

Appendix 5. Invasive Species Identification and Control

The Invasive Plants Association of Wisconsin (IPAW) and Wisconsin DNR websites have up-to-date information on invasive species control and are recommended as references as problems arise (visit <http://www.ipaw.org/> or <http://dnr.wi.gov/topic/invasives>).

Wetland Invasive Species

The top three invasive species in Wisconsin wetlands are reed canary grass, purple loosestrife, and *Phragmites australis* or giant reed grass. Reed canary grass may have been present in local wetlands for decades following disturbances, possibly planted directly into wetlands. Purple loosestrife is a more recent invader, and *Phragmites* is increasing in invasion. Reed mannagrass (*Glyceria maxima*) is a relatively new but aggressive invader with potential to spread widely. Controlling any of these plants in the early stages is critical to preserving native plants. If these invasives are allowed to grow unchecked they will rapidly expand and choke out native plants.

Reed Canary Grass (*Phalaris arundinacea*):

Reed canary grass is a perennial, sod-forming grass that dominates a large number of wetlands across the Midwest. The grass forms dense stands that exclude native vegetation and provide little benefit to wildlife. Most wetlands that have been overtaken by reed canary grass may be beyond the scope of immediate intervention. Allowing native shrubs and trees to grow and shade reed canary grass over time is one response to the problem. Native trees and shrubs may be directly planted if feasible.



Repeated application of herbicides is used to control smaller stands of reed canary grass. Great care must be taken to apply herbicides appropriately by an applicator familiar with reed canary and native vegetation so as to avoid damaging native plants. Large infestations of the grass will likely require applications over many years to be effective. The herbicide glyphosate (Rodeo or AquaNeat) is a non-selective herbicide that kills or injures nearly all plant species so it must be applied carefully. Rodeo and AquaNeat are appropriate for use over water. Apply to the grass in a 2% solution (1.08% active ingredient) mixed with a surfactant.

Depending on the size and distribution of your infestation, the herbicide can be foliar-applied using a dripless wick applicator, backpack sprayer, or boom sprayer.

Reed canary is the earliest plant to green and goes brown very late in fall. Herbiciding either early in spring before any other plants have emerged or in fall after all native plants are dormant is a good strategy to avoid damaging native plants. Fall is especially



Reed canary grass is distinguished by its tall ligule (membrane inside the leaf sheath that surrounds the stem)

appropriate as the grass pulls sugars down into its roots during this time. Herbicide is carried to the roots along with sugars, more effectively killing the plant. For large stands, you may also combine an herbicide treatment with another control treatment for better results. Cut the grass and allow to regrow to boot height. This helps obtain better herbicide coverage and reduce total herbicide use, since you are spraying only living green RCG that is 12 inches tall vs. 6-foot-tall stems mixed with old dead leaves.

Sethoxydim (Vantage®) is a grass-specific herbicide that has been used to kill RCG with some success, but it is also not labeled for aquatic use and cannot be used over water. Follow-up monitoring and treatment is necessary for several years to ensure complete eradication.

Purple Loosestrife (*Lythrum salicaria*):

Purple loosestrife is a tall plant with a brightly colored purple flower spike. The plant spreads rapidly by seed and can quickly overtake native vegetation. Any small stands of purple loosestrife can be controlled by herbicide. Control is usually done from mid July and mid August. First break off any flower heads and bag them to take off site. Paint the stem from top down about 3 feet with glyphosate (“Rodeo” or “Aqua Neat” for use over water) in a 10% concentration of the active ingredient. Use a paintbrush to apply so the herbicide will be restricted to the plant. The applicator should be sure to paint as many stems as possible. Color dye may be added to the

herbicide to aid in seeing what has been herbicided. Check the treated area in 2 weeks to assess the kill and reapply the herbicide to plants still alive.



Purple loosestrife flowers

Very large stands of purple loosestrife may be too widespread to easily treat with herbicide. Biological control has been introduced on purple loosestrife. *Gallerucella* sp. beetles have been imported from Europe after years of extensive research to determine their safe use. These beetles feed exclusively on purple loosestrife and can be purchased or grown for release in large purple loosestrife plots. If the release is successful they rapidly consume the loosestrife and destroy the flowering heads. Over time the size of the loosestrife stand is dramatically reduced. Check with the DNR (www.dnr.wi.gov) for more information on how to purchase the beetles.

