Aquatic Invasive Plants and Their Look-Alikes

A specimen-based guide to identification in the Great Lakes Region
Aquatic Invasive Plants and Their Look-Alikes
A specimen-based guide to identification in the Great Lakes Region
Andrea Miller
Lindsey Worcester
Andrew Hipp
Kenneth Cameron
This identification guide was written to assist landowners, land managers, and citizen scientists in identifying aquatic invasive species. To provide accurate reports to facilitate Early Detection Rapid Response, we must first accurately identify invading species.

With this guide, you can be confident in knowing the differences between aquatic invasive species and their look-alikes in the Great Lakes Region.

This resource was created as part of Thematic Collections Network National Science Foundation Award #1405396 to The Morton Arboretum and 1410683 to The University of Wisconsin, Madison.

Whenever possible, this resource makes use of herbarium specimens and their associated data. Photos used include live and pressed plants. Distribution maps for each species were created from occurrence and collection records and may not reflect the entire geographic range of every species.

In this guide, invasive species appear in red and native species in black. ‘Aquatic’ refers to emergent and submersed plants, as well as those that grow at the water’s edge.

To see more digitized specimens of aquatic invaders and their look-alikes, please visit the Great Lakes Invasives Network portal at www.greatlakesinvasives.org.
Brazilian waterweed
_Egeria densa_ Planch.

Invasive

Hydrilla
_Hydrilla verticillata_ (L. f.) Royle

Example Population

Common Waterweed
_Elodea canadensis_ Mich.

Invasive

Native

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org

Herbarium of The Morton Arboretum (MOR)

General Form

Andrea Miller, The Morton Arboretum
Native waterweed (right) has whorls of three leaves and is less densely leafy than Brazilian waterweed or hydrilla.

### Easy ID

<table>
<thead>
<tr>
<th>Brazilian Waterweed</th>
<th>Hydrilla</th>
<th>Common Waterweed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves in whorls of 4 to 8</td>
<td>Leaves in whorls of 4 to 8</td>
<td>Leaves in whorls of 3</td>
</tr>
<tr>
<td>Leaf undersides with smooth midvein</td>
<td>Leaf undersides with sharply toothed midvein</td>
<td>Leaf undersides with smooth midvein</td>
</tr>
<tr>
<td>No turions</td>
<td>Can reproduce via turions</td>
<td>Can reproduce via turions</td>
</tr>
</tbody>
</table>

Hydrilla and common waterweed can reproduce from turions (top). Hydrilla can also reproduce via tubers (bottom). Neither Brazilian nor common waterweed produce tubers.

Watch for and remove fragments of hydrilla and Brazilian waterweed caught on boat propellers, accidentally pumped into livewells, and entwined in boating equipment. All three species described above can reproduce from stem fragments.

For this reason, mechanical removal is not recommended. To control patches of Brazilian waterweed, carefully remove them manually, making sure to collect all fragments, or if permitted, cover the plants with opaque fabric to block out any light.

Report sightings: [www.eddmaps.org](http://www.eddmaps.org)
Fanwort

*Cabomba caroliniana* Gray

**Easy ID**

Fanwort is most easily recognizable by its emergent, elliptic leaves. Coontail does not have any floating or emergent leaves.

<table>
<thead>
<tr>
<th>Similar species</th>
<th>Easy ID characters</th>
</tr>
</thead>
</table>
| White water crowfoot  
*Ranunculus aquatilis*        | Leaf petioles absent or delicate  
Leaves alternately arranged |
| Milfoil  
*Myriophyllum spp.* | Leaf petioles absent  
Leaves pinnately compound |
| Fanwort (this ID guide)  
*Cabomba caroliniana* | Leaves palmately compound  
Stalks relatively long |
| Coontail (this ID guide)  
*Ceratophyllum demersum* | Leaves toothed along one side |
| Water marigold  
*Megaleontia* | Leaves heavily serrated/lobed edges |
| Lake cress  
*Noebeckia aquatica* | Leaves many-branching |

**Coontail**

*Ceratophyllum demersum* L.

