide application effective but may injure non-target species.

# Privet

*Ligustrum vulgare*

**Habit:** Bushy, stout, shrub with unevenly spreading branches, ranging in height from 3.5-4.5 m (12-15 ft), with a comparable spread.
**Leaves:** Simple, opposite, elliptic to ovate, 3-7 cm long, smooth margins, dark green above and paler beneath, turning purplish in fall; leafs out early, retains its leaves into the late fall/early winter.
**Stems/Bark:** Young branches green, minutely puberulent, becoming smooth with age; thin, gray-brown bark with lenticels.
**Flowers:** Small, white, 2.5-7.5 cm long, borne in terminal, branched cluster; strong odor; bloom mid- June.
**Fruits/Seeds:** Fruits are small, lustrous, black, berry-like drupes that ripen in September and persist on the shrub through winter.
**Habitat:** Ornamental shrub that has escaped to colonize disturbed areas, forests, and grasslands; can tolerate full sun to partial shade.
**Reproduction:** By seed; widely disseminated by birds.
**Similar Species:** superficially resembles honeysuckle species but leaves are smaller, flowers/fruit held at branch tip, not along its length.
**Comments:** Native to Europe, North Africa; planted widely historically but now less utilized; vulnerable to anthracnose twig blight.
**Monitoring & Rapid Response:** Monitor sunny, disturbed, upland grasslands and forest edges; privet leafs out early in spring and retains its leaves late in fall; hand pull or dig seedlings & small plants; remove all roots to prevent resprouting; treat cut stumps with herbicide; basal bark treatment is effective; foliar spraying may be effective for large populations, where there are few natives present**; s**ite should be monitored and new seedlings controlled until the seedbank is exhausted.

# Woody Vines

# Japanese Honeysuckle

*Lonicera japonica*

**Habit:** Perennial, woody vine that can climb up to 7 m (23 ft) tall and form a thick covering over trees, shrubs and groundcover species.
**Leaves:** Simple, opposite, oval to lobed with smooth margins, 4-8 cm long; leaf base round/triangular; leaves are semi-evergreen to evergreen.
**Stems/Bark:** Hairy, reddish/light brown, woody, hollow.
**Flowers:** White-cream-pink, paired, tubular flowers arising from leafs axils along stems; bloom April-June; fragrant.
**Fruits/Seeds:** Black to purple, glossy, paired fruit with 4-10 brown-black seeds.
**Habitat:** Native to East Asia; found in open woods, old fields, disturbed areas, roadsides and fence rows; moderately shade tolerant but prefers full sun.
**Reproduction:** By seed and vegetatively by root suckers and runners; sexual reproduction may be limited by lack of pollinators.
**Similar Species:** Native - Red honeysuckle *(L. dioica)*, yellow honeysuckle *(L. flava)*, hairy honeysuckle *(L. hirsuta)*, and grape honeysuckle *(L. reticulata)* - native honeysuckle vines have red-orange fruit and terminal, opposite leaves that unite at their bases (connate).
**Comments:** Can be detrimental to native host due to root competition for resources.
**Monitoring & Rapid Response:**
Monitor open areas and woodland edges; Japanese honeysuckle retains some leaves over winter; cutting, pulling and burning Japanese honeysuckle may weaken it but will not eliminate it; foliar application of herbicide is effective; late autumn or winter prescribed burns provide effective control when followed by foliar herbicide application about a month after resprouts emerge; minimize soil disturbance to prevent germination of seed from the seedbank.


# Kudzu

*Pueraria lobata*

**Habit:** Perennial, aggressive, semi-woody vine; forms dense mats covering other vegetation, structures, etc.
**Leaves:** Alternate, compound with 3 large leaflets; may be hairy.
**Stems/Bark:** young stems hairy, becoming smooth, brown; up to 7.5 cm (3 in) in diameter; vines that grow upright develop bark and annual rings, and overwinter; more robust than prostrate vines on flat ground; may grow up to 18 m (60 ft) in one season.
**Flowers:** Reddish, purple, pea-like, grow on upright spikes (up to 15 cm) from leaf axils; bloom from August to September, fragrant.
**Fruits/Seeds:** Dark brown, dry, clustered, flat, legume seed pods, 3-8 cm long, covered with stiff golden-brown, spreading hairs, each with up to 9 seeds.
**Habitat:** grows in full sun on a variety of soils; prefers deep loams.
**Reproduction:** By seed, root expansion and fragmentation; roots develop from nodes, forming root crowns every 1-2 square feet.
**Similar Species:** hog-peanut (*Amphicarpaea bracteata*) has similar leaves, pale pink flowers in clusters - not spikes.
**Comments:** Fixes nitrogen.
**Monitoring & Rapid Response:** Monitor open disturbed areas and forest edges; hand pull young plants, removing entire root crown; remove all plant material from site and destroy; mowing, grazing or tilling throughout growing season depletes root storage, weakens plant; most effective in conjunction with herbicide; kudzu is fire resistant; herbicides most effective in fall; older infestations require higher herbicide concentrations; treat cut stems with herbicide; basal bark treatment effective; foliar herbicide application also effective.

As this species has a limited distribution in Michigan, it is important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.


# Oriental Bittersweet

*Celastrus orbiculata*

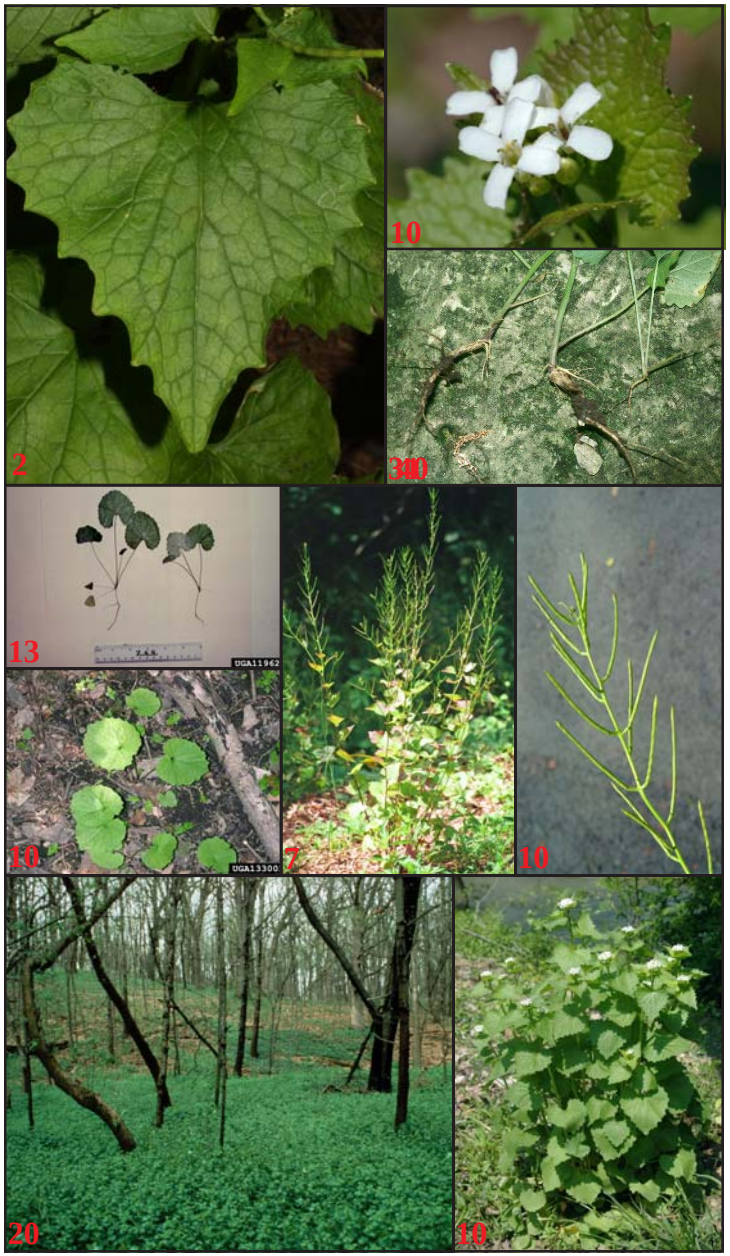
**Habit**: Deciduous, woody, twining vine.
**Leaves**: Simple, alternate, rounded, finely toothed, glossy; leaf tips acute or acuminate; 5-13 cm long; turns yellow in fall.
**Stems**: Light brown, often with noticeable lenticels; solid white pith; can climb 18 m (60 ft) high in trees and reach 10 cm (4 in) in diameter.
**Flowers**: Small; greenish yellow; 5-petaled; clustered in leaf axils; bloom in May-June.
**Fruits/Seeds**: Outer skin (green in summer and yellow orange in fall) covers a red, fleshy aril, which contains 3-6 seeds; fruits clustered in leaf axils; colorful fruit often remains on vines through the winter.
**Habitat:** Native to Asia; found in grasslands, open woods, woodland edges, undisturbed forests, roadsides and fencerows; extremely shade-tolerant.
**Reproduction**: By prolific seed production and spreading underground roots that form new stems.
**Similar Species:** Native - American or climbing bittersweet *(Celastrus scandens)* - has elliptical rather than rounded leaves; flowers and fruits terminal rather than axillary.
**Comments**: Oriental bittersweet hybridizes with American bittersweet *(C. scandens)*, making it a genetic threat to the native species; may impact host species by reducing photosynthesis and girdling trees; the native bittersweet (*Celastrus scandens*) is protected under Michigan law.
**Monitoring & Rapid Response:**
Monitor open woods and edge habitats in late fall when most native plants have dropped their leaves; Oriental Bittersweet can be readily identified by its bright yellow leaves and in the case of female plants, persistent showy fruit, which is located in leaf axils; for existing populations, begin control efforts in highest quality areas and remove mature plants that provide a source of seed; hand pull or dig up seedlings and young vines; treat cut stems with an herbicide.