Phragmites or Common Reed Grass (*Phragmites australis*):

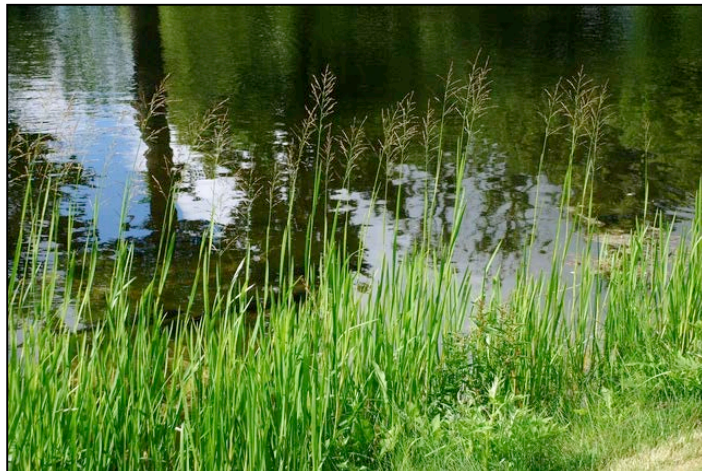
Phragmites is a tall grass with a plummy seed head, towering up to 20 feet (generally 6-8 feet tall). A single plant can continue to send out shoots and take over a large space in a very short period of time.

Phragmites must be controlled early in the invasion as it towers over native vegetation, choking it out. Using chemical means, follow the directions in the reed canary section to apply “Rodeo” or “Aqua Neat”, however apply herbicide earlier in the year if possible when the plant is not too tall. By late summer and fall the towering plant is very difficult to spray.



Reed Mannagrass (*Glyceria maxima*)

The first US sighting of reed mannagrass occurred in Racine County in 1975. Since then, the grass has been documented in four other counties in southeast Wisconsin and four counties in central and northern Wisconsin. Reed manna grass invades both disturbed and undisturbed wetland areas including swamps, creeks, lakes, ditches, and other habitats. It forms dense stands that exclude native wetland vegetation and degrade wildlife habitat, as the grass is a poor food source and nesting substrate.



Because reed manna grass is a relatively new invasive in the US, effective control methods are still in development. One option is cutting the grass several times a year, although it is difficult to completely kill the grass with this method. Flooding cut grass can aid in preventing regrowth. To

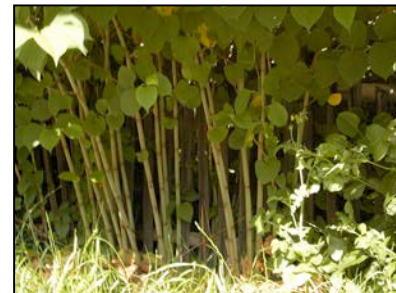


herbicide grass, use a 3% solution of glyphosate (“Rodeo” or “Aqua Neat”) during early summer and late summer months and follow up for several years. Grazing is not a recommended form of control, as the grass may be poisonous to cattle. If pulling *Glyceria* by hand, be sure to remove all pieces of the roots or the grass may re-sprout.

Japanese knotweed (*Polygonum cuspidatum*)

Japanese knotweed is an invasive herbaceous plant that forms dense stands, characterized by semi-woody, arching stems that resemble bamboo. The mature plant is 4-10 feet tall and spreads through rhizomes that form dense mats, reaching up to 6 feet below ground.

To manage Japanese knotweed manually, hand pull young plants or mow/cut multiple times a year for several years. If hand pulling, remove as much of the rhizomes as possible, as remaining rhizomes will sprout new plants. If treating chemically, it is most effective to cut plants when 4-5’ tall and apply chemical to regrowth at 3’ tall. Recommended herbicides include glyphosate with a surfactant, triclopyr formulated for use with water, dicamba, or imazapyr. Cut plant stumps can be treated with glyphosate or triclopyr.



Bamboo-like stems of Japanese knotweed.