Note: Other submerged aquatics that have similar feathery leaves to fanwort and coontail are compared in the table below to help distinguish between species.

**Prevention and Removal**

Fanwort, as with all aquatic invasive plants, is best managed by prevention. Fanwort can reproduce from small fragments. Watch for and remove fragments caught in boating equipment and in ballast water.

Mechanical removal works in the short term, but it is unlikely that all fragments will be effectively removed. Fanwort becomes brittle at the end of the growing season, so mechanical removal is not recommended late into the summer.

Report any sightings:

[www.eddmaps.org](http://www.eddmaps.org)
**European Frogbit**
*Hydrocharis morsus-ranae* L.

**Water-shield**
*Brasenia schreberi* Gmel.

**Distribution**

**General Form**

**Flowers / Inflorescence**

**Example Populations**

Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org

North Carolina State University Vascular Plant Herbarium, Midwesotherbaria.org, Cropped.

Angela DePalma-Dow, MDNR

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Troy Evans, Great Smoky Mountains National Park, Bugwood.org

European Frogbit
*Hydrocharis morsus-ranae* L.

Water-shield
*Brasenia schreberi* Gmel.

**Easy ID**

European frogbit has clefted, heart- or kidney-shaped leaves. Water-shield has entire, oval or football-shaped leaves.

<table>
<thead>
<tr>
<th>European Frogbit</th>
<th>Water-shield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reproduces by stolons</td>
<td>Reproduces by rhizomes</td>
</tr>
<tr>
<td>Flowers white</td>
<td>Flowers purple to pink</td>
</tr>
<tr>
<td>Leaves to 6 cm diameter</td>
<td>Leaves to 12 cm diameter</td>
</tr>
</tbody>
</table>

**Prevention and Removal**

Few control strategies have proven successful against European frogbit. Small groups of plants can be carefully pulled by hand if all fragments are gathered. Shading out small infestations may be possible at the risk of shading out native species.

One European frogbit plant can produce 100 turions each year! Prevention and early detection are crucial to its management. Watch for fragments caught in boating equipment and ballast water.

Report any sightings: www.eddmaps.org

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Invasive
Purple Loosestrife
Lythrum salicaria L.

Native
Blue Vervain
Verbena hastata L.

Native
Fireweed
Chamerion angustifolium (L.) Holub

Example Populations

Flowers and Inflorescence

This document is covered under Creative Commons License CC BY-NC-SA.
Purple Loosestrife  
*Lythrum salicaria* L.

Blue Vervain  
*Verbena hastata* L.

Fireweed  
*Chamerion angustifolium* (L.) Holub

### Leaves

<table>
<thead>
<tr>
<th>Purple Loosestrife</th>
<th>Blue Vervain</th>
<th>Fireweed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowers with 5-7 distinct petals</td>
<td>Flowers with 5 fused petals</td>
<td>Flowers with 4 distinct petals and 4 smaller sepals</td>
</tr>
<tr>
<td>Flowers magenta</td>
<td>Flowers purplish blue</td>
<td>Flowers magenta</td>
</tr>
<tr>
<td>Plants to 3m tall</td>
<td>Plants to 1.5m tall</td>
<td>Plants to 1.5m tall</td>
</tr>
</tbody>
</table>

### Prevention and Removal

Purple loosestrife can reproduce via underground buds so cutting stems is not an effective removal strategy. Small populations of purple loosestrife can be halted by hand pulling before the plants set seed. Be sure to remove the entire root system and underground stems.

Report any sightings:  
[www.eddmaps.org](http://www.eddmaps.org)

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**Easy ID**

Purple loosestrife grows to be much taller than blue vervain or fireweed. Look for 5-7 distinct petals, not fused, to confirm identification.
**Exotic Populations/Habitat**

- **Eurasian Watermilfoil**
  *Myriophyllum spicatum* L.

