William Radke, USFWS

Courtesy of Missouri Department of Conservation

CHAPTER 6. INVASIVE SPECIES AND WETLAND MANAGEMENT

"Noxious weeds are like a biological wildfire, raging beyond control."

– Max Peterson, USDA Forest Service (formerly).

More details on the biology and control of invasive species can be found in the Wisconsin DNR publication, WISCONSIN MANUAL OF CONTROL RECOMMENDATIONS FOR ECOLOGICALLY INVASIVE SPECIES (see Appendix A). The Invasive Plant Association of Wisconsin (IPAW) maintains a web site on invasive species at: www.uwex.edu/ces/ipaw/.

Plant diversity is an important goal of many wetland restoration projects and invasive plants are a serious threat to diversity. This chapter includes ideas for planning your site restoration to address invasive plants. It also touches upon specific control and management recommendations for the most common invasive plants: reed canary grass, purple loosestrife, giant (or common) reed, and glossy and common buckthorn.

The cumulative loss of habitat from invasive species cannot be overstated. Besides the most common wetland invaders mentioned above, other invasive plants beginning to spread into various regions in the state include cut-leaved teasel (*Dipsacus laciniatus*), Japanese knotweed (*Polygonum cuspidatum*), and European alder (*Alnus glutinosa*). These and other species may present greater problems in the future.

Planning for Invasive Species Control

To maintain or increase species diversity you will need to address the existing invasive species in your wetland and anticipate that others may colonize the site at a future time. During the mapping of your site (Chapter 3) it is important that you note the presence of invasive plant species. If they are

on your site, prepare plans to deal with them. If your project site adjoins invasive species on a neighboring property, it might be wise to contact your neighbor during planning. Perhaps you can jointly tackle the problem. Trying to control invasive species on your site that is already surrounded by invasive species on adjacent land, especially problem woody species (e.g., glossy buckthorn or box elder) is difficult. Areas on your site that flood need to be monitored yearly for seeds that will float in and re-invade from upstream colonies of invasive plants such as reed canary grass or purple loosestrife.

There is no better opportunity for invasive plants to establish themselves than on newly disturbed soil following construction and restoration. To avoid inadvertently bringing in invasive species, it is important that the tracks or tires of all excavator equipment be washed before entering your site. If there are invasive species in your construction area do not spread the excavated soils in a way that will contribute to the problem. Soils contaminated by invasive species belong in the bottom of a ditch or on adjacent upland cropland; do not leave them in a newly excavated wetland area.

Invasive plant control is difficult. Since sites vary, it is difficult to make general statements on how to set your particular site up for vegetation management. However, the best long-term technique for control of invasive species is to establish site circumstances where a desirable native plant community will outcompete the invaders. In order for this to be successful, it is important that you have a plan to take care of invasive plant species while they are still manageable. Aggressive treatment of small patches of invasive plants after restoration is extremely important. Careful attention to remnant native plants on site is equally important. Be sure to refer to Chapter 5 for seeding and planting considerations.

If you have a known invasive plant problem on your site (e.g., a meadow of reed canary grass) you need to plan in advance how you will control the plants during and after the restoration process. Maximum damage should be done to the existing invasive plants before and during construction. For example, you could use combinations of mowing, discing, burning, and herbiciding while the site is dry before construction begins. Construction equipment can be used to scrape monocultures of invasive plants or remove sediment layers that are harboring them. Finally, restoring hydrology to the site will further stress the invasive plants.

If you plan to actively manipulate water levels following construction, a control device must be incorporated into the design with enough height to flood the problem area. If you plan to burn following restoration, you may be able to better facilitate safe burning by adding some design features including burn units and fire breaks. Note prevailing wind directions, locations of hazards (i.e. roads, structures, and utility lines), and any other landscape features that might affect a burn. Think ahead about how to exit the site if a fire were to escape. Dry peat soils can ignite and burn under the surface causing extensive fires that are difficult to control. Check if this could be a problem on your site.

If mowing is part of your plan, determine how you will be able to access the area to be mowed and what kind of equipment can enter the site after


DNR Archive

construction. Widespread use of herbicides after construction could be counter-productive if you are trying to establish a desirable plant community from a remnant seed bank. You may want to apply herbicides very selectively, so we encourage you to plan where and how herbicide will be applied.

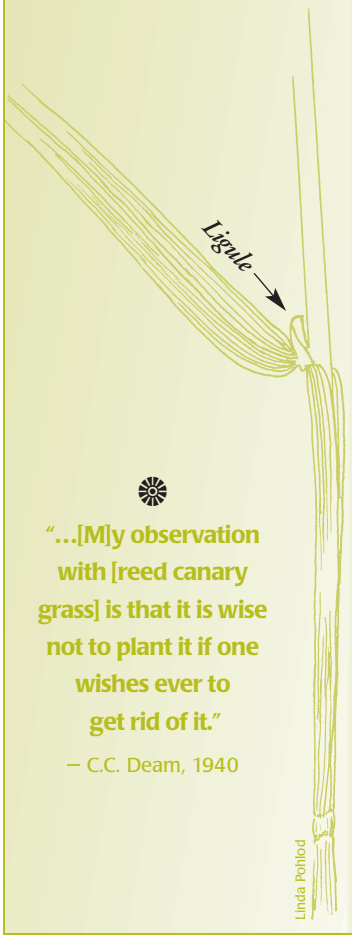
Plantings, if used, should be planned in advance. Please see the recommendations in this chapter dealing with problem invasive species and refer to Chapter 5 for more assistance.

As mentioned earlier, you should design adequate upland buffers to protect your restored wetland from stormwater or agricultural runoff. You may also want to incorporate features for pre-treating water coming onto the site. These design elements should be addressed during the restoration planning process, as nutrients and chemicals will exacerbate a problem with invasive species. Ideally you should integrate upland buffer and wetland areas management into your entire site plan. Take a map of your site and outline areas that you anticipate managing and write down the techniques you may use. Include this management plan with your permit applications to gain approval for these activities.