Upland Invasive Species

Eight invasive species common within upland communities include common buckthorn, glossy buckthorn, dame’s rocket, teasel, honeysuckle, garlic mustard, Canada thistle, and sweet clover. Each of these invasive species can overtake native vegetation, damaging wildlife habitat and narrowing plant and animal diversity.

Control in the early stages of invasion is critical to keeping a small problem from becoming a large one.

Common Buckthorn (*Rhamnus cathartica*):

Common buckthorn is a shrub / small tree that grows up to 25 feet tall. The shrub invades thickly in forests, prairies, fields and roadsides, blocking light to understory plants and preventing native tree regeneration. To identify the tree, note the leaf shape and veins, light lines on bark, spines on the twigs and orange color under the bark (see photos).

Removal of buckthorn should begin with the largest shrubs, especially those with berries. Cut the main stem at 6" or less and paint the stump thoroughly with a 12 to 15% concentration of triclopyr "Garlon". Adding a color dye will aid in through treatment. Cut material can be placed in a pile and burned, or shrubs with no berries can be allowed to decompose on the ground. Do not cut without applying herbicide or the plant



White lines (lenticels) on bark



Orange color under bark surface

will resprout and likely end up denser than before. Plants may be treated in late fall or winter when other vegetation is dormant.



Another effective way to control buckthorn is to treat basal bark with "Garlon" mixed in blue bark oil. Treatment is best done in the late fall or winter when native vegetation has died back and will not be affected. Because buckthorn plants retain their leaves long after native vegetation has lost its leaves, they are readily recognized in the late fall. A concentration of 12-15% triclopyr (active ingredient) "Garlon" in blue bark oil is recommended by the manufacturer. Use the herbicide in a backpack sprayer with a nozzle that produces a solid cone or flat fan spray. Spray the lower part of the trunk in such a manner that it becomes thoroughly wet, including the root collar, but not to the point of runoff. Each stem of the plant must be treated. Properly done, this basal bark treatment is extremely effective and the plant will not leaf out the following growing season. Once dead, the plant can be cut and removed or allowed to stand to rot.

Glossy Buckthorn (*Rhamnus frangula*)

Like common buckthorn, glossy buckthorn is a shrub / small tree that forms dense thickets, reducing light for understory species including native tree saplings. The shrub invades both wetlands and uplands, tolerating both sunlight and dark shade. Glossy buckthorn can be distinguished from common buckthorn by the absence of thorns and its toothless leaves, which have a greater number of veins. Both species of buckthorn have light-colored lenticels on their bark.

To manage small plants and seedlings, use controlled burns or pull by hand. Larger plants can be dug or pulled using a leverage tool such as a weed wrench. Restoration of flooding or high water tables in areas where water tables were artificially lowered may eliminate glossy buckthorn. To manage chemically, treat cut-stumps with glyphosate in late fall or apply triclopyr ester around base of trunk in late fall or winter.



Dame's Rocket (*Hesperis matronalis*)

Dame's rocket invades moist and mesic woodlands, woodland edges, roadsides, and open areas. The plant may be mistaken for garden phlox, which has five flower petals instead of four. Dame's rocket is erroneously included in native wildflower seed mixes and planted in gardens, where it can quickly escape because of its abundant seeds. While the plant generally grows in uplands, it may also invade drier wetland areas.

Plants can be pulled by hand in early spring. If flowers are in bloom, bag plants and dispose in a landfill. Infested areas may be burned in seedling or rosette stage or treated chemically by spraying leaves with glyphosate or triclopyr in late fall. During this time, native plants are dormant but basal rosettes of dame's rocket are still green.



Cut-leaved Teasel (*Dipsacus laciniatus*)

Cut-leaved (or cutleaf) teasel grows in open, sunny habitats, preferring roadsides and other disturbed areas. The plant can also invade high quality upland and wetland areas such as prairies, savannas, seeps, and sedge meadows. Cut-leaved teasel was introduced from Europe in the 1700's and spreads by producing abundant seeds. It grows in the northern states from Massachusetts to Colorado and has also been reported in Virginia, West Virginia and Kentucky. A single plant can produce up to 2,000 seeds and can remain viable in the soil for at least

two years. Cut-leaved teasel is a biennial and grows as a basal rosette for at least a year, and then the following year it sends up a flowering stalk that can reach 6-7 feet. The plant dies after flowering.