- **Parrotfeather**
  *Myriophyllum aquaticum* (Vell.) Verdc.

- **Northern Watermilfoil**
  *Myriophyllum sibiricum* Kom.

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### Example Populations/Habitat

- **Andrea Miller, The Morton Arboretum**

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### General Form

- **Paul Skawinski, University of Wisconsin-Stevens Point, image rotated**

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### Leaves

<table>
<thead>
<tr>
<th>Eurasian Watermilfoil</th>
<th>Parrotfeather</th>
<th>Northern Watermilfoil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branches numerous near surface of water</td>
<td>Branches numerous near surface of water</td>
<td>Branches few</td>
</tr>
<tr>
<td>Leaflets in 12 or more pairs per leaf</td>
<td>Leaflets in 10-15 pairs per leaf</td>
<td>Leaflets in 5-12 pairs per leaf</td>
</tr>
</tbody>
</table>

- **Eurasian Watermilfoil** (*Myriophyllum spicatum* L.)
- **Parrotfeather** (*Myriophyllum aquaticum* (Vell.) Verdc.)
- **Northern Watermilfoil** (*Myriophyllum sibiricum* Kom.)

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*Eurasian Watermilfoil Habit and Fragments*<br>**Drawing by Ann E. Bove, VTDEC**

*Parrotfeather Habit and Leaves*<br>**Herbarium of The Morton Arboretum (MOR)**

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Eurasian watermilfoil leaves lose their shape when held out of the water.

While Eurasian and northern milfoil have emergent flowers, only parrotfeather has emergent stems and leaves.

Myriophyllum spicatum (top left) has four leaves/whorl, M. sibiricum (top right) has four leaves/whorl, and M. aquaticum (bottom center) has five leaves/whorl.

Northern watermilfoil leaves remain rigid when held out of the water.

Watch for and remove fragments of milfoil or parrotfeather caught on boat propellers, accidentally pumped into livewells, and entwined in boating equipment.

Eurasian watermilfoil and parrotfeather stems easily fragment. These tiny bits can reproduce and propagate so mechanical pulling of large populations is not recommended. If the population is small, carefully pull each plant out by hand.

Report any sightings: www.eddmaps.org
Introduced **Phragmites**

*Phragmites australis* (Cav.) Trin ex Steud.

Example Populations

Because invasive and native *Phragmites* are so similar in appearance, the creation of an accurate map from EDDMapS and SEINet occurrence records was not possible.

Native **Phragmites**

*Phragmites australis* subsp. *americanus* Saltonstall

Stem
### Introduced Phragmites

*Phragmites australis* (Cav.) Trin ex Steud.

- **Stem** matte (dull), tan or green
- **Leaves** blue-green
- **Plant** to 6m tall
- **Inflorescence** forming dense stands, to 200 stems per m²

### Native Phragmites

*Phragmites australis* subsp. *americanus* Saltonstall

- **Stem** lustrous (glossy), red or green
- **Leaves** light, bright green
- **Plant** to 2m tall
- **Inflorescence** not forming dense stands, individuals scattered

---

#### Prevention and Removal

Invasive *Phragmites* reproduces clonally via underground stems, or rhizomes. Rhizomes store energy from season to season. Mowing late in the season over multiple years has been found effective at controlling *Phragmites*. Mowing early in the growing season will result in more stems.

Report any sightings:

[www.eddmaps.org](http://www.eddmaps.org)

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#### Native Phragmites

*Phragmites australis* subsp. *americanus* Saltonstall

- **Stem** lustrous (glossy), red or green
- **Leaves** light, bright green
- **Plant** to 2m tall
- **Inflorescence** not forming dense stands, individuals scattered

---

#### Easy ID

Invasive *Phragmites* have green or tan colored stems. *Phragmites* with a red, shiny stem are native.