# Herbaceous Plants

## Dame’s Rocket

*Hesperis matronalis*

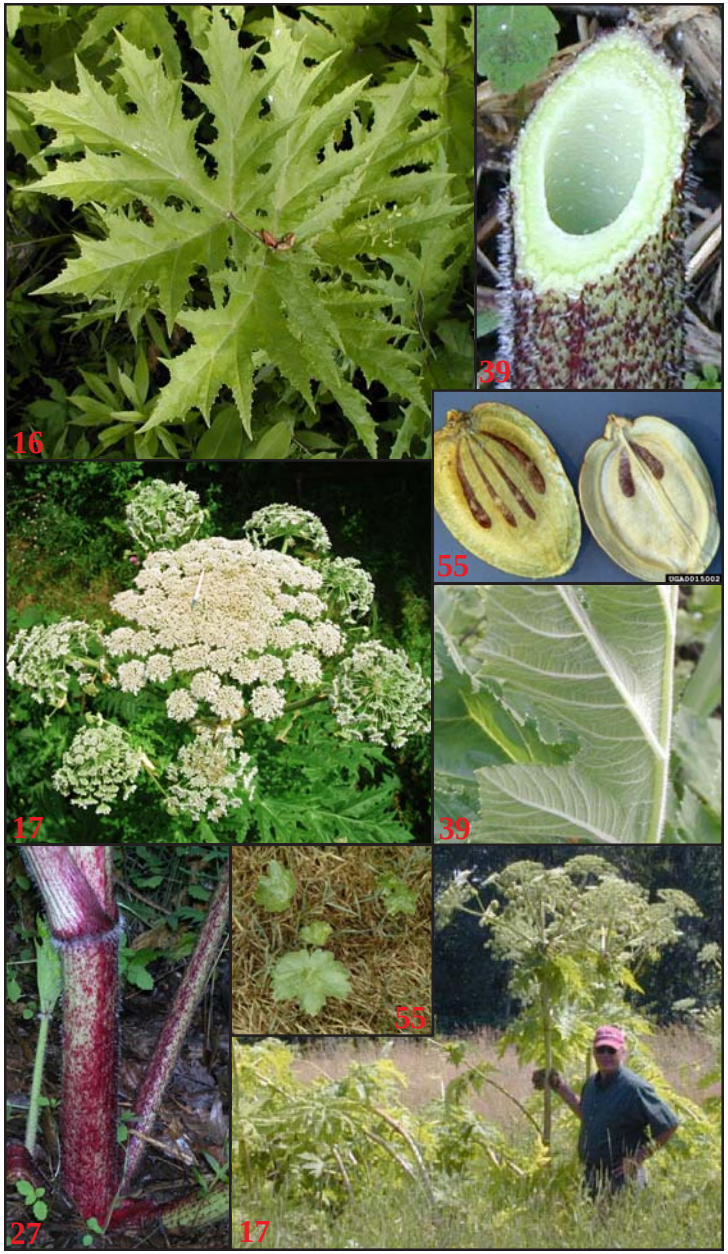
**Habit:** Showy, biennial or short-lived perennial; ranging between 0.6-1.0 m (2-3 ft) tall; first year plants over-winter as an evergreen basal rosette.
**Leaves:** Simple, alternate, lanceolate or ovate-lanceolate, toothed margins; downy, with simple hairs above, branched hairs below; leaves become smaller as they ascend the stem.
**Stems:** Upright, branched, with rough spreading hairs.
**Flowers:** White, pink, or purple; 4-petaled; borne in terminal clusters; bloom from mid-May through July; fragrant, clove-like aroma in evening.
**Fruits/Seeds:** Seeds are rounded, dark reddish-brown, 3-4 mm long; held in long, erect pods (siliques), up to 12 cm in length; ripen from June through August.
**Habitat:** prefers moist, well-drained loams; tolerates light shade but prefers full sun; tolerates high alkalinity; established along roadsides, woodlands, wetlands, old fields and open areas.
**Reproduction:** By abundant seed production; a single plant produces up to 20,000 seeds.
**Similar Species:** Phlox *(Phlox divaricata)* - native phlox have five petals.
**Comments:** Native to Europe; introduced in wildflower mixes; in some areas, has been present at low levels for many years but is now spreading aggressively like its mustard family relative, garlic mustard.
**Monitoring & Rapid Response:** Dame’s rocket is easiest to identify while in bloom during June and July; hand-pull plants while the soil is moist; remove flower and seed heads; do not compost; foliar herbicide applications are effective in early spring or late fall while native species are dormant; control efforts should continue for several years until the seedbank is exhausted.



# Garlic Mustard

*Alliaria petiolata*

**Habit**: Upright, herbaceous biennial growing up to 1 m (3ft) tall.
**Leaves**: Simple, alternate, triangular, toothed; lower leaves kidney shaped with palmate venation, 2-12 cm long, scalloped edges, arranged in a basal rosette; upper leaves stalked.
**Stems**: Up to about 1 m (3ft); typically one flowering stem per rosette but may be more.
**Flowers**: Numerous, small, white, 4-petaled; usually in clusters at the tops of stalks, sometimes in leaf axils; bloom late April-early June.
**Fruits/Seeds**: Seeds are small, dark brown/black; in long narrow capsules (siliques); one plant can produce up to 3,000 seeds; seeds viable within a few days of flowering and remain viable up to seven years; two germination periods - one in mid-spring and another in late summer.
**Habitat:** Found in upland and floodplain forests, savannas, along trails, roadsides and disturbed areas; shade tolerant but also found in full sun; spreads rapidly.
**Reproduction**: Prolific seeding, preferentially outcrosses but may self; produces basal rosette the first year, flowers the second year.
**Similar Species**: Basal leaves resemble those of *Thaspium, Zizia, Senecio, Viola* spp; fruiting structures similar to other mustards; can be distinguished by garlic odor when crushed.
**Comments**: All parts smell like garlic when crushed, especially in spring and early summer; dominates the ground layer of forests to the exclusion of almost all other herbaceous species; lacks mycorrhizal fungi needed by woody plants for regeneration.
**Monitoring & Rapid Response:** Monitor forest edges, paths and floodplains; remove all plants before seed is produced; begin control efforts in highest quality areas; pull seedlings; remove upper half of root or it may resprout; tamp soil thoroughly to minimize recolonization and germination; cut flowering stems at ground level; flowerheads must be removed to prevent seed development; herbicide can be used in early spring and fall, while native plants are dormant; continue control efforts until the seed bank is depleted.




## Giant Hogweed

*Heracleum mantegazzianum*

**Habit:** Extremely tall (2.5-6 m, 8-20 ft) biennial or short-lived perennial with a deep (40-65 cm, 16-26 in) tap root.
**Leaves:** Alternate; large (up to 1.5 m, 5 ft wide) deeply divided and dissected leaves; hairy beneath, leaf stalk enlarged and surrounding the stem; upper leaves gradually becoming smaller.
**Stems:** Thick (5-10 cm in diameter), hollow, purple-mottled; with coarse white hairs.
**Flowers:** Small, white flowers clustered into large umbels at the top of each stem; bloom June-July; typically bloom once and then die; although some perennials have survived after flowering.
**Fruits/Seeds:** Seeds in flat, dry, oval pods; 8-15 mm in length; one plant can produce up to 100,000 seeds.
**Habitat:** Prefers open, moderately moist, cool sites but can be found in a range of habitats.
**Reproduction:** By seed or by re-sprouts from cut stumps.
**Similar Native Species:** Cow parsnip is smaller, has fine white hairs under leaves; Angelica has a smooth, hairless stem.
**Comments:** Classified as noxious by the federal government - must remove the plant if found on property.
**Monitoring & Rapid Response:** Monitor riparian sites and disturbed edge habitat in partial shade; sap causes increased photosensitivity; may cause severe burns, blistering, dermatitis and dark scars, and even blindness; protect skin; mowing stimulates budding from the rootstalk; plants may be dug out – remove root; use glyphosate or triclopyr for foliar spraying as 2,4-D and dicamba kill leaves, not rootstalks.

As this species has a limited distribution in Michigan, it is
important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.

# Giant Knotweed

*Polygonum sachalinensis*

**Habit:** Perennial, herbaceous shrub up to 4 m (12 ft); although it is larger than many woody shrubs, stems die back to the ground each year.
**Leaves:** Simple, alternate, large, over 30 cm (1 ft) long and $^{2}/_{3}$ as wide with a heart-shaped base.
**Stems:** Upright, round, hollow with swollen nodes; resemble bamboo shoots.
**Flowers:** Sparse, greenish flowers on a slender stalk; arise from the leaf axils and stem tips;bloom August-September.
**Fruits/Seeds:** Fruits are 3-winged, seeds are dark and glossy; wind and water dispersed.
**Habitat:** Native to Asia, now found along roadsides, stream and river banks, wetlands, wet depressions and woodland edges; shade intolerant; can tolerate a wide array of soil and moisture conditions.
**Reproduction:** Primarily through rhizomes or fragments; does not reproduce significantly by seed.
**Similar Species:** Native - Virginia knotweed *(P. virginianum)* - not shrub-like, flowers on a slender spike. Non-native - Japanese knotweed *(P. cuspidatum)* is smaller in size and its leaves have a straight base.
**Comments:** Hybridizes with Japanese knotweed *(P. cuspidatum)*.
**Monitoring & Rapid Response**: Monitor sunny open sites along ditches and canals; ½" fragments can sprout and form new colonies; resprouts vigorously after cutting, mowing, tilling and digging; mowing twice per month may deplete the root system in two to three years; foliar herbicide application may provide effective control, cutting or spraying early in the season and then spraying later may be easiest as plants will still be short enough to spray efficiently; follow up may be required for several years; monitor up to 20' away from original population; stem injection has been extremely effective in trials (labor intensive), using higher concentrations than are normally used for foliar application.


# Japanese Knotweed

*Polygonum cuspidatum*

**Habit:** Perennial, herbaceous shrub reaching 3 m (10 ft); although it is larger than many woody shrubs, stems die but stalks persit through winter; growth form is a circular colony with interior plants dying as colony advances outward.
**Leaves:** Simple, alternate, broad, 8-15 cm long, 5-12 cm wide with an abruptly pointed tip and a flat base.
**Stems:** Upright, round, hollow, glaucous, often mottled; swollen nodes surrounded by a papery membrane; persistant dead stalks look like bamboo.
**Flowers:** Numerous, small, green-white flowers on a slender stalk arising from the leaf axils and near the ends of stems; blooms August-September.
**Fruits/Seeds:** Fruits are 3-winged, 8-9 mm, seeds are dark and glossy; wind and water dispersed.
**Habitat:** Semi-shade tolerant; found along roadsides, stream and river banks, wetlands, wet depressions and woodland edges; can tolerate a wide array of soil and moisture conditions.
**Reproduction:** Primarily through rhizomes or fragments; does not reproduce significantly by seed; spread by flood waters
**Similar Species:** Virginia knotweed *(P. virginianum)* - not shrub-like, flowers on a slender spike.
**Comments:** Forms dense thickets that shade out natives; aggressive rhizomes can damage pavement; once established, stands are extremely difficult to eradicate.
**Monitoring & Rapid Response**: Monitor riverbanks, stream and pond edges, particularly downstream from known occurrences; can be identified most readily while in bloom, in August and September; cutting or mowing at least 3 times per season can reduce rhizome reserves; biweekly cutting preferable; foliar herbicide application effective; provides best control when plants have been cut, allowed to resprout to 3’ tall and then treated; hand pull seedlings but not larger plants as new colonies can develop from cut stems or rhizomes; continued control efforts are required to keep this species in check.