Current Recommendations for Control of Specific Invasive Plants

Reed Canary Grass (*Phalaris arundinacea*)

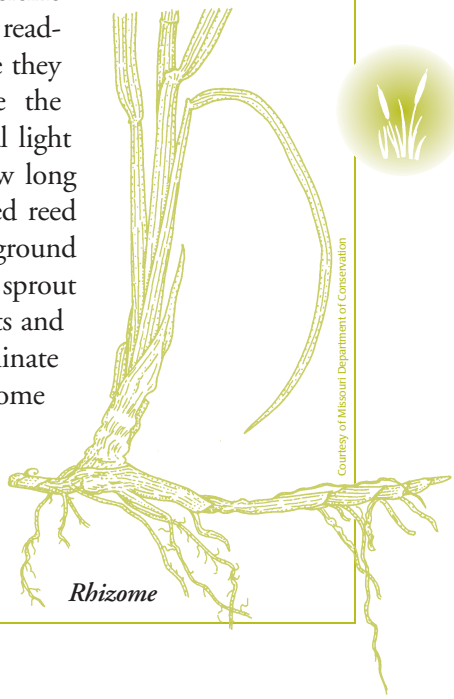
Reed canary grass can grow up to 6 feet tall and is common in farmed and urban wetlands and waterways. The grass has abundant leaves along hollow stems. If you gently pull the leaf away from the stem you will see a distinctive white membrane on the leaf called a "ligule" at the junction of the stem and leaf. In Wisconsin, the plant produces an open flowering head above the leafy canopy in June and sets seed by early July. The flowering head, or "spike", eventually contracts into a straight or sickle shape. The species reproduces from seed quite readily, as seeds need only a week of wetting before they will germinate. Seeds germinate best where the nearby vegetation is low and allows substantial light penetration to the ground. It is unknown how long viable seeds persist in the soil. Once established reed canary grass expands readily through underground stems called "rhizomes". Rhizomes are able to sprout new plants where the canopy is open. The roots and rhizomes of reed canary grass are dense and dominate the soil below the surface. Stems and rhizome growth increases when nutrients are abundant. Reed canary grass is a "cool season" grass and has a long growing season. It is one of the first plants to green up in spring and the last to die back each fall.



Linda Pohlod

"…[M]y observation with [reed canary grass] is that it is wise not to plant it if one wishes ever to get rid of it."

– C.C. Deam, 1940

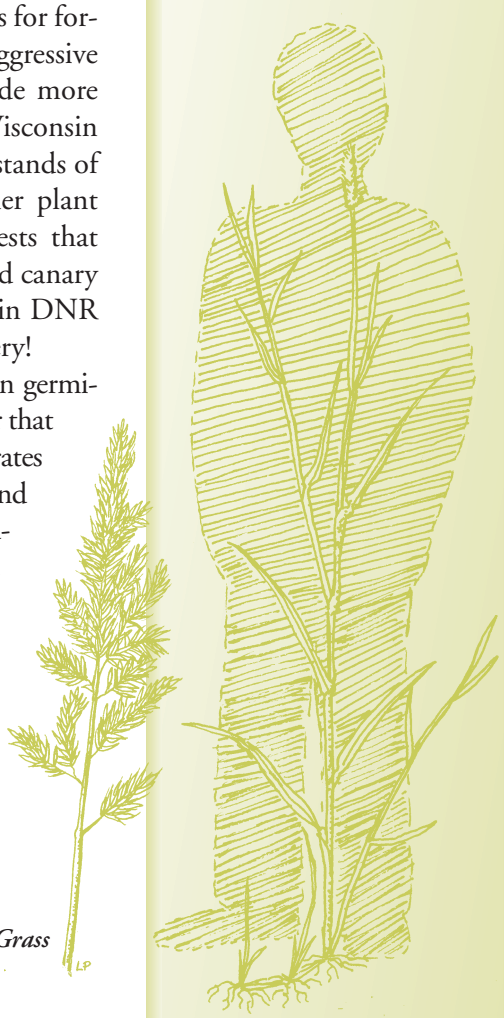


Courtesy of Missouri Department of Conservation

Beginning in the 1800s, farmers intentionally planted European and cultivated strains of reed canary grass throughout the United States for forage. To date, some agencies still encourage the planting of this aggressive grass. Additional cultivated strains are being produced to provide more nutritional forage for cattle. Today, many disturbed wetlands in Wisconsin support large monotypic stands of reed canary grass. These large stands of grass may entirely dominate vast acres to the exclusion of other plant species. This is especially becoming a problem in lowland forests that result in reduced tree regeneration. Large monotypic stands of reed canary grass have become so widespread in Wisconsin that the Wisconsin DNR is able to map its occurrence and abundance using satellite imagery!

Reed canary grass produces enormous quantities of seed that can germinate in disturbed soil, where the plant crowds out other vegetation, or that float downstream to colonize stream banks. Although the grass tolerates a wide variety of soils and moisture regimes, including drought and standing water, it can be set back or killed with at least 1 foot of standing water or through repetitive flooding for a duration of 3-6 months. Reed canary grass is intolerant of dense shade and can be shaded out by trees and shrubs. While a number of control techniques have been attempted, there is no simple solution for eliminating the species.

Before you attempt to control reed canary grass, you will need to assess the disturbances and impacts to your site (see Chapter 3). Large-scale problems including nutrient inputs, historic sedimentation, or drainage of the wetland may need to be addressed in conjunction with reed canary grass control and subsequent replacement by native species.



Reed Canary Grass

Reed Canary Grass Control

Controlling reed canary grass involves using a variety of techniques continuously over a number of years. Techniques vary depending on the size of the stand and the adjacent or underlying plant community that could compete with reed canary grass. Control of nutrients and sediment entering the wetland is very important. The best time to eradicate reed canary grass is before it takes over the site. Unfortunately this time has already passed for most wetlands. The best way to control reed canary grass is to combine several techniques that significantly and repeatedly stress the plant. For example, you could combine burning and spraying, mowing and spraying, or scraping away the root zone and flooding.

Although many ideas are presented below, there is no sure cure known at this time. Repeated control efforts over several growing seasons may be necessary for reducing or eliminating reed canary grass infestations. Be persistent! Research and experimentation on control techniques are ongoing.