To remove mechanically in rosette stage, dig rosettes and remove as much of the root as possible to prevent re-sprouting. Mature plants can be cut in full bud stage; the plant will re-sprout but re-flowering is rare. Cutting stalks before flowers form will result in re-sprouting of flowering stalks. Bag cut stalks and dispose in landfill, as seeds will continue to mature on cut stalks. Plants may also be burned in late spring. When cutting or digging is not feasible, chemical treatment of rosettes with glyphosate or 2,4-D

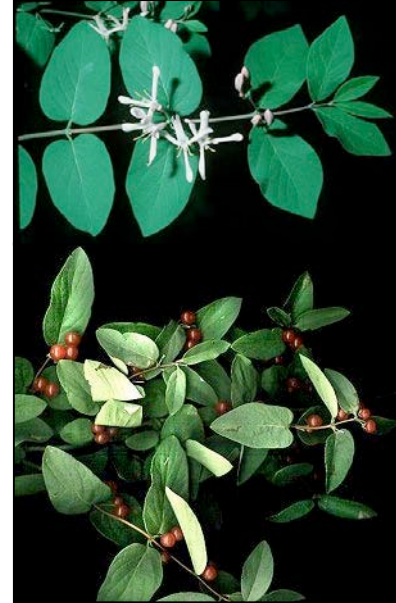


amine is recommended. Apply 1.5% solution of glyphosate to rosettes in early spring or late fall when native plants are dormant.

Tartarian honeysuckle (*Lonicera tatarica*):

Like buckthorn, tartarian honeysuckle is a dense shrub capable of shading out native wildflowers and tree saplings and must be removed to encourage native plant growth. The shrub grows 3-10 feet tall and has red to orange berries that grow at leaf axils along its branches. Tartarian honeysuckle invades forest edges, woodlands, fields, pastures, fens, bogs, and roadsides.

Do not cut stems without application of herbicide or the plant will vigorously re-sprout. Honeysuckle can be cut with either a brush cutter or a hand lopper. If a stem is too large to cut with a lopper, a handsaw can be used. With a brush cutter, it is important that the cutting blade be sharp. With a dull blade, the cut stems are often shredded and splintered, making them harder to treat with herbicide. For the largest stems, a chain saw may be necessary. No matter which cutting method is used, it is essential that the stumps be cut sharp and straight across, so that the cut stumps can be treated with herbicide.



Treat cut stumps with a 20% solution of glyphosate (“Roundup”). The concentration given here is percent of the active ingredient. Concentrated glyphosate, such as Roundup Ultra, is around 40% out of the bottle, so that a 20% solution can be made by mixing equal parts of glyphosate and water. If a spray bottle is used, place the tip of the spray bottle onto each cut stump, press gently to bring up several drops of solution, and spread them around the entire cut stump with the tip of the bottle.

As with buckthorn, honeysuckle can be cut at any time of the year. Winter is an excellent time to cut, and glyphosate works quite well then. Honeysuckle is very persistent, and will re-sprout readily if not treated with herbicide.

Garlic Mustard (*Allaria petiolata*):

Garlic mustard is a biennial plant that invades high-quality forests, woodlands, and disturbed areas. The plant forms low-lying rosettes in its first year that remain green throughout the winter. These rosettes resemble creeping-Charlie and violet and can be distinguished by their deep, abundant veins and rounded



First-year rosettes



Second-year plants w/ flowers

lobes along leaf edges (see next page). The second year, garlic mustard sends up flowering stalks that reach up to 4 feet tall.

Treatment over multiple years is important as the plant is very persistent and will crowd out native Wisconsin flowers in forest understories. Small stands of garlic mustard can be hand pulled, especially after a rain when the soil is moist. Plants must be immediately placed in plastic bags and removed from the site. Any flowering plants left on the ground can continue to ripen and drop seeds.

Larger stands of garlic mustard should be sprayed with a 2% solution of glyphosate herbicide. The spraying should be done in early spring or late fall when garlic mustard plants are green and native vegetation is dormant. Because garlic mustard produces a large bank of seeds that can remain in the soil for seven years, spraying or pulling must be repeated yearly for at least that long. Native species planting may be necessary if native plants do not readily return.