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This document is covered under Creative Commons License CC BY-NC-SA.
Invasive Curly Pondweed
*Potamogeton crispus* L.

Native Flat-stemmed Pondweed
*Potamogeton zosteriformis* Fern.

**Distribution**
- Counties present in both EDDMapS and SEINet
- Counties present in EDDMapS only
- Counties present in SEINet only
- Counties present in both EDDMapS and SEINet

**Example Populations**
- Andrea Miller, The Morton Arboretum
- Barre Hellquist, emonocot.org
- Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
- Britton, N.L., and A. Brown, USDA PLANTS Database
- Herbarium of The Morton Arboretum (MOR)

**General Form**
- Image of plant architecture

**Leaves**
- Image of Curly Pondweed leaves
- Image of Flat-stemmed Pondweed leaves
Curly Pondweed
*Potamogeton crispus* L.

The leaves of curly pondweed are wavy, like narrow lasagna noodles.

<table>
<thead>
<tr>
<th>Curly Pondweed</th>
<th>Flat-stemmed Pondweed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veins 3-5 per leaf</td>
<td>Veins to 35 per leaf</td>
</tr>
<tr>
<td>Leaves to 10 cm long x 1 cm wide</td>
<td>Leaves to 20 cm long x 5 mm wide</td>
</tr>
<tr>
<td>Leaf apex rounded</td>
<td>Leaf apex pointed</td>
</tr>
<tr>
<td>Leaf margins serrated</td>
<td>Leaf margins smooth</td>
</tr>
</tbody>
</table>

Flat-stemmed Pondweed
*Potamogeton zosteriformis* Fern.

The leaves of flat-stemmed pondweed are linear.

To manage curly pondweed, cut stems at their very bottom along the sediment level. Curly pondweed can reproduce by fragments so it is important to capture any freed leaf or stem pieces.

Report any sightings:

www.eddmaps.org

Both curly and flat-stemmed pondweed overwinter by creating turions, or winter buds. This burshed winter bud belongs to curly pondweed.

Prevention and Removal

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Donald Cameron, https://gobotany.newenglandwild.org/

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**Reed Canary Grass**  
*Phalaris arundinacea* L.

**Orchard Grass**  
*Dactylis glomerata* L.

**Bluejoint**  
*Calamagrostis canadensis* (Michx.) P. Beauv.

**Example Populations**

- **Andrea Miller, The Morton Arboretum**
- **Ohio State Weed Lab, The Ohio State University, Bugwood.org**
- **Dave Powell, USDA Forest Service (retired), Bugwood.org**

**Flowers/Inflorescence**

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Easy ID

Reed canary grass is rough to the touch while bluejoint is smoother.

Orchard grass grows in drier, upland habitats while reed canary grass and bluejoint often grow in wetlands where the soil is frequently saturated.

<table>
<thead>
<tr>
<th>Reed Canary Grass</th>
<th>Orchard Grass</th>
<th>Bluejoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide and robust leaves (10-20 mm wide)</td>
<td>Narrow leaves (~4-10 mm wide)</td>
<td>Narrow and delicate leaves (4-8 mm wide)</td>
</tr>
<tr>
<td>Auricles present on leaves</td>
<td>Auricles present on leaves</td>
<td>Auricles not present on leaves</td>
</tr>
<tr>
<td>2 tufts of hairs under the florets</td>
<td>No hairs under the florets</td>
<td>Ring of hairs under the florets</td>
</tr>
<tr>
<td>Inflorescence cylindrical</td>
<td>Inflorescence branches straight, diverging from a central axis, with large clusters of spikelets attached</td>
<td>Inflorescence feathery</td>
</tr>
</tbody>
</table>

Prevention and Removal

To control reed canary grass, approaches may vary among sites. For more information, contact your local DNR office or an agricultural extension specialist for best practices in your area.