Alice Thompson

Situation 1: Reed canary grass is limited to small patches or mixed among high quality native vegetation.

Right, control method for small, isolated clumps of reed canary grass.

Herbicide Use. Application of 6% glyphosate (i.e. commercial products Roundup® or Rodeo®) can be used to reduce growth of reed canary grass. Keep in mind that this is a general herbicide (i.e. it kills all vegetation) and is recommended only for solid monotypic stands of reed canary grass. Rodeo® is formulated for use over water. The herbicide should be sprayed directly onto the grass. Care must be taken to avoid herbicide contact to adjacent vegetation. Recent research on the timing of herbicide application indicates that the maximum effect on the grass is late summer and fall (August and September). It is this time of year when the grass is sending sugars down to its roots and can carry the herbicide to the roots as well. Unfortunately this is when the grass is at its maximum height, making application difficult. Pairing a preliminary burn or mowing and then spraying herbicide on the re-sprouts may prove more effective that using a single control method.

Another herbicide application technique for killing isolated reed canary grass clumps is to tie stems together in mid to late summer, cut and bag the flower heads, and apply 33% glyphosate to the leaves of the remaining plants with a hand-held spray bottle or wick applicator found at garden stores. Tying the plant eases herbicide application and reduces the impact to desirable plants nearby.

Vantage® and Poast® are reportedly grass specific herbicides that do not kill non-grass plants. One study of Vantage® use on reed canary grass indicated that sedges were not killed. Vantage® is being researched to selectively control reed canary grass; however, Vantage® cannot be used over standing water. Consequently this herbicide would be most useful in summer when many wetland sites are dry.

Read the instructions carefully on any herbicide that you intend to use to ensure proper application. Be careful that the spray does not come in contact with water or areas with native vegetation. Keep in mind that some herbicides require a permit for application.

Reed canary grass in bloom.

Alice Thompson

Controlled Burning. A late summer or early to mid-fall burn increases the potential for frost damage to the plants, which discourages growth. You may want to repeat summer burning each year or as the amount of burnable vegetation allows. Early spring burns may initially stimulate growth (by reducing litter and increasing the amount of light that reaches new sprouts), but spring burning might have some value over the long term if repeated annually or combined with

late summer herbicide application and mowing. A late spring burn may slow plant growth and the setting of seed for that season. Burning can work as the exclusive control technique where continued disturbances (including nutrient additions) are at a minimum and where there is a significant native plant community that can re-establish itself and outcompete reed canary grass for light and resources. Be aware that burning and the resulting increase of sunlight to the ground can stimulate the germination of any reed canary grass seeds that are present.

Planting Shrubs and Trees. Reed canary grass cannot form dense monoculture stands in wetlands that have an abundant cover of trees or shrubs. Only when forested wetlands are cut for timber or farming can large open stands of reed canary grass become dominant. Tree and shrub seedlings grow very slowly under a canopy of reed canary grass and are unable to re-populate the site. Planting of trees or shrubs to control reed canary grass is a possible long-term solution in areas of the state where wetlands were originally forested. Trees native to wetlands such as tamarack, white cedar, green ash, and American elm have been planted into very small stands of reed canary grass with some success. After several years of management by cutting the reed canary grass around saplings to allow light penetration, trees will often grow well. Do not undertake a larger planting than you can manage or maintain. Large scale planting of trees is discussed in detail further below.

Alice Thompson

Planting shrubs in a reed canary grass meadow.

Situation 2: Reed canary grass has become a monoculture.

Cutting or Mowing. Mowing reed canary grass will lower seed production but can stimulate a denser regrowth of stems. Used alone, mowing has questionable results, but can be useful in combination with other methods.

Mowing prior to herbicide treatment to stress the plant and shorten the sprouts to a manageable height is useful. This can reduce the amount of herbicide needed and allows better herbicide contact with the whole plant. Mowing before flooding can be another useful paired technique. Allowing mowed reed canary grass to dry and then burning the mown areas in mid-summer can produce a hotter fire that may damage the roots and the unwanted seed bank.

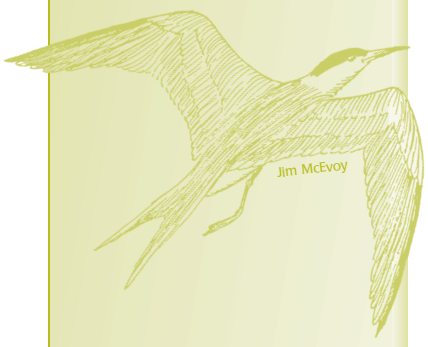
Controlled burn of a reed canary grass meadow after herbicide application.

Herbicide Use. It can be beneficial to use burning or mowing to reduce the litter and height of the grass prior to herbicide application. Apply 6% glyphosate to re-sprouting reed canary grass that is at least 6 inches tall. Current research indicates that mid-summer appears to be the most effective time to apply herbicide. Consider repeated applications of herbicide treatment over several years, and pair herbicide use with other control techniques.

Alice Thompson

Another technique is to apply herbicide in summer, disc the roots in the fall or spring, and apply a second herbicide application to the re-sprouts. Even after there is a native plant response, it will be necessary to continue to control reed canary grass. Consider using Vantage® or Poast®, both of which are grass-specific herbicides that purportedly do not harm sedges and other desirable native plants on sites with no standing water.

Discing. Using a disc to cultivate the sod as the grass comes into flower will stress the plants at a time when nutrient reserves in their roots are at a low level. Discing breaks up the dense root/rhizome mat and may allow other seeds physical space to germinate. If the seed bank only contains reed canary grass, however, the light will stimulate reed canary grass germination and disced plant fragments may re-sprout. As discussed earlier, discing may be most useful paired with other control techniques. For example, discing after herbicide treatment and followed by further herbicide application to re-sprouts has proven effective on some sites.