Garlic mustard leaf left, creeping-Charlie right. Both have kidney shape but differ in leaf veinination.



Violet leaf. Note shallow teeth and heart shape.

Canada Thistle (*Cirsium arvense*):

Canada thistle is a clone-forming perennial that thrives in disturbed areas. It generally produces basal leaves during the first year and flowering stems in the second year. Most seeds germinate quickly, within 8 to 10 days after flowers open, but can remain viable in soil for up to 20 years. Canada thistle can also spread vegetatively via horizontal roots. These roots can grow 10-12 feet from a plant's fibrous taproot in one year. Aerial shoots are sent up in 2 to 8 inch intervals along the horizontal roots.

Routine mowing or selective cutting can effectively reduce an infestation within 3 to 4 years. A scythe or other sharp tool should be used for selective cutting. The best time to cut is when the plants are in the early bud stage, prior to flowering and seed set, when food reserves are at their lowest point. Plants cut 8 days or more after flowers have opened must be removed from the site because seeds mature quickly.





For light to moderate infestations, repeated pulling, hand-cutting or mowing with a brush cutter can be effective. Plants should be pulled or cut at least three times during the growing season; for example, in June, August, and September. Dense infestations of Canada thistle on large sites can be controlled by mowing close to the ground when the plant is in full bloom or just before flowering. Control in this situation will take a few years. If seeds are ripe, cut flower heads must be removed from the site immediately to avoid further seed dispersal.

Healthy dense prairie vegetation can outcompete and successfully control Canada thistle. Therefore, the best defense is to encourage the development of native communities and treat Canada thistle early after it has established.

Sweet Clover (*Melilotus alba*, *Melilotus officinales*):

Sweet clovers (including white and yellow sweet clover) are aggressive biennial plants that degrade native grasslands by overtopping and shading native sun-loving species. They are members of the legume family and can fix nitrogen. After germination in late spring or summer, the plants put their energy into developing a healthy root system. First-year plants are strictly vegetative, and appear in late summer as a small, branched stem with clover-like leaves. In the second year, plants appear bushy and may be seen in late April or early May. By that time, individuals have a strong taproot and a root crown from which new shoots appear. Plant height is dependent on root development and growing conditions; healthier plants are taller (three to five feet). Sweet clovers flower from late May through September, set seed, and die. Both species produce small, hardy seeds that remain viable in the soil for as long as thirty years.



White sweet clover

Fire typically encourages the growth and spread of sweet clovers by scarring seeds and stimulating germination. However, on grasslands managed with prescribed burning, it is possible to greatly reduce sweet clover by burning two years in a row. Burning should be done early during the first year (before green-up – usually in early to mid-April) to stimulate germination. The burned area should then be checked in late summer for first year plants. If plants are found, another burn should be conducted the next year in early to mid May. If burning is conducted before the buds are developed, the plants will re-sprout. Heavily infested areas may need this burning sequence repeated after a few years. The fire may be of low intensity – just enough to touch the stems.



Yellow sweet clover

Damaged plants wither quickly if they are not completely destroyed by fire. For small patches or those areas not completely burned, a flame gun (torch) may be used when the vegetation is damp to avoid burning the surrounding prairie plants. Another burning strategy is to mow later in the summer, allow the cut plants to dry, and then burn. This can be stressful to the native vegetation, however, and should not be done annually.

Small infestations of sweet clover can be controlled by hand-pulling in late fall after first-year plant root-crown buds have developed, or in May or June before second-year plants flower. Pulling is easiest when the soil is wet. Plants can also be cut at ground level with brush loppers. If pulling is done too early, many plants may be missed, and those with succulent stems may break off and re-sprout. However, pulling must occur before seeds are set, or cut plants will have to be removed from the natural area. It is necessary to inspect the area a couple of times in summer for late flowering plants.

For very dense small patches, cutting with a power brush-cutter using a heavy duty saw blade is effective. The stand should be cut just before flowering and checked a week later for individuals missed or partly cut. Large stands may be mowed before flowering occurs.