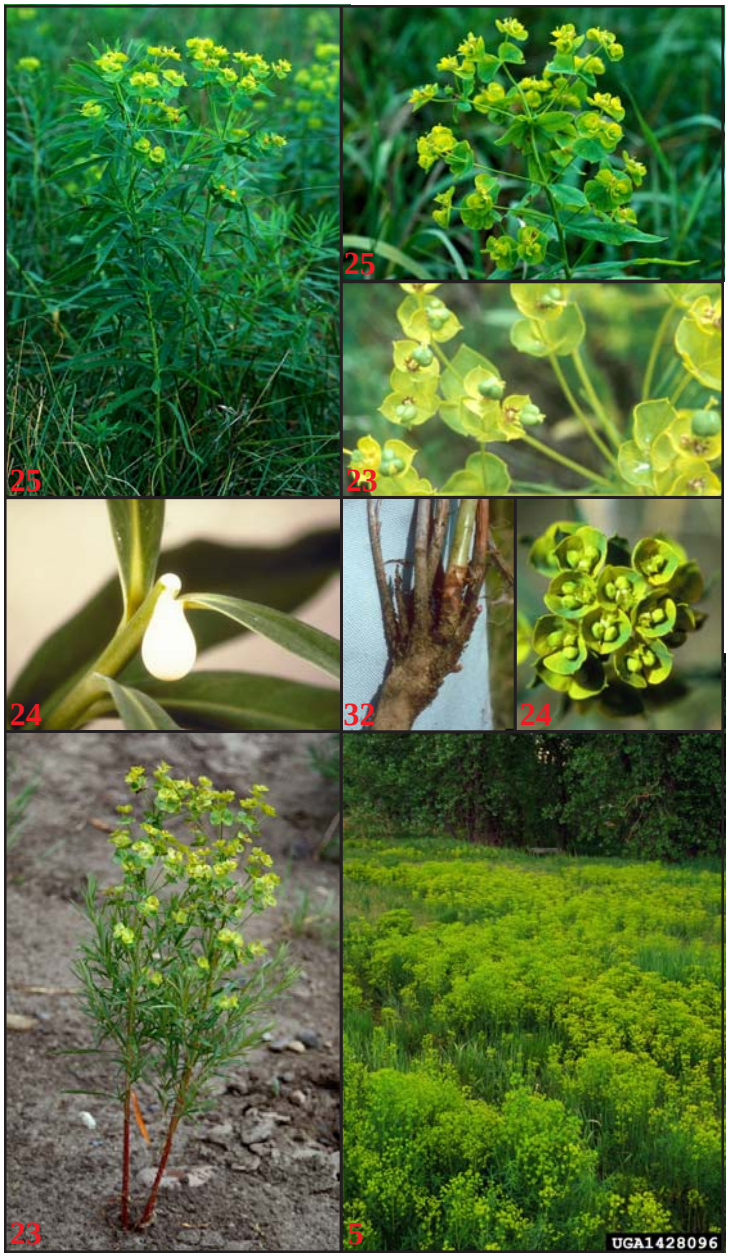

## Japanese Stilt Grass

*Microstegium vimineum*

**Habit:** Annual grass growing up to 1 m (3 ft) tall.
**Leaves:** Alternate, lance-shaped, thin, 5.0-7.5 cm long; .03-1.5 cm wide, slightly hairy on both surfaces with a line of silver hairs down the center on the upper surface; tapers at both ends, pale green turning slightly purplish in the fall.
**Stems:** More or less reclining, up to 100 cm (40 in) long.
**Flowers:** Inflorescences multiple, terminal or arising from leaf axils; paired flowers with one sessile and one stalked flower; spikelets hairy.
**Fruits/Seeds:** Seed is a yellowish-red, oval grain ripening in September-October; one plant can produce up to 1,000 seeds per plant, remain viable for 3-5 years.
**Habitat:** Shade tolerant; does not tolerate full sun or standing water; found in streambanks, disturbed areas, roadsides, ditches.
**Reproduction:** By seed and rooting nodes along the stem.
**Similar Species:** Whitegrass (*Leersia virginica*) is smaller, with 1-flowered spikelets, while those of stilt grass are paired.
**Comments:** This species is not yet recorded in Michigan
**Monitoring & Rapid Response:** Monitor shady moist sites; hand pull, mow or burn in fall during flowering but before seed set, timing critical; burning useful in conjunction with herbicide; imazameth preferred herbicide as it kills stilt grass but not sedges, ragweeds or legumes; less selective herbides and pre-emergent herbicides are inappropriate except for highly degraded sites; follow-up required until seedbank is exhausted.

As this species is **not yet recorded in Michigan**, it is important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.




# Leafy Spurge

*Euphorbia esula*

**Habit:** Herbaceous perennial ranging in height from 15-92 cm (6-36 in).
**Leaves:** Simple, alternate, long, narrow, bluish green; usually pointed and drooping with smooth margins; exude white milky sap when crushed.
**Stems/Roots:** Upright stems that branch towards the top of the plant; dry stems may persist into the winter and following summer; stems also release white, milky sap when broken; deep taproot, up to 3.5-4.5 m (12-15 ft) deep; tough, woody extensive root system that may spread laterally up to 10 m (35 ft); large root reserves allow plant to recover from most disturbances.
**Flowers:** Small, yellowish-green flowers with fused petals forming a cuplike structure; bloom mid-June to late-July.
**Fruits/Seeds:** Smooth, oblong, gray-brown seeds; one plant can produce up to 200 seeds; high germination rate; viable up to 8 years with adequate moisture.
**Habitat:** Roadsides, prairies, savannas, gravel pits, open areas.
**Reproduction:** By prolific seed production and long distance seed dispersal (up to 4.5 m); also spreads rapidly though its persistent root system from crown and root buds that over-winter under the soil surface.
**Similar Species:** Flowering spurge *(Euphorbia corollata)* - has white flowers and erect leaves; non-native Cypress spurge (*Euphorbia cyparissias*) has stem leafblades less than 2.5mm wide.
**Comments:** Classified as noxious in Iowa, Minnesota, and Wisconsin.
**Monitoring & Rapid Response:** Monitor open sites and woodland edges; early detection is critical; leafs out early in spring; bright yellow-green bracts appear in late May or early June, seedlings develop buds w/in 7-10 days of emergence; long shoots spread laterally (up to 4.8 m deep)**;** pulling, digging, burning and tilling may cause increase; foliar herbicide application provides effective control of small occurrences; surveillance and control efforts needed for 5-10 years; biological control agents undergoing research currently..


## Mile-a-minute Weed

*Polygonum perfoliatum*

**Habit:** Herbaceous, annual, fast-growing, trailing vine; covers and eventually kills its host vegetation; variable height.
**Leaves:** Simple, alternate, triangular, light green-blue, barbs on the underside.
**Stems:** Reddish, narrow, covered with barbs that attach to other plants; stems with circular, cup-shaped, leafy appendages (ocreas) that surround the stem; stems up to 7 meters long.
**Flowers:** Small, unnoticeable, white, closed, emerge from ocreas along the stem; flower in June.
**Fruits/Seeds:** Metallic, greenish-white, turning dark blue in fall, pea-sized, clumped berries.
**Habitat:** Relatively shade intolerant; found on moist sites in open disturbed areas, woodland edges, wetlands, stream banks.
**Reproduction:** Mainly through self-pollinated seed production.
**Similar Species:** Mile-a-minute weed's triangular, light green-blue leaves are distinctive.
**Comments:** Native to East Asia, introduced in the 1930s.
**Monitoring & Rapid Response**: Monitor roadsides, thickets, streambanks, meadows, woodland edges, clearcuts and utility right-of-ways; most easily recognized in late March and early April as it germinates early in the season; for small infestations, hand-pulling, mowing and cultivating may provide effective control by preventing flowering and seed production; remove and dry vines before disposal; wear heavy gloves; foliar herbicide application provides effective control - as the leaves have a waxy coating, a surfactant will help the herbicide adhere.

As this species is **not yet recorded in Michigan**, it is important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.

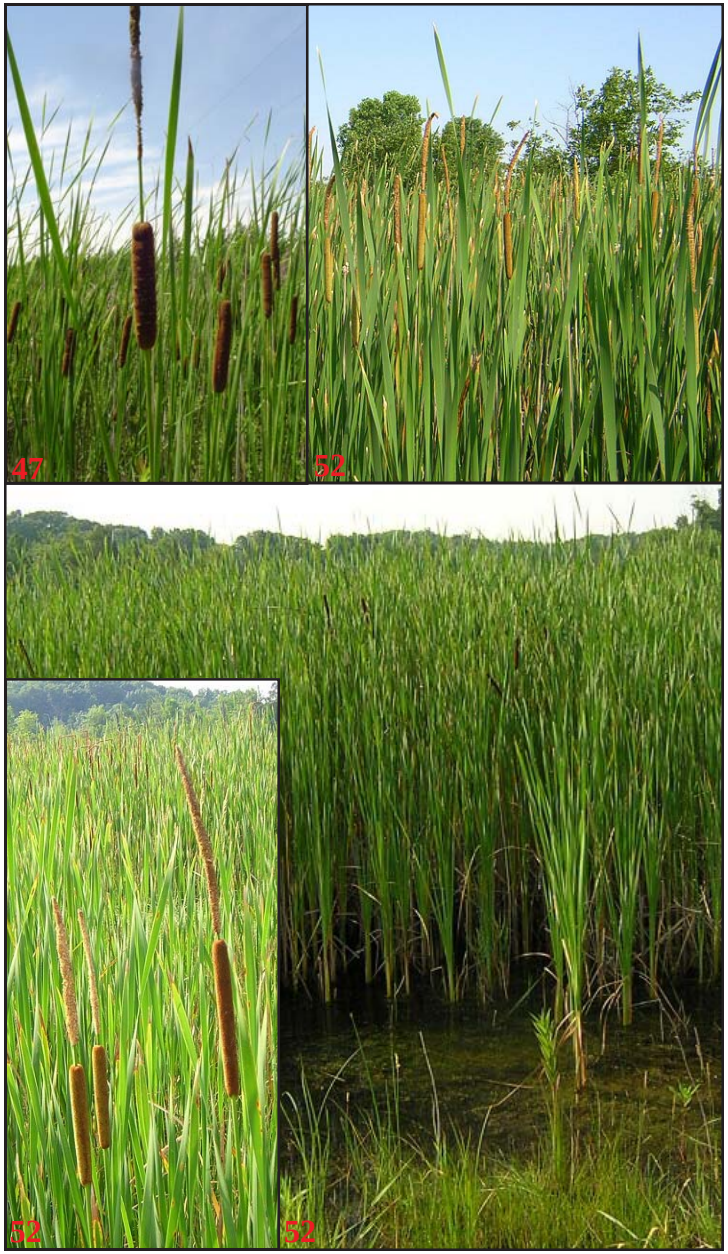
## Narrow-leaved Bitter-cress

*Cardamine impatiens*

**Habit:** Herbaceous annual or biennial; grows up to 2 feet in height.
**Leaves:** Pinnately divided with numerous (6-20), sharply toothed leaflets, with membranelike, narrow, pointed auricles at the leaf base (see circled structure in photo); basal leaves are arranged in a rosette and pinnately divided; 3-11 leaflets with rounded lobes.
**Stems:** Erect, glabrous
**Flowers:** Small, white, up to 2.5 mm (0.1 in.) long; petals lacking or shorter than the sepals, bloom May to August.
**Fruits/Seeds:** Slender seedpods (siliques) on spreading-ascending to erect pedicels, 1.5-2 cm (0.6-0.8 in.) long; 10-24 seeds; ripen from May to September.
**Habitat:** Established in Michigan; found on banks, along thicket margins, shady woods and on moist limestone rocks and cliffs.
**Reproduction:** Seeds project out of siliques.
**Similar Species:** Native - Sand bitter-cress (C. *parviflora*) and Pennsylvania bitter-cress (*C. pensylvanica*) - the most important distinguishing characteristic of C. *impatiens* is the narrow, pointed auricles at the base of the leaves.
**Comments:** Easily dispersed due to its seed shooting ability; can form dense stands outcompeting native species.
**Monitoring & Rapid Response:** Monitor moist forested sites in spring and summer; can be identified by its sagittate-auriculate leaf bases. Hand pull and remove all plants before seed dispersal.

As this species has a limited distribution in Michigan, it is
important to document new occurrences.

Please obtain flowering or fruiting specimens with the diagnostic leaf bases and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.