Flooding. You can use high water as a control tool where reed canary grass is the dominant species and where native plants are few and expendable. Cut or burn the site prior to flooding. Increase the amount of water on the site with the use of a temporary water control device to allow accumulation of 8-18 inches of water for a minimum of three months during the growing season. Drain the site, burn or cut again in the fall or spring, submerge again during the next growing season and then drain. Stressed reed canary grass will begin to clump. It may take several seasons to impact the reed canary grass. The site will eventually contain interspersed patches of native vegetation and open water. Once the reed canary grass has been eliminated or significantly reduced, regular restoration practices can commence.


Jeff Nania


Art Kitchen

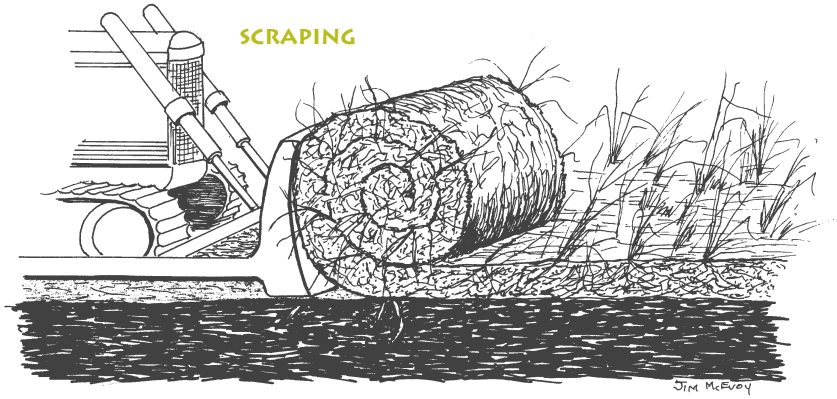
Top, water control structure used to flood reed canary grass meadow.

Bottom, reed canary grass is stressed and clumping under inundation; post restoration.

Excavating. When mechanically removing reed canary grass sod with a bulldozer you should scrape approximately 6-12 inches of sod in order to include the extensive rhizomes. This is sometimes a useful technique for eliminating a monoculture of reed canary grass. The reed canary sod can be "rolled up" and deposited into a ditch where the plants will drown. Even though this may not completely eliminate the invasive species, at least the reed canary grass propagules (seeds and rhizomes) will be depleted. If the site has upland sediment over original wetland soils, try to remove the sediment to expose the original wetland soil layer, thereby uncovering any residual seed bank of native plants. This technique has had success in southern Wisconsin where a wide diversity of native species re-established themselves once reed canary grass was mechanically removed from the original hydric soils (see Case Study #2 in Chapter 13).

Original wetland (darker) soils revealed under sediment.

Art Kitchen



Scraping is a useful technique for eliminating reed canary grass sod.

Planting Native Seeds or Live Plants. You may want to investigate the seed bank (reservoir of viable, ungerminated seeds in the soil) on your site before you begin management of reed canary grass. Instructions on how to do a seed bank study are found in Chapter 5. If you have few native seeds on site, then you need to introduce native seed or plants so they can get a head start in occupying the site and compete with reed canary grass, which will likely re-colonize the site if a native plant population is not well established. To determine appropriate native species to introduce to the site, visit the more diverse wetlands in your area that have similar soil and water conditions, or look at any remnant patches of native wetland vegetation on your site. Discuss your site with a local Wisconsin native plant nursery. Some plants that appear to compete with reed canary grass include native wetland grasses such as prairie cord grass (*Spartina pectinata*), rice cut grass (*Leersia oryzoides*), Canada blue-joint grass

The Department of Natural Resources maintains A CURRENT LIST OF NATIVE PLANT NURSERIES around the state. You may contact the DNR for a copy.

www.dnr.wi.gov/org/land/er/invasive/info/nurseries.htm

Native Plant Conservation Program Manager
Bureau of Endangered Resources
P.O. Box 7921
101 S. Webster Street
Madison, WI 53707
(608) 267-5066

The WWA "WETLAND RESOURCE DIRECTORY" available on the WWA web site lists many native plant nurseries and private consultants in Wisconsin and the region.

(*Calamagrostis canadensis*), and fowl manna grass (*Glyceria striata).* Any *Glyceria* spp. may be useful in areas with low light. In wet situations consider planting lake sedge (*Carex lacustris*), wool-grass (*Scirpus cyperinus*), river bulrush (*Scirpus fluviatilis*), and soft-stem bulrush (*Scirpus validus*).

Prairie grasses planted on the upland edge of a reed canary grass patch are also very competitive over time. One strategy is to prepare a mixture of seed that can tolerate a wide range of water conditions. Spread the seed over the site where you have bare ground and let the plants establish themselves wherever they will do best. Current research suggests that dense stands of species-rich vegetation are more resistant to invasion by reed canary grass than stands of low species diversity with open canopies that allow light penetration. Most undisturbed wetlands are very rich in the number of plant species they contain. You should attempt to plant seeds of a large diversity of native species to simulate what might have once been found on the site. A variety of plants will attract more diverse wildlife.

White oak in spring.

Alice Thompson

Planting Trees or Shrubs. As discussed earlier, a long-term management tool for the control of reed canary grass involves planting trees and shrubs native to wetlands on the site to shade out the grass. Common native trees and shrubs can be purchased from your county land management or Wisconsin DNR office. They are usually ordered in the winter for spring planting. This strategy is still experimental and the long-term results are uncertain. We do not recommend planting a large number of trees or shrubs without planning for their management. Without management small saplings will wither under the dense shade and impenetrable root zone of reed canary grass. In addition, reed canary grass provides habitat for small mammals that may girdle planted trees. Even with the best intentions to manage your site, randomly planted tree saplings may be impossible to locate unless they are somehow tagged or marked. If you do decide to plant trees, they should be planted in pre-treated reed canary grass, using a combination of herbicide application, mowing, discing, or burning as previously described. State foresters recommend planting trees in rows so herbicide or mowing treatments can be performed between the rows. Plan the width of the rows to accommodate the width of your equipment. Randomly spaced trees look more natural, but time and resources will be invested best if the trees can be managed until they are well established. Only after trees emerge above the reed canary grass canopy can you selectively thin individuals to achieve a less patterned distribution. Furthermore, once reed canary grass has been controlled and there is a shady canopy, additional native shade-tolerant herbaceous plants can be seeded or planted under the trees or shrubs.