Small patches of orchard grass can be dug up and removed. Dig to a depth of at least 3 inches and refill the hole immediately. To prevent weeds from establishing, either re-seed or plant sod in the open area.

Report any sightings:

www.eddmaps.org

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Invasive
Water Soldier
Stratiotes aloides L.

According to current records from EDDMapS and SEINet, water soldier is present in Ontario, Canada but has not yet entered the United States.

Native
American Bur-reed
Sparganium americanum Nutt.

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Easy ID

Water soldier has **sharp teeth** along the edges of its leaves. Native bur-reeds do not have serrated edges.

<table>
<thead>
<tr>
<th>Water Soldier</th>
<th>American bur-reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf margins serrate</td>
<td>Leaf margins smooth</td>
</tr>
<tr>
<td>Leaves fragile and rigid</td>
<td>Leaves flexible</td>
</tr>
<tr>
<td>Flowers showy and uncommon</td>
<td>Flowers densely packed in spherical heads</td>
</tr>
</tbody>
</table>

Water soldier looks like the common houseplant, aloe vera.

Prevention and Removal

If you spot water soldier while boating, slow down to reduce wake. Disruption can dislodge plants and send them floating to new areas.

To remove water soldier, rake up the floating plants, bag, and take to a landfill. Watch for and remove any floating pieces. Water soldier is fragile and can reproduce by fragments. Wear arm and leg protection to prevent skin injury.

Report any sightings:

www.eddmaps.org

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Example Populations

Invasive
**Hybrid Cattail**
*Typha ×glauca* Godr.

Invasive
**Narrowleaf Cattail**
*Typha angustifolia* L.

Native
**Broadleaf Cattail**
*Typha latifolia* L.

Leaf Width

Herbarium of The Morton Arboretum (MOR)

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The hybrid cattail, *Typha glauca*, is produced by frequent crosses between the native broadleaf and the non-indigenous narrowleaf.
There is no easy, reliable field identification for these taxa. In pure populations, narrowleaf and hybrid cattails have a gap between the male and female flowers, broadleaf cattails do not.

Due to hybridization, backcrossing to one of the parental species, and introgression, all Typha in the Great Lakes region may be invasive. Recent genetic work on Typha has suggested that morphological measurements alone may not be enough to confidently ID these species.

<table>
<thead>
<tr>
<th>Hybrid Cattail</th>
<th>Narrowleaf Cattail</th>
<th>Broadleaf Cattail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem 2-3 m tall</td>
<td>Stem 1-3 m tall</td>
<td>Stem 1-3 m tall</td>
</tr>
<tr>
<td>Leaf 6-15 mm wide</td>
<td>Leaf 4-10 mm wide</td>
<td>Leaf 14-23 mm wide</td>
</tr>
<tr>
<td>Spike longer than 15 cm</td>
<td>Spike shorter than 15 cm</td>
<td>Spike shorter than 15 cm</td>
</tr>
<tr>
<td>Gap between male/female flowers 0.5-4 cm</td>
<td>Gap between male/female flowers 2-8 cm</td>
<td>No gap between male/female flowers</td>
</tr>
</tbody>
</table>

The most effective way to control cattail populations is to repeatedly cut shoots below water level. This can be done in late summer or early autumn. Cutting stems too early will result in increased growth.

Report any sightings: www.eddmaps.org
Invasive

Yellow Floating Heart
*Nymphoides peltata* (Gmel.) Kuntze

Native

Yellow Pond Lily
*Nuphar lutea* (L.) Sm.