# Narrow-leaved Cat-tail

*Typha angustifolia*

**Habit:** Aquatic, emergent perennial ranging from 1.2-3.7 m (4-12 ft) in height.
**Leaves:** Upright, flat, long (up to 1 m) and narrow (0.6-1.25 cm wide) with parallel veins; dark green; rounded on back of the leaf.
**Stems:** Upright, 1-2 m long.
**Flowers:** Borne in dense, dark brown, terminal spikes; separated into male and female clusters with the male flowers occurring 2.0-10 cm above the female flowers. Male portion 7-20 cm long and 7-15 mm wide; female portion 10-20 cm long and 1-2 cm wide.
**Fruits/Seeds:** Numerous, tiny seeds; one plant can produce 250,000 seeds; seeds are wind dispersed in the fall and spring; may remain viable in the seed bank for up to 100 years.
**Habitat:** Native to Eurasia; found in wetlands, ditches, stream and lake shores and wet depressions; tolerates high levels of silt, nutrients and salt.
**Reproduction:** By seed establishment on bare soil and vegetatively by thick spreading rhizomes; also by fragmentation.
**Similar Native Species:** Common cat-tail *(Typha latifolia)*- no gap between male and female portions of flower head, wider leaves (1.0-2.0 cm).
**Comments:** *Typha angustifolia* hybridizes with the native common cat-tail *(Typha latifolia)* to produce *Typha* X *glauca*; hybrid cat-tail larger than parents, sterile; reproduces vegetatively through rhizomes; tolerates a greater range of conditions than parents; cattail-dominated habitat in the Midwest has increased dramatically over the past few decades as *Typha angustifolia* and *T.* X *glauca* have increasingly colonized wetlands.
**Monitoring & Rapid Response**: Eliminating narrow-leaved cat-tail impractical but all cat-tail species may become invasive; 50% open water preferable; aerial photos useful in assessment; where water level manipulation is possible, cut or burn stems just before flowering to cut off oxygen to roots and flood to at least 3'-4'; water levels from 4'-5' encourage muskrats; foliar herbicide also effective, particularly when followed by cutting and flooding; prescribed fire ineffective without herbicide or flooding.

# Purple Loosestrife

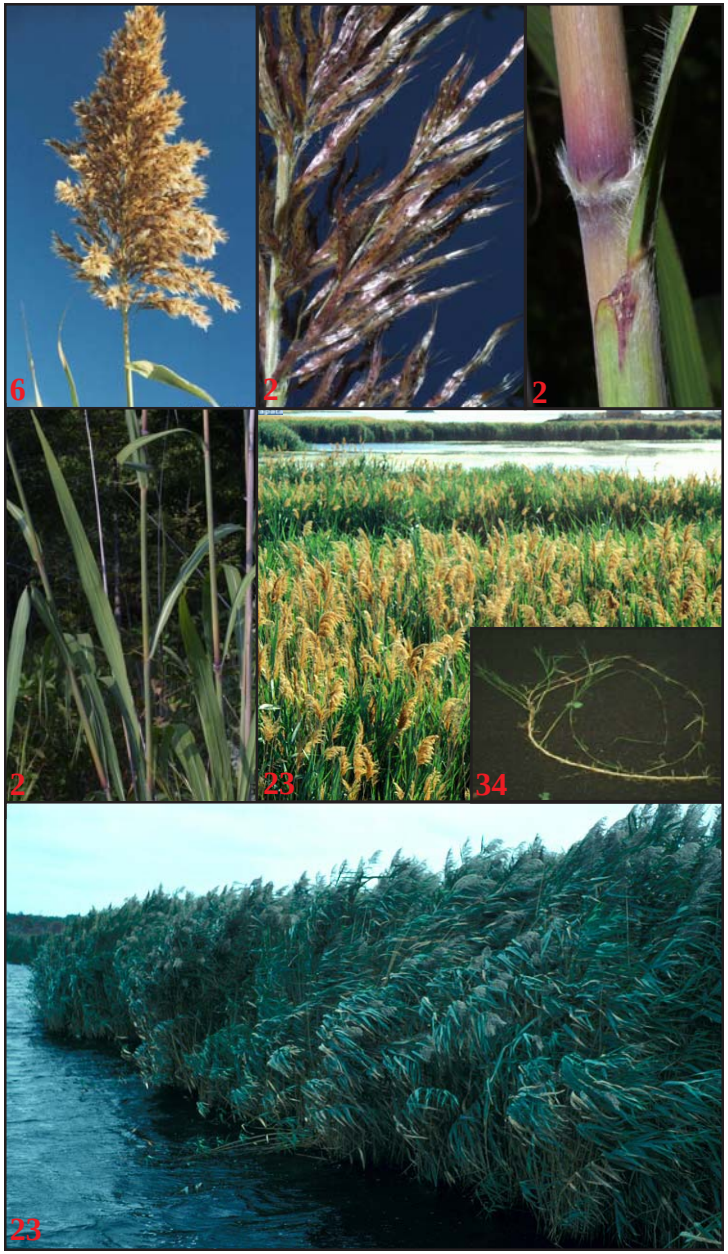
*Lythrum salicaria*

**Habit:** Herbaceous, perennial, stout, erect, 0.5 to 2.0 meters in height, densely pubescent, especially the upper part of the plant, pubescence can be variable; strongly developed taproot which becomes woody with plant maturity.
**Leaves:** Leaf shape variable, lanceolate to almost linear, opposite or whorled; sessile to somewhat clasping; 3-10 cm with larger leaves at the base.
**Stems:** Four-angled; glabrous to pubescent.
**Flowers:** Numerous, purple (can also be white or light pink), terminal spike-like inflorescences in axillary clusters of two to several; bract and floral tube pubescent; 5-7 petals about 7-11 mm long; petioles red-purple, 7-12 mm; stamens mostly 12; blooms July to October.
**Fruits/Seeds:** Capsule with small seeds; prolific seed production.
**Habitat:** Shade intolerant but can tolerate up to 50 percent shade; found in marshes, bogs, shores, borders of rivers and streams, ditches, other disturbed wet soil areas; tolerates a wide range of soils but prefers high organic soils.
**Reproduction:** By seed, or vegetatively by resprouting from cut stems and regenerating from pieces of root stock.
**Similar Species:** Native: winged loosestrife (*Lythrum alatum*) - has solitary flowers borne in axils of small bracts; petals 4-7 mm long; leaves are larger toward base of plant; fireweed (*Epilobium angustifolium*) has 4-petaled flowers and leaves taper at base.
**Comments:** Attractive but persistent weed; spreads vigorously in moist soil conditions; crowds out native wetland plant species.
**Monitoring & Rapid Response:** Monitor wetlands, lake and stream banks, and ditches in July and August when plants are in bloom; hand pull seedlings; remove all flower and seed heads; foliar spraying with herbicide after peak bloom (late August) provides effective control but may damage non-target plants; apply herbicide with an absorbent cotton glove, worn over a chemical resistant glove, for more selective control; a biological control, the *Galerucella* beetle, provides effective control (on smaller populations the beetle colonies may die out).


# Reed Canarygrass

*Phalaris arundinacea*

**Habit:** Cool-season, colonial, perennial grass ranging from 0.7-2.4 m (2.5-8 ft) tall; forms dense monotypic stands.
**Leaves:** Flat leaf blades; rough in texture; 1.9-2.6 cm wide and up to 45 cm long; top blades are horizontal with a prominent transparent ligule.
**Stems/ Roots:** Stems are upright; bluish-green in color. Root system is a thick, fibrous mat of rhizomes.
**Flowers:** Found in crowded, branched clusters at the end of each stem. Flower clusters dense and spike-like at immaturity, spreading open at maturity.
**Fruits/Seeds:** Small, shiny brown seeds; dispersed by water, humans, animals and machinery.
**Habitat:** Native to temperate regions of North America and Europe; most colonies found throughout the Midwest are thought to be escapes of cultivated and European varieties; widely planted for erosion control, now found throughout wetlands, ditches, stream and pond banks, and wet meadows.
**Reproduction:** Primarily through dense, mat-forming, spreading rhizomes; also by seed.
**Similar Species:** Native blue joint grass *(Calamagrostis canadensis)* occurs in many of the same sites but is draping rather than upright.
**Comments:** Reed canarygrass is a cool-season grass.
**Monitoring & Rapid Response:** Monitor moist, fertile sites and wetlands; most visible in spring when inflorescences expand to facilitate pollination; all control methods require ongoing monitoring and follow-up for 5-10 years until seedbank is exhausted; for small populations, in July or August, tying large clumps together, cutting off stems and immediately spraying them with herbicide is effective;root fragments may resprout; burning, mowing, discing and plowing must be ongoing - one-time efforts may increase population; can be effectively combined with herbicide or flooding where possible; herbicide provides effective control; reseeding beneficial.




# Giant Reed

*Phragmites australis*

**Habit:** Stout, warm-season perennial grass ranging in height from 1.8-3.9 m (6-13 ft).
**Leaves:** Alternate, flat, smooth leaf blades; 25-50 cm long, 1-3.5 cm wide; hairy ligules; green to grayish-green, yellow-orange in fall.
**Stems:** Stems upright, rigid and hollow; up to 2.5 cm in diameter.
**Flowers:** Dense branched clusters on bearded axis at the end of each stem; becoming open and feathery at maturity.
**Fruits/Seeds:** Seeds with white hairs below that are almost as long as the seed; prolific seeder but seed is not always viable.
**Habitat:** Native to North America and found around the world; aggressive colonies are thought to the result of genetic crossing between native and more invasive European varieties. Found in marshes, wetlands, ditches, swales, stream and pond banks.
**Reproduction:** Primarily through an extensive, aggressive system of horizontal and vertical rhizomes that can live for 3-6 years; rarely by seed establishment.

**Similar Species:** *Phragmites* is distinctive and much taller than most other grasses. The state threatened wild rice (*Zizania aquatica* var. *aquatica*) though quite tall, lacks the feathery appearance; large non-flowering plants of reed canarygrass (*Phalaris arundinacea*) appear similar but lack hairy ligules.
**Comments:** Forms dense, impenetrable stands.
**Monitoring & Rapid Response:** Monitor wetlands, ditches and moist sites, particularly adjacent to areas which receive nutrient rich run-off or road salt; mowing, discing and digging may increase populations; foliar herbicide spraying in late summer provides effective control for large dense stands; may be combined with August mowing and herbicide application of resprouts; for small populations, in July or August, tying large clumps together, cutting off stems and immediately spraying them with herbicide is effective; where controlled flooding is possible, cutting off *Phragmites* shoots and flooding them 3 feet deep for at least 4 months during the growing season may provide control.