Purple Loosestrife (*Lythrum salicaria*)

Purple loosestrife arrived from Europe in the early 1800s as an imported garden perennial. It also inadvertently arrived as seeds carried in the ballast water of ships. The species has spread to all 50 states and is replacing native wetland vegetation in some areas. Purple loosestrife is an erect plant from 3 to 9 feet tall with characteristic four to six-sided stems that die back each year. The leaves are paired opposites that hug the stem. The bright purple flower spikes are visible from July to September. A mature purple loosestrife plant can produce anywhere from 100,000 to 2,500,000 seeds annually. The plant invades marshes, stream margins, alluvial flood plains, sedge meadows, and wet prairies. Once established in a wetland purple loosestrife may outcompete and often displace native vegetation. Although attractive, it is little used by wildlife.

Several methods can be used to remove purple loosestrife from your site. If there are relatively few small plants in loose soils, they can be pulled by hand before they set seed. The removal of the entire plant is important. Dispose of the plants by bagging them and sending them to a landfill, or dry and burn them in an upland area so that the seeds will not ripen and spread. If purple loosestrife is cut and then completely submerged for one year, the plants will die. Be careful not to inadvertently kill desirable native plants!

Herbicides can be effective against purple loosestrife if they are applied to the leaves in mid-summer before the plants flower. Spraying the leaves with glyphosate (e.g., Rodeo®) should only be attempted if there is a dense stand of purple loosestrife and few native plants nearby that could be killed by the herbicide. A weak solution of 1% glyphosate applied to 25% of the leaf surface has been demonstrated to kill purple loosestrife. Another control method is to cut the plant stems low (knee high) and apply glyphosate herbicide to the cut stems with a drip bottle. The plant tops should be placed in a plastic bag and carried off site. It is important to cut the stems before flowering or early in the flowering season as late flowers may have mature seed. Herbicides applied to stems should contain 20%-40% active ingredient. You will need to apply for a permit to use herbicides over water. Contact your Wisconsin DNR aquatic plant management coordinator for more details.

If your site has large stands of purple loosestrife that cannot be controlled by the methods described above you may want to consider biological control. Several insects native to Europe that feed on purple loosestrife are being released to control this exotic plant species. Two small beetles, *Galerucella calmariensis* and *Galerucella pusilla*, eat purple loosestrife leaves exclusively and have been the most successful control insects. In Europe it is difficult to find large healthy robust stands of purple loosestrife because of persistent insect damage by these beetles and other insects. The ecology and feeding preferences of *Galerucella calmariensis* and *Galerucella pusilla* have been extensively researched to make sure that other native and agricultural plants are not damaged by their release.

Daniel Q. Thompson

Purple loosestrife in bloom.

For details about the PURPLE LOOSESTRIFE BIOLOGICAL CONTROL PROGRAM, access the Wisconsin DNR's web site at:

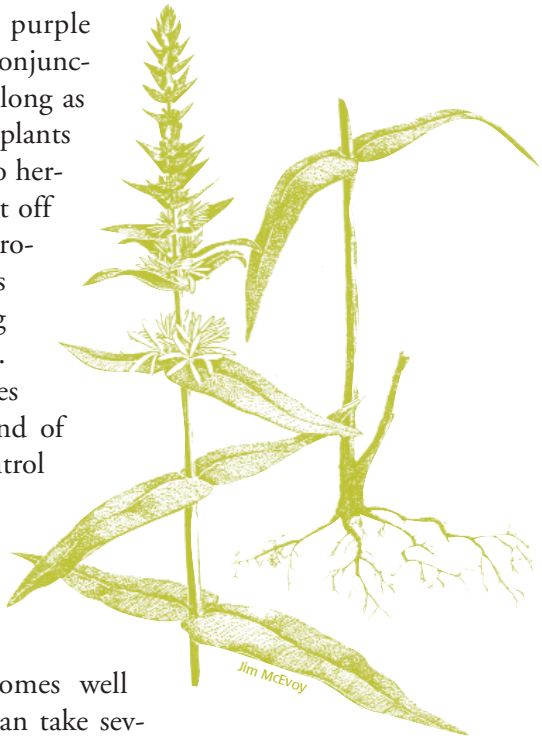
www.dnr.wi.gov/org/land/er/invasive/factsheets/loose.htm

For further information about the program, call your Wisconsin DNR regional aquatic plant manager or contact Brock Woods, the state biological control coordinator, at:

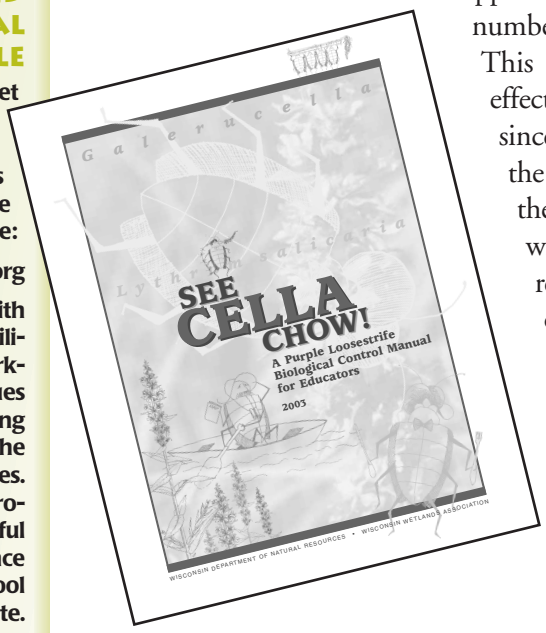
Brock.Woods@dnr.state.wi.us or at:

Wisconsin DNR
Biological Control Program
1350 Femrite Drive
Monona, WI 53716
(608) 221-6349

Biological control of purple loosestrife may be used in conjunction with other methods as long as the introduced insects have plants to eat and are not exposed to herbicide. One strategy is to cut off the flowers to prevent seed production, but allow the leaves to remain for the developing beetle population to feed on. You can also introduce beetles at the center of a large stand of purple loosestrife and control the plants at the periphery by using other methods to avoid further spread. Using beetles for control can become self-sustaining as the insect population becomes well established. However, this can take several years and may require multiple releases. Keep in mind that some sites with summer flooding may be unsuitable for beetles.