General Form

Flowers / Inflorescence

Distribution

Example populations/Habit

Counties present in EDDMapS only
Counties present in SEINet only
Counties present in both EDDMapS and SEINet
Georeferenced specimens, SEINet
Georeferenced observations, EDDMapS


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Yellow floating heart can be distinguished most easily by its wavy leaf margins. It might also be confused with European frogbit, but yellow floating heart has much larger leaves. (13 cm vs. 6 cm across)

<table>
<thead>
<tr>
<th><strong>Yellow Floating Heart</strong></th>
<th><strong>Yellow Pond Lily</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves to 13 cm diameter</td>
<td>Leaves to 40 cm diameter</td>
</tr>
<tr>
<td>Leaf margins wavy</td>
<td>Leaf margins smooth</td>
</tr>
<tr>
<td>Flowers unscented</td>
<td>Flowers scented</td>
</tr>
<tr>
<td>Flower petal margins fringed</td>
<td>Flower sepal margins smooth</td>
</tr>
</tbody>
</table>

Small patches of yellow floating heart can be controlled by hand-pulling if all fragments are gathered. The plant grows from underwater stems called stolons. If a stolon breaks off with a node intact, the fragment can establish a new population.

Watch for and remove fragments of yellow floating heart caught in boating equipment and in ballast water.

Report any sightings:

www.eddmaps.org
Auricles - Pair of ear-like or horn-like structures that extend from the leaf sheath and generally wrap around the culm at the point where the sheath ends meet.

Culm - Stem of a grass, sedge, or rush.

Elliptic - Having an oval shape.

Emergent - Growing up from the water’s surface, thus growing in part below and in part above the surface.

Habit - Pattern of growth form.

Inflorescence - Group of flowers.

Leaflet - Segment of a compound leaf.

Ligule - A flap of tissue, typically thin and membranous, attaching at the point of connection between the leaf blade and the stem in grasses, sedges, Potamogeton, and occasional other families.

Node - The point at which a leaf starts growing from the stem.

Petal - Modified showy leaf around reproductive structures.

Petiole - The stalklike structure that connects a leaf to the stem; plants in which this structure is not distinguishable from the leaf blade are said to be sessile.

Rhizome - Underground stem, facilitates cloning.

Sepal - Modified leaf at base of flower, often green.

Spike - Unbranched inflorescence.

Stolon - Stem running along surface of substrate, facilitates cloning.

Submerged - Growing completely underwater.

Tuber - Underground stem, stores starches.

Turion - Winter bud, dense leaf tissue, facilitates cloning.

Whorl - Leaf arrangement of three or more leaves coming from a node, surrounding the stem in circular pattern.
Collections database with plant, fish, and mollusk occurrence records and specimen images.

www.greatlakesinvasives.org

Online and smartphone application to report invasives sightings and create distribution maps.

www.eddmaps.org

Collections database with plant and animal occurrence records and specimen images.

www.idigbio.org

Node of the USGS NAS database. Includes nonindigenous, range expansion, and watchlist species.

www.glerl.noaa.gov/res/Programs/glansis/glansis

Collections database and hub for plant species information. Focused on the Great Lakes Region.

www.midwestherbaria.org
References

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California Invasive Plant Council - www.cal-ipc.org

Flora of North America - www.efloras.org

GLANSIS, Great Lakes Aquatic Nonindigenous Species Information System - http://www.glerl.noaa.gov/glansis/


Michigan State University, Midwest Invasive Species Information Network - http://www.misin.msu.edu/


Ontario's Invading Species Awareness Program - www.invadingspecies.com

Plants For A Future - www.pfaf.org

New Jersey Agricultural Experiment Station, Rutgers, The State University of New Jersey. Copyright © 2016 - njaes.rutgers.edu


Skawinski, Paul M., 2011. Aquatic Plants of the Upper Midwest: A photographic field guide to our underwater forests. Self-published, Wausau, WI.

USDA, Plants Database - http://plants.usda.gov

Wisconsin Department of Natural Resources - http://dnr.wi.gov/

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Special thanks to the reviewers of this guide:
Paul Skawinski, University of Wisconsin - Stevens Point
Joshua Sulman, Stantec
Christy Rollinson, The Morton Arboretum
Kurt Dreisilker, The Morton Arboretum
Dan Larkin, University of Minnesota

Andrea Miller, The Morton Arboretum

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