# Spotted Knapweed

*Centaurea maculosa*

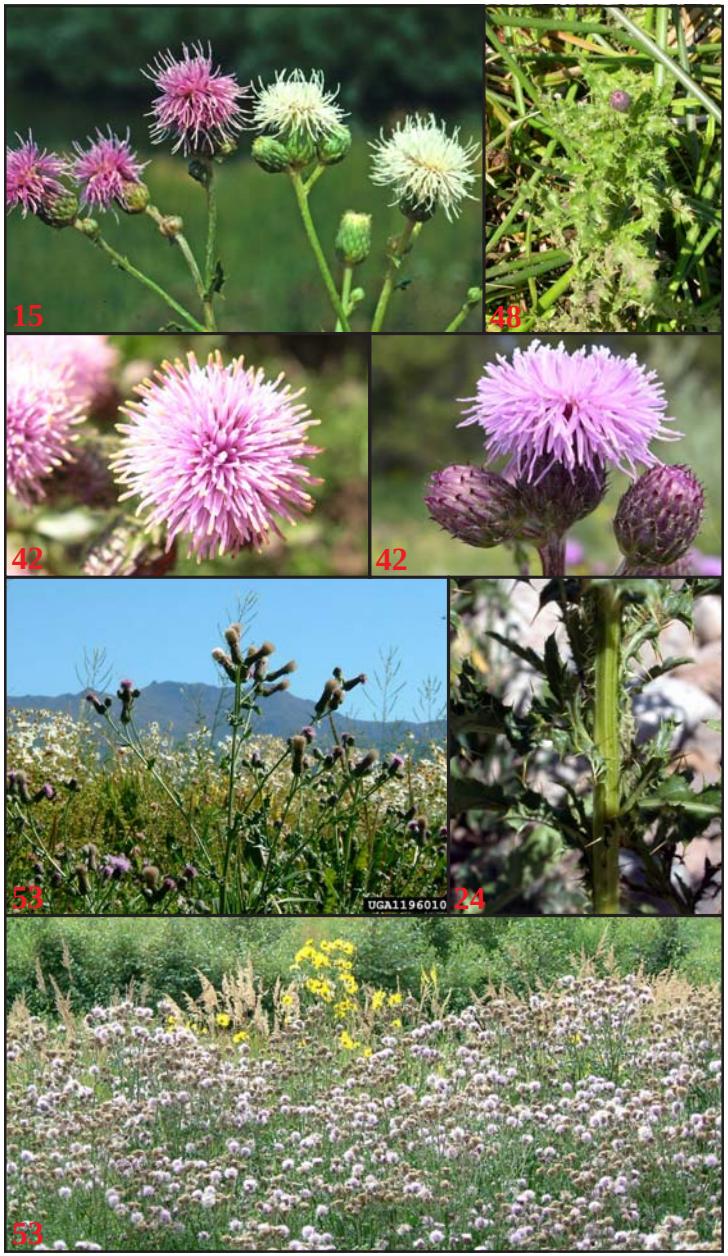
**Habit**: Short-lived herbaceous biennial or perennial reaching 0.6-1.2 m (2-4 ft).
**Leaves**: All leaves pale or grayish green with rough fine hairs; basal leaves form a rosette which may persist for up to four years; basal and lower stem leaves up to 15 cm long; leaflets deeply divided to irregularly lobed, tapered at both ends; upper stem leaves smaller (2-7 cm in length) with few lobes or smooth margins.
**Stems**: 1-7 upright rough stems that branch towards the upper half of the plant.
**Flowers**: Numerous, pink-purple, terminal solitary flowers at the end of each stem; phyllaries with dark tips and fringed margins; bloom from July-September.
**Fruits/Seeds**: Small brown wind-dispersed seeds; germinate throughout the growing season; remain viable for up to nine years.
**Habitat:** Roadsides and right-of-ways, old fields, pastures, undisturbed dry prairies and oak and pine barrens.
**Reproduction**: By prolific seed production and to a lesser extent by lateral roots.
**Similar Non-Native Species:** Russian knapweed *(Centaurea repens)*, diffuse or white-flowered knapweed *(C. diffusa)*, black knapweed *(C.nigra)*, brown knapweed *(C. jacea)*, short-fringed knapweed *(C. nigrescens)*, and yellow star thistle *(C. solstitialis)*. The best way to distinguish spotted knapweed is by the dark tips and fringed margins of its phyllaries.
**Comments**: A serious threat to western rangelands; may cause skin reactions in some individuals.
**Monitoring & Rapid Response:** Monitor well-drained, sunny sites – knapweed is recognizable throughout the growing season; wear gloves, long pants and sleeves to prevent skin contact; begin control efforts in highest quality areas; pull or dig plants in small infestations; remove entire root; remove flower/seed heads from site; tamp down soil; foliar herbicide spraying of rosettes is most effective (before stem elongation); continue control annually until the seedbank is exhausted.


## Swallow-worts

*Vincetoxicum nigrum, V. rossicum*

**Habit:** Herbaceous perennials; both range from 0.6-1.8 m (2-6 ft) tall.
**Leaves:** Simple, opposite, narrow, oblong to ovate with a pointed tip; dark green leaves with a smooth, waxy coating; emits a pungent herbal smell when crushed.
**Stems:** Twining; may climb or creep around adjacent plants.
**Flowers:** Small, 5-petaled, clustered in leaf axils; bloom June-August; slight rotting odor; *V. nigrum*: purple-black with straight white hairs on dorsal surface; peduncles 0.3-3 cm; *V. rossicum*: pale to dark maroon, purple or pink, glabrous; peduncles 2-5 mm.
**Fruits/Seeds:** Seed pods resemble those of milkweed; pods split open in mid-summer to release wind-borne seeds.
**Habitat:** Native to southern Europe, now found in hardwood forests, shaded woods, open prairies, fields, savannas, roadsides; can tolerate a range of light and soil conditions.
**Reproduction:** By seed; vegetatively by rhizomes and shoots from root crown of parent plant.
**Similar Species:** Native *Apocynum* spp. have similar seedpods but are not vines.
**Comments:** Grows rapidly over native vegetation; wind-dispersed seed travels long distances.
**Monitoring & Rapid Response:** Monitor disturbed sites and also edges and paths in undisturbed sites; populations most visible in late summer when the leaves turn golden and seedpods appear; hand-pulling difficult as roots are fragile - digging preferred, remove roots from site; prescribed fire is not effective when used alone and may improve conditions for increased germination; may be useful following herbicide application, to control seedlings with less developed root systems; remove and burn seedpods; foliar herbicide application provides effective control; cut-stem herbicide application provids slightly less effective control; labor intensive; multi-year monitoring and follow-up required.

Please report sightings with GPS positions to Dr. DiTommaso at: ad97@cornell.edu.




# Canada Thistle

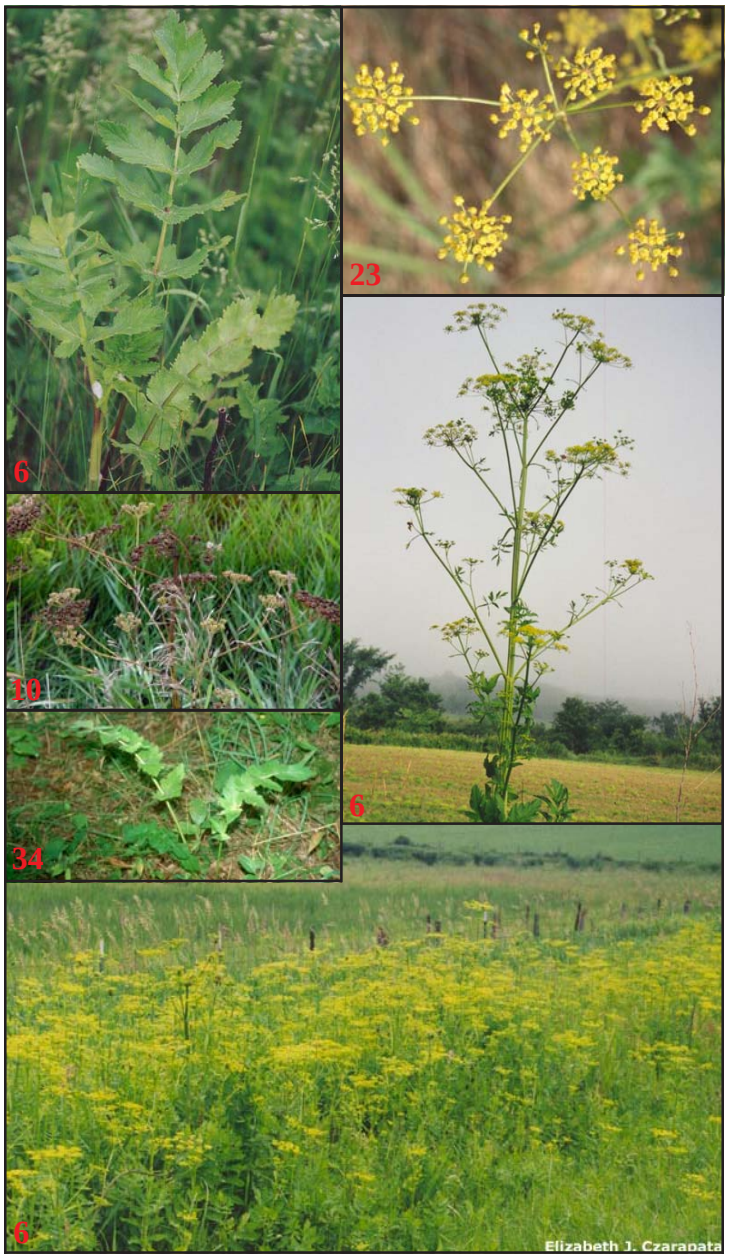
*Cirsium arvense*

**Habit:** Perennial, rhizomatous thistle ranging in height from 0.6-1.5 m (2-5 ft); forms large monocultures.
**Leaves:** Simple, alternate, lance-shaped; crinkly, tapering, with irregular lobes and spiny toothed margins.
**Stems:** Upright, slender and branching towards the top, becoming increasingly hairy with age.
**Flowers:** Numerous, purple-lavender flowers, small flowerheads (< 2.5 cm high), clustered at the tops of stems, blooms June-September; fragrant.
**Fruits/Seeds:** Seeds are small, light brown; tufts of hair attached to the tip for wind dispersal; one plant produces between 1500-5000 seeds, which can germinate 8-10 days after flowering begins and persist in the seed bank for up to 20 years.
**Habitat:** Found in disturbed open areas, roadsides, agricultural fields; invades prairie and riparian areas; salt-tolerant; shade intolerant.
**Reproduction:** Primarily by creeping, laterally spreading rhizomes, but also by prolific seed production; dioecious, with separate male and female clones; some hermaphroditic forms.
**Similar Species:** Native swamp thistle *(Cirsium muticum)* - has pink rather than purple flowers and flower heads are sticky.
**Comments:** Canada thistle was introduced to North America from Europe in the early 1600s; declared a noxious weed in Vermont in 1795.
**Monitoring & Rapid Response:** Monitor sunny, disturbed sites including degraded grasslands, open woodlands, edge habitats and restoration sites; begin control efforts in highest quality areas; pull seedlings within 2.5 weeks after germination or they become perennial; Canada thistle is clonal; resprouts from root fragments; may require 5-10 years of ongoing efforts to eradicate this species; different strains of Canada thistle respond differently to the same herbicide; herbicides most effective with two applications per season – spring (just before flowering) and fall (on new growth after mowing).