Jim McEvoy

You can establish a local population of *Galerucella calmariensis* or *Galerucella pusilla* by raising your own beetles from propagation stock for $200 or less. To raise beetles you can receive instructions, netting (free if you agree to rear beetles for 3 years or more), and "starter beetles" ($25.00) from the Wisconsin DNR. The rest of the cost is for purchasing supplies. If you start with 100 beetles in early spring you can expect to release up to 10,000 beetles in June or July. If you are unable to raise your own beetles—for example, if you do not have a convenient place to keep the beetle rearing apparatus—then you can purchase a large number of beetles for immediate release. This is a very expensive and likely less effective than raising your own beetles, since it is best if the beetles are adapted to the local environment. Please note that the release of these exotic beetles comes with a small risk since research is currently on-going and all possible outcomes have not been tested. Nonetheless, the risk of a future problem with the release insects is considered very small relative to the risk of further damage to Wisconsin's wetlands by invasion with purple loosestrife.



Wisconsin Wetlands Association coordinated a region-wide purple loosestrife volunteer survey for coastal counties of Wisconsin in 2002 with a grant from the Wisconsin Coastal Management Program. The data on over 600 loosestrife infestations from this preliminary survey have been entered into a statewide database and map of the distribution of the species. The survey was continued and expanded to many other counties in 2003. The **PURPLE LOOSESTRIFE DATABASE** is maintained by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC).

Access their web site and loosestrife distribution information at:

www.glifwc-maps.org

In conjunction with the state purple loosestrife biological control coordinator and a group of educators from throughout the state, Wisconsin Wetlands Association has produced a set of **TEACHER ACTIVITIES ON WETLANDS AND THE BIOLOGICAL CONTROL OF PURPLE LOOSESTRIFE** that meet Wisconsin teaching standards for science and environmental education. This manual of activities can be viewed at the WWA web site:

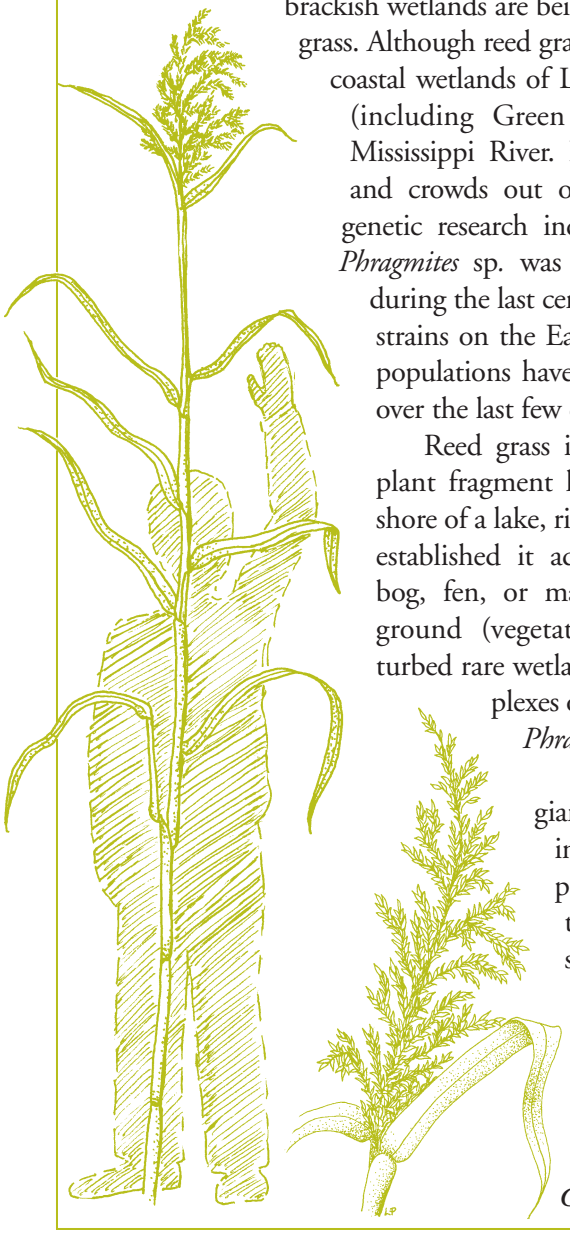
www.wiscwetlands.org

WWA is collaborating with the Wisconsin DNR to facilitate teacher training workshops on the techniques of rearing and releasing *Galerucella* beetles and the use of the teacher activities. The biological control program provides a wonderful hands-on learning experience for middle and high school students around the state.

Giant or Common Reed Grass (*Phragmites australis*)

Common reed grass (*Phragmites australis*) is the tallest wetland grass in Wisconsin. The grass can grow upwards of 14 feet, towering over all other wetland vegetation. It is a warm season grass with a round stem, long, wide leaves, and a prominent plume-like seed head that is whitish to purplish in color. The grass is tolerant of salt (i.e. brackish conditions) and thrives in roadside ditches. Since only a small percentage of the seed it produces is fertile, common reed grass spreads mostly by its rhizomes (underground stems).

In Europe this grass has a long history of being used as material for thatching roofs. In fact, some Europeans are concerned that historic reed beds are declining. Reed grass is found in marshes, wet shores, ditches and swales, tamarack bogs, and is reported in open water up to 6 feet deep. Some North Americans are concerned that many rare native plants in freshwater and brackish wetlands are being outcompeted by stands of reed grass. Although reed grass is a native species, it is invading coastal wetlands of Lake Superior and Lake Michigan (including Green Bay), and floodplains of the Mississippi River. It frequently forms dense stands and crowds out other plant communities. Recent genetic research indicates that a Eurasian strain of *Phragmites* sp. was introduced into North America during the last century and has swamped out native strains on the East Coast the Midwest. Aggressive populations have only been noticed in Wisconsin over the last few decades.



Giant Reed Grass

Reed grass is able to establish itself when a plant fragment lands in available habitat on the shore of a lake, river, or wetland. Once reed grass is established it advances quickly into adjourning bog, fen, or marsh habitat through its underground (vegetative) rhizomes. Pristine, undisturbed rare wetlands such as ridge and swale complexes or fens are currently threatened by *Phragmites* invasion.

Early and effective control of giant reed grass is necessary before an invading patch becomes a serious problem. Rather than inhibiting this grass, prescribed burns in the spring or fall will actually *encourage* its growth. However, burning in summer (mid-June to August) when the soil is dry can damage the rhizomes. Reed grass appears to be more vulnerable to

Top,* Phragmites *invading a Door County sedge meadow from roadside ditch.

Middle,* Phragmites *used for thatch in Europe.

Bottom,* Phragmites *invading a fen with orchids.

Alice Thompson

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Steve Eggers

burning at this time because the plant is sending carbohydrates (sugars) to the rhizomes. A mid-summer burn may trigger the plant to sprout from buds that would normally overwinter in an unburned stand. These young shoots are then susceptible to frost kill the following winter.

Herbicide control with Rodeo®, a glyphosate herbicide, has had some success. However, Rodeo® is not specific to reed grass and a broad application of this herbicide can also kill the vegetation you are trying to protect. Other grass specific herbicides have not been tested but may be suitable in non-aquatic situations. Application is recommended when plants are at mid- to full bloom from late July through October. In a calcareous fen in Minnesota, a prescribed burn followed by hand-wicking Rodeo® on the re-sprouting shoots achieved 99% control in the first 2 years and 70% control after 4 years. The Nature Conservancy in Massachusetts reports cutting reed grass and individually spraying Rodeo® (at 20-30% strength) into each cut stem with a hand held squirt bottle avoiding adjacent native plants. This may be a time consuming method but can be useful for small or localized reed grass infestations in a high quality wetland.

Common Buckthorn

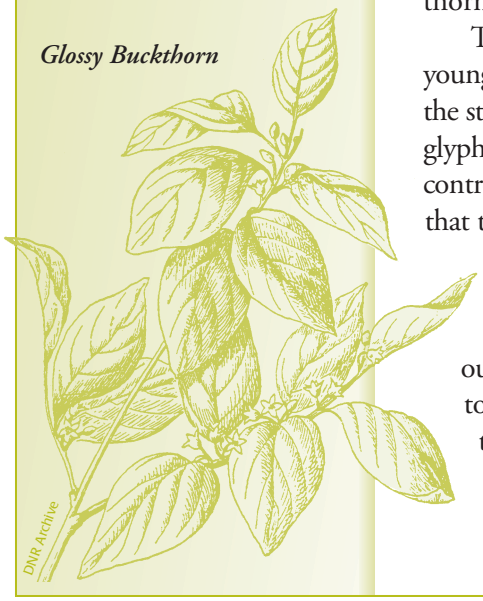
Courtesy of Missouri Department of Conservation

Glossy Buckthorn (*Rhamnus frangula*) and Common Buckthorn (*Rhamnus cathartica*)

Glossy buckthorn is a small tree or tall shrub native to European wetlands. Currently it is invading wetlands in Wisconsin and consequently shading out native vegetation. Common buckthorn is a related upland species that can invade disturbed wetlands, particularly along the drier borders. While common buckthorn has long thorns on the ends of the twigs, glossy buckthorn has no thorns.

Both species are spread when birds or other animals eat the berries and disperse the seeds in their droppings. Wetlands are susceptible to invasion by glossy buckthorn regardless of how disturbed they are. This aggressive shrub can invade virtually any type of wetland including bog, fen, sedge meadow, and swamp forest. Ironically, the only wetlands that glossy buckthorn cannot readily invade are wetlands dominated by reed canary grass!

Glossy Buckthorn



DNR Archive

The best method of control for *Rhamnus* spp. is to physically pull out young seedlings. If the seedling has become too large to pull you should cut the stem close to the ground and paint the cut surface with a solution of 50% glyphosate herbicide. The herbicide must be applied immediately; chemical control is ineffective if you wait more than a few hours for treatment. Be aware that the shrub will re-sprout vigorously if cut and left untreated.

A good time to locate and treat the shrubs is in the fall, as the species holds its leaves longer than most native wetland trees and shrubs. Another time to control buckthorn is in spring, as the shrub leafs out earlier than native shrubs. If you have a large infestation, give priority to treating the largest fruit-producing trees first. Then focus on mid-sized trees, and finally seedlings. If possible, cut and remove the fruit-bearing trees to an off site location. Keep in mind that once *Rhamnus* spp. invades, only routine ongoing removal will keep these species in check.

CATTAILS AND DISTURBANCE

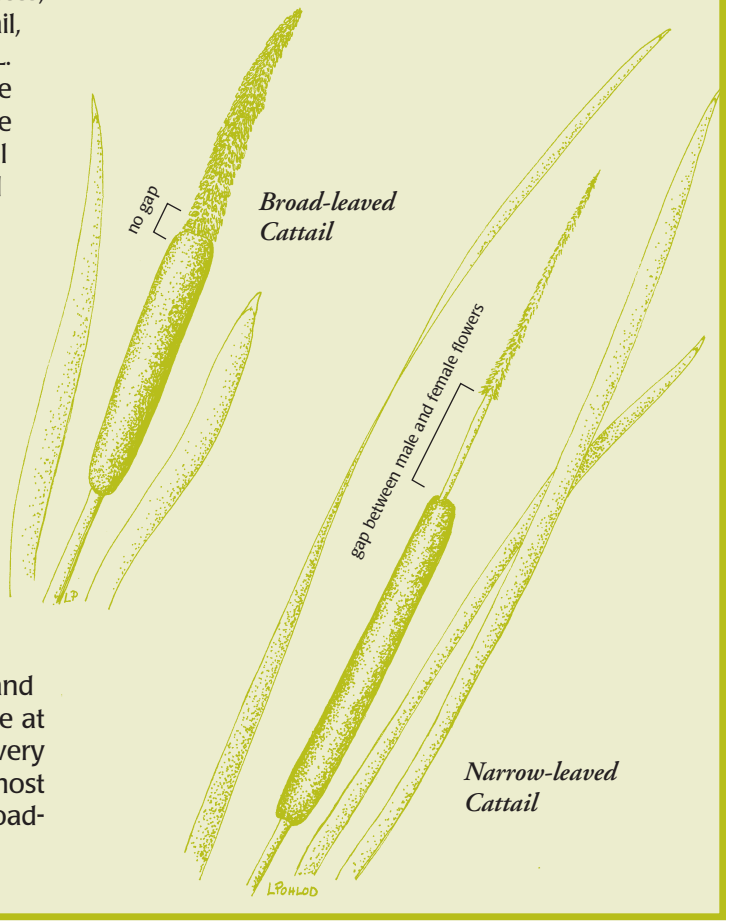
By S. Galen Smith, Professor Emeritus
Department of Biology, University of Wisconsin-Whitewater