# European Swamp Thistle

*Cirsium palustre*

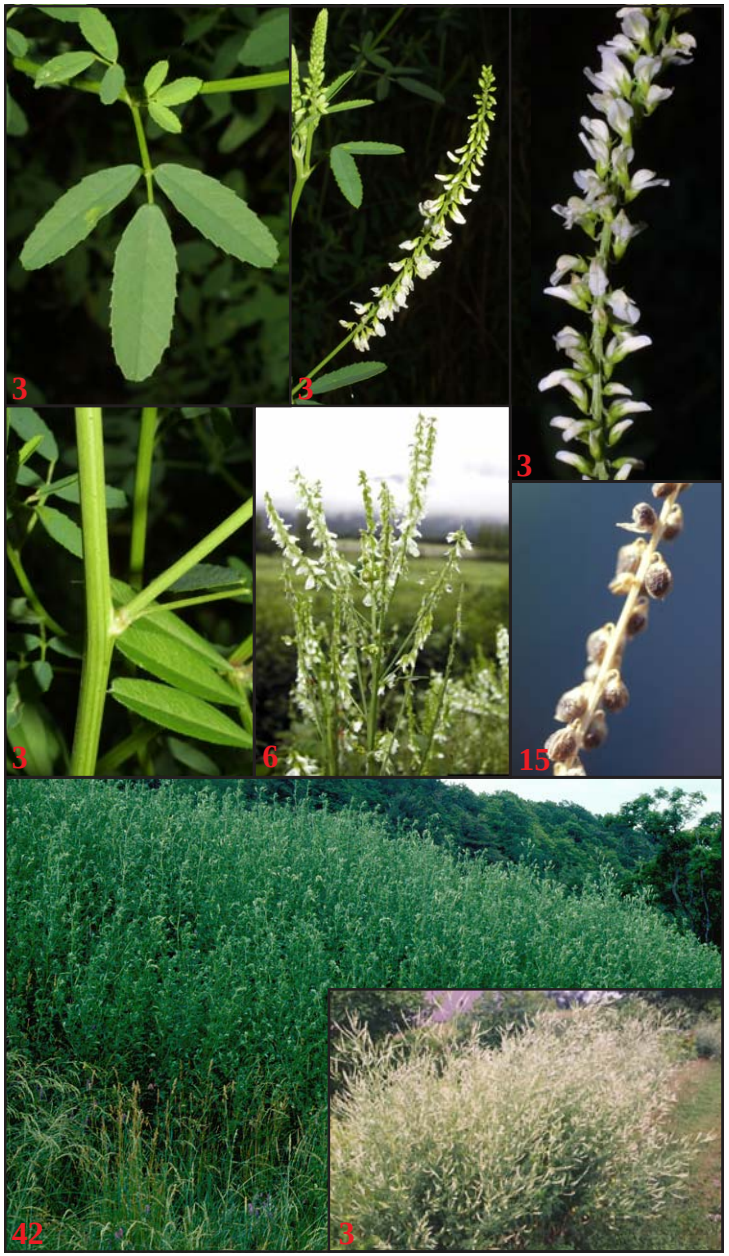
**Habit:** Herbaceous biennial ranging in height from 0.5-2 m tall.
**Leaves:** Thin, deeply lobed into pinnate segments, covered with loose matted hairs and spiny teeth along margins, up to 20 cm long; basal leaves longer than those higher in the stem in flowering plants; leaves of basal rosettes (first year plants) are spiny, deeply lobed, long and hairy below.
**Stems:** Thick, with spiny lengthwise wings along stem; sometimes reddish; branching at the top.
**Flowers:** Spiny, purple flowerheads composed of disc flowers; bloom June-August.
**Fruits/Seeds:** Fruit is a tiny achene, 3 mm long; attached to a pappus or “thistledown”.
**Habitat:** Prefers moist, acidic soil conditions, shade intolerant; found in ditches, wetlands, swamps, fens.
**Reproduction:** By wind dispersed seed.
**Similar Species:** The native swamp thistle *(Cirsium muticum)* has non-spiny stems and flowerheads; non-native Canada thistle has non-spiny stems and flowers.
**Comments:** European swamp thistle is considered a high priority invasive species in the Hiawatha National Forest and has spread widely throughout northern Michigan.
**Monitoring & Rapid Response:**
Monitor moist acidic sites including wetlands, forest edges and fields; marsh thistle blooms in June and July but can be identified by its thorny winged stems throughout the growing season; mowing or cutting close to the ground throughout the growing season can reduce infestations; flower heads should be removed from site; foliar herbicide application effective; can be used on fall rosettes, when plants are small (6-10") and during the bud/ flowering stage.




# Wild Parsnip

*Pastinica sativa*

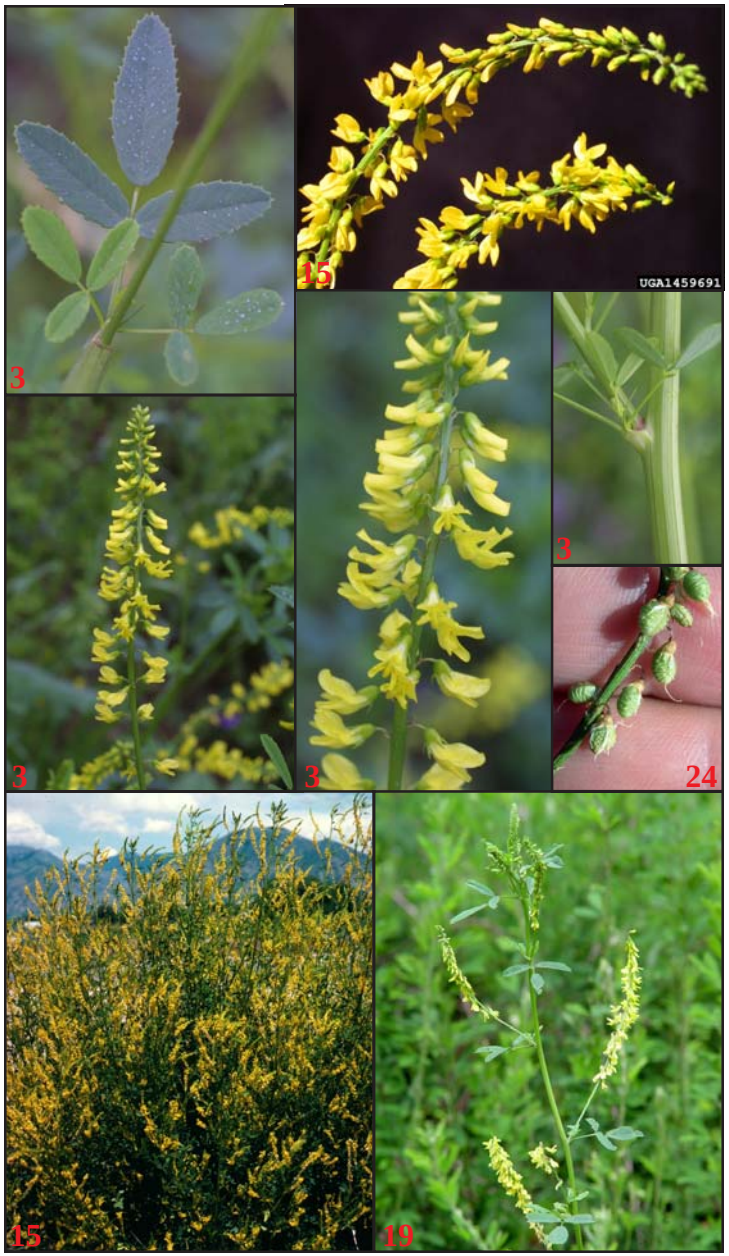
**Habit:** Tall, herbaceous perennial that dies after producing seed.
**Leaves:** Long (15 cm) leaves from a basal rosette on 1-2 year old plants; mature plants with pinnately compound, alternate leaves of 5-15 oval, smooth, toothed leaflets.
**Stems/ Roots:** Stem is upright, unbranched, thick, hairy, grooved; long, thick taproot.
**Flowers:** Numerous, small, yellow, 5-petaled, found in 5-15 cm wide flat, terminal umbels; lateral flowers of umbel often taller than central flowers; blooms June- mid-July.
**Fruits/Seeds:** Seeds are large, flat, round, yellowish; seeds can remain viable for up to four years.
**Habitat:** Native to Eurasia; found in open habitats such as prairies, savannas, and fens. Tolerates a range of soil and moisture conditions; shade intolerant.
**Reproduction:** By seed
**Similar Native Species:** Golden alexanders *(Zizia aurea)*- much shorter that wild parsnip, leaves with 3-7 leaflets. Prairie parsnip *(Polytaenia nuttallii)*-leaflets oblong with few teeth, rounded umbels.
**Comments:** Chemicals found in leaves, stems, and flowers of wild parsnip can cause skin rashes, burns, and blisters, especially in the presence of sunlight.
**Monitoring & Rapid Response**: Monitor grassland edges; easiest to identify in June and July when it begins to bloom; sap causes increased photosensitivity; may cause severe burns, blistering, dermatitis and dark scars - protect skin; wild parsnip may be cut 1" to 2" below the soil surface; if flowering has begun, remove flower and seed heads; mowing, cutting throughout the season effective; if a brush cutter or string trimmer is used, use protective clothing and a face shield; foliar herbicide application on basal rosettes effective; fire does not control but exposes early rosettes in spring.




## White Sweet Clover

*Melilotus alba*

**Habit:** Herbaceous annual or biennial that can grow up to 1.5 m (5 ft) tall.
**Leaves:** Compound, alternate, clover leaves with three finely toothed leaflets.
**Stems/Roots:** Upright, many-branched; smooth; often hollow; leafy stems that may be spreading near the base giving the plant a bushy appearance. Deep taproot, extensive lateral roots.
**Flowers:** Numerous, white, pea-like, fragrant; crowded onto elongated stems; bloom May-September.
**Fruits/ Seeds:** Fruit is a tiny, wrinkled seedpod containing 1-2 small, tough seeds; seeds may remain viable for up to thirty years; seed germination stimulated by burning.
**Habitat:** Native to Eurasia; found in open, dry, disturbed sites such as roadsides and old fields; also found in calcareous soils of sand dunes and prairies. Shade intolerant; will tolerate nutrient poor soils.
**Reproduction:** By prolific seed production; up to 350,000 seeds per plant.
**Similar Species:** Non-native - Resembles yellow sweet clover *(Melilotus officinalis)* which has yellow rather than white flowers; seedlings may also resemble alfalfa *(Medicago spp.)* - has hairs (pubescent) on the leaf underside.
**Comments:** Capable of nitrogen fixation.
**Monitoring & Rapid Response:** Monitor open, sunny sites; sweet white clover is most easily identified in June and July, while in bloom; for small infestations, pull first year plants in fall, after the root-crown buds have developed; pull second year plans before flowering; flowering plants should be removed and disposed of so that seed does not develop; poorly planned prescribed fire will increase infestations; multiple hot burns needed, timing critical, dependent on population age structure; a single burn may also be combined with herbicide application.