Cattails are well known, characteristic wetland plants found throughout most of the world. Species found in Wisconsin are broad-leaved cattail, (*Typha latifolia)* and narrow-leaved cattail, (*T. angustifolia).* Although common, cattails in a wetland may indicate a disturbance problem.

In recent decades many naturalists in Wisconsin and other parts of North America have become alarmed to find species-rich natural plant communities replaced by nearly pure stands of cattails. In Wisconsin the concern is mainly with narrow-leaved cattail and "hybrid cattail," a cross of narrow- and broad-leaved cattail (*T.* × *glauca*) which have been markedly increasing in range and abundance. Broad-leaved cattail is native to North America, where it is ecologically important in many nutrient-rich marshes, sedge meadows, fens, springy places, and shores. In contrast, narrow-leaved cattail, according to data gathered by Ronald L. Stuckey and D. P. Salamon at Ohio State University, may have been introduced to the Atlantic Coast of North America in colonial times and has been migrating westward ever since.

The spread of narrow-leaved cattail in recent years, especially since World War II, may be partly due to increased eutrophication, or nutrient enrichment, of wetlands and increased use of road salt. Narrow-leaved cattail is especially abundant in slightly saline places such as near tidewater along the Atlantic Coast, and in eutrophic places such as rich agricultural lands. It is absent or rare in nutrient-poor habitats such as bogs and in regions with mineral-poor geological substrates. Where it becomes established in sedge meadows and fens in southeastern Wisconsin, for example at Lulu Lake in Walworth Co., it often forms very dense stands that appear to exclude most native species. In contrast, our native broad-leaved cattail forms less dense stands.

The main ecological effect of narrow-leaved cattail in North America, however, may be through hybridization with broad-leaved cattail to form the sterile "hybrid" cattail. This hybrid is remarkably successful ecologically because it spreads by means of rhizomes to form very large clones. It often out-competes the parent species, especially in eutrophic, disturbed habitats with unstable water levels. In Wisconsin, "hybrid" cattail now dominates many wetlands; two notable examples are large areas of the Horicon Marsh and the Yahara River marshes along the Highway 12 & 18 Beltline southeast of Madison. It has also invaded and seriously reduced the biodiversity of numerous prairie pothole wetlands. Further research is badly needed to document the effects of the spread of the narrow-leaved and hybrid cattails.



Managing Your Restored Wetland

Using Fire

Natural and human-caused fires influenced wetlands historically associated with the prairie/oak savanna ecosystem. Prairie fires also swept through sedge meadows and low prairies, often killing or setting back the encroaching shrubs and trees. Wetland systems today can benefit from prescribed burns that remove thatch and expose the soil to light. This allows sedges and forbs to germinate. However, not all wetland systems depend upon fire, especially those in the northern part of the state. For example, tamarack trees are very sensitive and will not survive a burn.

Do not attempt a controlled burn without experienced assistance! Small, controlled fires can quickly rage out of control, causing extensive damage. Dry peat soils can ignite during a controlled burn, swiftly burrowing underground and burning uncontrolled for weeks or more. Always, without exception when using fire, err on the side of caution. Check with your local Wisconsin DNR warden for information on burning permits and be sure to discuss the burn with your local fire department. Further information on managing wetlands with controlled burns is referenced in Appendix A.

Mowing/Removing Brush

In situations where burning is not an option, mowing or brush removal can be just as effective in controlling encroaching brush on an open wetland. When the ground is frozen, mow vegetation about 6 to 8 inches tall in order to effectively remove brush without damaging the dormant vegetation. Do not mow during the nesting season!

Attracting Wildlife

Wildlife will be attracted to wetlands managed with the techniques mentioned earlier, including invasive plant control, buffer zones planted with native species, and doing prescribed burns where appropriate. If installed properly, nest boxes with predator guards can increase nesting success. Bird species that nest in cavities include: wood ducks, hooded mergansers, blue birds, tree swallows, house wrens, prothonotary warblers, and screech owls. In general, the best way to attract wildlife is to restore the landscape as closely as possible to how it existed prior to human interference. A diversity of habitats and plant species will attract more diverse wildlife to your wetland.

Alice Thompson

Art Kitchen

Top, wetlands may need an occasional controlled burn to discourage invasion by shrubs and invasive species.

Bottom, wetland with vegetated buffer.

Ongoing Management . . .

Ongoing adaptive management may be critical to reaching your project goal. Although you should plan for a self-sustaining wetland, management practices exist that will enhance your project. We caution against planning management projects that are unrealistic or unachievable. Prioritize the activities and start with those that add the greatest value to wetland habitat and species diversity.

Prescribed burns, brush control, tree plantings, berm or plug repair, maintenance of upland buffer areas, and controlling invasive plants are all important management activities but will vary in importance depending on your site. You can spend a lot of time building nesting platforms and boxes, but the most worthwhile activities should focus on providing wildlife habitat by establishing varied native vegetation. Many publications, agencies and organizations can help you achieve your management objectives; a few of these are listed in Appendix A.