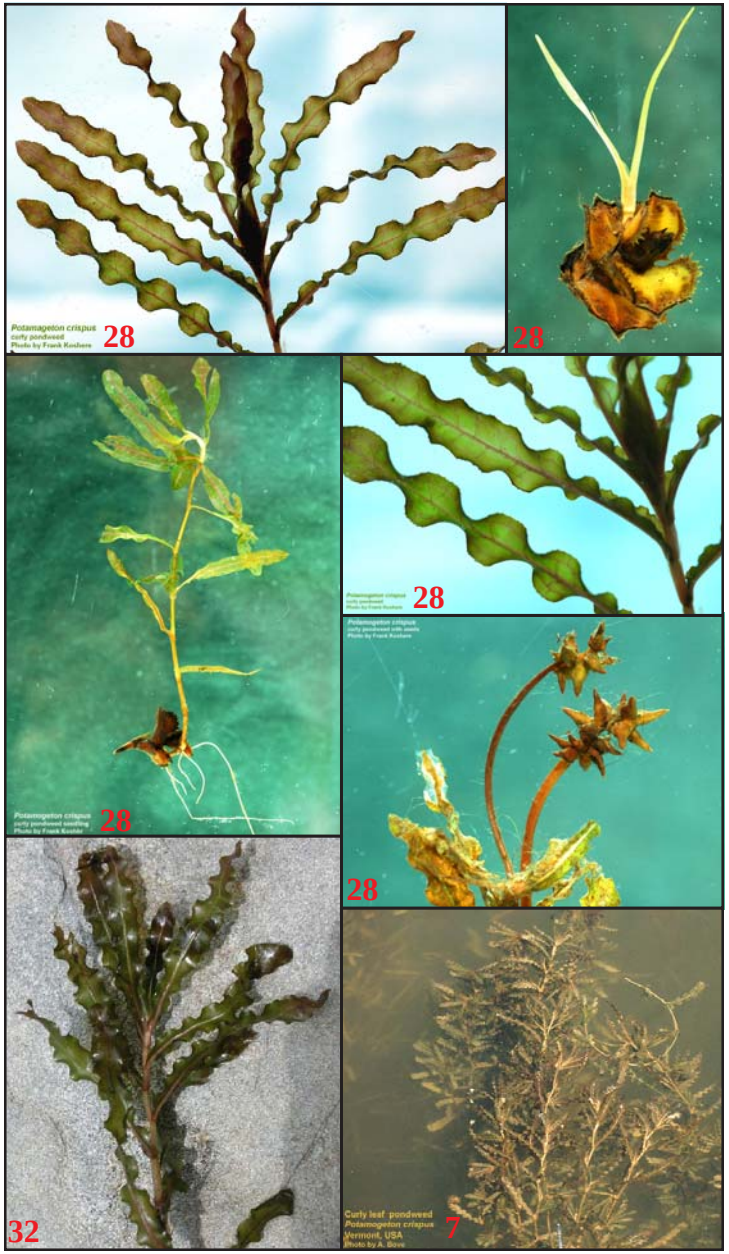



# Yellow Sweet Clover

*Melilotus officinalis*

**Habit:** Herbaceous annual or biennial that can grow up to 1 m (3 ft) tall
**Leaves:** Compound, alternate, clover leaves with three finely toothed leaflets.
**Stems:** Upright, many-branched; often hollow; leafy stems that may be somewhat spreading near the base giving the plant a bushy appearance. Deep taproot, extensive lateral roots.
**Flowers:** Numerous, yellow, pea-like, fragrant; crowded onto elongated stems; bloom May-September.
**Fruits/ Seeds:** Fruit is a tiny, wrinkled seedpod containing 1-2 small seeds that may remain viable for up to thirty years; seed germination stimulated by burning.
**Habitat:** Native to Eurasia; occurs in open, disturbed sites such as roadsides and old fields; invades prairies, savannas and dunes; shade intolerant; tolerates nutrient poor soils
**Reproduction:** By prolific seed production; up to 350,000 seeds perplant.
**Similar Species:** Non-native - Resembles white sweet clover *(Melilotus alba)*- which has white rather than yellow flowers; seedlings may also resemble alfalfa *(Medicago spp.)*, which has hairs (pubescent) on the leaf underside.
**Comments:** Capable of nitrogen fixation.
**Monitoring & Rapid Response:** Monitor open, sunny sites; sweet yellow clover is most easily identified in June and July, while in bloom; for small infestations, pull first year plants in fall, after the root-crown buds have developed; pull second year plans before flowering; flowering plants should be removed and disposed of so that seed does not develop; poorly planned prescribed fire will increase infestations; multiple hot burns needed, timing critical, dependent on population age structure; a single burn may also be combined with herbicide application.

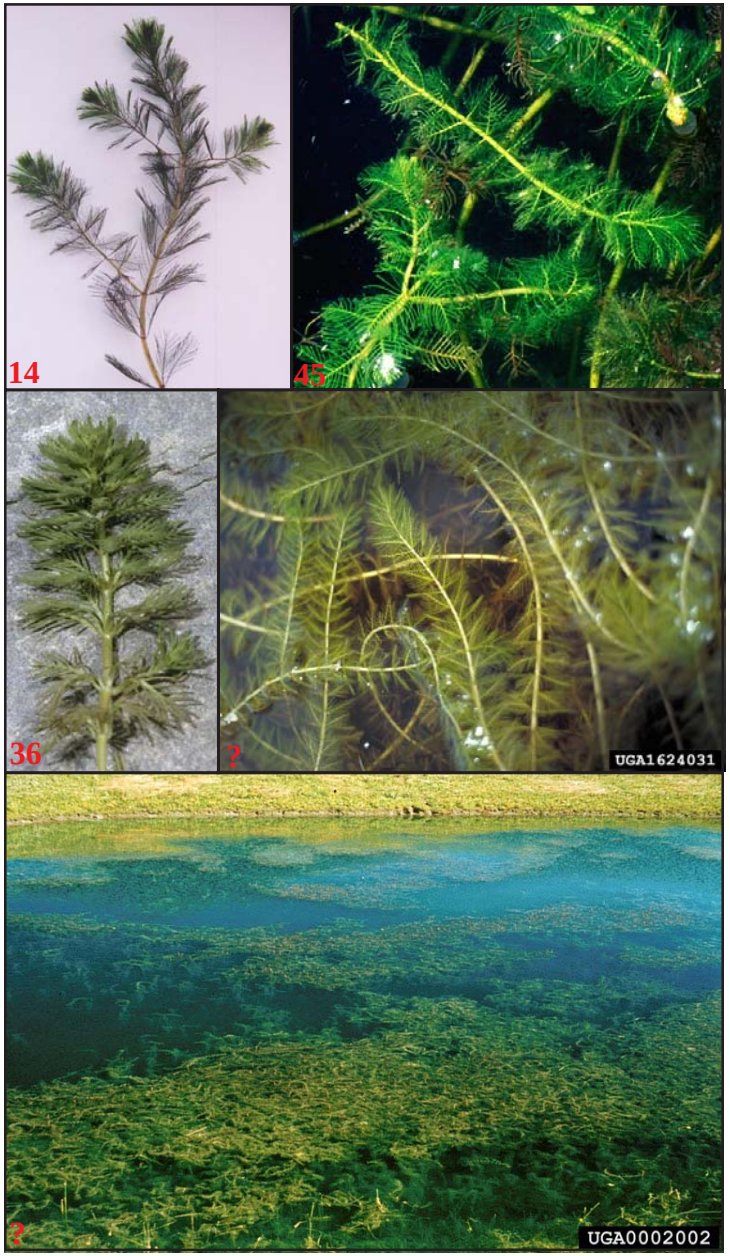
# Aquatic Plants



# Curly Pondweed

*Potamogeton crispus*

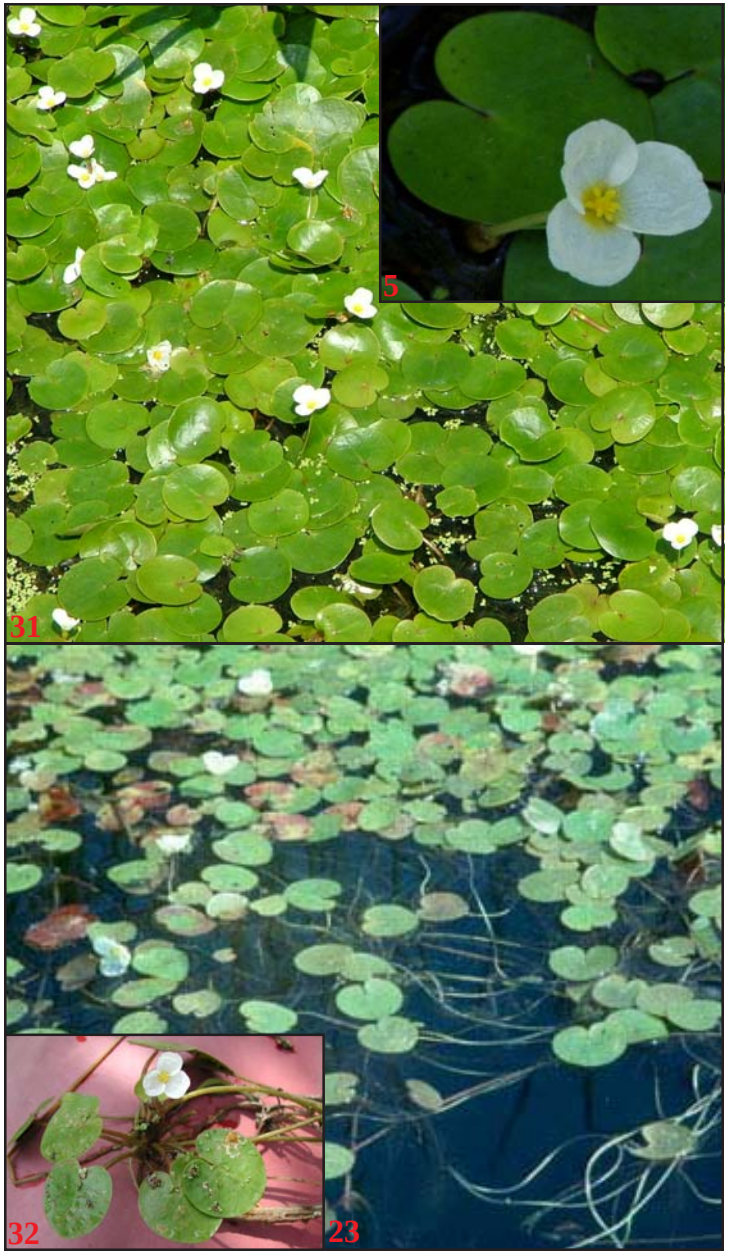
**Habit:** Submergent aquatic perennial; ranges from 30-80 cm (1-2.5 ft) in length; forms dense mats.
**Leaves:** Submerged, alternate, oblong, 3-9 cm long and 5-10 mm wide; rounded at the tip; slightly clasping the stem at the base; wavy leaf margins with fine teeth.
**Stems:** Compressed, 4-angled, with few branches, up to 80 cm long and 1-2 mm wide.
**Flowers:** Found on dense cylindrical spikes that rise above the water for wind pollination; bloom in late spring/early summer.
**Fruits/Seeds:** Small (4-6 mm long), brown, with a distinct, pointed beak.
**Habitat:** Found in shallow to deep water of lakes and rivers; pollution-tolerant; prefers alkaline, nutrient-rich waters.
**Reproduction:** Vegetatively by spindle-shaped turions (winter buds that form at leaf axils and stem tips); turions lie dormant during summer, germinate in fall; also spreads by fragmentation; seeds probably not viable.
**Similar Species:** Variable leaf pondweed (*Potamogeton gramineus*) but its leaf margins are not toothed.
**Comments:** Begins growing in early spring, dies back completely by mid summer after blooming; inhibits growth of native plants; midsummer die-back results in masses of dead vegetation, increase in phosphorus levels and potential algal blooms.
**Monitoring & Rapid Response**: Monitor water bodies for new colonies in spring; public education on transport mechanisms and prevention is critical; raking/cutting at sediment surface in spring can prevent propagule formation - remove all fragments; herbicide applications at low rates in early spring provide effective control , less negative effects on native aquatic plants; - plants die back completely by late spring or early summer so later application ineffective; where water levels can be manipulated, fall drawdown can kill turions.




# Eurasian Water Milfoil

*Myriophyllum spicatum*

**Habit:** Submergent aquatic perennial; commonly ranges from 3-10 feet in length but may reach 33 ft; forms dense mats.
**Leaves:** Submerged, featherlike, 4-5 leaves with 9-21 threadlike pairs of leaflets whorled around stem at each node; bright green; limp when out of water.
**Stems:** Thick near the base; becoming more slender and branching near the water surface; usually 1-3 m (3-10 ft) long.
**Flowers:** Inconspicuous yellow four-parted; flower spikes rise 2-4 in above water surface.
**Fruits/Seeds:** Fruit is a hard capsule with 4 seeds.
**Habitat:** Found throughout Midwestern ponds and lakes in 1-3.5 m (3-12 ft) of water, prefers disturbed shorelines and nutrient rich waters.
**Reproduction:** Vegetatively by fragmentation and creeping runners; seeds viable but not an important dispersal mechanism.
**Similar Species:** There are six native milfoils in Michigan; most closely resembles northern water milfoil *(Myriophyllum sibiricum)* - has 7-11 pairs of leaflets, remains rigid out of water and forms winter buds; may also resemble coontail *(Ceratophyllum demersum)* - has forked rather than featherlike leaves.
**Comments:** Eurasian milfoil begins to photosynthesize and grow prolifically in early spring, allowing it to dominate an area and limit light availability to other aquatic life, disrupting the aquatic food web.
**Monitoring & Rapid Response**: Monitor water bodies for new colonies; public education on transport mechanisms and prevention is critical; reduce nutrient enrichment (fertilizer, manure runoff) where possible; hand pull or rake out colonies, removing all fragments; biological control – native herbivorous weevil (*Eurhychiopsis lecontei*) shows promise; herbicides show mixed results; check current research – treatment rapidly evolving.



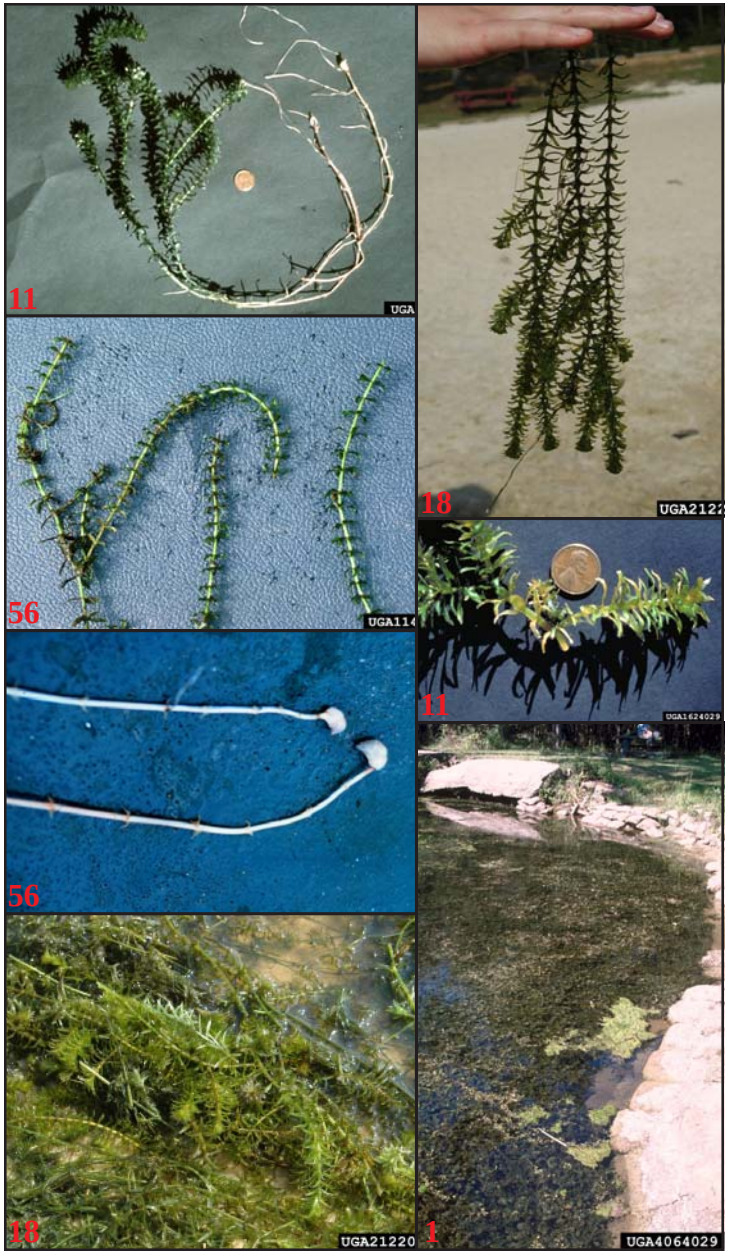

# European Frog-bit

*Hydrocharis morsus-ranae*

**Habit:** Perennial, free-floating aquatic herb that forms large colonies, creating dense mats with tangled roots.
**Leaves:** Usually floating, kidney shaped with long stems, dark purple beneath, resemble tiny water lilies, 0.5-2.25 in in diameter.
**Stems:** European frog-bit has strong, cord-like stolons.
**Flowers:** White, cup-shaped, 3-petaled with yellow dots at the base; bloom mid-summer.
**Fruits/Seeds:** fruit a globose, many-seeded berry; fruit/seedset uncommon.
**Habitat:** Occurs in shallow, slow-moving water on the edges of lakes, rivers, streams, swamps, marshes and ditches.
**Reproduction:** primarily vegetative, through long stolons and turions (winter buds that are produced on the stolons); in fall, turions drop off and remain dormant until spring when they begin to grow; one plant can produce over 100 turions a year.
**Similar Species:** European frog-bit superficially resembles a water lily (*Nymphaea odorata*) but it is much smaller and its flowers have only 3 petals.
**Comments:** Most plants are dioecious and many populations consist of only one sex; in mixed populations, most plants are male and little seed is produced.
**Monitoring and Rapid Response:** Monitor for new populations; no control measures have been reported for this species; although no reports are available, hand pulling or raking out colonies before fall, when turions drop off, seems advisable.

As this species has a limited distribution in Michigan, it is
important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.



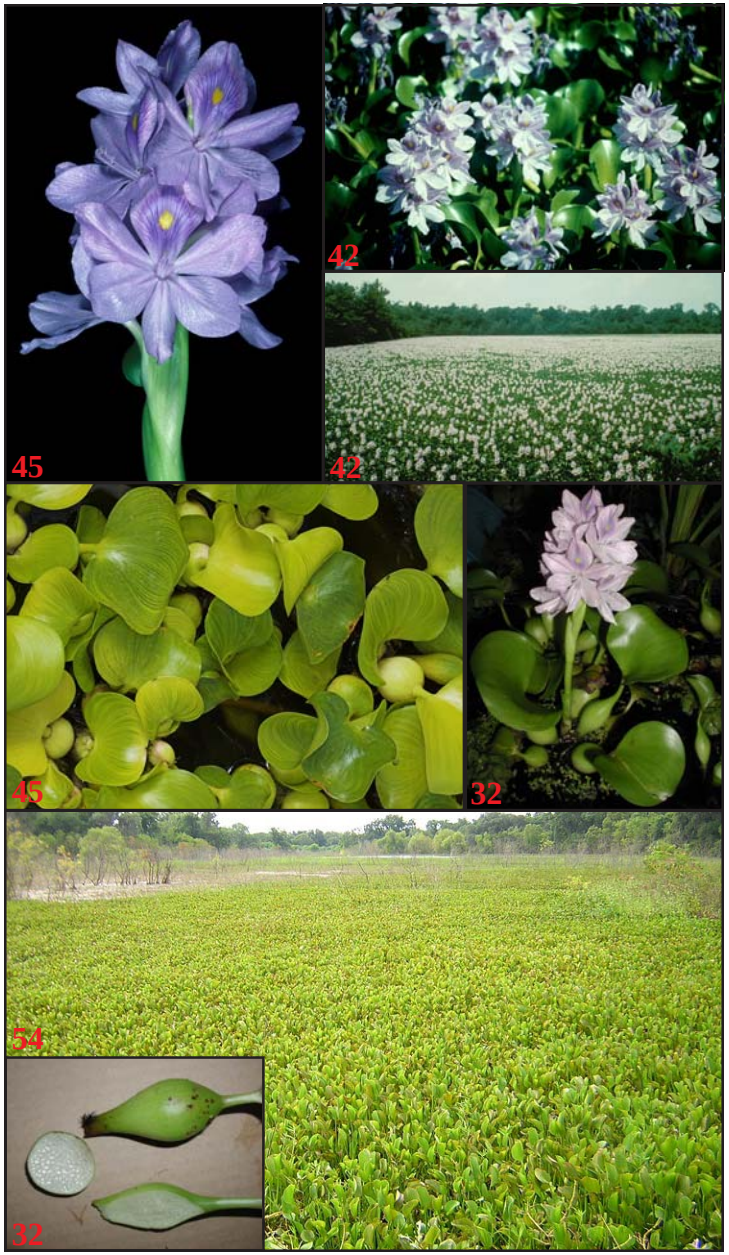
# Hydrilla

*Hydrilla verticillata*

**Habit:** Submerged, rooted, perennial; forms extensive monocultures.
**Leaves:** Whorls of 3-10 thin (2-4 mm wide, 6-20 mm long), rough leaves at the node; small spines give the leaf margin a toothed appearance; midribs red and often spiny.
**Stems:** usually rooted - roots in water up to 6 m (20 ft) deep; little branching in deep water but dense at water's surface; forms horizontal stems in water (stolons) and underground (rhizomes).
**Flowers:** Female flowers are small, white, 6-petaled, occur from leaf axils; male flowers are green and resemble an inverted bell.
**Fruits/Seeds:** Cylindrical seedpods; 1-5 smooth, tiny, brown seeds.
**Habitat:** Found in lakes, ponds, reservoirs and ditches.
**Reproduction:** Vegetatively by tubers and vegetative winter buds (turions); fragments root at nodes; seed less important.
**Similar Species:** Canadian waterweed *(Elodea canadensis)* - without the toothed leaf margins, red veins, and spiny leaf midrib of *Hydrilla verticillata.*
**Comments:** Listed federally as a noxious weed.
**Monitoring & Rapid Response:** Monitor aquatic habitats; mechanical removal requires specialized machines; may need to be repeated up to 6 times in one growing season, fragments may produce new plants; drawdown from fall through spring may reduce population levels; herbicides with contact poisons have been used to control hydrilla but are non-selective and may be highly toxic to fish; systemic herbicides reduce the overall growth rate of this species, without eliminating it completely; biocontrols being tested.

As this species is **not yet recorded in Michigan**, it is important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.



## Water-hyacinth

*Eichhornia crassipes*

**Habit:** Free floating aquatic plant ranging from 0.5-1 m in height with distinctive air bladders that keep leaves afloat above the water; forms dense, floating mats.
**Leaves:** Thick, waxy, round, broad, 10-20 cm in diameter, cuplike, glossy, green leaves.
**Stems:** Spongy, erect, stems (up to 50 cm long) inflated with air bladders towards the base.
**Flowers:** Showy, lavender-blue, 6-petaled flowers; upper petals with a central, yellow, blue-bordered blotch; 8-15 flowers occur on a single spike that can be up to 30 cm long.
**Fruits/Seeds:** Fruit is a 3-celled capsule with numerous tiny seeds.
**Habitat:** Native to the Amazon Basin, now found primarily in southern and western wetlands, marshes, ponds, lakes, and rivers.
**Reproduction:** By fragmentation of stolons, adventitious root system, and to a lesser extent by seed.
**Similar Species:** Pickerelweed (*Pontederia cordata*) has purple flower spikes and lacks the conspicuous air bladder; not mat-forming.
**Comments:** Capable of doubling in size in two weeks. Considered to the be one of the most troublesome aquatic weeds in the world.
**Monitoring & Rapid Response:** Monitor ditches, ponds, wetlands, lakes and rivers for this species, particularly in nutrient-enriched waters; most recognizable in bloom (late summer, early fall); hand pull small populations; several herbicides are effective – young plants move herbicides from stolons to roots faster than old plants; old plants and flowering plants may be more susceptible overall; herbicides are taken up more rapidly in warm water than in cold water.

As this species is **not widely distributed in Michigan**, it is important to document new occurrences.

Please obtain flowering or fruiting specimens and submit to: Anton Reznicek, Curator (Vascular Plants), University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2287.

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